



RFP No. RT210089ZC

**TRI-COUNTY METROPOLITAN TRANSPORTATION
DISTRICT OF OREGON
REQUEST FOR PROPOSALS
FOR
NEXT-GEN TRANSIT SIGNAL PRIORITY**

1. The Tri-County Metropolitan Transportation District of Oregon (TriMet) invites sealed proposals for Next-Gen Transit Signal Priority, as described in this RFP.
2. TriMet will receive sealed Proposals from interested firms through its eProcurement System (TriP\$). Proposals must be submitted to TriMet through TriP\$ no later than **January 29, 2021 at 11:30 AM**. Proposals will not be publicly opened.
3. **A pre-proposal conference will be held on December 15, 2020 from 8:30 a.m. to 9:30 a.m., PST via an online conference call.** WebEx information will be provided upon receipt of RSVP. Interested proposers are strongly encouraged to attend.
4. Proposers wishing to attend the pre-proposal conference must RSVP to Zach Cooper via email: cooperz@trimet.org by 3:00 P.M. on December 14, 2020. Attendees calling in should do so no more than 5 minutes prior to the meetings start. Proposers must be registered on TriP\$ at:

<https://solutions.scquest.com/apps/Router/SupplierLogin?CustOrg=TriMet>

In the event solicitation addenda are issued, only registered Proposers will be notified of the availability of addenda for download. **Acknowledgement of addenda will be required.**

5. All questions regarding this procurement must be directed to Zach Cooper, Contracts Manager, via email at cooperz@trimet.org.

By: Zach Cooper

Issue Date: **December 7, 2020**

Contracts Manager

Procurement & Contracts Department

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SECTION 1 – PROPOSAL FORMS, REQUIREMENTS, CONDITIONS, AND EVALUATION OF PROPOSALS

SECTION 1.1 – PROPOSAL FORMS

1.1.1 Required Proposal Forms

The Proposer must complete and submit the Proposal Forms (Exhibit B); Proposal Price Form (Exhibit B1); and the Requirements Tracibility Matrix (Exhibit D). **All Proposal Forms, including the Proposal Price Form, must be submitted via upload into the Supplier Attachment section in TriP\$** (see Section 1.2.7 Submission of Proposals for additional details). Emailed Proposals, Proposal Forms, and/or Proposal Price Forms directly to TriMet's Contract Administrator are not allowed and will not be accepted. **Proposals, Proposal Forms, and/or Proposal Price Forms not uploaded into TriP\$ will be deemed non-responsive, and rejected.**

1.1.2 Proposal Price Form Instructions

Proposers must complete the Proposal Price Form, which is provided as Exhibit B1. The Proposal Price Form should provide costs at a high-level rather than at the subtask level.

1.1.3 Technical Compliance Matrix Form Instructions

Proposers must submit a completed Requirements Traceability Matrix (see Exhibit D). The submission should be in an Excel spreadsheet format indicating compliance with the Technical Requirements specified in this Request for Proposals. Proposers must indicate compliance with each system requirement as Fully Compliant (F), Complies With Intent (I) or Does Not Comply (N) as defined below. Proposers are not allowed to break out portions of the requirement to respond to individual parts of that requirement.

- A. **Fully Compliant** responses must not include comments, limitations, conditions, qualifications or explanations. Any Fully Compliant responses by the Proposer that are qualified by comments, explanations, limitations, etc. in the Compliance Matrix shall be considered non-compliant (Does Not Comply). Comment boxes shall not include other statements (e.g., N/A) if Proposer "fully complies." If Proposers are fully compliant with only part of the requirement, the correct response would be (I), or "Complies with Intent," and a detailed description shall be provided.
- B. **Complies With Intent** responses shall include an explanation in the Compliance Matrix to clearly describe how the Proposer's solution meets the functionality of the requirement(s), and may include limitations or qualifications explaining why the solution is not Fully Compliant. Proposers shall clearly indicate whether or not the solution is new development (and the extent of development required) or "off the shelf."
- C. **Does Not Comply** responses are not required to include comments in the Compliance Matrix, however proposers are encouraged to provide remarks. If Proposers do not comply with only part of the requirement, the correct response would be (I), or "Complies with Intent," and a detailed description shall be provided.

The Compliance Matrix must be signed by an authorized representative of the Proposer with authority to enter binding contracts on its behalf. Additionally, each page must be initialed by the authorized

representative. Proposal responses that are missing appropriate signatures and/or initials shall be considered unresponsive. TriMet reserves the right to request more information for all responses listed as Complies with Intent.

SECTION 1.2 – PROPOSAL REQUIREMENTS

1.2.1 Request for Proposals – RFP (08/16)

The Tri-County Metropolitan Transportation District of Oregon (hereinafter "TriMet") requests proposals for providing a cloud-based Transit Signal Priority System as described in Section 2 Scope of Work. This RFP sets forth the minimum requirements that all proposals shall meet. Failure to submit proposals in accordance with this RFP may render the proposal unacceptable. This RFP is issued by the Procurement & Contracts Department. All communications pertaining to this RFP shall be directed to TriMet, Procurement & Contracts Department Attn: Zach Cooper, Contracts Manager via email at cooperz@trimet.org.

TriMet reserves the right to analyze, examine, and interpret any proposal for a period of not more than ninety (90) days, commencing from the proposal due date and time. Proposals shall not be conditioned to allow for less than a ninety (90) day acceptance period.

1.2.2 Questions and Changes to the RFP (08/16)

TriMet reserves the right to make changes to the RFP. All changes to the RFP, prior to receipt of proposals shall be electronically posted to TriMet's Procurement System (TriP\$), which can be accessed at <https://solutions.scquest.com/apps/Router/SupplierLogin?CustOrg=TriMet>. Failure to acknowledge receipt of an addendum may cause a proposal to be rejected as non-responsive. Following receipt of proposals, any changes to TriMet's RFP will be conveyed in writing by TriMet to those Proposers determined to be in the competitive range.

Proposers may submit questions, request clarification, or request a change to the RFP by submitting a written request to Zach Cooper, Contracts Manager, cooperz@trimet.org. The request shall specify the provision of the RFP in question, and, if a change is requested, contain an explanation for the requested change. Requests must be submitted no later than **December 22, 2020 at 11:30 a.m. PST**.

TriMet shall evaluate any question or request submitted, but reserves the right to determine whether to respond or accept the requested change.

Proposers shall not rely on oral or written representations regarding this RFP unless issued in writing as an addendum by the Procurement & Supply Chain Mgmt. Department.

1.2.3 Pre-Contractual Expenses (08/16)

Pre-contractual expenses are defined as expenses incurred by the firm in: 1) preparing its proposal in response to the RFP; 2) submitting that proposal to TriMet; 3) negotiating with TriMet any matter related to this proposal; and 4) any other expenses incurred by the firm prior to the effective date of award, if any, of a contract resulting from this solicitation.

TriMet shall not, in any event, be liable for any pre-contractual expenses incurred by firms in the preparation of their proposal. Firms shall not include any such expenses as part of their proposal.

1.2.4 Multiple Proposals (08/16)

Multiple proposals from a single proposer as Prime will not be accepted. Vendors may participate in multiple proposals as subcontractors.

1.2.5 Late Proposals (08/16)

A Proposal is late if TriMet receives it after the deadline stated in this RFP for delivery of Proposals. A Proposal shall be deemed received by TriMet when it is available to be viewed by TriMet in TriP\$.

1.2.6 Supplements to Proposals (08/16)

If any proposal indicates minor noncompliance or variance with the RFP, TriMet may, but need not, request that the proposal be supplemented.

If requested, the Proposer may submit a supplement to the proposal responsive to such a request, within the time period established in such request, which TriMet will receive and evaluate in conjunction with the proposal. Supplements shall not be considered to be Best and Final Offers.

1.2.7 Submission of Proposals (08/16)

Proposers shall submit their proposal via TriMet's eProcurement System (TriP\$), at or before the time specified in this RFP. No proposals shall be accepted by TriMet after the time specified. TriMet shall not be liable for delays in delivery of proposals. TriMet shall keep submitted proposals via its eProcurement System (TriP\$) unopened until the time fixed for the receipt of proposals. TriMet reserves the right to postpone the proposal due date/time for its own convenience.

Proposals must be submitted electronically, via TriMet's eProcurement System (TriP\$), no later than **January 15, 2021 at 11:30 a.m. (PST). Proposals, Proposal Forms, and/or Proposal Price Forms(s) not uploaded into TriP\$ will cause rejection of the proposal.**

Proposals must be submitted (uploaded) on TriP\$, as two (2) separate files as follows:

- A. **One (1) PDF version of the Technical Proposal**, including a cover letter and **Exhibit B - Proposal forms except for Exhibit B1 – Proposal Price Form.**
- B. **One (1) PDF version of Exhibit B1 – Proposal Price Form.**
- C. **One (1) PDF version of Exhibit C – Requirements Traceability Matrix.**

1.2.8 Cancellation of RFP (08/16)

TriMet reserves the right to cancel this RFP at any time without liability prior to execution of the contract by TriMet if cancellation is deemed to be in TriMet's best interest. In no event shall TriMet have any liability for the cancellation of award. The proposer assumes the sole risk and responsibility for all expenses connected with the preparation of its proposal.

1.2.9 Confidentiality of Proposal (08/16)

Prior to Contract award, TriMet believes that the public interest will be harmed by disclosure of Proposals, Proposal supplements, and all communications made in the course of procurement negotiations, and will hold all such documentation in confidence, until after Contract award, pursuant to ORS 192.355(4).

After Contract award, TriMet will treat Proposals, Proposal supplements, and all communications made in the course of procurement negotiations a matter of public record, except to the extent they contain trade secrets, confidential information, or are otherwise exempt from disclosure under Oregon or federal law.

1.2.10 Trade Secrets and other Confidential Information (08/16)

Proposers must clearly and specifically identify confidential or trade secret information in their Proposals and must cite statutory or regulatory authority for every asserted exemption from public disclosure. When exempt information is mixed with nonexempt information, the nonexempt information must be disclosed. The fact that a proposer marks and segregates certain information as exempt from disclosure does not mean that the information is necessarily exempt. TriMet will make an independent determination regarding exemptions applicable to information that has been properly marked.

IF A PROPOSER DOES NOT PROPERLY MARK TRADE SECRET AND CONFIDENTIAL INFORMATION IN A PROPOSAL, TRIMET MAY DISCLOSE SUCH INFORMATION IN RESPONSE TO A PUBLIC RECORDS REQUEST.

TriMet disclaims liability for disclosure of trade secrets or other information entitled to confidential treatment if the Proposer fails to identify trade secrets or other confidential information clearly, has failed to cite statutory or regulatory authority for keeping such information confidential, or identifies an entire proposal or proposal supplement as confidential or exempt.

If, in response to a public records request, TriMet refuses to release the records in question due to such information being properly marked by the Proposer as trade secrets or other confidential information, the Proposer agrees to provide information sufficient to sustain TriMet's position to the District Attorney of Multnomah County, who currently considers such appeals. If the District Attorney orders that the records be disclosed, TriMet will notify the Proposer in order for the Proposer to take all appropriate legal action. The Proposer agrees to hold harmless, defend, and indemnify TriMet for all costs, expenses, and attorney fees that may be incurred by TriMet as a result of any legal proceeding regarding the disclosure of the Proposer's records.

1.2.11 Procurement Confidentiality (08/16)

Proposers are cautioned that until submission of their proposal, they may have contact concerning this RFP with only those District representatives, agents, or personnel designated in writing herein. Discussions or communications concerning this RFP with Source Evaluation Committee (SEC) Committee Members, District Project Managers, District employees, its consultants, or members of the TriMet Board of Directors, are strictly prohibited. Any violation of this restriction may result in disqualification of the Proposer from further participation in this procurement and from award of any contract or subcontract under this solicitation.

1.2.12 Administrative Remedies (08/16)

A proposer or offeror may seek administrative remedies under Proposal/Proposal Protest Procedures of TriMet's Contracting Rules. Copies of TriMet's Proposal/Protest Procedures are available upon request from TriMet's Procurement and Contracts Department, 1800 SW First Avenue, Suite 300, Portland, Oregon 97201.

1.2.13 Anticipated Selection Schedule

The following schedule is subject to change:

Issue RFP.....	December 7, 2020
Pre-Proposal Conference	December 15, 2020
RFP Questions Due.....	December 22, 2020
Post Response to Questions.....	January 4, 2021
Proposals Due	January 29, 2020
Proposal Evaluation.....	February 1 through February 16, 2021
Interview/Coordination Materials.....	February 16 through February 25, 2021
Discussions/Interviews (if held)	March 1 through March 5, 2021
Reference Follow Up (if needed)	February 22 through March 3, 2021
Client Visits (if needed).....	February 22 through March 3, 2021
Request for Best and Final Offers	February 22 through March 3, 2021
Proposer BAFO Response Period	March 3 through March 15, 2021
Best and Final Offers Due	March 15, 2021
BAFO Evaluation and Acceptance.....	March 15 through April 1, 2021
Notice of Intent to Award	by April 2, 2021
Board of Directors Approval (if required)	by April 28, 2021
Award of Contract.....	by April 30, 2021
Issue Notice to Proceed.....	by May 3, 2021

1.2.14 RFP Definitions

The following words used throughout this RFP are intended to have the following meaning:

- Proposer: Entity preparing a response to the RFP.
- Vendor: Entity who is awarded the contract, used interchangeably with Contractor.
- Contractor: Used interchangeably with Vendor, applies to the entity awarded the contract.

SECTION 1.3 – SPECIAL PROPOSAL CONDITIONS

1.3.1 One Award (8/16)

One contract award is anticipated under this solicitation. Multiple contract awards will not be made.

1.3.2 Unnecessarily Elaborate Proposals (08/16)

Unnecessarily elaborate brochures or other presentations beyond those sufficient to present a complete and effective response to this solicitation are not desired and may be construed as an indication of the firm's lack of cost consciousness. Elaborate artwork, expensive paper and bindings, and expensive visual and other presentation aids are neither necessary nor required.

1.3.3 Materially Unbalanced Proposals (08/16)

TriMet reserves the right to reject proposals that are materially unbalanced, i.e., that contain unreasonably high unit prices for some items and/or unreasonably low prices for other items.

1.3.4 Detailed Description of Supplies/Services (08/16)

Firms are cautioned that the item descriptions on the price form are not intended as complete descriptions of the required supplies or services to be purchased under this solicitation. Each firm must consult the Specifications or Statement of Work sections of the solicitation document for complete descriptions of the required supplies or services.

1.3.5 Inclusion of Costs (08/16)

The proposed billing rates must include any incidental expenses including, but not limited to indirect costs, overhead, insurance, and other ordinary expenses or incidental costs. Any other expenses or direct costs shall be included in Vendors proposed billing rates; no additional compensation will be allowed.

1.3.6 Inclusion of Option Pricing in Evaluation of Proposal (08/16)

TriMet shall evaluate proposals for award purposes by including the total price for the basic requirement together with any option pricing; i.e., option pricing will be included in the evaluation for award purposes. Optional items shall not necessarily be purchased under this solicitation.

1.3.7 Responsibility Determination (08/16)

Following evaluation of proposals, TriMet may meet with competitive finalists to ensure that the selected proposer is capable of meeting the requirements of the contract. The proposer will be required to demonstrate that it has, or has readily available access to, adequate personnel and sufficient equipment necessary to perform the work and provide the deliverables of this contract as specified.

1.3.8 Organizational Conflict of Interest (08/16)

The Vendor warrants that, to the best of the Vendor's knowledge and belief, there are no relevant facts or circumstances which could give rise to an organizational conflict of interest, or that the Vendor has disclosed all such relevant information.

The Vendor agrees that if an actual or potential organizational conflict of interest is discovered after award, the Vendor will make a full disclosure in writing to TriMet. This disclosure shall include a description of actions which the Vendor has taken or proposes to take, after consultation with TriMet, to avoid, mitigate, or neutralize the actual or potential conflict.

TriMet may terminate this contract for convenience, in whole or in part, if it deems such termination necessary to avoid an organizational conflict of interest. If the Vendor was aware of a potential organizational conflict of interest prior to award or discovered an actual or potential conflict after award and did not disclose or misrepresented relevant information to TriMet, TriMet may terminate the contract for default, or pursue such other remedies as may be permitted by law or this contract.

The Vendor further agrees to insert provisions which shall conform substantially to the language of this clause, including this paragraph (d), in any subcontract or consultant agreement hereunder.

1.3.9 Pre-Award Analysis (08/16)

TriMet intends to analyze all proposals and proposers to ensure specifications are met and products are authentic, prior to Contract award. More documentation may be required from the proposer and/or manufacturers of the products to satisfy this analysis, which proposers shall provide within three (3) business days of TriMet's request. Failure by any proposer to provide requested documentation, and within the timeframe stated in this Article, will cause their proposal to be rejected.

SECTION 1.4 – EVALUATION OF PROPOSALS

1.4.1 Evaluation Criteria (08/16)

1.4.1.1 Format of Proposal

Proposal shall be prepared simply and economically, providing a straightforward, concise description of the Proposer's capabilities to satisfy the requirements of the RFP. Submission of technical literature, display charts, or other supplemental materials is the responsibility and within the discretion of the Proposer.

- (a) Proposers shall submit proposals as set forth in Paragraph 1.2.7, Submission of Proposals, above.
- (b) Proposers are cautioned not to minimize the importance of an adequate response in any area.
- (c) Technical proposal documents shall be sectionalized as described below. Each section should be preceded by a blank page (not included in page limits).
- (d) **Proposal shall not exceed sixty (60) pages, not including Exhibit B - Proposal Forms, the Cover Letter, References, Resumes, or Compliance Matrix.** Proposers shall use a 12-point font, single-spaced and one-inch page margins.

1.4.1.2 Content of Technical Proposal

At a minimum, the items described in each section below shall be addressed. Points will be awarded based on the Proposer's past performance for services relevant to TriMet's needs. Provide the following information:

1.4.1.2.1 Technical Proposal Section 1 – Introductions and References (Not Scored)

- (a) **Introduction:** Provide an introduction of the Proposer. Describe primary business experience of the Proposer, the Proposer's overall mission statement, length of time in business, ownership, the location of office(s), telephone number, email address, website address and other information Proposer might deem pertinent and introductory in nature. Company resumes are acceptable, as long as all information requested is provided. A primary contact person for solicitation purposes with phone number and email address must be included.
- (b) **References:** Proposer shall provide a list of agencies for which their firm has provided similar services. The list shall include:
 - Name of client (contact person name, title, full address, email, and telephone number)
 - Period of contract
 - Value of contract
 - Services delivered and results

TriMet may contact these references. Failure to include required references may cause the proposal to be rejected as non-responsive.

1.4.1.2.2 Technical Proposal Section 2 – Qualifications of Proposer, Staff and Diversity (60 Possible Points)

- (a) **Qualifications of the Proposer** (15 points): In this Section, the Proposer shall provide its history, experience and past performance relevant to TriMet's needs, including but not limited to, a description of the Proposer's direct experience which is similar in size, scope and complexity to that required by this contract. Information regarding the Proposer's direct relevant experience shall include a list which provides dates, locations, cost of contracts, project managers, and names, addresses, contact persons and telephone numbers of clients.
- (b) **Qualifications of Staff** (20 points): This Section shall contain the Proposer's staffing and organizational plan, which shall identify the Project Manager and any other key personnel who will be assigned to the work under this contract. Identify the level of commitment (in percentage available) that staff will be dedicated to this project. This Section shall also contain the direct qualifications, experience and training of each key individual or group of individuals. Resumes must be complete and concise (limited to a maximum of one (1) page for each employee), and include, at a minimum, work experience, education, training and certifications, and number of employees supervised,

where applicable. Resumes shall be focused upon experience directly relevant to the work to be performed under this contract.

- (c) Workforce Diversity (5 points): TriMet values, encourages, and supports diversity in its workforce and in the workforce of those who contract with TriMet. The Proposer shall complete the Workforce Utilization form contained in Section 1.1 (Proposal Forms) of the RFP to describe its current workforce. If the Proposer currently has an underrepresentation of minorities or women, describe how it might propose to remedy the underutilization over time. If any subVendors are proposed, the Proposer shall provide this information for proposed subVendors.
- (d) Financial Responsibility (10 points): The Proposer shall provide information demonstrating that it has the necessary financial resources to satisfactorily complete the entirety of this contract work. The Proposal shall include copies of financial information such as audited financial statements, balance sheets, bank references, or similar information. If the Contractor deems any of such information proprietary in nature, the Contractor shall place such portion of its proposal in a separate envelope clearly and prominently marked "PROPRIETARY INFORMATION." TriMet shall not disclose or reveal any such information unless required to do so by law or legal process, provided, however, that TriMet may disclose such information to its legal and financial advisors as TriMet may reasonably deem to be necessary or appropriate.
- (e) Subcontractor Utilization (10 points)
1. The Offeror shall provide a narrative description of its experience in encouraging participation on the part of Disadvantaged Business Enterprises (DBE) as contractors, consultants or suppliers on previous projects. Discuss any innovative or particularly successful measures that the Offeror has undertaken. Include a list of those certified DBE firms with which it has had a contractual relationship during the last 24 months.
 2. The Offeror shall complete the DBE Utilization Form using the online platform Elations as described in Section 6., including potential DBE subcontractors and types of work for the Project. (See Appendix A for additional information.)
 3. Project Subcontracting Plan

The Offeror shall provide a detailed outreach program or plan for obtaining utilization of DBE firms on this project. The outreach plan shall be realistic and based on Offeror's successful past experience. Include in the plan documentation of the results achieved by Offeror's past DBE outreach efforts, a detailed schedule of events, and those steps that will or have been taken to support DBE participation.

The Offeror shall describe any plans, which shall be realistic and achievable, to provide innovative mentoring, technical or other business development services to DBE team members needing or requesting such services. Possible elements of an expanded DBE Plan are shown below.

- *Outreach efforts regarding announcement of subcontracting opportunities to minority, women and emerging small business organizations through pertinent organizations or channels.*
- *Commitment of staff and resources to provide administrative assistance, financial, technical or other support to the subcontracting team.*
- *If appropriate to the project, opportunities for one or more DBE firms to develop small prime contracting skills under mentorship of the Offeror.*
- *If appropriate to the project, equipment sharing programs to reduce costs for DBE firms.*
- *Documented, successful experience at fostering DBE firms and minorities and women in the workforce; demonstration of success in working with DBE firms and minorities and women in the workforce; complete an innovative plan for accomplishing and supporting utilization of DBE firms.*

4. Resources Available

The State of Oregon's Office of Minority, Women and Emerging Small Business (OMWESB) is the state agency responsible for federal DBE certification. Proposers are encouraged to use information available through OMWESB in preparing proposals pursuant to this RFP. OMWESB maintains a directory of all firms certified as D/M/W/ESBs. Copies of the directory may be obtained from:

State of Oregon, Office of Minority, Women and Emerging Small Business
775 Summer St. NE, Suite 200
Salem, Oregon 97301
PH: 503-986-0069

Website: <http://www.oregon4biz.com/certification>

1.4.1.2.3 Technical Proposal Section 3 – Understanding of the Work (100 Possible Points)

As part of the evaluation under this section, the SEC will consider the firm's responses to the questions and requested information, outlined below:

- (a) Proposals shall describe a proposed contracting plan for the full scope of all Project work, including design, manufacture, testing, installation, and implementation.*
- (b) The Proposer shall also provide a narrative description of which elements of work it intends to self-perform and which elements of work that it intends to subcontract. For subcontracted work, a detailed description shall be provided regarding the qualifications and experience of the Vendor.*
- (c) The Proposer shall identify potential risks and a plan to manage and mitigate those risks associated with the work plan. The Proposer's technical approach will be evaluated according to the following six (6) overall criteria, listed in descending order of importance.*

- *Concept and Design (40 points)*– proposals will be evaluated in terms of the degree the proposed concept and design meets the requirements of the RFP
- *Service Proven (10 points)*– proposals will be evaluated in terms of the degree service proven components and software are used in the proposed design.
- *System Integration (15 points)*– proposals will be evaluated in terms of the approach for integrating with components of the system to be furnished by others and the Proposer's approach for meeting the RFP's API requirements.
- *Servicing and Maintainability (10 points)*– proposals will be evaluated in terms of the ease of maintaining the components of the system and the expected reliability of the equipment throughout system lifecycle.
- *Schedule (5 points)*– the Proposer's high-level project schedule will be evaluated for reasonableness and its ability to help TriMet to meet its overall system implementation schedule. The initial deployment of the Next-Gen TSP system is intended to be a pilot corridor for the Division Transit Project¹. We expect the pilot to be fully operational by March 2022.
- *Technical Requirements Tracibility Matrix (10 points)* – As part of its Technical Proposal, Proposers shall submit a completed Compliance Matrix (See Appendix E) as defined in Section 1.1.3.

1.4.1.2.4 *Technical Proposal Section 4 – Exceptions or Deviations (Not Scored)*

This Section shall contain any exceptions or deviations from the requirements set forth in the RFP. Technical exceptions or deviations shall be segregated from exceptions or deviations to the contractual terms and conditions. Where the Proposer wishes to propose alternative technical approaches, these alternatives shall be thoroughly explained.

Contractual terms and conditions exceptions or deviations will not be allowed and/or negotiated after the proposal due date/time. **Any exceptions or deviations to the contractual terms and conditions submitted after the proposal due date/time will be denied by TriMet.** Contractual terms and conditions exceptions or deviations submitted by Proposer with their proposal are not accepted or approved by TriMet, but shall be used as a basis for negotiation with the awarded Proposer. *Under no circumstance will TriMet deviate with regards to its Indemnification clause (see Section 7.4 – Indemnification).* TriMet reserves the right to deny any and all submitted exceptions or deviations to all contractual terms and conditions at its sole discretion.

¹ Division Transit Project website: <https://trimet.org/division/>

By submission of a proposal, Proposer agrees to all contractual terms and conditions not requested to be excepted or deviated from with the submission of their proposal.

1.4.1.2.5 Price Proposal/Cost (40 Possible Points)

Points will be mathematically calculated based upon the reasonableness of the proposed price for the work to be performed and the competitiveness of the price with other proposals received. Any and all pricing shall be fully burdened.

This is a firm/fixed unit price, requirements contract for the services specified in the Scope of Work, and effective for the period stated in the RFP.

The evaluation of the Price Proposal will be based on the Contract Price provided in the Proposal Price Form.

Exhibit B1 **shall be submitted (uploaded), separate and apart** from the technical proposal document and Proposal Forms in TriMet's eProcurement System (TriP\$).

Pricing is the total price of all costs necessary to perform the services as outlined in the Scope of Work. No additional costs, outside of those proposed on Proposal Price Form (Exhibit B1) will be considered or approved by TriMet.

1.4.2 Evaluation Procedure (08/16)

- A. A Source Evaluation Committee (SEC) will be appointed to evaluate proposals. The SEC will employ only those evaluation criteria set forth in Section 1.4.1 of this RFP or in addenda that may be issued. An evaluation criterion is deemed to include any unstated "sub-criterion" that logically might be included within the scope of the stated criterion.
- B. Only those proposals determined by the SEC to be within the competitive range will be considered for award. The SEC will determine which proposals are within the competitive range in accordance with the evaluation criteria and points set forth in Section 1.4.1 above.
- C. To determine the competitive range, the SEC shall evaluate and score technical proposals, and select those Proposers technically qualified to perform the work irrespective of price. TriMet shall then open the price proposals of only those Proposers technically qualified to perform the work, and each price proposal shall be evaluated and scored on the basis of a 40-point maximum for the price structure most advantageous to TriMet. The sum total points scored on both the technical and price will be considered in determining the final competitive range. After determination of the final competitive range, the SEC shall determine whether acceptance of the most favorable initial proposal(s) without discussion is appropriate, or whether discussion should be conducted with all Proposers submitting proposals within the competitive range.
- D. If award determination is made based upon the most favorable initial proposal(s), the SEC reserves the right to perform or have performed a cost analysis of the apparent successful proposal(s) before determining to proceed with a recommendation for award.

- E. TriMet reserves the right to make changes to the RFP during discussions/negotiations. Any changes to the RFP shall be distributed to all Proposers remaining within the competitive range at the time the change is made.
- F. TriMet may request demonstrations and/or interviews of Proposers for further evaluation purposes. Information gathered at these meetings shall be included as part of the proposals and evaluated as such. If TriMet desires to conduct interviews with those Proposers in the Competitive Range, they shall be conducted via web/teleconference only.
- G. If the SEC elects to enter into discussions (including interviews) with Proposers, each Proposer remaining within the competitive range at the close of discussions/interviews will be allowed to submit a final supplement denominated the "Best and Final Offer (BAFO)." Any changes to the Proposer's initial technical or price proposal, including any issues addressed in discussions, must be submitted in writing in the BAFO in order to be considered by the SEC. The SEC will evaluate the BAFOs utilizing the evaluation criteria at Section 1.4.1 and make a recommendation for award.
- H. TriMet reserves the right to investigate the qualifications of all Proposers under consideration and to confirm any part of the information furnished by a Proposer, or to require other evidence of managerial, financial or technical capabilities which are considered necessary for the successful performance of the work. TriMet reserves the right to visit sites where work of a similar nature has been performed by the Proposer and/or visit the Proposer's work facility during the evaluation period.
- I. TriMet's General Manager shall have full authority over TriMet's source selection and decision to award, subject to applicable Board policy.

1.4.3 Notice to Unsuccessful Firms (08/16)

Following contract award, TriMet may inform unsuccessful firms, who were within the competitive range at the time of contract award, of:

- (1) The number of proposals TriMet received;
- (2) The name and address of the successful firm; and
- (3) The total contract price, including descriptions of items, quantities, and unit prices, if practical.

TriMet will attempt to give the notice under this paragraph promptly after contract award. TriMet's failure to give that notice shall not be deemed to affect the validity of the contract.

1.4.4 Cost Analysis (08/16)

TriMet may perform a cost analysis upon receipt of proposals. Each Proposer must submit cost data in a format acceptable to TriMet. Allowability of costs will be determined in accordance with the Federal Acquisition Regulations Part 31.

1.4.5 Compensation (08/16)

TriMet will not enter into a contract where compensation is based upon cost plus a percentage of cost. Compensation will be at the prices set forth in the successful Proposer's initial proposal and/or best and final offer (BAFO).

The Contractor shall be paid in accordance with the Milestone Payment Schedule shown below. Each milestone payment shall be due and payable only to the extent it is supported by the completion of the corresponding individual Milestones. The percentages shown are based on the BAFO.

Milestone Payment Schedule

Description	% of BAFO Payment
Project Management Plan and Schedule	5
Preliminary Design	20
Final Design	30
Acceptance of Pilot Test	35
Final System Acceptance	10
Total	100

1.4.6 Board Approval (10/17)

Approval by TriMet's Board of Directors is required at the following thresholds:

- a) \$ 500,000 for personal services contracts
- b) \$1,000,000 for goods and ordinary services contracts.

Revenue contracts and other contracts for routine operational expenses and ongoing services may be approved or delegated for approval by TriMet's General Manager.

1.4.7 Pre-Award Accounting System Review (08/16)

Prior to award of any contract as a result of this solicitation, TriMet, at its sole discretion, may perform, or have performed, a pre-award accounting system review to ascertain the Vendor's ability to accurately accumulate and bill program costs under any resulting contract. TriMet shall be responsible for any costs associated with the pre-award accounting system review. The Vendor, by submission of a proposal, agrees to assist TriMet or its designated representative(s) in performing the pre-award accounting system review.

END OF SECTION 1 –PROPOSAL FORMS, REQUIREMENTS, CONDITIONS, AND EVALUATION OF PROPOSALS

SECTION 2 – BACKGROUND, PURPOSE, AND SCOPE OF WORK/SPECIFICATIONS

SECTION 2.1 – BACKGROUND

TriMet recognizes that the transportation industry is currently undergoing revolutionary change as new technologies, new business models, and new partnerships are changing the landscape of how people travel. From the transit perspective, this change includes the concept of “Mobility Management”, which is a new philosophy to public transportation. This new philosophy includes the public sector’s partnership with other public, private, and institutional partners in the delivery of holistic, equitable, frictionless, convenient, and reliable transportation. Transit Signal Priority (TSP) is a key enabling technology, particularly in delivering reliable and high frequency transit service. TriMet and its public agency partners recognize that in order to achieve our mobility, safety, climate, and equity goals, the Portland-metropolitan region will need to make public transportation more competitive with travel by the private automobile.

TriMet is seeking a contractor to design and implement the next generation of its regional TSP system, referred in this document as Next-Gen TSP. The initial deployment of the Next-Gen TSP system is intended to be a pilot corridor for the Division Transit Project². We expect the pilot to be fully operational by March 2022. The system will be able to support the future integration of information from the traffic signal system with data from fleet vehicles (buses, trains, fire trucks, and other vehicles) in a way that meets agency policy for reducing emissions.

SECTION 2.2 – PURPOSE

The Next-Gen TSP concept was developed by TriMet to address the shortcomings of the existing TSP system, in particular the technical limitations of the IR-based vehicle-to-intersection communications and the distributed architecture of the bus TSP system. TriMet is seeking a solution that can:

Be adaptable and scalable as new needs are identified and as new service routes, modes (including rail and emergency vehicles), and traffic agencies come on board

Make TSP request calls to traffic signals far in advance of the signal (to no longer be limited by line-of-sight constraints as with the current system) so that the traffic signal controller has sufficient time to implement an effective strategy

Provide varying levels of prioritization among its vehicles, routes, and fleets, based on configurable criteria

Support a platform for robust performance analytics and reporting that draws from multiple data sources (e.g., combining data feeds from the vehicle side and the infrastructure side)

Require minimal TSP-specific hardware to be installed on the vehicle or in roadside traffic signal cabinets

The Next-Gen TSP concept addresses these needs through a cloud-based center-to-center

² Division Transit Project website: <https://trimet.org/division/>

architecture, leveraging robust cellular connectivity between the vehicle and central system and a scalable cloud platform to centralize most of the priority request functions that were previously processed individually on-vehicle (in the case of bus TSP).

Crucially, this architecture requires that reliable, low-latency two-way communications be available at each communications link—wirelessly between vehicle and the TSP Cloud System, and between TSP Cloud System and the traffic signal controllers (which may be direct or via a central advanced traffic management software/system [ATMS], e.g., Intelight MaxView or Transcore TransSuite, over wireless or wired connections).

The sections below detail the architectural components and key functions of this next-generation TSP concept.

2.2.1 Rail TSP Functionality and Implementation Phasing

The full build-out of the Next-Gen TSP concept, described in Section 2.3 below, includes support for TriMet light rail vehicles in addition to buses. However, the scope of this procurement will be specific to the implementation of TSP functionality for bus, not rail. Descriptions of rail functionality are included throughout this scope of work to provide the Vendor sufficient context such that their proposed solution does not preclude the eventual incorporation of rail and other vehicle types into the system as part of future enhancements. However, the vendor is welcome to identify places where their proposed solution would work or are near being able to work for TriMet’s rail use case.

Next-Gen rail TSP will share much of the Next-Gen concepts with bus, but there are some significant differences. Most notably, rail will continue to use the existing VETAG call loop preemption system as its primary means of providing signal priority and will continue to activate the system at all equipped signalized crossings unconditionally as is done today. The Next-Gen features described above will supplement the current system by providing ETA and signal request messages to the downstream traffic signal controllers earlier than can be provided by the existing fixed-position call loops. This will provide the signal controllers time to implement earlier-in-the-cycle strategies so that when the preemption call comes in, the signal phase is more likely to be already in a complementary state. Sometimes referred to as “predictive priority”, these traffic signal strategies can include phase swaps, phase sequence alterations, and cycle length modifications to get the signal to the green band as timed to the train’s predicted arrival time.

Some key conceptual benefits of the rail-specific Next-Gen TSP system include:

Reduced instances where a signal phase cannot clear in time for the approaching train

Reduced preemption-related impacts to other road users (e.g., be able to serve full pedestrian phase more consistently)

SECTION 2.3 – NEXT-GEN TSP CONCEPTUAL ARCHITECTURE

2.3.1 Conceptual Physical Architecture

The Next-Gen TSP conceptual physical architectures for bus and rail are shown on the following pages. The first set of physical architecture diagrams (Figures 1 and 2) highlight where the key TSP functions are performed. The second set of physical architecture diagrams (Figures 3 and 4) highlight which components are part of the Next-Gen Project versus existing.

2.3.1.2 TSP logical object-focused architecture diagrams

Figure 1 and Figure 2 depict the respective bus and rail architectures using colors to identify the physical components associated with the three TSP logical objects as defined by the TSP standards—Priority Request Generator (PRG), Priority Request Server (PRS), and Coordinator (CO). Components and connections shown in blue are those systems (whether on-vehicle, wayside, or cloud-based) involved in generating a priority request. Purple components are those involved in receiving and granting priority requests. And orange components are those involved in implementing signal priority strategies.

Note that the physical locations of the PRG, PRS, and CO function shown in these diagrams—PRG and PRS in the TSP Cloud System and the CO at the controller—reflect just one possible alternative of the physical locations where these functions may reside. The actual locations will ultimately be determined by the selected vendor’s proposed solution.

Also note that the bus conceptual architecture (Figure 1) includes “Legacy” components. These represent the existing Opticom infrared (IR) TSP system that will continue to be operated and maintained alongside the new system. The Next-Gen concept incorporates the legacy IR system to continue to provide TSP for existing IR-enabled signals that lack central communications capabilities and therefore may not be suitable for the Next-Gen system.

2.3.1.3 New versus existing component-focused architecture diagrams

Figure 3 and Figure 4 depict the same respective bus and rail architectures as the previous figures but use colors to distinguish between components which are existing and which are part of this Next-Gen TSP project procurement (or a future phase, as for rail). Existing components are shown in blue and Next-Gen components in green.

Note that the architectures assume no new on-board components will be needed. Rather, the probe data generation function (depicted as the green “Probe” logical object) is proposed to be a software-based function processed by the existing onboard systems. In the case of the bus, the INIT *COPILOTpc2* vehicle logic unit (VLU) performs this function with input from the other on-board systems.

TriMet is developing a proof-of-concept with INIT to demonstrate the capability of the INIT onboard systems to generate and transmit this TSP Probe Message. As described in Scope of Work Section 2.4.1 *On-Board System Functions*, the selected Vendor is required to fully develop this proof-of-concept and integrate it into their Next-Gen TSP solution.

Also note that it may be necessary for the selected Vendor to contract with the edge component vendors—e.g., INIT for the onboard equipment, Intelight for the traffic signal controllers—for design and implementation services to provide the required functionality of these edge components to support the Next-Gen TSP concept. (Refer to Scope of Work Section 2.4.4 *Traffic Signal System (TSS)*.)

For future phase implementations of Next-Gen TSP for TriMet LRT vehicles and emergency vehicle fleets (e.g., Portland Fire Bureau), it is anticipated that a similar probe data generation function will be performed by those vehicles’ AVL components.

TriMet Bus – Next-Gen Cloud-Based TSP Concept
 PRG, PRS, and CO Physical Components

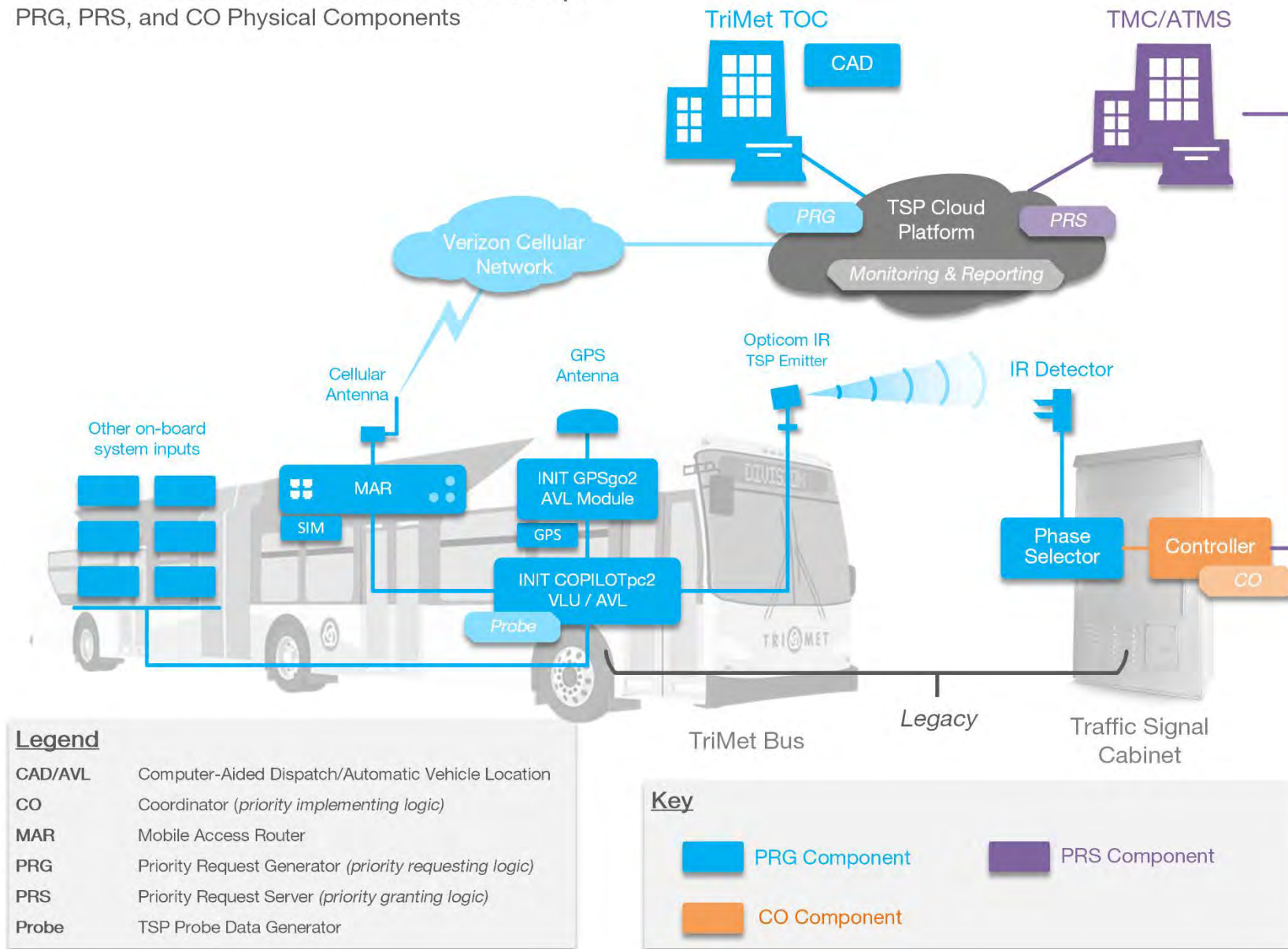


FIGURE 1. NEXT-GEN BUS TSP PHYSICAL ARCHITECTURE—PRG, PRS, AND CO COMPONENTS

TriMet Rail – Next-Gen Cloud-Based TSP Concept
PRG, PRS, and CO Physical Components

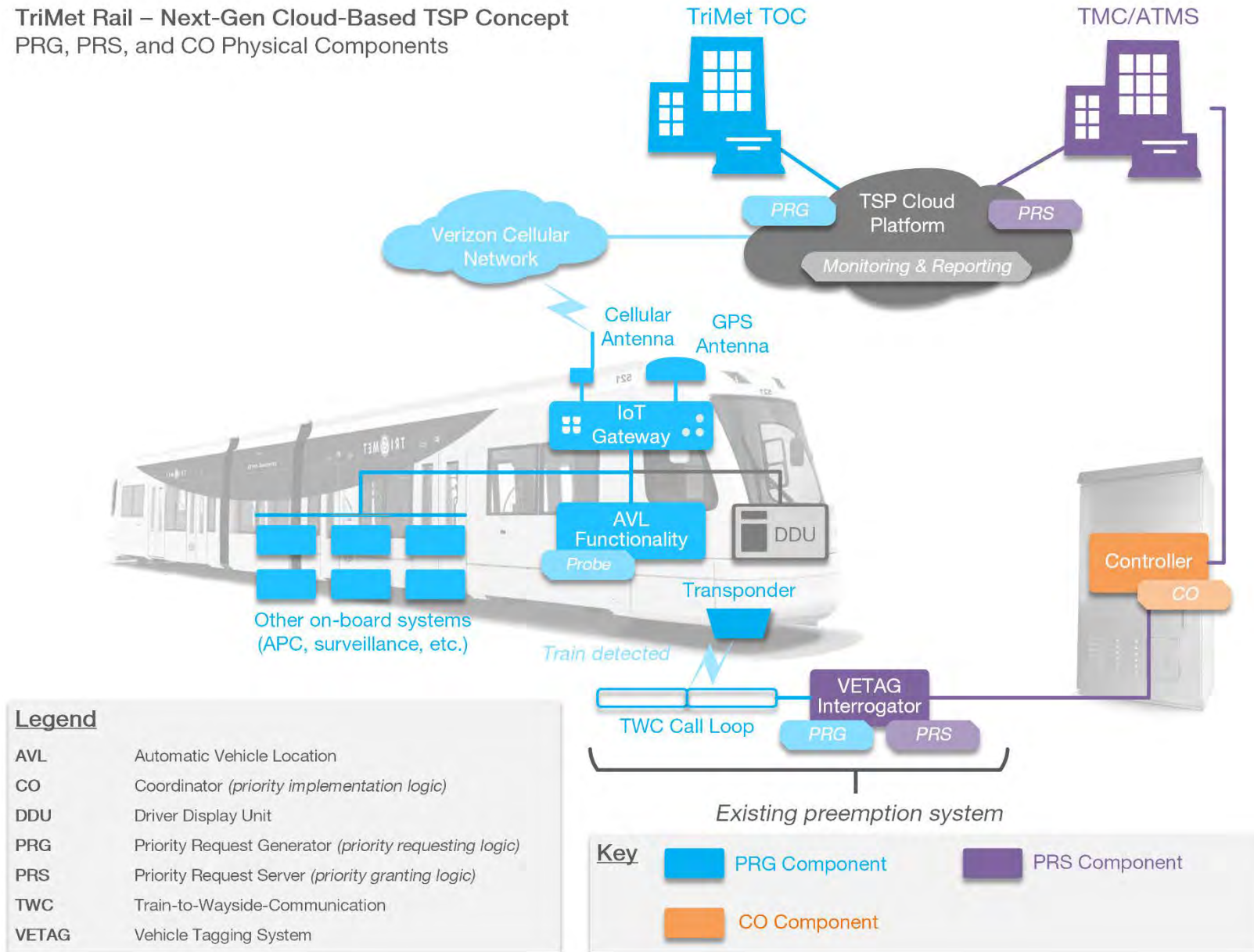


FIGURE 2. NEXT-GEN RAIL TSP PHYSICAL ARCHITECTURE—PRG, PRS, AND CO COMPONENTS

TriMet Bus – Next-Gen Cloud-Based TSP Concept Existing and Proposed Project Physical Components

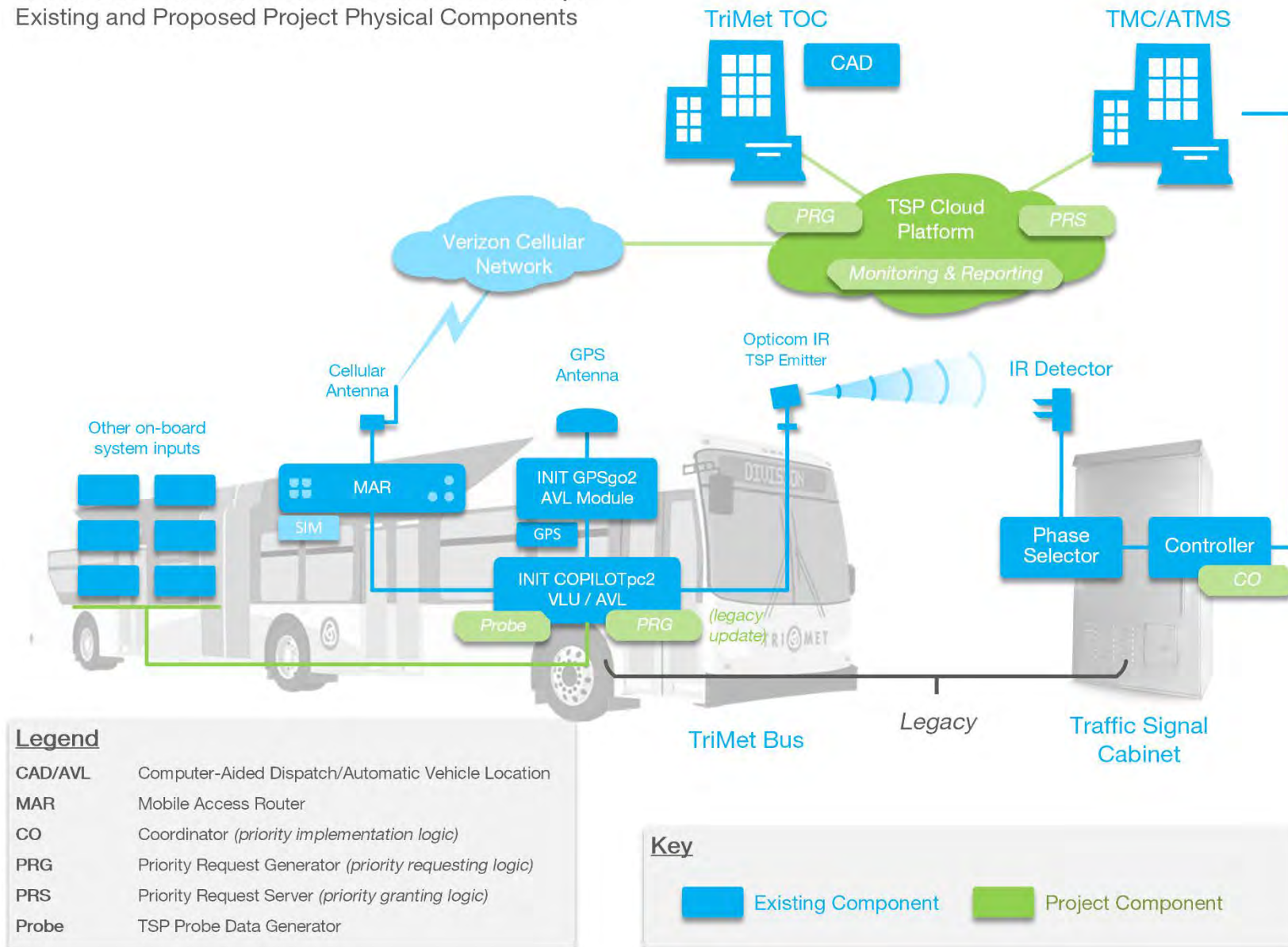


FIGURE 3. NEXT-GEN BUS TSP PHYSICAL ARCHITECTURE—EXISTING AND PROJECT COMPONENTS

TriMet Rail – Next-Gen Cloud-Based TSP Concept
Existing and Proposed Future Physical Components

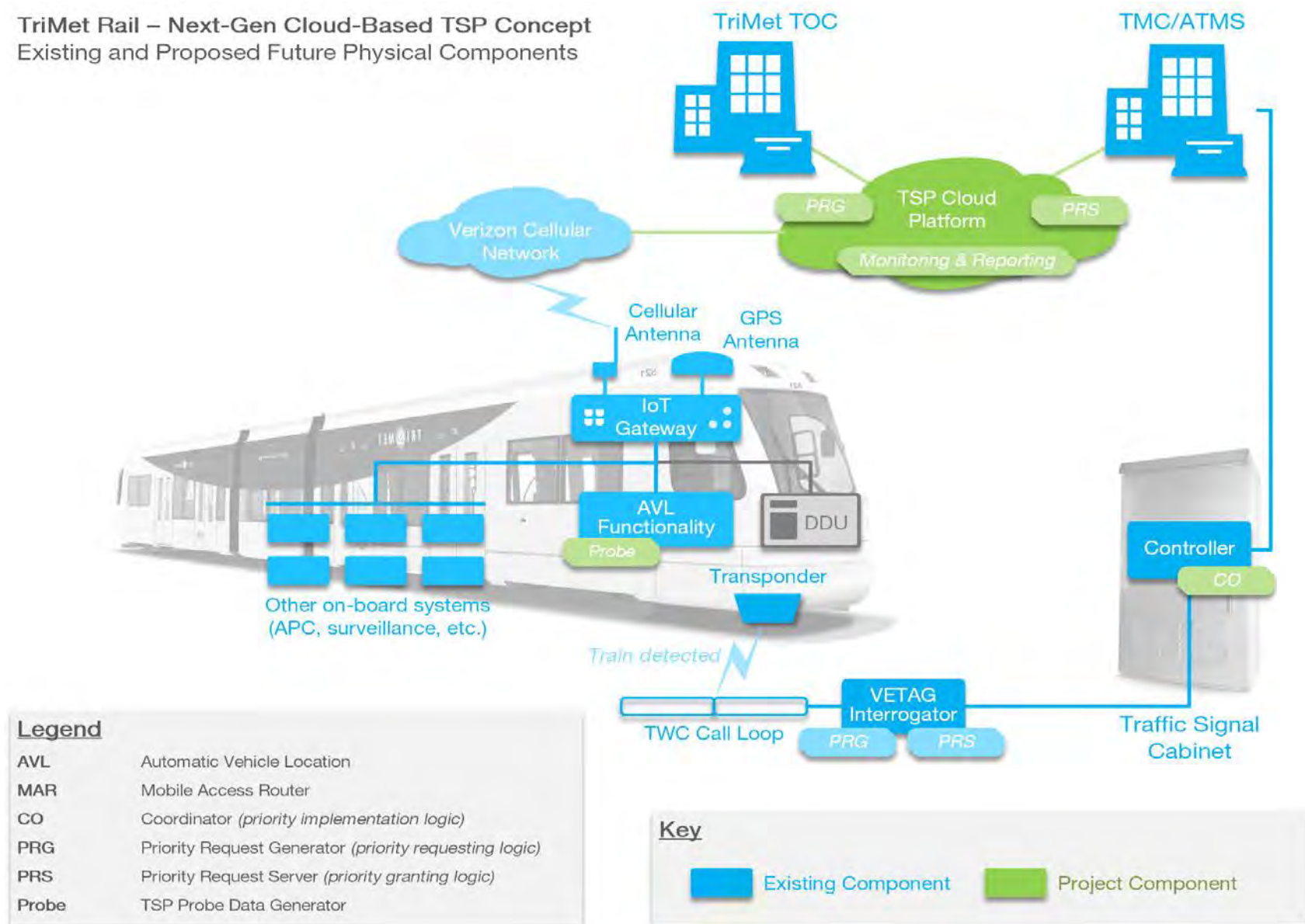


FIGURE 4. NEXT-GEN RAIL TSP PHYSICAL ARCHITECTURE—EXISTING AND PROPOSED FUTURE COMPONENTS

2.3.2 Conceptual Functional Architecture

Figure 5 shows the high-level functional architecture of the proposed Next-Gen TSP system. In brief, the simplified initial priority request end-to-end process is:

1. Individual vehicles generate probe data messages, which are then provided to the Priority Request Generator (PRG)
2. The PRG receives the probe data, determines whether priority is needed, and generates applicable priority request messages, which are then provided to the Priority Request Server (PRS)
3. The PRS receives the priority requests, determines a prioritization among the requests, and generates a service request message, which is then provided to the Coordinator (CO)
4. The CO evaluates the request and implements a signalization strategy if it can do so

TriMet Bus – Next-Gen Cloud-Based TSP Concept
High-Level Functional Architecture

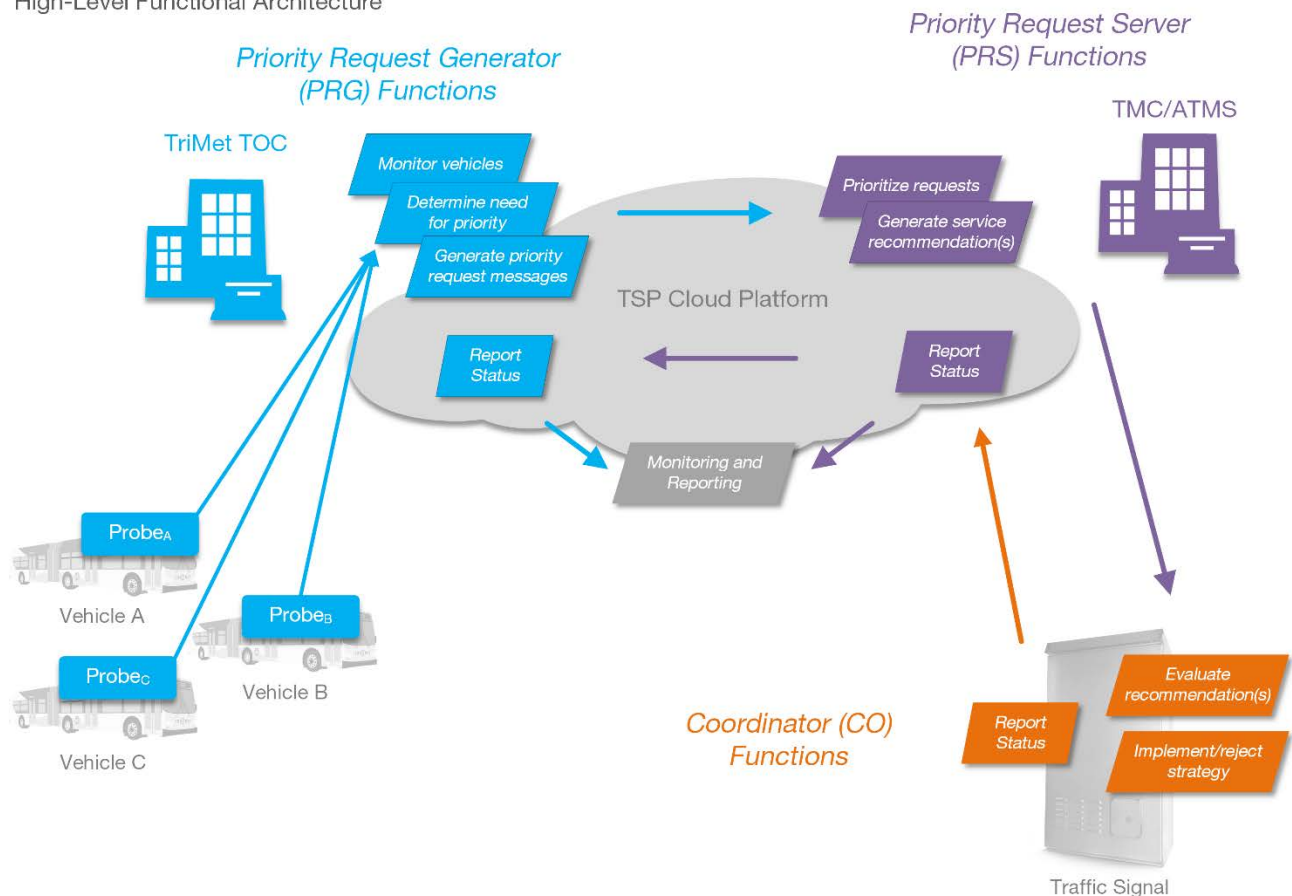
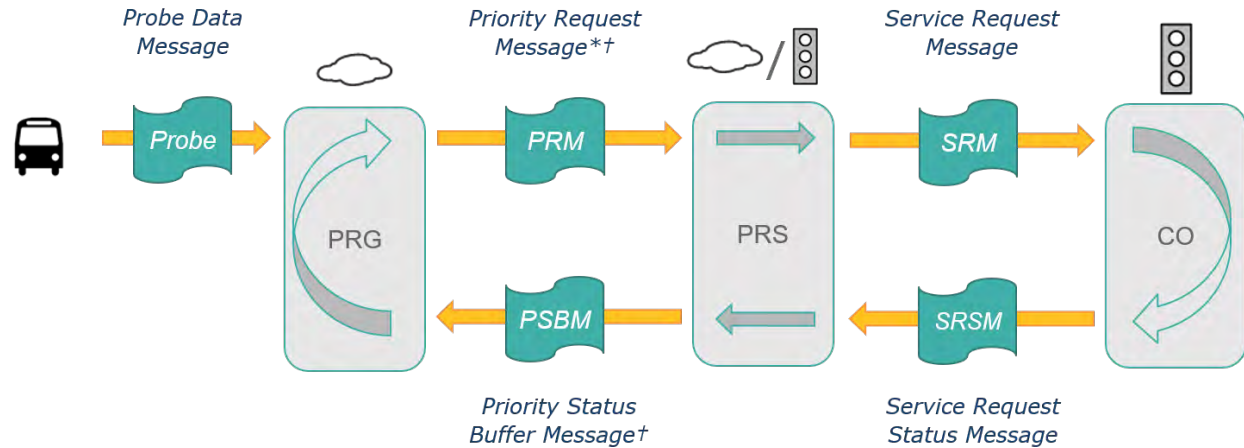


FIGURE 5. NEXT-GEN TSP HIGH-LEVEL FUNCTIONAL ARCHITECTURE

2.3.3 Conceptual Message Architecture

As the Next-Gen TSP concept follows a center-to-center architecture, standardized messaging between systems is a key need. Figure 6 illustrates the proposed end-to-end message flow to support the PRG, PRS, and CO functions described previously. The diagram illustrates how the different systems pass requests to one another but also provide status responses to ensure each system is updated. Following a standards-based TSP interface design, each of the PRG, PRS, and CO maintains and updates a table of active priority requests. The messages exchanged between the systems are the mechanism by which these tables are kept in sync.



* Four types of priority request messages: *Initial, Update, Cancel, Clear*

† Equivalent SAE J2735 request message is *Signal Request Message (SRM)*; equivalent status message is *Signal Status Message (SSM)*

FIGURE 6. END-TO-END MESSAGE EXCHANGE

In addition to defining standards for PRG, PRS, and CO functions, standards bodies like SAE and NTCIP provide definitions for the messages to be exchanged between the logical entities³.

- **Priority Request Message (PRM).** The PRM, sent from the PRG to the PRS for one or more downstream intersections, is the initial message exchanged between the two entities, and provides key information about the vehicle making the signal priority request, including a vehicle identification, a calculated priority level, what kind of movement is needed, and an estimated time of arrival (ETA).

Four versions of the PRM are supported—an *initial* priority request, an *update*, a *cancel*, and a *clear*—to provide the signal system updated vehicle status information as the bus transitions through the intersection.

- **Priority Status Buffer Message (PSBM).** The PSBM, sent from the PRS to the PRG, allows the PRS to update the PRG with any actions that may have been taken on the priority

³ Refer to the Task 2 TSP Standards Evaluation deliverable, *Next-Gen TSP Industry Scan*, for a more detailed discussion of NTCIP 1211 and SAE J2735 messaging standards, including mandatory and optional data fields and message sequencing requirements.

request, including queued, overridden, processing, canceled, completed, or no adjustment needed.

- **Service Request Message (SRM).** The SRM, sent from the PRS to the CO, represents the PRS's identification of the order of priority request(s) to grant, and the type of service to be provided and when. The message may contain what signal phases to service, what signal phases may be omitted, and how many seconds a phase may be extended or reduced.
- **Service Request Status Message (SRS).** The SRS, sent from the CO to the PRS, allows the CO to update the PRS with any actions that may have been taken on the service request received earlier. The SRS message returns the identical fields contained in the SRM message, but simply updates their values based on its assessment of the proposed strategy.

Finally, the probe message, while not defined in SAE or NTCIP standards, contains pertinent vehicle location and status information necessary for the PRG to determine whether the vehicle requires priority and to form a compliant priority request message. A description of the conceptual probe message is provided in the On-Board System section below.

Figure 7 focuses in on three of the message types (Probe, PRM, and SRM) and provides a stylized illustration of how competing priority requests for a single intersection can be handled through standardized message exchange.

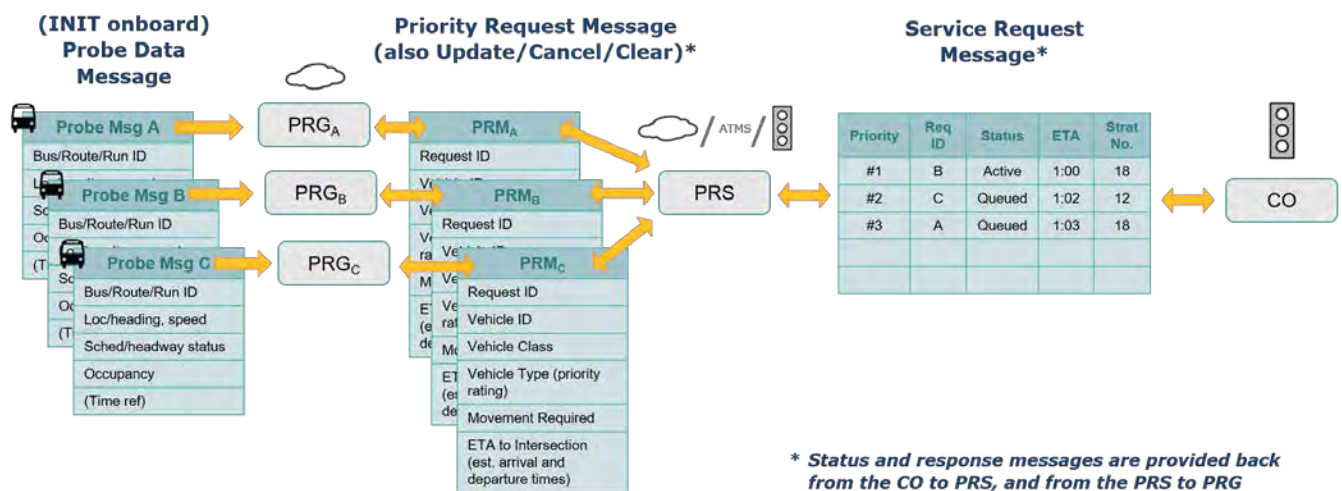


FIGURE 7. KEY MESSAGE DATA ELEMENTS FOR PRIMARY MESSAGE EXCHANGES

SECTION 2.4 – SCOPE OF WORK

This section provides Contractors context for understanding TriMet's strategic vision and requirements for the Next-Gen TSP system. It describes the functions and systems necessary to support the conceptual Next-Gen TSP architecture described in the previous section.

Responses will be evaluated in terms of how well these functions are supported and how well the proposed product positions TriMet to achieve the ultimate Next-Gen TSP vision.

A Requirements Traceability Matrix (RTM), provided as Appendix E, details the requirements associated with the specifications described in this Scope of Work. The requirements in the RTM are organized by system component, cross referenced to the associated Scope of Work section, and classified under the following requirement types:

- Architectural – Describes how the system is structured including physical infrastructure and interfaces.
- Functional – Describes what the system is intended to do such as PRG and PRS processes.
- Implementation – Describes what the Vendor is responsible for during system development, testing, implementation, commissioning, training, and on-going maintenance.
- Performance – Describes how well the system must perform such as latency, quantity, quality, and readiness.
- Technical – Describes how the system is built including accessibility, backup, capacity, and security.
- Other – Describes general requirements of the project.

As described in Section 1.4.1 Evaluation Criteria, the Vendor shall state whether or not their proposed solution fulfills each requirement listed in the RTM. The Vendor may respond to each requirement with an alternative requirement, subject to TriMet review.

2.4.1 On-Board System (OBS)

The On-Board System (OBS) will be upgraded to support near real-time transit probe data transmission to the TSP Cloud System. Probe data is defined in Table 1.

Separate from this procurement, TriMet is developing a proof-of-concept with INIT, the Vehicle Logic Unit (VLU) vendor, to demonstrate the capability of the INIT onboard systems to generate and transmit the TSP Probe Message described in the following subsections. For this procurement, the selected Vendor is required to finalize this proof-of-concept and integrate it into their Next-Gen TSP solution. The Vendor is ultimately responsible for end-to-end functionality of the complete solution; any coordination with INIT necessary to fully develop and integrate the TSP Probe message shall be identified by the Vendor in their response to this RFP.

Requirements for the OBS are included in the RTM under the On-Board System component.

2.4.1.1 *Physical Requirements*

The OBS includes the INIT *COPLOTpc2* VLU and Verizon cellular mobile access router currently installed on all transit vehicles.

2.4.1.2 Functions

The OBS components and processes in the Next-Gen TSP concept primarily serve to update the TSP Cloud System with the vehicle's latest location and status information, to be processed and acted upon separately by the centralized systems. Its core functions are:

- Obtain vehicle location
- Obtain relevant vehicle status information
- Package TSP probe message
- Transmit TSP probe message to the TSP Cloud System

A final core function of the on-board systems unrelated to the generation of a probe message is to accommodate the concurrent operation of the legacy Opticom IR TSP system for specific locations that will operate the legacy system and not the Next-Gen system.

The following subsections describe these functions, their associated physical components, required capabilities, and an identification of modifications or enhancements to existing components that may be needed.

2.4.1.2.1 Obtain Vehicle Location

This function relates to obtaining real-time GPS coordinates of the subject vehicle. The existing AVL component—the INIT *GPSgo2* AVL module connected to the INIT *COPLOTpc2* vehicle logic unit (VLU)—is assumed to be sufficient for the Next-Gen TSP system to obtain accurate, second-by-second vehicle location information, and therefore, will not be a Vendor-provided function of this project. Key technical aspects of the INIT *GPSgo2* AVL module are:

- Algorithmic combination of GPS, gyroscope, and odometer-based dead-reckoning measurements to estimate a vehicle's location
- Positional accuracy of 2 meters (6.5 feet)⁴
- 1 Hz position update (once per second)

Note that end-to-end system time synchronization will be the responsibility of the TSP Cloud System. (Refer to Section 2.4.3.2 *TSP Cloud System Infrastructure – Functions* for a description of this function.)

The INIT *COPLOTpc2* VLU maintains two sets of coordinates for every location estimate made: a “physical” location and a “logical” location. The physical location represents the estimate from the algorithmic combination process described above. The logical location is obtained by applying an adjustment to the physical location estimate by “snapping” it to the nearest point on the vehicle's known route.

Vehicle location data for the Next-Gen TSP system will be generated on-board by these INIT systems and included in the TSP probe message feed to the TSP Cloud System. Both the

⁴ As per the INIT *GPSgo2* System Design Document (version 3.3), this figure represents a Circular Error Probable (CEP) measure, which is the radius of the circle around the true position containing 50 percent of the individual measurements being made. The number also assumes good GPS signal and a well-calibrated unit. This accuracy will decrease at longer GPS outages.

physical and logical location coordinates shall be included in the probe message feed.

2.4.1.2.2 *Obtain Vehicle Status Information*

This function relates to accessing vehicle status data stored on or generated by various on-board systems that may be relevant to the TSP Cloud System for priority request generation. See Table 1 for an identification of proposed bus and rail vehicle data elements to comprise the respective bus and future rail TSP probe messages. Again, note that the bus-related functions described in this section are initially being developed by TriMet and INIT as part of a TSP Probe Message proof-of-concept. The Vendor shall fully build out this proof-of-concept and integrate it into their proposed solution.




The table is organized as follows:

Category of the data element

Description of the data element and how it may be useful to TSP




- For both bus and rail:
 - **Source** of the data, identifying both the system being interfaced with directly (“direct”) and, if different, the originating system that generated the data (“originator”)
 - **Modifications required**, including potential system or software updates that may be required, either at the originating system or the receiving system, to obtain the data needed. This includes new interfaces and data translation and/or processing that may be needed to receive the data in a usable format. Note that modifications will also be necessary to the bus on-board INIT *COPILOTpc2* VLU to package and provide the TSP probe message with those data elements described in the table
- For fire and emergency vehicle:
 - This column is included to indicate that future expansion of the system may include fire and emergency vehicle support. As such, the system designed should not preclude this potential expansion.

TABLE 1. TSP PROBE MESSAGE DATA ELEMENTS AND SOURCES

		Proof-of-Concept + this Procurement		Potential Future Expansion	
DATA ELEMENT	DESCRIPTION/USE	 BUS PROBE MESSAGE		 RAIL PROBE MSG	 FIRE/EV PROBE MSG
		SOURCE DIRECT/ORIGINATOR	MODS REQUIRED?	RAIL EQUIVALENT	FIRE/EV EQUIVALENT
TIME SYNC REFERENCE					
OPTION 1: NETWORK TIME PROTOCOL (NTP) TIMESTAMP	Implement time sync across network devices by instituting Network Time Protocol (NTP) to sync clocks to Coordinated Universal Time (UTC)	New Mobile Access Router (MAR)	Yes, new MAR not yet installed, NTP not yet established	TBD (via new IoT Gateway)	TBD
OPTION 2: VEHICLE TIMESTAMP	Time reference generated by vehicle's VLU. Bus's COPILOT time reference drifts up to several seconds from INIT Central Time. TBD what rail's	INIT COPILOTpc2 VLU	Yes, would require correction or estimated deviation field as part of the message to sync; or more frequent time	TBD (via future AVL component)	TBD




Proof-of-Concept + this Procurement

Potential Future Expansion

DATA ELEMENT	DESCRIPTION/USE	 BUS PROBE MESSAGE		 RAIL PROBE MSG	 FIRE/EV PROBE MSG
		SOURCE DIRECT/ORIGIN ATOR	MODS REQUIRED?	RAIL EQUIVALENT	FIRE/EV EQUIVALENT
	VLU's drift is from the central system's time.		updates of COPILOT clock		
VEHICLE IDENTIFICATION					
VEHICLE #	Used to identify this vehicle to the TSP Cloud System and determine whether vehicle is valid	INIT COPILOTpc2 VLU	No	TBD	TBD
BLOCK #	and operating on a TSP corridor. Also can be used in assigning prioritization	INIT COPILOTpc2 VLU	No	TBD	TBD (Will need an output from the AVL/routing system to determine upcoming signals to send requests to)




Proof-of-Concept + this Procurement

Potential Future Expansion

DATA ELEMENT	DESCRIPTION/USE	 BUS PROBE MESSAGE		 RAIL PROBE MSG	 FIRE/EV PROBE MSG
		SOURCE DIRECT/ORIGINATOR	MODS REQUIRED?	RAIL EQUIVALENT	FIRE/EV EQUIVALENT
TRIP #		INIT COPILOTpc2 VLU	No	TBD	N/A
STOP #		INIT COPILOTpc2 VLU	No	TBD	N/A
OPERATOR #	May not be used directly for TSP, but could inform support functions (e.g., ETA calcs)	INIT COPILOTpc2 VLU	No	TBD	TBD
LOCATION INFORMATION					
GPS LOCATION – PHYSICAL	Algorithmically derived location based on vehicle's AVL component. Bus's AVL module incorporates GPS,	INIT COPILOTpc2 VLU / INIT GPSgo2 AVL module	No	TBD (via future AVL component)	TBD




Proof-of-Concept + this Procurement

Potential Future Expansion

DATA ELEMENT	DESCRIPTION/USE	 BUS PROBE MESSAGE		 RAIL PROBE MSG	 FIRE/EV PROBE MSG
		SOURCE DIRECT/ORIGIN ATOR	MODS REQUIRED?	RAIL EQUIVALENT	FIRE/EV EQUIVALENT
	gyroscope, and odometer. Rail TBD				
GPS LOCATION – LOGICAL	Adjusted location estimate, snapped to the vehicle's scheduled path	INIT COPILOTpc2 VLU / INIT GPSgo2 AVL module	No	TBD (via future AVL component)	TBD
PERFORMANCE INFORMATION					
SCHEDULE/ HEADWAY DEVIATION	Key information when compared against configured thresholds in the TSP Cloud System to determine need for priority	INIT COPILOTpc2 VLU / CAD/AVL	No	TBD	N/A
CURRENT SPEED	May be useful in conjunction with recent	INIT COPILOTpc2 VLU / AVL	No	TBD	TBD




Proof-of-Concept + this Procurement

Potential Future Expansion

DATA ELEMENT	DESCRIPTION/USE	 BUS PROBE MESSAGE		 RAIL PROBE MSG	 FIRE/EV PROBE MSG
		SOURCE DIRECT/ORIGINATOR	MODS REQUIRED?	RAIL EQUIVALENT	FIRE/EV EQUIVALENT
	history to improve ETA calcs	module? Vehicle interface?			
PASSENGER LOAD ESTIMATE	High-level representation (e.g., empty, small, med, large) of current passenger load	INIT COPILOTpc2 VLU / APC	No	TBD	N/A
DEPARTURE DELAY	For vehicles currently at a layover with a known dwell time	INIT COPILOTpc2 VLU / CAD/AVL	No	TBD	N/A
VEHICLE SYSTEM STATUS FLAGS					
VEHICLE MOVING		INIT COPILOTpc2 VLU / Vehicle inputs	No	TBD	TBD
REVERSE		INIT COPILOTpc2	No	N/A	TBD




Proof-of-Concept + this Procurement

Potential Future Expansion

DATA ELEMENT	DESCRIPTION/USE	 BUS PROBE MESSAGE		 RAIL PROBE MSG	 FIRE/EV PROBE MSG
		SOURCE DIRECT/ORIGINATOR	MODS REQUIRED?	RAIL EQUIVALENT	FIRE/EV EQUIVALENT
		VLU / Vehicle inputs			
ENGINE ON		INIT COPILOTpc2 VLU / Vehicle inputs	No	N/A	TBD
PASSENGER STOP REQUEST	Initial indication that ETA estimate should account for upcoming stop delay	INIT COPILOTpc2 VLU / Vehicle inputs	No	N/A	N/A
TURN SIGNAL	Left, right, flashers, yield. May be useful to infer or confirm certain activities that impact ETA (e.g., arriving/departing a stop, hazard encountered, etc.)	INIT COPILOTpc2 VLU / Vehicle inputs	No	N/A	TBD




Proof-of-Concept + this Procurement

Potential Future Expansion

DATA ELEMENT	DESCRIPTION/USE	 BUS PROBE MESSAGE		 RAIL PROBE MSG	 FIRE/EV PROBE MSG
		SOURCE DIRECT/ORIGIN ATOR	MODS REQUIRED?	RAIL EQUIVALENT	FIRE/EV EQUIVALENT
DOOR OPEN		INIT COPILOTpc2 VLU / Vehicle inputs	No	TBD	N/A
KNEEL	Whether bus is kneeling. Useful for improving accuracy of stop dwell time estimate to inform ETA	INIT COPILOTpc2 VLU / Vehicle inputs	No	N/A	N/A
RAMP	Whether ramp engaged. Useful for improving accuracy of stop dwell time estimate to inform ETA	INIT COPILOTpc2 VLU / Vehicle inputs	No	N/A	N/A
COVERT ALARM STATUS	May not be used directly for TSP, but may have future utility	INIT COPILOTpc2	No	TBD	N/A

Proof-of-Concept + this Procurement

Potential Future Expansion

DATA ELEMENT	DESCRIPTION/USE	 BUS PROBE MESSAGE		 RAIL PROBE MSG	 FIRE/EV PROBE MSG
		SOURCE DIRECT/ORIGINATOR	MODS REQUIRED?	RAIL EQUIVALENT	FIRE/EV EQUIVALENT
		VLU / Vehicle inputs			

2.4.1.2.3 *Package TSP Probe Message*

This function relates to generating a well-formed TSP probe message containing a real-time snapshot of the vehicle status relevant to TSP. The existing INIT *COPILOTpc2* VLU will be the primary on-board component to package the TSP Probe Message. On the rail vehicle, it is anticipated that this will be accomplished by a future rail VLU solution. Specifically, the INIT *COPILOTpc2* VLU and the future rail VLU solution will be used to:

- Interface with on-board systems providing required data
- Translate and/or process data as needed to ensure it is in the required structured format
- Form the message with appropriate headers, footers, and payload

It is expected that the on-board bus systems are polled and a new TSP probe message is constructed every few seconds. It is anticipated that the proposed rail VLU solution shall be capable of creating the TSP probe message at the desired frequency.

2.4.1.2.4 *Send TSP Probe Message to TSP Cloud System*

This function relates to transmitting the TSP probe message from the vehicle to the TSP Cloud System.

Bus: On the bus, it is assumed that the planned upgraded mobile access router (MAR) will be the primary on-board component to route the TSP Probe Message from the vehicle to the TSP cloud via a Verizon cellular network connection.

Rail: On the rail vehicle, it is anticipated that the proposed rail IoT Gateway solution will be the primary on-board component performing this function. Like with the bus, the rail solution will support cellular communications over the Verizon cellular network.

2.4.1.2.5 *Support Supplemental use of Legacy Bus TSP System*

In addition to generating TSP probe data messages, the Next-Gen TSP bus on-board systems will also need to manage or otherwise support the concurrent operation of the existing legacy TSP system for locations without sufficient central communications capabilities. This will entail the selective activation of the legacy Opticom IR TSP system, which will be operated concurrently with the Next-Gen system.

The proposer shall describe their solution for accommodating legacy TSP functionality and identify any OBS software development effort that may require contracting with INIT to deliver. Some potential approaches that may be considered are described below:

- (a) Based on its interpretation of the vehicle's location and proximity to a legacy Opticom IR signal, TSP Cloud System provides an instruction to the INIT *COPILOTpc2* VLU to activate the on-board legacy Opticom IR system. The TSP Cloud System would likewise "know" that the vehicle was approaching a legacy signal and would therefore not generate a Next-Gen TSP priority request for this signal. Note that while the TSP Cloud System will not generate a TSP request for this legacy signal, it *will* continue to generate Next-Gen TSP priority requests for any adjacent signals along the route that are Next-Gen capable. This approach will require a software enhancement in the INIT

COPILOTpc2 VLU to enable an on-demand legacy system activation/deactivation capability.

- (b) Alternatively (and less desirable), the logic of when to operate Next-Gen or Legacy TSP could reside fully within the INIT *COPILOTpc2* VLU, which would also require a significant software enhancement to the VLU. This alternative would remove the need for bi-directional messaging between the TSP Cloud System and the vehicle as described previously. However, the TSP Cloud System should be made aware of the current Legacy TSP operational status so that it does not provide competing or conflicting priority requests at the same time.

2.4.1.3 *Communications*

The OBS will communicate over existing Verizon 4G LTE using on-board mobile access router. The OBS accommodates asymmetric wireless transfer rates of 14 Mbps download and 2 Mbps upload.

2.4.1.4 *Security*

The OBS will have Verizon and TriMet security protocols in place. The Vendor shall comply with all TriMet network security requirements as described in the policy documents *TriMet - Network Connection Policy* and *TriMet IT Policies for RFP*, incorporated by reference in Appendix C *TriMet IT Security Requirements*.

Any cloud-based solution proposed by the Vendor additionally requires the completion of the *TriMet Software-as-a-Service (SaaS) Security Assessment Form*, also included in Appendix C *TriMet IT Security Requirements*. The SaaS Security Assessment Form documents TriMet's currently evolving Cyber Security policy. While it has no currently actionable requirements, requirements related to the Cyber Security Audit may be included as part of BAFO.

2.4.1.5 *Maintenance*

The OBS will be administered, maintained, and monitored by TriMet.

2.4.2 *TSP Cloud System Functions*

The TSP Cloud System is the central component of the Next-Gen concept. This section describes the key TSP Cloud System functions of the conceptual Next-Gen TSP architecture. The Vendor shall describe how their solution will implement the specific TSP Cloud System functions described here. Requirements for the TSP Cloud System Functions are included in the RTM under the TSP Cloud System component.

2.4.2.1 *Integrate TSP Probe Message Streams*

As described in Section 2.4.1 *On-Board System*, the Vendor will be responsible for ensuring end-to-end functionality of the system, including the integration of the TSP Probe message streaming from equipped fleet vehicles. The Vendor shall identify any coordination activities with INIT necessary to achieve this integration.

To ensure that the TSP Cloud System accurately captures the current state of the Next-Gen

TSP fleet, it is essential that the TSP Cloud System be capable of receiving and integrating the TSP Probe Message streams at whatever rate they are being delivered, without loss of data, at the expected rate of one message per vehicle every 1-5 seconds.

2.4.2.2 *Monitor all TSP Vehicles and Intersections*

The TSP Cloud System will maintain a continuously updated current state representation of all active TSP-enabled vehicles and intersections. Primary data sources will be the streaming TSP Probe messages from the vehicles and event log output from the Priority Request Generator (PRG) and Priority Request Server (PRS). Additional current state information about the traffic signals may be provided by a data feed from the traffic signal system.

Desired monitoring functions of the TSP Cloud System include:

- A map-based graphical user interface to monitor real-time activity
- Monitor real-time data feeds to verify that vehicles in revenue service are transmitting TSP Probe messages as expected without interruption
- Detect disruptions and anomalies with the data feeds that might suggest communications issues
- Performance monitoring dashboards

2.4.2.3 *Manage Legacy TSP System*

In coordination with the onboard legacy TSP system functionality, the TSP Cloud System manages or is otherwise informed of the selective activation of the onboard Opticom TSP system on vehicles approaching legacy TSP traffic signals. Refer to Section 2.4.1.2.5 *Support Supplemental use of Legacy Bus TSP System* for a description of the desired functionality.

The TSP Cloud System supports this functionality by maintaining a Legacy Corridor geofence reference such that the system can determine whether a particular Next-Gen TSP vehicle is within the specified area where legacy TSP operations should occur.

2.4.2.4 *Manage and Archive Data*

The TSP Cloud System will collect, organize, archive, and make available for analysis relevant data obtained from the Next-Gen TSP System and linked TriMet systems. Optionally, data from traffic signal systems or other third-party data systems that can support performance analysis and reporting may be integrated into the TSP Cloud System data archive.

The Vendor's proposed data hub and archive solution shall be robust and scalable to support the incorporation of additional data sources in the future, without impacting the performance or stability of the environment. The Vendor shall describe how their solution will incorporate external data sources as part of the initial deployment and how it will support the ingestion of new data sources in future enhancements.

The following are the data sources to be captured and archived by the TSP Cloud System data archive at initial build-out and those to be supported for future integration.

2.4.2.4.1 *Initial Build-Out*

- (a) Next-Gen TSP System data
 - TSP Probe Message streams (see Section 2.4.1.2.2 *Obtain Vehicle Status Information*)
 - Event log output from the PRG (see Section 2.4.2.7.13 *Log PRG events to reporting system*)
 - Event log output from the PRS (see Section 2.4.2.8.10 *Log PRS events to reporting system*)
- (b) Legacy Opticom TSP System data:
 - N/A – no additional data management requirements above what is currently available

2.4.2.4.2 *Optional/future phase*

- (a) **Traffic signal system performance data:**
 - Traffic agency signal performance measures (ATSPM data)
 - Traffic agency signal phase and timing data
- (b) **Third-Party data:**
 - Congestion data
 - Congestion related event data—incidents, construction, planned events
 - Travel times

2.4.2.5 ***Maintain Reporting and Performance Monitoring System***

The TSP Cloud System will maintain a reporting and performance monitoring subsystem. The subsystem will calculate TSP-related performance measures by collecting priority request event data and correlating it with event data from PRS and the CO. TSP-related performance measures will be summarized and graphically represented to the users in a dashboard. Desired performance measures to be provided in the dashboard include:

- | | |
|---|---|
| <ul style="list-style-type: none"> • Bus Travel Time • Travel Time Variability • On-Time Performance • Headway Distribution • Transit Segment Speed • Transit Approach Delay • Split Time Variability • Side Street Delay • Frequency of Skipped Phases • Frequency and Proportion of TSP Requests Granted/Rejected | <ul style="list-style-type: none"> • Response Time for TSP Requests • TSP Priority Request Status • Signal Strategy Actions Taken <ul style="list-style-type: none"> • Distinguish early green, arrival on normal green, and green extension • Distinguish arrival on red versus arrival on green • Signal Control Status • External Systems Communications Latency • Pedestrian Delay Increase and Pedestrian Delay |
|---|---|

- Aggregation of data for person delay using estimates
- Cycle length before, during and after TSP service

The reporting and performance monitoring subsystem should primarily rely on readily available data within the proposed TSP system. The Vendor may propose the use of other third-party data sources to supplement the reporting and performance monitoring subsystem.

2.4.2.6 *Manage and Monitor TSP Messages and Interfaces*

The Vendor shall provide a standards-based messaging architecture (as described in Section 2.3.3 *Conceptual Message Architecture*) to support the priority request message exchange between the PRG, PRS, and CO.

2.4.2.7 *Priority Request Generation (PRG) Functions*

This section describes the core functions of the TSP Cloud System related to generating priority request as part of the Next-Generation architecture described in Section 2.3. The proposer should describe how their proposed solution will deliver these functions. Any deviations or alternate approaches shall be noted and described.

The core priority request generation functions of the TSP Cloud System are the following:

1. Determine current Next-Gen TSP eligibility for each vehicle
2. Determine current need for priority for each vehicle
3. Assign prioritization level for each vehicle requiring priority
4. Identify upcoming signals and intersection movements needed
5. Calculate estimated time of arrival (ETA) to subject intersection
6. Calculate ETA confidence rating
7. Calculate estimated duration through subject intersection
8. Generate *Initial/Update/Clear/Cancel* priority request messages
9. Facilitate standards-based message exchange between the PRG and PRS/CO: Send priority request message(s) to PRS, Receive status updates from PRS, Update request items with status from PRS
10. Log events to reporting system

Additionally, the TSP Cloud System should provide TSP system configuration tools to enable users to manage and update PRG configuration and TriMet business rules as needed. The TSP Cloud System shall also be able to demonstrate future capability to support emergency vehicle preemption.

Table 2 summarizes these priority request generation functions and identifies relevant logical

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inputs and potential data sources. The subsections that follow discuss each in more detail.

TABLE 2. KEY PRIORITY REQUEST MESSAGE PROCESS STEPS, LOGICAL INPUTS, AND DATA SOURCES

PROCESS STEP	CONSIDERATIONS/LOGICAL INPUTS	DATA SOURCE (DATA ELEMENT)
DETERMINE TSP ELIGIBILITY	In revenue service?	Probe (vehicle status)
	Bus ID/route/run enabled for TSP?	Probe (vehicle ID)
	Within Next-Gen TSP corridor geofence?	Probe (vehicle location), TSP Cloud System (map reference)
	Within Legacy TSP corridor geofence?	Probe (location), TSP Cloud System (map reference)
DETERMINE NEED FOR PRIORITY	TSP “operating mode” (e.g., schedule adherence, maintain headways, minimize delay/unconditional priority, evacuation mode)	TSP Cloud System (operating mode configuration settings)
	Schedule status	Probe (schedule deviation), TSP Cloud System (schedule reference, threshold settings)
	Headway status/deviation	Probe (headway deviation), TSP Cloud System (headway reference, threshold settings)
ASSIGN PRIORITIZATION LEVEL	Prioritization logic subprocess (see additional discussion below)	TSP Cloud System (prioritization subprocess)

PROCESS STEP	CONSIDERATIONS/LOGICAL INPUTS	DATA SOURCE (DATA ELEMENT)
	Vehicle class type (e.g., emergency vehicle vs. LRT vs. enhanced transit bus vs. local service vs. express)	Probe (vehicle ID), TSP Cloud System (vehicle class association table, prioritization subprocess, configuration)
	Route ridership (for time of day, direction, etc.)	Probe (vehicle ID), TriMet reporting system (ridership tables), TSP Cloud System (prioritization subprocess, configuration)
	Schedule/headway lateness	Probe (schedule/headway deviation), TSP Cloud System (prioritization subprocess, configuration)
	Vehicle occupancy	Probe (passenger load estimate), TSP Cloud System (prioritization subprocess, configuration)
DETERMINE UPCOMING SIGNALS AND MOVEMENTS NEEDED	Vehicle's trip path	Probe (location), TSP Cloud System (schedule reference, trip path and signal mapping reference table)
CALCULATE ETA TO INTERSECTION(S) AND ETA CONFIDENCE	ETA calculation subsystem (see additional discussion below)	TSP Cloud System (ETA calculation subsystem)
	Distance to intersection	Probe (location), TSP Cloud System (route paths and

PROCESS STEP	CONSIDERATIONS/LOGICAL INPUTS	DATA SOURCE (DATA ELEMENT)
		signal mapping reference table)
	Number of signals prior to subject intersection	TSP Cloud System (route paths and signal mapping reference table)
	Number of stops prior to subject intersection (may represent an estimate if bus only stops if passenger requests or someone is waiting at stop)	Probe (vehicle status—stop request activated), TSP Cloud System (schedule reference, ETA calculation subsystem—historical database)
	Historical stop/station dwell time	TSP Cloud System (ETA calculation subsystem—historical database)/ TriMet reporting system
	Currently at a stop/station?	Probe (vehicle status)
	Estimated remaining dwell time at current stop/station	Probe (vehicle status [e.g., vehicle moving, door open]), TSP Cloud System (schedule reference, ETA calculation subsystem—historical database)
	Historical segment travel time (e.g., by time of day, week, season, etc.)	TSP Cloud System (ETA calculation subsystem—historical database)
	Historical <i>sub</i> -segment travel times (e.g., between current location and next traffic signal, or between current location and next	TSP Cloud System (schedule reference, ETA

PROCESS STEP	CONSIDERATIONS/LOGICAL INPUTS	DATA SOURCE (DATA ELEMENT)
	stop/station, or between consecutive downstream traffic signals)	calculation subsystem–historical database)
	Real-time congestion conditions	TSP Cloud System (ETA calculation subsystem–external data feed)
	Real-time phase state information for downstream traffic signals (Note: may not be feasible in the near-term as an input to the ETA calculation, but is still useful for post-analysis)	TSP Cloud System (ETA calculation subsystem–traffic signal system interface)
DETERMINE WHETHER TO REQUEST PRIORITY AND FOR WHICH SIGNALS	Decision-to-request subprocess (see additional discussion below)	TSP Cloud System (decision-to-request subprocess)
	Is vehicle authorized for TSP and approaching a TSP-enabled signal? (see Determine TSP Availability process step)	TSP Cloud System (Determine TSP Availability process step output)
	Has a need for priority been established? (see Determine Need for Priority process step)	TSP Cloud System (Determine Need for Priority process step output)
	Is distance to subject intersection within threshold? (May vary by intersection depending on signal's cycle length or other individual characteristics)	Probe (vehicle location), TSP Cloud System (decision-to-request configuration)

PROCESS STEP	CONSIDERATIONS/LOGICAL INPUTS	DATA SOURCE (DATA ELEMENT)
	Is ETA to subject intersection within threshold? (May vary by intersection)	TSP Cloud System (ETA calculation), TSP Cloud System (decision-to-request configuration)
	Is ETA confidence within threshold?	TSP Cloud System (ETA confidence), TSP Cloud System (decision-to-request configuration)
GENERATE <i>INITIAL</i> PRIORITY REQUEST MESSAGE(S)	Form message for each qualifying traffic signal based on parameters calculated in previous process steps	Standards-based message format settings
	Include additional or custom fields that may be needed by the PRS or to achieve desired TSP functionality	
GENERATE <i>UPDATE</i> PRIORITY REQUEST MESSAGE(S)	Time-based update intervals	TSP Cloud System (PRM [Update] configuration table)
	Distance-based update intervals	Probe (vehicle location), TSP Cloud System (PRM [Update] configuration table)
	ETA changes (or ETA confidence changes, if this gets passed to the PRS) exceeding a given threshold	TSP Cloud System (ETA calculation), TSP Cloud System (PRM [Update] configuration table)

PROCESS STEP	CONSIDERATIONS/LOGICAL INPUTS	DATA SOURCE (DATA ELEMENT)
	Prioritization calculation changes (e.g., as affected by changes in schedule deviation or passenger load, or changes to configuration weightings since the last message)	TSP Cloud System (prioritization subprocess)
	Other status change triggers? (e.g., desired movement changes)	TSP Cloud System (PRM [Update] configuration table)
GENERATE <i>CLEAR</i> PRIORITY REQUEST MESSAGE	Triggered when vehicle departs the subject intersection	Probe (vehicle location)
GENERATE <i>CANCEL</i> PRIORITY REQUEST MESSAGE(S)	Is vehicle no longer behind schedule/headway?	Probe (schedule/headway deviation), TSP Cloud System (PRM [Cancel] configuration table)
	Is updated ETA or ETA confidence now outside thresholds?	TSP Cloud System (ETA calculation), TSP Cloud System (PRM [Cancel] configuration table)
	Has service been cancelled for this vehicle?	TSP Cloud System (PRM [Cancel] configuration table)
SEND PRIORITY REQUEST MESSAGE(S) TO PRS	Use NTCIP 1211/SAE J2735 interface data elements	TSP Cloud System (PRS signal associations/ routing info)
RECEIVE STATUS UPDATES FROM PRS	Implement NTCIP 1211/SAE J2735 interface standards	

PROCESS STEP	CONSIDERATIONS/LOGICAL INPUTS	DATA SOURCE (DATA ELEMENT)
UPDATE REQUEST ITEM WITH STATUS FROM PRS	Implement NTCIP 1211/SAE J2735 interface standards	
LOG EVENT TO REPORTING SYSTEM	Implement NTCIP 1211/SAE J2735 interface standards	

2.4.2.7.1 *Determine current Next-Gen TSP eligibility for each vehicle*

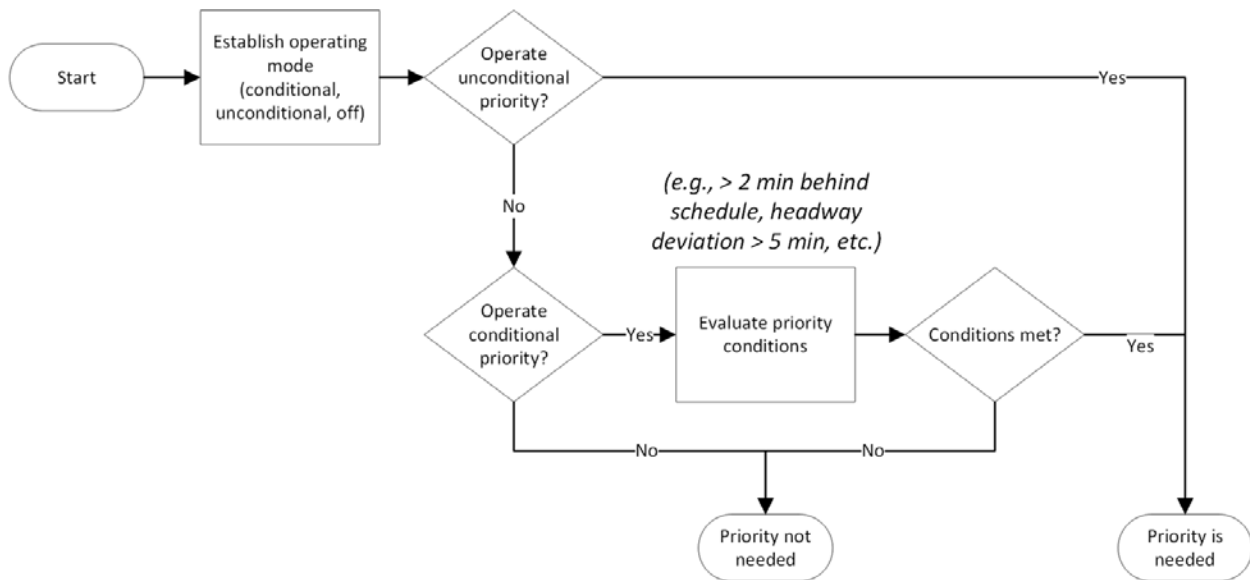
The first logical step in generating a priority request is to confirm whether an individual vehicle transmitting a TSP Probe message is currently eligible for Next-Gen TSP. The system should establish whether the vehicle is currently in revenue service (as indicated in the TSP Probe message) and whether the current run or route is designated for TSP.

Finally, because the Next-Gen TSP concept requires parallel support for the Legacy Opticom IR TSP system, the Next-Gen TSP Cloud System must also have a means to selectively disable Next-Gen TSP requests to those signalized intersection where the Opticom system will be operated instead. It must also activate the on-board Opticom system when the vehicle enters a pre-determined zone within range of the traffic signal's IR Detector. See additional discussion of this requirement in Section 2.4.1.5 *Support Supplemental use of Legacy Bus TSP System*.

2.4.2.7.2 *Determine current need for priority for each vehicle*

The TSP Cloud System is responsible for determining whether an individual vehicle warrants priority, based on data received from the TSP Probe message and business rules configured in the system. The figure below illustrates the conceptual process for determining whether priority is needed.

As indicated in the figure, the function should be flexible in supporting various operating modes, including unconditional (as may be used with LRT) and conditional, based on factors such as schedule adherence or headway maintenance. It should also be configurable to support other modes as needed, for example an "evacuation mode", which might specify unconditional priority for certain evacuation routes in a certain direction.



Associated with each specific operating mode are the conditions and triggers that determine whether priority is needed. These conditions and the trigger values should be configurable and should include:

- Schedule status, factoring in each unique scheduled Block, & Trip, & Stop
- Headway status/deviation
- Bus operational health (e.g., vehicle is in breakdown state then no need for priority)

Most data should be available from the TSP Probe message and triggers/thresholds should be configurable in a configuration settings interface the TSP Cloud System.

2.4.2.7.3 Assign prioritization level for each vehicle requiring priority

The Next-Gen TSP concept was developed to support the expansion of signal priority across various lines operating at different service levels, as well as different modes and vehicle class types. Therefore, it becomes important to account for different relative priorities among the various vehicles that may be sharing the same transportation infrastructure. The Next-Gen concept requires a robust relative priority assignment process that takes into account the key service and vehicle characteristics that may be considered when determining a particular vehicle's relative priority at any one time.

Criteria to be included in the prioritization assignment function are:

- Vehicle class type (e.g., emergency vehicle vs. LRT vs. enhanced transit bus vs. local service)
- Route ridership (for time of day and direction)
- Schedule or headway status
- Relative amount of service remaining (to differentiate between a vehicle with many stops and

therefore many downstream riders and a vehicle that is nearing the end of its service with few remaining riders)

- End of trip actions that may impact need for priority (e.g., Will the vehicle be deadheading? Is adequate layover buffer anticipated? Is there a crucial time point that must be met?)
- Vehicle occupancy

The priority level value in the Next-Gen TSP concept is intended to represent the vehicle's relative priority in terms of transit-side factors only; it does not take into account external factors such as traffic conditions or a traffic signal's current phase state. Such conditions may ultimately be part of the traffic signal's determination about which conflicting requests to prioritize (e.g., to grant priority to a lower-ranked request because it would be less disruptive to service), but that should be a part of the traffic signal controller's operation, not the PRG.

Key support function: Request Prioritization Assignment subprocess. The Next-Gen TSP concept provides a framework for flexible and configurable prioritization assignment that incorporates any number of transit-side business rules to be used to establish relative priorities of participating vehicles.

This conceptual subsystem maintains support for Priority Request Message standards (e.g., NTCIP 1211 *Vehicle Class Level* message object representation of a vehicle's relative priority), while also retaining a dynamic prioritization assignment capability. One potential approach to achieve these dual ends is to apply a weighting to various criteria categories, as shown in Figure 8 below, and then scale the value to the standards-based integer range used in TSP messaging standards (e.g., NTCIP 1211 1-10 integer value for *Vehicle Class Level*.)

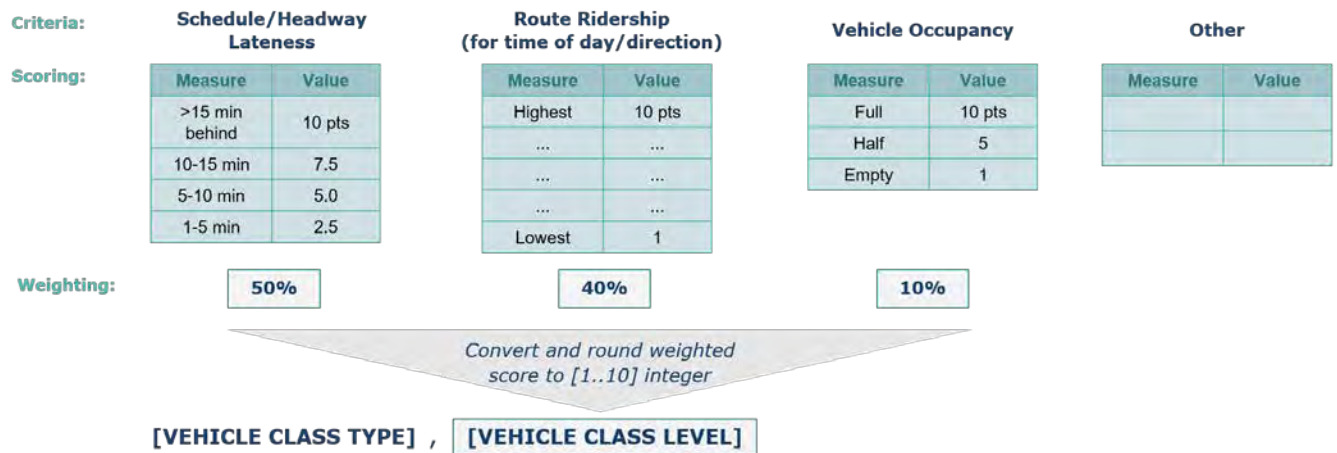


FIGURE 8. DYNAMIC PRIORITIZATION WEIGHTING EXAMPLE

The Vendor shall describe how they will provide a flexible and configurable priority assignment capability and how an authorized user will be able to add or modify criteria, scoring, and weightings as needed.

2.4.2.7.4 Identify upcoming signals and intersection movements needed

An association must be made between a vehicle's predicted route path and the traffic signals along that path that are TSP-enabled in order for the TSP Cloud System to route priority request messages to the appropriate signals. This function compiles this signal information based upon the vehicle's planned path for its current schedule and its latest location as provided by the TSP Probe message.

Additionally, in order for an appropriate signal strategy to be identified, the PRG must also provide an indication of the type of movement required through a given intersection (e.g., at Intersection X, a northbound through movement is required, or left turn, right turn, or queue jump). From this desired movement information, the PRS can associate it with a particular phase and assign a specific signal strategy.

Information from this subsystem will be used to associate priority requests to downstream signals and as input into ETA calculations.

The Vendor shall describe how they will provide such a signal and movement association table and identify how it may be updated to account for changes in vehicle's scheduled routes (e.g., due to construction-related diversions) and potential changes to the traffic signals.

2.4.2.7.5 Calculate estimated time of arrival (ETA) to subject intersection

One of the fundamental advantages of the center-to-center based architecture of the Next-Gen TSP concept is that it allows for priority requests to be transmitted to signals (and multiple signals) much earlier than would be possible under the traditional vehicle-to-infrastructure architecture. This makes it possible for advanced traffic signal systems and controllers to generate more responsive signal strategies that can be better tuned to the arriving transit vehicle and potentially less disruptive to other traffic.

However, inaccurate or unreliable arrival predictions can significantly impair the traffic signal's ability to provide green time to the arriving transit vehicle and minimize disruption to other traffic. Therefore, to take full advantage of the center-to-center architecture potential, it becomes important to make the arrival prediction as accurate as possible.

Potential logical inputs and data sources for the ETA calculation are described below. But a critical aspect of the conceptual subsystem is that it continuously integrates recent measures of actual arrival times to build a historical database against which to assess recent estimates and improve future estimates.

This "learning" process may be manual, rules-based, statistical model-driven, Big Data-based, machine learning-based, or some combination of the above, or another approach altogether. But one of the key benefits of having access to a continuous stream of probe data (i.e., the TSP Probe message) is that it allows the rapid development of a large historical data set against which to run some sort of analysis.

The Vendor shall describe how they will provide a robust and accurate ETA calculation capability that is able to incorporate historical and real-time data to improve the accuracy and reliability of its ETA calculations.

ETA calculations should be continually updated based on the latest TSP Probe data received from the vehicle.

TriMet has identified the following factors that impact the transit vehicle's time of arrival to an intersection. The Vendor should consider these in developing the ETA calculation algorithm:

- Distance to intersection
- Number of signals prior to subject intersection
- Number of transit stops prior to subject intersection
- Historical stop/station dwell time
- Likelihood of stopping at downstream transit stop(s)
- If currently at a stop, estimated remaining dwell time at stop
- Historical travel time between signals or on link approaching
- Real-time congestion data
- Real-time phase state information for downstream traffic signals (note: acquiring this data in a timely manner may not be feasible in the near-term)

2.4.2.7.6 Calculate ETA confidence rating

As mentioned in the previous section, sending inaccurate or unreliable arrival estimates to the traffic signal can result in ineffective TSP and increase disruption to other traffic. Therefore, the Next-Gen TSP concept introduces the concept of ETA confidence as a factor in determining whether to send a priority request in the first place or to cancel an existing priority request that is still active.

As part of the ETA calculation subprocess described previously, the TSP Cloud System generates an ETA confidence value to be used as a criteria for determining whether to generate a TSP request at this time and whether to keep an existing one active.

It is expected that arrival time prediction analysis and improvement process would occur continuously, drawing from the TSP Probe data set streaming in and historical data maintained in the TSP Cloud System.

The Vendor shall describe how their ETA calculation subsystem will incorporate historical and real-time data to generate useful ETA prediction confidence ratings.

2.4.2.7.7 Calculate estimated duration through subject intersection

One of the mandatory fields in the standard priority request message is the time of estimated departure, which indicates how long the vehicle will take to cross the intersection once it has arrived. This value will be a function of expected speed of the vehicle through the intersection and the length of the intersection.

The Vendor shall develop duration estimates appropriate to the each of the individual signalized

intersections to be included in this project.

2.4.2.7.8 *Generate Initial priority request message*

The TSP Cloud System shall generate a vehicle's *Initial* priority request message for each qualifying signalized intersection when:

- Vehicle has a need for priority and is approaching a Next-Gen TSP-enabled signal
- ETA to the subject intersection and the confidence rating of that ETA calculation are within a user-configurable threshold, specific to that intersection (refer to ETA and ETA confidence function descriptions above)

The system must also be capable of incorporating additional logic in the determination of whether to generate an Initial priority request message, with user-configurable criteria.

Once the conditions for generating the request are met, the TSP Cloud System will form an Initial priority request message for all qualifying downstream signalized intersections using a standards-based message format (NTCIP 1211/SAE J2735 PRM format).

At a minimum, the message must contain:

- Time message was generated
- Vehicle location (latitude, longitude)
- Subject intersection and operating agency identifier
- Fleet operating agency identifier
- Vehicle identifier
- Request identifier
- Intersection movement needed
- Vehicle type
- Priority rating (conveyed as Vehicle Class Type and Vehicle Class Level)
- ETA to intersection (aka Time of Service Desired [TSD])
- Estimated duration through intersection (aka Time of Estimated Departure [TED])

The Vendor should identify and configure any additional or custom fields in the priority request message that may be needed to achieve the TSP functionality described in this Next-Gen TSP architecture.

2.4.2.7.9 *Generate Update priority request message*

The TSP Cloud System generates a standards-based *Update* priority request message for qualifying signalized intersections following the *Initial* priority request message described in the previous section. The Update messages are generated dynamically based on real-time status update triggers. Note that, potentially, *Update* messages may be sent to the PRS nearly

continuously, depending on how often vehicle status conditions change (as provided by the TSP Probe message) and the how finely these thresholds are configured.

Key criteria from the TSP Probe Message that should be supported in this function are:

- Current ETA calculation differs from previous calculation by more than [X] seconds, where X is configurable
- Current priority level calculation differs from previous calculation by more than [X] points, where X is configurable.

In addition to supporting configurable thresholds for triggering an Update message, the Vendor shall also enable the addition of other criteria triggers as needed, such as time-based or distance-based update interval triggers (for example, that an Update message can be configured to always send at 30 seconds and 15 seconds prior to arriving at the subject intersection.

2.4.2.7.10 Generate Clear priority request message

The TSP Cloud System generates a standards-based *Clear* priority request message when the vehicle departs the subject intersection to notify the PRS that the signal can return to its standard service or begin its recovery process.

The Next-Gen TSP concept has this function being done in the TSP Cloud System using streaming vehicle location data from the TSP Probe message, which is then compared against a location reference for that intersection to establish the time of departure. The *Clear* message should be sent as soon as it is determined that the vehicle has cleared the intersection.

The Vendor shall describe how they will generate a reliable, accurate, and timely *Clear* message and how the proposed system will accommodate potential communication delays or position errors with the vehicle's self-reported location information.

2.4.2.7.11 Generate Cancel priority request message

The TSP Cloud System generates a standards-based *Cancel* priority request message when it determines that the vehicle no longer satisfies the need-for-priority conditional criteria (as defined in the *Determine current need for priority* function), or if configured thresholds for ETA/confidence are exceeded (refer to the *Calculate ETA confidence rating* function).

Note that the vehicle's priority request can also be cancelled by the PRS (e.g., because the signal's Time to Live threshold—the maximum amount of time a PRS considers a priority request for servicing—has been exceeded); this function is described in the PRS functions in Section 2.4.2.8.

In addition to supporting configurable thresholds for triggering a *Cancel* message, the Vendor shall also enable the addition of other criteria triggers as needed.

2.4.2.7.12 Receive status updates from PRS

Following a standards-based messaging architecture, the PRS element of the TSP Cloud System receives a Priority Status Buffer Message from the PRS, which provides the PRG a status of the priority requests.

2.4.2.7.13 Log PRG events to reporting system

Following a standards-based messaging architecture, the TSP Cloud System will update its Reporting System with TSP events recorded by the PRG. This includes a record and details of each priority request generated and updates to the request status as provided by the PRS.

2.4.2.7.14 PRG Support Function: TSP system configuration tools

The Next-Gen TSP concept supports extensive configuration and customization of the parameters that go into generating a priority request. The Vendor shall describe how their proposed solution will incorporate TriMet TSP business rules into the system and provide authorized users configuration tools to customize the system as needed.

2.4.2.8 Priority Request Server (PRS) Functions

This section describes the core functions of the TSP Cloud System related to the granting of priority requests as part of the Next-Generation architecture described in Section 2.3. These functions fall within the TSP standards definition of the Priority Request Server (PRS) logical object and will be referred to as *PRS functions* in this section.

The proposer should describe how their proposed solution will deliver these PRS functions. Any deviations or alternate approaches shall be noted and described.

The core PRS functions of the TSP Cloud System are the following:

1. Receive priority request message(s) from PRG
2. Maintain table of active priority requests
3. Associate a signal strategy with requested movement
4. Clear expired or invalid requests
5. Determine prioritization of current valid requests
6. Send service request message to CO (Controller)
7. Receive status updates from CO
8. Update request table with status updates from CO and from PRG
9. Send status updates to PRG
10. Manage and monitor TSP messages and interfaces
11. Log events to reporting system

Additionally, the TSP Cloud System should provide TSP system configuration tools to enable

users to manage and update PRS configuration and traffic signal business rules as needed.

2.4.2.8.1 Receive priority request message(s) from PRG

Following a standards-based messaging architecture, the PRS element of the TSP Cloud System receives priority request messages from the PRG. Note that while the Next-Gen TSP Concept identifies the PRG and PRS logical objects as co-residing within the TSP Cloud System, exchanges between the two should still comply with TSP interface and messaging standards. This is to support compatibility and flexibility for future expansion to the system.

2.4.2.8.2 Maintain table of active priority requests

The PRS element of the TSP Cloud System maintains a table of priority requests received from the PRG for each Next-Gen TSP-enabled signalized intersection in the system. Following TSP standards, this table represents a live snapshot of the priority requests for each participating signalized intersection. It is updated based on internal PRS priority-related functions and status updates provided by the PRG and the traffic signal controller (or *Coordinator* [CO], in standards-based logical object terminology).

2.4.2.8.3 Associate a signal strategy with requested movement

The TSP Cloud System PRS element maintains a configured mapping of vehicle intersection movements to available signal strategies. It performs a translation of the vehicle's intersection-movement-needed field contained in the priority request message from the PRG to a set of valid signal strategies that the traffic signal can provide. (Refer to the *Identify upcoming signals and intersection movements needed* function description in Section 2.4.2.7 *PRG Functions*.)

The specifics of the signal strategy will depend on how the subject intersection's traffic signal controller and traffic signal system are configured and may vary by intersection.

2.4.2.8.4 Clear expired or invalid requests

One of the primary logical functions of the PRS is to incorporate traffic-side business rules to determine which requests for priority should be considered and which may be acted upon. The initial step involves clearing expired or otherwise invalid requests. The Vendor shall provide a PRS element that enables the clearing of priority requests based on configurable business rules, which may vary by signalized intersection. These business rules will be developed in cooperation with the traffic signal owners.

Intersection-specific, configurable business rules shall include at a minimum:

- Time-to-live
- ETA within threshold
- Re-service period

Other potential considerations that may optionally be incorporated are traffic and congestion-related thresholds. Refer to Section 2.4.2.8.11 *PRS Support Function: Intersection data and*

TSP business rules entry for a discussion of the requirements of the intersection configuration function.

The proposer shall describe how their solution will incorporate traffic agency business rules into the system and provide authorized users configuration tools to customize the rules as needed.

2.4.2.8.5 Determine prioritization of current valid requests

The other main logical function of the PRS is to determine how to prioritize the current active, valid priority requests and which to recommend to the CO for implementation. The Vendor shall provide a prioritization algorithm based on configurable business rules, which may vary by signalized intersection. These business rules will be developed in cooperation with the traffic signal owners.

The prioritization algorithm should take into account the following factors at a minimum:

- Vehicle's Class Type (as provided in the priority request message)
- Vehicle's Prioritization Level (as provided in the priority request message)
- ETA to intersection
- Ease of serving the vehicle's desired movement (i.e., will the vehicle's predicted arrival correspond with a green phase without significant alteration to the signal cycle?)
- Is there a movement that needs to occur prior to the prioritized vehicle?

In the future, this prioritization function may be revised as signal system and controller capabilities allow. The proposer shall describe how their solution will incorporate traffic agency business rules into the system and provide configuration tools to update the algorithm as needed.

2.4.2.8.6 Send service request message to CO (Controller)

The PRS element of the TSP Cloud System will form a Service Request Message for the subject signalized intersection using a standards-based message format (NTCIP 1211/SAE J2735 PRM format). The message will contain the recommended signal strategy or strategies to be implemented by the CO as determined by the PRS. Note that the signal strategy produced by the PRS represents a recommendation only; it is ultimately the responsibility of the CO to determine whether and which strategy to implement.

The Vendor should identify and configure any additional or custom fields in the priority request message that may be needed to achieve the TSP functionality described in this Next-Gen TSP architecture.

2.4.2.8.7 Receive status updates from CO

Following a standards-based messaging architecture, the PRS element of the TSP Cloud System receives a Service Request Status Message from the CO, which provides a status of actions taken by the CO on priority requests.

2.4.2.8.8 *Update request table with status updates from CO and from PRG*

Following a standards-based messaging architecture, the PRS element of the TSP Cloud System updates its internally maintained table of requests with status updates received from the PRG and the CO. This enables the PRS to stay in sync with the other two logical objects.

2.4.2.8.9 *Send status updates to PRG*

Following a standards-based messaging architecture, the TSP Cloud System will provide status updates to the PRG based on any changes made by the PRS or the CO to a vehicle's priority request.

2.4.2.8.10 *Log PRS events to reporting system*

Following a standards-based messaging architecture, the TSP Cloud System will update its Reporting System with TSP events recorded by the PRS. This includes a record and details of each update made to the request table by the PRS.

2.4.2.8.11 *PRS Support Function: Intersection data and TSP business rules entry*

The Next-Gen TSP concept supports extensive configuration and customization of the parameters that go into granting a priority request and implementing a response. The Vendor shall describe how their proposed solution will incorporate traffic signal business rules into the system and provide authorized users configuration tools to customize the system as needed.

2.4.2.9 ***Support Future Modal Expansion: LRT and Emergency Vehicles***

One of the key needs of the Next-Gen TSP system is that it be adaptable, flexible, and scalable to support the addition of new service routes, modes (including rail and emergency vehicles), and traffic agencies. While rail and emergency vehicle preemption are not part of this specific procurement, the Vendor's Next-Gen TSP solution must be developed in such a way that it does not preclude the incorporation of these modes and their priority and preemption needs in future system enhancements.

2.4.3 TSP Cloud System Infrastructure

The TSP Cloud System Infrastructure is responsible for hosting the TSP Cloud System and interfacing with the On-board System (OBS) and Traffic Signal System (TSS). The Vendor is responsible for providing the TSP Cloud Infrastructure. Requirements for the TSP Cloud System Infrastructure are included in the RTM under the TSP Cloud Infrastructure component.

2.4.3.1 ***Physical Requirements***

The TSP Cloud System shall be hosted in a cloud environment per Vendor's TSP Cloud Hosting Plan as approved by TriMet. TriMet shall provide all equipment necessary to establish the OBS-TSP Cloud System network connection. TriMet shall provide all equipment necessary to establish the TSP Cloud System-TSS network connection with Partner Agency. The TSP Cloud System-TSS network connection will use fiber optic medium or VPN over Internet.

2.4.3.2 Functions

The TSP Cloud System shall include equipment management functions, time synchronization, database management and storage, and recovery/troubleshooting capabilities.

The TSP Cloud System shall provide the functionality to monitor and test the system from central offices and from the field for maintenance and testing capabilities.

The TSP Cloud System shall provide a capability to confirm the proper end-to-end functionality of the TSP system. Users with sufficient credentials shall be able to load dummy data to simulate one or more vehicles with configurable attributes under different scenarios to confirm:

- Message content
- PRG, PRS, and CO message exchange
- Traffic signal controller response
- Data capture and reporting
- End-to-end network reliability and speed
- Message speed and latency

The TSP Cloud System shall also provide a time synchronization solution to coordinate clocks between the TSP Cloud System and each connected system or device. The solution shall calculate and maintain time offsets for each connected system relative to the time reference used by the TSP Cloud System. The TSP Cloud system shall regularly ping (and/or handshake with) the external traffic signal systems and Next-Gen vehicles to determine each system's needed offset at any given time.

The TSP Cloud System shall work with TriMet's IT network monitoring system to determine bandwidth and latency issues, and trigger an alarm under configurable parameters.

2.4.3.3 Communications

The TSP Cloud System shall interface with the On-Board System (OBS) and Traffic Signal System (TSS) over secure VPN and cellular connections. TSP Cloud System-TSS network infrastructure shall support IPSec VPN with minimum 128-bit AES encryption (256-bit preferred). Hashing for VPN packet checksum shall be provided in VPN tunnel and shall use SHA1 algorithm or stronger for calculation of message digest.

The routing of the TSP Cloud System-TSS link will utilize the TriMet I-NET front door. Alternative communications routing proposed by the Vendor are subject to review and approval by TriMet IT.

2.4.3.4 Backup

The TSP Cloud System shall support automated and manual backup functionality.

2.4.3.5 Scalability

The TSP Cloud System shall accommodate initial loading and maximum load conditions considering planned and future TriMet OBS and Partner Agency TSS integration.

2.4.3.6 Latency

The TSP Cloud System shall operate under minimal latency from receipt of probe data to the service of the TSP message by the TSS.

2.4.3.7 Availability

The TSP Cloud shall meet uptime and recovery requirements to maintain system operations.

2.4.3.8 Security

The TSP Cloud shall be architected to provide end-to-end layered security and security monitoring functionality. The Vendor's TSP Cloud solution shall comply with all TriMet network security requirements as described in the policy documents *TriMet - Network Connection Policy* and *TriMet IT Policies for RFP*, incorporated by reference in Appendix C *TriMet IT Security Requirements*. Additionally, the Vendor shall complete the *TriMet Software-as-a-Service (SaaS) Security Assessment Form*, included in Appendix C *TriMet IT Security Requirements*, with respect to its proposed TSP Cloud solution.

2.4.3.9 Maintenance

The TSP Cloud will be administered, maintained, and monitored by TriMet. On-going technical support contract will be negotiated with the Vendor. Partner traffic agencies will continue to monitor, support, and maintain their IT networks including from ATMS to the controller.

2.4.4 Traffic Signal System (TSS)

The Traffic Signal System (TSS) will require TSP System messaging between the TSP Cloud System and Partner Agency traffic signal systems. The Vendor is responsible for collaborating with TransCore and Q-Free/Intelight to integrate TSP messages with Intelight signal controllers. TriMet and Vendor are responsible for establishing communications between the TSP Cloud System and TSS. Requirements for the TSS are included in the RTM under the Traffic Signal System component.

Additional traffic signal controllers currently utilized in the region include: PEEK Voyage, Wapiti WKS, Transcore SCATS, Rhythm InSync, and Trafficware SynchroGreen. TriMet and partner agencies may explore integration with these in future phases.

2.4.4.1 Physical Requirements

The TSS will include Transcore *Transuite* and Intelight *MaxView* traffic signal management software and Intelight *MaxTime* signal controller software. The TSS will communicate between central and roadside TSS equipment through existing fiber or copper communications infrastructure. Where hardwired communications are not available, the TSS may communicate through a cellular link using a fixed-location mobile access router. Vendor shall demonstrate that cellular to traffic signal is supported.

2.4.4.2 Functions

This section describes the TSS core functions, Coordinator (CO) per NTCIP 1211, related to implementing priority request signal strategies as part of the Next-Generation architecture described in Section 2.3. These functions fall within the TSP standards definition of the Coordinator (CO) logical object and will be referred to as *CO functions* in this section.

CO functionality will be provided entirely by the participating traffic agencies' traffic signal system(s), independent of the TSP Cloud System. Intelight ATC controllers will be the primary devices hosting CO functionality.

The Vendor is ultimately responsible for end-to-end functionality of the complete solution, including CO functionality to be performed by the traffic signal management software and ATC controllers. Specific interaction with Intelight or Transcore necessary to fully develop and integrate the CO functionality shall be identified by the Vendor in their response to this RFP.

The proposer should describe how their proposed solution will deliver these CO functions. Any deviations or alternate approaches shall be noted and described.

The core CO functions to support the Next-Gen TSP concept are the following:

- Receive service request messages from PRS
- Maintain table of active priority and preemption requests
- Determine and implement signal strategies
- Update PRS with actions taken and status changes made
- Have a configuration capability

2.4.4.2.1 *Receive service request message from PRS*

Following a standards-based messaging architecture, the traffic agency's CO receives service request messages from the TSP Cloud System PRS element. The traffic agencies' existing Center-to-Field communications will be used to transmit messages to and from the traffic signal controllers.

2.4.4.2.2 *Maintain table of active priority requests*

The CO element of the TSP Cloud System maintains a table of priority requests received from the PRS via the service request message. Following TSP standards, this table represents a live snapshot of the priority requests for the subject signalized intersection. It is updated based on internal CO priority-related logic and status updates provided by the PRS.

2.4.4.2.3 *Implement signal strategies*

The CO is the TSP logical object that makes the ultimate decision about whether to implement a signal strategy and how to implement it. The traffic agency's CO will have its own internal logic, with access to current signal state information and any preemption activity, to determine what signal strategy action to take. The proposer shall describe how their solution will incorporate the

controller vendor's CO functionality and business rules to support the Next-Gen TSP concept described in this RFP.

2.4.4.2.4 *Send status updates to PRS*

Following a standards-based messaging architecture, the CO will provide status updates to the TSP Cloud System PRS element based on changes to a vehicle's priority request and signal strategy actions taken.

2.4.4.2.5 *CO Support Function: Intersection data and TSP business rules entry*

The Next-Gen TSP concept supports extensive configuration and customization of the parameters that go into granting a priority request and implementing a response. The Vendor shall describe how their proposed solution will incorporate CO business rules into the system and provide a means for authorized users to configure the rules as needed. To the extent that the Vendor's proposed solution merges PRS and CO functionality, business rule updates to the PRS should automatically flow down to the CO from the PRS configurator.

2.4.4.3 **Communications**

The TSS communications network will be configured and tested by TriMet, the Partner Agency, and the selected Vendor. These are for use by TriMet IT in securing end-to-end communications. The vendor solution is shall meet operational requirements on low latency, high speed fiber optic network to the controller.

2.4.4.4 **Security**

The TSS will support a secure VPN connection with the TSP System. The TSS network infrastructure will be terminated by firewalls. The TSS network infrastructure will be inside Partner Agency WAN with traffic management center server rooms and roadside traffic signal cabinets providing physical security.

2.4.4.5 **Maintenance**

The TSS will be administered, maintained, and monitored by the Partner Agency. Documentation for the system will be provided for implementation of transit signal priority.

SECTION 2.5 – IMPLEMENTATION SERVICES

2.5.1 Project Management

The Vendor shall identify a robust project management team and project management plan to support the complete development and implementation of the system. The Vendor's plan for managing the project shall clearly demonstrate an appropriate allocation of project management resources that have the ability and experience to ensure that the system design and implementation will be properly coordinated and managed, and will be completed on schedule and within budget. The Proposer shall provide tools to manage tasks, schedules, risks, and changes that are required to effectively manage the project.

The selected Vendor will submit a comprehensive Project Management Plan (PMP) shortly following Notice to Proceed (NTP) that details, at a minimum, project organization, master schedule, and how the project scope, cost, risk, safety, quality, project changes, and other key aspects of the project will be managed by the Vendor.

2.5.2 Design Review and Approval

Three formal design review phases will be undertaken during the project to develop and describe the technical design that will satisfy the needs in this scope of work. For each design review phase (Conceptual, Preliminary, and Final), the Vendor shall submit a set of documentation and software demonstrations to TriMet for review and approval. The requirements in this section describe the criteria for execution and approval of each design review phase.

2.5.2.1 General Requirements

The Vendor shall employ commonly accepted industrial design principles throughout the design and manufacturing processes. Design calculations, layouts, and other documentation that summarizes the human factors and engineering considerations will be submitted during the design review. Topical reviews to address key issues will be held as needed.

The Vendor shall submit a Design Review Plan for TriMet review and approval within 30 calendar days of NTP. This plan will describe the scope, schedule, and deliverable format for each of the formal design reviews. Formal design reviews will be conducted to evaluate the design progress, as well as the technical, functional, and programmatic adequacy of the design in meeting the requirements in this SOW.

Design reviews will occur onsite or virtually with the Vendor project manager, lead engineer and all relevant technical staff attending in person and will consist of the following activities at a minimum:

- A design review package will be submitted by the Vendor and reviewed by TriMet and consultant staff.
- A design review Master Issues List (MIL) will be created as a result of the review and will be provided to the Vendor.
- A formal design review meeting (or series of meetings) will be held between the Vendor and agency staff, where the Vendor will explain the design and TriMet will confirm compliance with the applicable requirements. Where possible, issues will be resolved during the design review meetings.
- All issues discussed during the meetings will be documented. TriMet will determine the appropriate action to close an issue, considering where the project is within the overall design.
- If required, the Vendor shall take action defined by TriMet, including resubmittal of the design review package or parts of the package, to address the issues identified during TriMet's review and subsequent design review meeting.

- The design review package will be approved upon TriMet's determination that identified issues have been addressed.

The Vendor shall submit design review packages that include all required project documents and supporting documentation at least 21 calendar days prior to each formal design review meeting. There will likely be multiple meetings for each phase to accommodate the iterative approach.

If resubmittal of all or part of any design review package is required, the Vendor shall provide the revised documents within 14 calendar days following completion of the formal design review meetings.

2.5.2.2 *Conceptual Design Review*

The objectives of Conceptual Design Review (CDR) are to acquaint TriMet with the Vendor's intended system design, resolve any open items related to external system interfaces, and provide the basis for proceeding with Preliminary Design Review (PDR). The complete CDR package will be submitted within 45 calendar days of NTP. At a minimum, the vendor shall do the following for CDR:

- Confirm the structure of the Vendor's management team and the scope of any subVendors.
- Provide preliminary design details for all equipment described in the requirements.
- Provide narrative descriptions of the major systems and subsystems proposed by the Vendor.
- Provide system block diagrams identifying all interfaces between system components, including external systems, that will not be provided by the Vendor but will interface with the system.
- Describe the responsibilities and schedule for completion of detailed system interface definitions.
- Provide a software conceptual design, including software block diagrams for key system components.
- Confirm the Vendor's understanding of the intended operations and maintenance environment.
- Identify key information and decisions required from TriMet.
- Document the approach for how each customer-facing or employee-facing device and system will achieve Americans with Disabilities Act (ADA) and accessibility compliance, in the form of a draft Accessibility Compliance Plan.
- Provide visual aids where possible.

2.5.2.3 *Preliminary Design Review*

The objectives of Preliminary Design Review (PDR) are to review progress of the system design

and evaluate compliance with the requirements of this SOW. PDR will represent approximately 75 percent completion of the total technical and operational system design. At PDR, the Vendor shall demonstrate programmatic adequacy of design in meeting the requirements in this SOW. The Vendor is encouraged to categorize PDR information into logical topics for organized review and discussion. The PDR submittal for each element will be submitted within 90 calendar days of CDR approval for that element.

At a minimum, the Vendor shall do the following for PDR:

- Schedule compliance review and discussion of variances or delays.
- Provide detailed hardware and software specifications for all Vendor-supplied devices, including power diagrams, functional block diagrams, mounting arrangements, installation methods, and visual aids where possible.
- Provide detailed software flow charts for all back office applications.
- Provide complete customer and operator user interface specifications, flow charts, and messages for all Vendor-supplied devices and systems, including accommodations for all boundary and error conditions.
- Provide detailed interface and communication specifications for all internal and external system interfaces.
- Provide detailed specifications for all configuration control systems.
- Provide detailed specifications for access control systems supporting back office operations.
- Provide detailed descriptions of system backup and recovery procedures.
- Provide a Maintenance Plan.
- List special tools and diagnostic test equipment needed for maintenance of each Vendor-supplied device and system.
- Update the approach for how each customer-facing or employee-facing device and system will achieve ADA and accessibility compliance, in the form of a draft Accessibility Compliance Plan.

2.5.2.4 *Final Design Review*

The objective of Final Design Review (FDR) is to finalize the detailed system design that satisfies all of the requirements in this SOW. FDR will represent 100 percent completion of the detailed system design with production specifications and drawings ready for release. The FDR submittal for each element will be submitted within 60 calendar days of PDR approval for that element.

At a minimum, FDR will include the following:

- Scheduled compliance reviews and discussion of variances or delays.

- Assembly drawings for all Vendor-supplied devices, down to the Lowest Level Replaceable Unit (LLRU).
- Electrical schematic drawings for all Vendor-supplied devices.
- Preliminary “as-built” drawings and prototypes for all device mounting configurations.
- Final system architecture drawings.
- Detailed software specifications for all back office applications with software module descriptions in a narrative format and data flow diagrams to the lowest level of decomposition.
- Detailed specifications for all system transaction formats.
- Detailed descriptions of all message formats and data elements for device and system events and alarms.
- Interface control documentation for all systems and subsystems.
- Complete data dictionary and detailed database design documentation, including all tables, views, and materialized views for all database schemas in the System, in electronic format (e.g., ER Studio).
- Documentation of database programming features including, but not limited to; queries, query formats, triggers, jobs, functions, and procedures.
- List of spare parts required to support the System.
- Drawings and/or mockups for how each customer-facing or employee-facing device and system will achieve ADA and accessibility compliance, in a final Accessibility Compliance Plan.
- Visual aids where possible.

2.5.3 Installation

2.5.3.1 *General Installation Needs*

The Vendor shall provide all equipment, accessories, and other materials necessary to install, integrate, and make the system fully operational.

The vendor shall perform installation and post-installation commissioning testing on all field equipment while working in close coordination with TriMet. TriMet will provide the necessary power and communications at the installation locations. The vendor shall provide all hardware and device-specific cabling necessary to properly install and secure the equipment in its planned location.

The Vendor shall identify and provide a secure facility in the Portland area at a location approved by TriMet for the placement of a Vendor-furnished agency test facility. The vendor

shall install, configure, and test all Vendor-provided equipment, back office applications, and other necessary hardware and software for the agency test facility. The vendor shall provide and install all cabling and hardware necessary to properly install and secure the equipment in its planned location(s).

The vendor shall perform a commissioning test for each installation that may be witnessed by TriMet at their discretion. Detailed test results will be recorded electronically to show that each device and system has been inspected and tested in accordance with this SOW, and submitted to TriMet for review and approval.

2.5.3.2 *Installation Plan (as needed)*

The vendor shall provide detailed Installation Plans for TriMet review and approval during FDR, and a final version no later than 120 calendar days prior to the first delivery of equipment.

The Installation Plans will describe all aspects of equipment and system installation. That includes site and vehicle surveys of every unique make/model/type, communications testing, prototype installations, site preparation, pre-wiring, equipment and vehicle staging, production installation and sequencing, media deployment, quality assurance and control, and scheduling. It will also detail installation and configuration of all software systems, including the back-office applications, test facility, interfaces and web applications, and their respective schedules, including precedents and dependencies.

The Installation Plans will provide the power and communication requirements for each piece of equipment and at each installation location. The communication requirements will include a description of any networking equipment necessary to connect the Vendor devices to the agency-provided network. These requirements may be revised and submitted to TriMet following completion of the site surveys.

Of particular importance is the Vendor's plan for launching the system with the least amount of risk and disruption to agency operations and to the public. The plan needs to identify any additional, temporary, or special equipment, data migration, and staffing requirements.

2.5.3.3 *Site Surveys (as needed)*

The vendor shall perform detailed site surveys for all vehicle types, and equipment and back office install locations, including other agency locations, to identify installation requirements, needed upgrades, and any existing provisions that may be used to support installation.

Initial vehicle surveys will be completed as a part of the design review process. As part of FDR, the vendor shall submit the installation details and specifications for all equipment installations for agency review and approval. The vendor shall test and verify the configuration of the agency-provided communication network for deployment of the System as designed prior to the approval of FDR. The vendor shall identify any modifications or additional provisions needed for installation of the System equipment and related system components, but will work as much as

possible within the limits of intended location.

2.5.3.4 *Prototype Installations (as needed)*

The vendor shall work with agency staff to create and test a prototype installation of Vendor provided field devices in each of the different field environments in which the equipment will be installed. TriMet will have at least one (1) week of service experience with each prototype installation to confirm robustness of the installation design. Prototype installation results will be documented and submitted to TriMet for review and approval.

2.5.3.5 *Onsite Work Requirements*

Agency and site-specific work rules, safety training, and track access requirements will be provided to the Vendor following contract award.

2.5.3.6 *Installation Procedures (as needed)*

The Vendor will provide installation procedures in accordance with the approved installation plan, agency rules, and guidelines. The Vendor will supply an installation procedure manual for TriMet. The procedures will detail how any modifications made to agency-owned facilities and equipment as a part of equipment installations will be sealed and corrected in order to preserve the integrity of the infrastructure.

2.5.3.7 *Shop As-built Drawings (as needed)*

The vendor shall submit shop as-built drawings used in its manufacturing facility, assembly facility, or shop to fabricate, assemble, and/or install parts of the System, whether manufactured from raw materials or purchased from others in a ready-to-use condition. Shop drawings and their projected delivery dates will be noted on the master schedule.

For each set of as-built drawings, the vendor shall submit prior to final acceptance:

- One (1) copy on electronic media, in a format approved by TriMet
- One (1) reproducible CAD-generated hardcopy

All drawings will contain dimensions, physical details, connections, and other information pertinent to system diagnostics, maintenance, and troubleshooting. Drawings will reside in the document control system as specified.

A master index of drawings will be submitted that clearly indicates the organization of the shop and as-built drawings, listed by drawing number. The master drawing index will also provide cross-references to related drawings, and will indicate the hierarchy of all drawings and drawing layers.

2.5.4 Testing and Testing Documentation

The System requires thorough testing before rollout to ensure that it meets this scope of work and the needs of TriMet and partner traffic agencies. The Vendor shall develop and provide a Testing Plan that includes test procedures and criteria to test functionality of the system and shall include traffic agency partner testing responsibilities to be approved by TriMet and partner traffic agencies prior to testing. The Vendor shall provide a test plan outline consistent with IEEE 829-2008, IEEE Standard for Software and System Test Documentation, Section 9, Level Test Plan(s).

The Vendor will document all testing activities to provide evidence of acceptable system design and delivery, including all components and subsystems. The Testing Plan will include user testing and user experience metrics for all test phases. Testing documentation will include the capabilities being tested, required equipment, and how/why a test is relevant. The vendor shall obtain all required testing equipment. TriMet shall approve all testing documentation in writing during design reviews. The Vendor will not perform any test until the corresponding test plan has been approved.

Development and testing may occur in an iterative and staged manner. Some elements of the System may be ready for testing before others. Leading up to the System Acceptance Test (SAT), certain elements of the System will advance through testing phases before other elements as long as they are not contingent upon one another. The SAT will be performed on the entire system, as deployed. All testing phases will be completed in their entirety for every element of the System.

The testing will be completed in five phases:

1. Conceptual Prototype Testing
2. System Integration Testing
3. On-site Integration Testing
4. Pilot testing (Division Street Next-Gen TSP System)
5. System Acceptance Testing

TriMet shall perform analysis, review, and approval of data integrity and system performance before approving each testing phase for an element undergoing testing. The vendor shall identify and record all critical issues and corrective actions taken prior to completion of testing.

2.5.4.1 Testing

The five types of testing are described as follows:

2.5.4.1.1 Conceptual Prototype Testing

Conceptual Prototype Testing will confirm that a message can be generated by the bus, transfer

to the TSP system in the cloud, be directed to an intersection controller, and forwarded to the central system. The purpose of Conceptual Prototype Testing (CPT) is to demonstrate in a controlled laboratory environment that each of the System components and associated software furnished by the Vendor meets all capabilities through final design, prior to full system integration. Successful completion of component-level software development, and installation of production equipment in the agency test facility are prerequisites.

CPT will occur at the TriMet test facility. CPT procedures will be submitted to TriMet for review and approval prior to the scheduled test. The functional and cycling tests will demonstrate all base functions of the System. All device interfaces with the back office necessary to perform the testing may be simulated, if the interfaces or back office software is not ready to be tested. The vendor shall fully document all test results and explain test results not meeting specification requirements and submit a plan for corrective action.

Subsequent to successful completion of the transactional CPT, the vendor shall conduct an environmental cycling test at expected extremes. Successful completion of the testing requires no failures or discrepancies in the functionality described in the SOW and agreed to at FDR.

(a) Conceptual Prototype Devices (as needed)

Conceptual Prototype Testing of the devices will cover all onboard devices and other hardware. The Vendor and TriMet shall jointly develop the structure, timing, and pass/fail criteria of the CPT. Cycle testing will be performed on all devices.

2.5.4.1.2 System Integration Testing

When Conceptual Prototype Testing has been successfully completed, the vendor shall conduct a System Integration Test (SIT) in which all devices, back office applications, interfaces, integrations, and all other aspects of the System are exercised. The vendor shall submit detailed SIT procedures to TriMet for review and approval. SIT is needed to confirm that when installed, the fully integrated system will perform, operate, and communicate as required in a controlled laboratory environment.

SIT is intended to demonstrate all device functionality and back office operation, monitoring and reporting functions described in this SOW with full integration of the devices and back office, including all support systems. SIT will also test communications and data transmission as required to complete the tests. This will include database accuracy testing, which will demonstrate the accuracy between the AUT (application under test) and the relational database in which application-generated data is stored. The testing will also demonstrate atomicity, consistency, isolation and durability of the database. At a minimum, testing will include:

- Prescribed days of continuous testing of all system components, during which the components will be operational 24 hours a day
- A minimum number of actions at each system component type
- All alarm and boundary conditions tested a prescribed number of times each

During SIT, all software modifications will be reviewed, demonstrated, tested, and approved by

TriMet. The vendor shall record version information for all software modules, including the date and time the software was created, size of each file, and version number. With successful completion and approval of SIT, all software and configuration files will be “frozen,” and the Vendor will make no changes without agency authorization. Upon agency approval, Field Integration Testing of the System components may commence.

2.5.4.1.3 Field Integration Testing

Field Integration Testing provides evidence that subsystems are performing as designed to meet overall system requirements when integrated. The Vendor shall be responsible for supporting all elements of any integration testing, including, but not limited to, equipment maintenance and reporting. Volume and stress testing will occur during integration testing.

Upon completion of SIT and initial field installation activities, the vendor shall conduct a Field Integration Test (FIT) in which all devices, back office applications, interfaces, integrations and all other aspects of the System are exercised in what will become the production environment. The entire production back office and a portion of each type of equipment must be fully installed and configured prior to the commencement of FIT. The vendor shall submit detailed FIT procedures to TriMet for review and approval prior to commencement of FIT.

The Program needs the Vendor to include pre- and post-installation checklists and test reports for all installed equipment as part of the FIT procedures. The production system will be provisioned with data simulating the System’s operational databases under full operational load, which will be defined in the FIT test procedure and approved by TriMet prior to commencement of FIT. At a minimum, FIT will include:

- Prescribed days of continuous testing of all system components, during which the components will be operational 24 hours a day
- All alarm and boundary conditions tested a minimum number of times each

Final transaction volumes and specifics of FIT testing will be included in the FIT procedures to be reviewed and approved by TriMet.

Additionally, FIT will fully test all system redundancy measures, successfully demonstrate execution of the Disaster Recovery Plan, and include database accuracy testing, which will demonstrate the accuracy between the AUT and the relational database in which application-generated data is stored. The testing will also demonstrate atomicity, consistency, isolation, and durability of the database.

2.5.4.1.4 Pilot Testing

Pilot Testing will be performed on the Division Street Project using transit vehicles equipped with the Next-Gen Transit Signal Priority technology. The Vendor will test various attributes of the system in a real-time setting. The system must pass all requirements prior to advancing to the system acceptance phase.

Just as during FIT, there will be challenges associated with conducting a pilot test. The Vendor will be expected to work collaboratively with the TriMet to develop a Pilot Test Plan that accomplishes the needs of system testing. The Pilot Test Plan will be approved during design review.

Following integration testing and prior to the start of pilot testing, a settling period will commence. TriMet may, at their sole discretion, conduct additional ad-hoc testing during the settling period. System devices may be installed throughout the settling period, but all devices must be installed and tested prior to the start of acceptance testing. Successful completion of the settling period will demonstrate that the System is ready to enter the System Acceptance Testing phase.

2.5.4.1.5 *System Acceptance Testing*

Systems Acceptance Testing (SAT) is the final phase of testing. System Acceptance Testing demonstrates that the complete and deployed system meets all requirements. When all other testing is complete, the Vendor will commence the SAT, which will verify that the entire system and all provided equipment as deployed meet the System performance requirements for Final System Acceptance. The vendor shall meet regularly with TriMet during SAT.

The Vendor will develop a System Acceptance Test Plan that describes system acceptance testing in detail, and submit it for approval by TriMet. SAT will be performed in the production environment with all components, subsystems, and third-party networks completely functional, operational, online, and in service. Following the completion of any SAT, the vendor shall provide all testing data, reports, and other testing information to TriMet for review and approval.

All testing prior to the SAT can be done by element, with some elements completing a test phase and moving on to the next phase before other elements have completed the first phase. The SAT will be performed on the entire system, as deployed. The SAT will measure overall system performance and the entire system will pass SAT as one unit.

During SAT, system components must meet or exceed all defined performance requirements. The vendor shall identify and implement remedial action on the System after unsuccessful SAT at no cost to TriMet. The SAT duration may be extended until all performance requirements are met during an agreed-upon duration.

Achievement of the Final System Acceptance milestone will be based upon the successful completion of SAT and delivery of all contract-required work, equipment, and documentation, and is subject to written approval from TriMet. TriMet shall issue a certificate upon approval of the Vendor's request for Final System Acceptance.

2.5.4.2 *Test Documentation*

The test documentation will include and Inspection and Test Plan, Inspection and Test Procedures, Testing Reports, and Testing Waivers as described below.

2.5.4.2.1 *Inspection and Test Plan*

The vendor shall detail the capabilities being tested, the schedule, and the Vendor-provided

staff covering each test within the Inspection and Test Plan. The Vendor shall provide complete test documentation for all applicable tests identified above. The Test Plan should include the following at a minimum:

- Scope of the Test Plan
- Test Environments – Include how and where the tests will be performed, location of testing will be selected with TriMet and partner traffic agencies. Also identifies the test equipment and software to be used to conduct the tests.
- Operational Considerations – Discuss operational issues such as the impacts on transit vehicle operations, traffic operations, maintenance staff, and safety
- Roles and Responsibilities – Identify the roles and responsibilities of the participants during the conduct of the test
- Requirements to be tested, including identifying constraints
- Test suspension criteria and requirements for resumption of testing
- Identification of Test Deliverables
- Test schedule

The Test Plan shall also include Interface Tests, during which the Vendor shall verify conformance to the interface requirements for the following system interfaces, as appropriate:

- The interface between the TSP Cloud System and a TSS for each Partner Agency
- The interface between the OBS and the TSP Cloud System

The Inspection and Test Plan will include the number and range of tests, as well as the criteria for acceptance of each phase of testing. All performance measurement procedures and acceptance criteria, including the number and type of failures allowed in each phase of testing, will be subject to agency review and approval. The Vendor shall submit a draft and a final version of the test plan to TriMet for review and approval during the associated design review.

2.5.4.2.2 Inspection and Test Procedures

The Vendor shall submit each inspection and test with all associated procedures for review and approval by TriMet. A software installation plan and system configuration diagram for the agency test facility will be submitted as part of the procedures. Procedures will include detailed test scripts for each test case to be performed as part of the test as well as an identification of the pass/fail criteria. Test scripts will include test case setup instructions and preconditions, step-by-step instructions for performing the test, and expected results for each step. Re-testing will be performed if desired by TriMet after corrective action has been implemented due to the result of any prior failed test. TriMet may develop additional testing or test scenarios ad hoc during all phases of testing and have access to the test facilities, as available.

The Test Plan shall provide and maintain a Requirements to Test Procedure Traceability Matrix (RTPTM). The purpose of the RTPTM is to allow the Vendor, TriMet and its partner agencies to

confirm that all requirements in the specifications have been fulfilled and considered in the Test Plan.

2.5.4.2.3 *Inspection and Test Reports*

The Vendor shall submit a report for every test completed, including all testing scripts and data generated, for agency approval. All transaction data generated during testing will be submitted in Excel format to allow for simple storage and analysis by TriMet. The vendor shall note any exceptions to a test such as test conditions, corrective actions, or re-testing. A testing phase is not complete until the associated report is approved by TriMet.

2.5.4.2.4 *Test Waivers*

The Vendor may request waiving tests for components or subsystems that are at least substantially similar to previously tested components or subsystems, if agreed to by TriMet. Specific testing requirements for each system component will be considered individually, and waivers will be issued on an individual test and component basis; it is possible TriMet may grant a waiver for certain tests while others will still be required. Waivers will not be granted for integration or acceptance phase testing.

2.5.4.3 *Agency Test Facility*

The vendor shall identify and provide a secure facility in Portland at a location approved by TriMet for the placement of a Vendor-furnished test facility where TriMet and the Vendor may test current system hardware and software. The test facility will be configurable to utilize one or more of the back office environments. These back-office environments will include all specified support systems which fully replicates the production environment. The test facility back office hardware will be identical to the production system hardware, but will not require system redundancy.

The test facility will include hardware and software representative of TriMet's installed system, including any existing equipment (e.g., CAD/AVL system, radio, MAR) that is integrated with the new System. TriMet will be responsible for maintaining the configuration of any test facility equipment that is not provided by the Vendor. TriMet will be responsible for providing wireless communications for the test facility. The vendor shall provide all maintenance support for the test facility equipment, systems, and interfaces through Final System Acceptance, and maintain the test facility software configuration throughout the terms of the warranty and software maintenance agreement for all devices and modules down to the Lowest Level Replaceable Unit (LLRU).

2.5.4.4 *Final System Acceptance*

Final System Acceptance will designate the start of the warranty term for each phase of implementation. Final System Acceptance will be contingent on satisfying all of the following conditions for each phase of the implementation.

TriMet may grant Final System Acceptance only when:

- SAT has been successfully completed and approved by TriMet.
- All system devices are delivered, installed, and operational.
- All back office applications and software, including all required reports, are installed and fully functional.
- All spare parts have been delivered.
- All requisite contract deliverables have been delivered to TriMet and accepted.
- The Disaster Recovery Plan has been successfully demonstrated and approved by TriMet.
- All required training has been provided and accepted by TriMet.
- All required intellectual property has been delivered to TriMet or the escrow agent.
- Final resolutions to all identified critical issues are fully implemented and accepted by TriMet.

TriMet will issue a certificate upon approval of the Vendor's request for Final System Acceptance.

2.5.5 Training

2.5.5.1 General Requirements

The vendor shall provide a comprehensive program to educate, train, and teach agency personnel on all equipment and systems for which agency personnel are responsible, enabling them to properly operate, service, and maintain the System and each of its components throughout its useful life. Agency personnel to be trained include, but are not limited to, those in Information Technology (IT), operations team, vehicle operators, supervisors, maintenance and repair personnel, auditors, field operations and command center personnel, managers, and trainers.

Training course delivery will consist of Vendor-led direct classroom training, shadowing, and train-the-trainer instruction. Training will be delivered across multiple environments including agency-provided classroom space, in the field, in maintenance facilities, and on-the-job where transit services are being delivered. The training plan will emphasize modern, modular training that can be delivered remotely as well as in a classroom environment. Training courses will include the ability to test for competency, and address multiple adult learning styles (e.g., video, visual aids, etc.). Instruction will include sufficient time and materials to allow hands-on instruction for every student.

2.5.5.2 Training Plan

The vendor shall develop and submit for agency approval a Training Plan that documents the design of the program for training agency personnel and each course to be delivered. The

course curriculum will include instruction of all areas of agency personnel who will interface with the System. The Training Plan will include at a minimum the following for each course:

- Identification and summary descriptions of the training course, including course lengths
- The methods of training to be used
- Learning objectives and outcomes
- The sequence of activities
- Targeted trainees for each course
- Maximum number of trainees per course
- Methods and criteria for evaluating performance, including an objective grading system to report progress of trainees during the training
- Resources and materials to be used including but not limited to training equipment, shop space, vehicles, student materials, and A/V equipment

The Training Plan will include a schedule for delivery of the training courses. The schedule will consider the sequence of training, hours of instruction, system readiness and proximity to startup, trainee availability, and venue for the training.

2.5.5.3 *Training Materials and Equipment*

The vendor shall provide all necessary training materials and equipment for the delivery of each course (including train-the-trainer) discussed in the Training Plan. Master copies of all training materials for agency-led and Vendor-led training will be provided. The training materials will be provided in hardcopy and electronic format. The vendor shall provide device training units, that enable students to receive hands-on equipment operation and maintenance instruction while in a classroom setting. The training units need to be configured to replicate specific deployed configurations. Training will require access to a non-production back office that is running production software whether training is on back office interfaces or training units. A non-production back office environment will be available to support training for the life of the contract.

All Vendor-provided materials identified in the Training Plan and used during instruction, including but not limited to training units, manuals, student handouts, presentations, simulators, and drawings, will become the property of TriMet upon completion of the training. Training documentation will be separate from the operation and maintenance manuals but may reference them.

Draft training materials will be submitted at FDR. Final training materials will be submitted to TriMet at least 30 calendar days before training classes are scheduled to begin. All documentation and training material will be submitted in an electronic form specified by TriMet.

2.5.5.4 Training Courses

The vendor shall identify the curriculum of courses to be delivered that will meet all of the training needs of the project. The training courses will emphasize modern, modular training that can be delivered remotely as well as in a classroom environment. Training courses will include the ability to test for competency, and address multiple adult learning styles (e.g., video, visual aids, etc.) The course curriculum will include instruction of agency personnel in at least the following broad categories:

- Back office system administration, configuration, operations and maintenance, reporting, backup, and disaster recovery
- Onboard equipment operations and maintenance (as needed)
- Wayside equipment operations and maintenance (as needed)
- Installation training for equipment in accordance with installation procedures (as needed)

Course sizes will be designed to assure that all trainees have some level of one-on-one training with equipment and software. The vendor shall maintain records of all training delivered including students trained and any issues that were encountered.

2.5.6 Manuals

The vendor shall provide instruction manuals that describe and illustrate in detail how to manage, operate, and maintain the system delivered under the Vendor contract. The manuals will include detailed documentation for all equipment, systems and software.

2.5.6.1 Manual Content & Format

Manuals will contain all text, step-by-step procedures, illustrations, drawings, block diagrams, illustrated parts breakdowns, schematics, parts lists, troubleshooting guides, and repair and replacement procedures needed to allow TriMet to operate, maintain, diagnose and repair all equipment and systems for which they are responsible. These items will facilitate descriptions of assemblies and the relationships of components, subsystems, and systems.

All manuals will be written in clear and concise English and will use English and/or metric units of measurement. All manual versions will be reviewed and edited by a professional technical writer prior to delivery to TriMet. Care will be taken to provide easily understood explanations and step-by-step instructions with cross-references to all drawings, diagrams and photographs. Electrical wiring diagrams and other diagrams necessary for operation of the equipment will be provided. Diagrams will be complete and legible in all respects.

Manuals related to repair, maintenance, and installation will provide all information needed for troubleshooting service failures, performing equipment and installations and replacements, and for performing preventative maintenance for each component, including general servicing and inspecting.

Manuals related to back office operation and maintenance will be presented in terms that are

meaningful to users. They will include functional explanations and descriptions of each application program and its use. Step-by-step procedures will be provided that explain how each parameter is configured and the effects obtained by varying each parameter. All user guidance, alarms, and error messages will be described, along with the steps necessary for recovery from error.

All manuals will be submitted in hard copy and electronic formats to be defined during design review and all documents may be used and modified in whole or in part for TriMet use without approval from the Vendor.

Revisions to the manuals will be recorded on a control list in the front of each document. The list will be issued with each revision and will show the date of each revision and the page reference. The vendor shall maintain all updated lists for each document. TriMet will review and comment on each manual submission as required.

Information gathered during installation and acceptance testing, and throughout the warranty and Software Maintenance Agreement (SMA) terms, will be incorporated into the manuals to be submitted to TriMet.

2.5.6.2 *Required Manuals*

The following types of manuals will be required at a minimum. The complete list and format of documentation will be submitted by the Vendor and approved by TriMet during design review.

- Operating Instruction Manual
- Preventative Maintenance Manual
- Corrective/Field Maintenance Manual
- Shop Repair and Overhaul Manual
- Parts Manual
- Software and Programming Manual
- Software Source Code Manual
- User Quick Reference Guides
- OEM Manuals – as supplied
- Field Maintenance Quick Reference Guides
- Administrator's Manual
- User's Manual
- System Configuration Manual
- Asset Incident Management Application Operations Manual

- System Manager Operations Manual
- Operations and Maintenance Manual

SECTION 2.6 – OPERATIONS & MAINTENANCE

2.6.1 Warranty

The Program needs the Vendor to provide assurance that specific facts or conditions relating to the System are true, including but not limited to freedom from defects in materials and workmanship, and that the System performs as intended. A Failure Review Board (FRB) will be established to determine, in the event of a dispute, which equipment and back office failures will be covered under the terms of the warranty.

2.6.2 Reliability Requirements

Reliability is a measure of the frequency at which a component or system successfully operates without experiencing an issue that results in disabled or degraded operation. Within the system, reliability will be measured for all frontend devices and calculated using a failure rate (i.e., number of chargeable failures across the active pool of devices over a calendar month). This calculation is described in greater detail below.

Frontend device reliability will be calculated using a device failure rate:

$$\text{Equipment Reliability} = 1 - \frac{\text{\# of Chargeable Failures}}{\text{\# of Active Pieces of Equipment}}$$

Active pieces of equipment are defined as those deployed for customer and agency use in the production environment, and do not include spares or test equipment.

2.6.3 Availability Requirements

Availability is a measure of the time that a component is operational and available for its intended use (e.g., uptime). Since availability is dependent not only on a component's performance (e.g., reliability), but also the time to respond to and repair an issue, availability can only be measured for the parts of the System that the Vendor is responsible for maintaining, which is to say, the back office applications.

Back office availability will be calculated based on the total out of service time for the associated system:

$$\text{Back Office Availability} = 1 - \frac{\text{Out of Service Time for the Back Office System}}{\text{Total Operating Time for the Back Office System}}$$

Total Operating Time is defined as the number of minutes in a day (1440) multiplied by the number of days in the month of measurement, while Out of Service Time is defined as all time during which the System is not in a fully operational state, and includes all time necessary to respond and repair to issues. Scheduled maintenance time is excluded from the calculation.

2.6.4 Incident Response Times

Maintenance response time will be determined based on the average time for the Vendor to arrive onsite for any maintenance incident reported by TriMet or through the SM that requires Vendor in-person attention:

All incidents determined to require Vendor attention are to be included in the calculation, whether or not a failure is found or chargeable.

$$\text{Maintenance Response Time} = \frac{\text{Total Time to Arrive for Reported Maintenance Incidents}}{\text{Number of Maintenance Incidents Requiring Onsite Attention}}$$

2.6.5 Failure Review Board

The Program needs the Vendor to document the methods of measurement that will show progress towards the KPIs. A Failure Review Board (FRB) will be established to determine, in the event of a dispute, which equipment and back office failures will be chargeable against the performance KPIs. The FRB will also assess the severity of failures through the duration of the contract and acceptance testing in order to make a determination on the successful completion of SAT, the granting of Final System Acceptance, and whether any fleet defects exist.

2.6.6 Failure Definition

A non-chargeable failure is a malfunction caused by a condition external to the System component under consideration, and not included in a functional, environmental, test, or other capability described in this SOW. A non-chargeable failure is not expected to be encountered during normal and correct operation of the System components.

A chargeable failure is a hardware or software malfunction where the delivered equipment or systems fail to perform or perform in a way that does not meet the requirements of the contract. Chargeable failures count against the System KPIs.

END OF SECTION 2 – BACKGROUND, PURPOSE, AND SCOPE OF WORK/SPECIFICATIONS

SECTION 3 – SAMPLE CONTRACT



Contract No. RT210089ZC

TRI-COUNTY METROPOLITAN TRANSPORTATION DISTRICT OF OREGON

GOODS AND SERVICES CONTRACT FOR NEXT GEN TRANSIT SIGNAL PRIORITY

THIS CONTRACT is by and between Tri-County Metropolitan Transportation District of Oregon ("TriMet"), and _____ ("Vendor").

WHEREAS, TriMet solicited RFP No. RT210089ZC for the Vendor submitted a proposal in response to the RFP; and

WHEREAS, TriMet has determined that Vendor submitted the overall responsive and responsible "best value" proposal for those goods and services;

NOW, THEREFORE, in consideration of the mutual promises and the terms and conditions set forth in this Contract, the parties agree as follows:

1.0 CONTRACT ORDER OF PRECEDENCE

Every provision of the documents listed below are incorporated in this Contract by this reference. Any conflict between or among any of the documents listed below shall be resolved in favor of the order of precedence listed below.

- A. Written contract modifications executed by the parties after contract execution;
- B. This Contract form, including Exhibit A – Federal Requirements;
- C. Addenda issued prior to receipt of proposals, as well as addenda issued during discussions;
- D. The Special Proposal Conditions (Section 1.3 of the RFP) set forth in TriMet's Request for Proposal for this Contract;
- E. The Proposal Requirements (Section 1.2 of the RFP) set forth in TriMet's Request for Proposal for this Contract; and
- F. Vendor's Proposal, to include all supplements, and as finally amended by the Vendor's Best and Final Offer (BAFO), if requested.

2.0 FEDERAL REQUIREMENTS (02/19)

This Contract is funded in part under a financial assistance agreement between TriMet and the U.S. Department of Transportation, Federal Transit Administration (FTA) and Federal Highway Administration (FHWA). This Contract is subject to all provisions prescribed for third party contracts by that financial assistance agreement, including, but not necessarily limited to, the provisions in **Exhibit A**, which is attached to, and made a part of, this Contract.

3.0 TERM

Unless terminated sooner under the provisions of this Contract, the term of this Contract shall be from May 1, 2021 through December 31, 2026. At its sole discretion, TriMet may renew this Contract for one (1) additional five (5) year term.

4.0 COMPENSATION

Total contract compensation shall not exceed \$_____ during the term of this **Contract**, payment of which shall be in accordance with Vendor's BAFO Price Proposal, which is attached as **Appendix _____ – Vendor's BAFO Price Proposal**, and made a part of this Contract.

5.0 SCOPE OF WORK/SPECIFICATIONS

The Contractor shall comply with the Specifications as stated in Section 2 of the RFP.

6.0 SPECIAL CONTRACT CONDITIONS

6.1 Type of Contract (08/16)

This is a firm/fixed unit price, requirements contract for implementation and annual maintenance of a Next Generation Transit Signal Priority System. Contractor shall be paid the rates specified in Exhibit B, in accordance with the following milestone schedule:

Milestone Payment Schedule

Description	% of BAFO Payment
Project Management Plan and Schedule	5
Preliminary Design	20
Final Design	30
Acceptance of Pilot Test	35
Final System Acceptance	10
Total	100

Additional TSP Application and Licensing, as requested by TriMet, shall be at the rates specified in Section B of Exhibit B.

6.2 Payments and Invoicing (08/20)

TriMet shall pay the Contractor, upon the submission of invoices, the prices stipulated in this Contract for services accepted, less any deductions provided in this Contract. TriMet shall pay the Contractor within thirty (30) days of the receipt of a properly completed and submitted invoice. The Contractor may submit no more than one invoice per month.

Notwithstanding any other additional requirements of this Contract, invoices shall contain the contract number, the date(s) supplies were delivered or services were furnished; a detailed description of the supplies or services furnished, and a price breakdown showing contract prices and units.

All invoices shall be submitted electronically to TriMet's Finance Department via email to accountspayable@trimet.org. Failure to strictly comply with this provision will result in a delay in payment.

TriMet no longer offers payment by check. In order to enter into this Contract, Contractor must be willing to accept payment via ACH (Automatic Clearing House). TriMet will not execute this Contract without receiving the required information from the Contractor via its eProcurement System (TriP\$), at <https://solutions.scquest.com/apps/Router/SupplierLogin?CustOrg=TriMet>.

6.3 Travel Costs (08/16)

Vendor shall be reimbursed for the cost of airfare, lodging (up to allowable government rate), and TriMet's standard per diem costs, as determined in accordance with TriMet's Travel Policy in effect on the date of this Contract. All travel costs must be pre-approved by TriMet's Project Manager in order to be reimbursed. Travel charges shall reflect, where appropriate, any cost savings realized when Vendor is travelling to Portland on behalf of other clients. Vendor's time spent traveling to the Portland area, however, will **not** be reimbursed.

6.4 Price Adjustments (08/16)

No price increases shall occur during the first year of this Contract. Thereafter, price increases shall be limited to one-year intervals. The effective date of the first price increase will establish the initial one-year interval.

Vendor may increase unit prices to TriMet by an amount not to exceed the change in Vendor's actual direct costs. Sixty (60) days prior to the effective date of contract extension, Vendor shall submit all data necessary to demonstrate to TriMet's satisfaction the actual changes in Vendor's cost of performing the Services since time of original proposal submission. Price increases shall be effective upon the start of the one-year interval. In no event shall price increases be greater than the percentage listed in the yearly percentage change in the Consumer Price Index – All Urban Wage Earners and Clerical Workers (CPI-W), for the Portland-Salem area Western Region, Pacific Division – Class A. The applicable CPI-W shall be the most recently published figure as of the anniversary date of this agreement.

Should decreases in Vendor's direct costs occur, Vendor shall promptly notify TriMet and shall promptly decrease price to TriMet by the same amount. Price decreases shall occur on date effective to Vendor.

6.5 Extra Charges (08/16)

Extra charges must be agreed upon by the parties through a written modification of the contract. TriMet will pay no extra charge that is not made a part of the contract through a written modification. Vendor acts at its own risk in incurring an extra expense before an extra charge has been included in a fully-executed modification. TriMet will not pay Vendor extra for overtime needed to meet a delivery deadline.

6.6 Project Managers (08/16)

The Vendor's designated Project Manager shall be the Vendor's representative for the administration of the contract documents and the supervision of the work. In all matters relating to the performance of the work and payment therefore, and in all situations involving actual, recommended or, proposed changes, TriMet shall accept commitments and instructions of the Vendor only from the Project Manager or a duly authorized representative of the Project Manager so designated in writing. After initial approval by TriMet, the Vendor shall not change the Project Manager without the prior written approval of TriMet. TriMet shall appoint its own Project Manager for the work required by this Contract.

TriMet's Project Manager is:

Name (provided after award of Contract)

Title

503.962.xxxx

ProjectManager@trimet.org

6.7 Insurance (08/16)

During the term of this Contract, Vendor shall purchase and maintain any insurance required by this Contract. Vendor shall furnish acceptable certificates of insurance and additional insured endorsements to TriMet within ten (10) days after award of this contract, and prior to commencement of any contract work.

Vendor shall be responsible for the payment of all premiums and deductibles and shall indemnify TriMet for any liability or damages that TriMet may incur due to Vendor's failure to purchase or maintain any required insurance.

Vendor shall maintain insurance of the types and in the amounts described below.

(1) Commercial General Liability Insurance

Commercial General Liability insurance, with coverage limits not less than:

- (a) \$2,000,000.00 per occurrence, bodily injury and property damage; and
- (b) \$2,000,000.00 general aggregate, bodily injury and property damage.

Such coverage will be equivalent to or better than the Insurance Service Office (ISO) standard coverages, conditions, and extensions, and shall not contain limitations or exclusions for Blanket Contractual, Broad Form Property Damage, Personal Injury, Premises-Operations, Products and-Completed Operations, Independent Vendors, Fire Legal Liability, and Explosion, Collapse, and Underground (XCU).

The General Liability policy shall be endorsed with CG 2010 1185 or CG 2010 1001 and CG 2037 1001 or equivalent, naming TriMet and its directors, officers, representatives, agents, and employees as additional insured.

If Vendor is working within 50' of a railroad, the commercial general liability policy exclusion must be deleted.

(2) Business Auto Liability Insurance

Automobile bodily injury and property damage liability insurance covering all motor vehicles, whether owned, non-owned, leased, or hired, with not less than the following limits:

- (a) Bodily injury: \$2,000,000.00 per person; \$2,000,000.00 per accident; and
- (b) Property damage: \$2,000,000.00 per accident.

The Automobile policy shall be endorsed with CA 20 48 02 99 or equivalent, naming TriMet and its directors, officers, representatives, agents, and employees as additional insured.

If Vendor's work is within 50' of a railroad, the auto policy shall be endorsed with CA 20 70 10 01 or equivalent and this endorsement must be attached to the insurance certificate.

(3) Worker's Compensation Insurance

Oregon statutory workers' compensation and employer's liability coverage, including all states protection, if applicable, voluntary compensation and Federal endorsement. Vendor shall include U.S. Longshore and Harbor Workers Compensation Act and Maritime coverage ("Jones Act"). Employer's liability coverage shall have the following minimum limits:

- (a) Bodily Injury by Accident: \$1,000,000.00 each accident
- (b) Bodily Injury by Disease \$1,000,000.00 each employee
- (c) Bodily Injury by Disease: \$1,000,000.00 policy limit

Vendors who are non-subject workers meeting one of the exceptions in ORS 656.027 may not be required to carry worker's compensation insurance. Any Vendor requesting an exemption from the worker's compensation coverage listed above must make that request in writing, stating the Vendor's qualification for exemption under ORS 656.027.

Failure of TriMet to demand certificates of insurance, additional insured endorsements or other evidence of full compliance with these insurance requirements or failure of TriMet to identify a deficiency from evidence that is provided shall not be construed as a waiver of Vendor's obligation to maintain such insurance.

(4) Professional Liability Insurance

Vendor shall maintain at all times while services contemplated by this Contract are being completed, a Professional (Errors and Omissions) Liability policy. This policy shall insure against claims arising from the negligent performance of the licensed professional and any entity for whom the licensed professional is legally liable under the terms and conditions of this Contract. The policy shall cover the financial loss incurred as a result of an error or misstatement. The Vendor's Professional Liability Policy shall provide no less than \$2,000,000 each claim and in the aggregate. If the policy is written on a "claims made" basis it shall include a retroactive date commencing with the start date of this Contract. "Tail" coverage shall be provided for no less than six (6) years from the date of the Project completion.

The insurance required under this Paragraph shall:

- (1) Include (as evidenced by endorsement) TriMet and its directors, officers, representative, agents, and employees as additional insureds with respect to work or operations connected with the contract (excluding Professional Liability and Worker's Compensation policies);

- (2) Require Vendor to give TriMet not less than thirty (30) days written notice prior to termination, cancellation, or non-renewal of coverage;
- (3) Insurance policies shall be purchased only from insurance companies that meet TriMet's A.M. Best Rating criteria of "A-" or better (excluding SAIF) and are authorized to do insurance business in Oregon;
- (4) Vendor will cause its underwriters of insurance policies to waive their rights of subrogation arising from the work performed under this Contract.
- (5) Vendor's insurance shall apply as primary and will not seek contribution from any insurance or self-insurance maintained by, or provided to, the additional insureds listed above. This must be noted on the insurance certificate.
- (6) **Be uploaded into the Vendor's profile via TriP\$** (including an upload of the most current Certificate of Insurance (COI)). Insurance information and most current COI shall be uploaded and maintained by the Vendor, in the Vendor's TriP\$ profile at all times.

6.8 Notice to Proceed (08/16)

The Vendor shall not proceed with any work required under this Contract without a written Notice to Proceed from TriMet's Procurement Department or the authorized TriMet Project Manager. Any work performed or expenses incurred by the Vendor prior to the Vendor's receipt of Notice to Proceed shall be entirely at the Vendor's risk.

6.9 Time of Essence (08/16)

Time is of the essence in this Contract. Vendor's failure to deliver services on time shall be a material breach of this Contract. If Vendor fails to deliver services on time, TriMet, at its discretion, may procure those services from another source. If the price paid by TriMet for services procured from another source under this Paragraph is higher than the price under this Contract, Vendor shall pay TriMet the difference between those prices. TriMet may deduct that difference from any amount TriMet owes Vendor.

6.10 Rejection of Services (08/16)

Definition. "Services" as used in this clause includes services performed, workmanship, and material furnished or used in performing services.

If any of the services performed do not conform to contract requirements, TriMet may require the Vendor to perform the services again in conformity with contract requirements, for no additional fee. When the defects in services cannot be corrected by reperformance, TriMet may: (1) require the Vendor to take necessary action to ensure that future performance conforms to the contract requirements and (2) reduce any fee payable under the contract to reflect the reduced value of the services performed.

If the Vendor fails to promptly perform the services again or take the action necessary to ensure future performance in conformity with contract requirements, TriMet may: (1) by contract or

otherwise, perform the services and reduce any fee payable by an amount that is equitable under the circumstances or (2) terminate the contract for default.

6.11 Intergovernmental Cooperative Agreement (08/16)

Pursuant to ORS 279A and TriMet Contracting Rules, other public agencies may have the ability to purchase the awarded goods and services from the awarded Vendor(s) under terms and conditions of the resultant contract.

Any such purchases will be between the Vendor and the participating public agency and shall not impact the Vendor's obligation to TriMet. Any estimated purchase volumes listed herein do not include other public agencies and TriMet makes no guarantee as to their participation.

Any bidder, by written notification included with their solicitation response, may decline to extend the prices and terms of this solicitation to any and/or all other public agencies.

6.12 Electronic Signatures (08/16)

This Contract and related documents may be executed by the parties separately in any number of counterparts, each of which shall be deemed to be the original, and all of which together shall constitute one and the same instrument. Each will be considered signed when the signature of a party is delivered by electronic signature, or electronic (email) transmission to the other party, when it is delivered in a manner that reasonably identifies the signatory as the individual named. Such electronic signatures shall be treated in all respects as having the same effect as an original signature. If requested by either party, documents bearing original signature may be subsequently submitted to replace copies bearing electronic signatures. By signing this Contract, the representative of the Offeror thereby represents that such person is duly authorized by the Company to execute this Contract on behalf of the Offeror and that the Company agrees to be bound by the provisions thereof.

6.13 Brand Names/Substitution of Specified Material (08/16)

The provisions of this paragraph shall only become effective after the award of the contract if the Vendor proposes to substitute material or equipment other than the material or equipment that was specified in the Vendor's proposal and accepted by TriMet at the time of the award of the contract. TriMet will only accept a substitution of alternate material or equipment when: (1) the Vendor submits documentation acceptable to TriMet attesting that the material or equipment specified in the Vendor's proposal is no longer available; (2) the alternate material or equipment will be supplied at no additional cost; and (3) the alternate material or equipment meets the requirements and specifications set forth in the Scope of Services/Specifications and in the Price Sheet. Documentation supporting the non-availability of material or equipment may include, but not be limited to, one of the following: certification from the manufacturer that the item has been discontinued or that there has been a substantial change in its specifications; the manufacturer has gone out of business; or new import restrictions have been imposed on the item.

6.14 DBE Reporting Requirements (10/20)

The Contractor and any subcontractor with Disadvantaged Business Enterprise (DBE) utilization must maintain records of all subcontracts entered into with DBEs and records of materials purchased from any DBE suppliers. Records of DBE utilization shall be entered into TriMet's Diversity Compliance Reporting System developed by B2Gnow, which is an on-line database manager, more fully described below. DBE records must show the name and business address of each DBE subcontractor or vendor and the total dollar amount actually paid to each DBE subcontractor or vendor.

The participation of a DBE subcontractor will not be considered part of the prime contractor's DBE achievements until progress payments, as well as any retainage held by the prime contractor, has been paid to the certified firm. Prime Contractor's payment applications will not be approved, until all monthly data is entered into the Diversity Compliance Reporting System.

B2Gnow is an online, web based contract diversity compliance system intended to track DBE participation. This system addresses public project reporting and monitors requirements set forth by state and federal laws. It is intended to reduce the reporting burden on contractors and subcontractors while at the same time easing administrative efforts placed on public agencies to monitor these compliance issues. For more information, go to <https://trimet.diversitycompliance.com/>

For construction and maintenance contracts, all Certified Payroll must be entered into LCP Tracker weekly. LCP Tracker is cloud-based solutions for certified payroll, prevailing wage compliance, and workforce diversity reporting. For more information, go to <https://lcptracker.com>.

TriMet will provide a training session at the start of the contract to introduce the Diversity Compliance Reporting System to the Contractor's and subcontractors' administrative teams.

6.15 Safety (08/16)

Notwithstanding any safety provisions elsewhere in this contract, and in addition to Vendor's own safety procedures, Vendor shall implement and enforce all safety requirements that are standard in the industry and/or that are required by TriMet's Safety Department

6.16 TriMet Facility Security (08/16)

In accordance with TriMet policy, attached as **Appendix C – TriMet Vendors Safety Guide**, and by this reference made a part of this Contract, all persons inside the perimeter of TriMet buildings and yards must display TriMet-issued badges upon their person. Vendor employees who are required to access TriMet buildings or yards to perform the requirements of this Contract shall comply with this requirement.

If such access shall be occasional and during regular business hours, badges shall be "Visitor Pass" type, for which Vendor's employees shall check in and out at the site's reception desk for each visit to a site. Photo identification shall be required at check in.

If Vendor's employees shall need access frequently over an extended period, and/or consistently at times other than regular business hours, badges shall be "Vendor Badge" type, which TriMet's Project Manager shall obtain for Vendor's employees. Vendor shall coordinate TriMet-issued badge requirements with TriMet's Project Manager within ten (10) days of contract award. Vendor is responsible for ensuring compliance by each of Vendor's employees with all TriMet facility security access control procedures. Vendor is responsible for the return of all "Vendor Badges" at the time of contract expiration or termination. Vendor Badges are initially provided at no charge; however, any badges not returned as required will result in a \$100 per badge charge to Vendor. This charge will be deducted from the final payment invoice.

Vendor Badges are for identification and building/yard access only. If Vendor employees are required to ride transit as part of the contractual requirements, tickets or passes may be purchased for this purpose.

Vendors that require vehicular access to TriMet operations facilities shall comply with vehicle access control procedures in effect at the site. Any vehicular access to a TriMet operations facility by a non-TriMet vehicle is by permission only and via designated gates and roadways only. Vendor's vehicle drivers shall comply with site-specific vehicle access control procedures, including the Visitor Pass procedure or display of TriMet-issued Vendor Badges, for all vehicle occupants.

All Vendor employees not displaying a TriMet-issued Visitor Pass or Vendor Badge while inside a TriMet building or yard will be requested to leave the premises and obtain a Visitor Pass. Non-compliance by Vendor employees with these requirements may result in being barred from performing work on TriMet premises and removal of Vendor employees from TriMet buildings/yards.

Before TriMet grants Vendor employees access to TriMet property under this Agreement or at any time thereafter, in accordance with applicable laws and TriMet requirements, TriMet reserves the right to: (1) conduct or obtain, or require Vendor to conduct or obtain background checks on Vendor's employees; (2) have Vendor require its subVendors to conduct or obtain background checks on their respective employees; and (3) require Vendor to provide written certification and documentation as determined by TriMet evidencing compliance with these requirements.

Criminal background information shall be evaluated to determine whether Vendor's employee will be granted building access. Convictions for crimes that impact public safety, property or life, and crimes against persons may be cause for denial of access to TriMet properties.

6.17 Sensitive Security & Protected Personal Information Requirements (08/16)

- A. In addition to the requirements set forth in this Contract, Vendor acknowledges and agrees that this Contract may involve certain information that constitutes Sensitive Security Information under 49 CFR Part 1520, as may be amended, other security/safety related information or other protected information subject to restrictions on creation, access, dissemination, handling, safeguarding and use (hereinafter referred to as "Protected Information"): (1) as determined by TriMet in its sole discretion; (2) as determined by any legal authority or other governmental entity; or (3) as defined by or

pursuant to any law, rule, regulation or policy. Vendor shall, at its own cost and expense, promptly and diligently observe and comply with all legal requirements applicable to such Protected Information, and any TriMet policies, procedures or directives as may be established by TriMet with respect to such Protected Information. Vendor agrees to promptly execute and provide all acknowledgements and other documentation under such terms as required by TriMet with respect to such Protected Information, including but not limited to non-disclosure and other agreements relating to creation, access, dissemination, handling, and safeguarding of Protected Information, by Vendor, its employees and Vendors.

- B. In performing this Contract, the parties specifically agree that Vendor will receive, maintain, process or otherwise have access to personal information ("Personal Information") of TriMet customers that may be collected, retrieved, stored, or that is otherwise accessed by Vendor. The term "Personal Information" includes the data defined as "Personal information" under SB 601 (Chapter 357, Oregon Laws 2015), the Oregon Consumer Identity Theft Protection Act (hereinafter "Act"), and any implementing regulations thereto, and any other personally identifying data protected or made confidential by other state or federal law, rule or regulation. "Personal Information" includes but is not limited to a financial account number, credit or debit card number, and/or access codes or passwords that would permit access to a financial account. "Personal Information" constitutes Protected Information under this Contract.
- C. Vendor is responsible for compliance with all provisions of the Act, including but not limited to breach of security notification requirements, and shall immediately notify TriMet's Project Manager upon discovery of a breach of security. Vendor shall develop, implement and maintain reasonable safeguards to protect the security, confidentiality and integrity of the Personal Information, including disposal of the data.
- D. Vendor specifically agrees to keep all Personal Information confidential and will not disclose or otherwise make any part of Personal Information available, in any form, to any person other than Vendor's employees whose job performance requires such access. Vendor agrees to instruct all such employees on these contract obligations with respect to the confidentiality of Personal Information and to implement such security measures and procedures as necessary to ensure employee compliance. If Vendor wishes to have a subVendor or consultant perform work under this Contract that involves access to Personal Information, prior to commencement of such work Vendor shall obtain a written confidentiality agreement from such subVendor or consultant that contains at a minimum the conditions and requirements with respect to the Personal Information set forth in this Contract. If Vendor breaches any of its obligations with respect to the use or confidentiality of Personal Information, TriMet shall be entitled to equitable relief to protect its interests therein, including but not limited to preliminary and permanent injunctive relief as well as any other remedies at law. The obligations set forth in this Paragraph D are in addition to, and not in lieu of any requirements of state or federal laws, rules or regulations applicable to the performance of this Contract. Vendor's obligations under this Paragraph D shall survive the termination of this Contract.

- E. Vendor shall observe and comply with all legal requirements and all policies and procedures established by TriMet applicable to Sensitive Security Information, as defined by 49 CFR Part 1520, and to Personal Information as defined by ORS 646A.600, et seq., the Oregon Consumer Identity Theft Protection Act ("Protected Information"). Vendor shall maintain records in accordance with TriMet's records retention policy and shall implement and maintain reasonable safeguards, including encryption, to protect the security and confidentiality of the Protected Information, including when such information is to be disposed of and/or destroyed. Vendor shall promptly notify TriMet of any breach of these safeguards. Vendor, its employees, and subVendors, shall keep confidential any part of the Protected Information except to those employees or subVendors whose jobs require such access. If Vendor breaches any of its obligations with respect to the use or confidentiality of Personal Information, TriMet shall be entitled to equitable relief to protect its interests therein, including but not limited to preliminary and permanent injunctive relief as well as any other remedies at law.

6.18 Service Level Commitments (08/20)

The objectives for Service Level Agreements (SLA) shall be documented in the attached and incorporated **Exhibit C** [supplied upon agreement between the parties].

6.19 TriMet System Security (08/20)

Contractor acknowledges and understands that it may be required to access TriMet's computer networks in delivering or performing Services under this agreement. In providing access to Contractor, TriMet places special confidence and trust in Contractor. Contractor acknowledges and understands that any access granted by TriMet to its computer network shall be limited, restricted, and conditioned upon Contractor's compliance with TriMet's security policies and practices related to such access which TriMet will provide to Contractor before execution of the contract. Contractor warrants that it will provide all products and perform all Services in full compliance with TriMet's applicable security policies and practices.

7.0 GENERAL CONTRACT CONDITIONS

7.1 Vendor's Status and General Responsibilities (08/16)

Vendor is an independent Vendor for all purposes and is entitled to no compensation from TriMet other than that provided by this Contract. Vendor shall inform TriMet of

Vendor's Federal Internal Revenue Service Employer Identification Number, or, if Vendor is an individual with no employer identification number, Vendor's Social Security Number. The Vendor and its officers, employees, and agents are not officers, employees or agents of TriMet as those terms are used in ORS 30.265. The Vendor, its employees or officers shall not hold themselves out either explicitly or implicitly as officers, employees or agents of TriMet for any purpose whatsoever, nor are they authorized to do so.

Vendor shall provide and pay for all labor, materials, equipment, utilities, and other goods or services necessary for full contract performance unless this Contract specifically provides

otherwise. Vendor shall supervise and direct contract performance using its best skill, and shall be responsible for selecting the means of contract performance. If, during or after the term of this Contract, Vendor learns of any actual or potential defect in the services provided under this Contract, of any problem associated with the results of contract performance, or of any nonconformance with a provision of this Contract or of Federal, state, or local law, Vendor shall inform TriMet immediately in writing with a full description of the defect, problem, or nonconformance.

7.2 Notices and Communications (08/16)

All notices and other communications concerning this Contract shall be written in English and shall bear the contract number assigned by TriMet. Notices and other communications may be delivered personally, by facsimile, by email, by regular, certified or registered mail or other commercial delivery service.

A notice to TriMet will be effective only if it is delivered to that person designated in writing in either (a) the Notice of Award of this Contract, (b) the Notice to Proceed under this Contract, or (c) to another individual specifically designated by this Contract. A notice to the Vendor shall be effective if it is delivered to the individual who signed this Contract on behalf of Vendor at the address shown with that signature, to a corporate officer if Vendor is a corporation, to a general partner if Vendor is a partnership, or to another individual designated in writing by the Vendor in the contract or in a written notice to TriMet.

7.3 Assignment and Subcontracting (08/16)

Vendor shall not assign any of its rights or subcontract any of its responsibilities under this Contract without the prior written consent of TriMet. Vendor shall include in each subcontract any provisions necessary to make all of the provisions of this Contract fully effective. Vendor shall provide all necessary plans, specifications, and instructions to its suppliers and subVendors to enable them to properly perform their work.

7.4 Indemnification (08/20)

- A. To the fullest extent permitted by law, Contractor shall hold harmless, defend and indemnify TriMet and its officers, employees and agents, from all claims, demands, suits, legal actions, losses, damages, liabilities, judgments, costs and expenses of whatsoever nature, including attorney fees and costs, resulting or arising from the intentional wrongdoing, reckless, grossly negligent or negligent acts or omissions of Contractor and/or its officers, employees, or agents, including any intentional wrongdoing, reckless, grossly negligent or negligent acts or omissions of its subcontractors under this Contract. Contractor shall not be responsible for any damages to the extent caused by the negligent acts or omissions of TriMet, its officers, employees or agents.
- B. The obligations of Contractor under this Section will not in any way be affected or limited by the absence in any case of insurance coverage or by the failure or refusal of any insurance carrier to perform any obligation on its part to be performed under insurance policies affecting this Contract. In no way shall the Contractor limit its liability under this Contract.

- C. This indemnity shall survive the termination of this Contract or final payment hereunder. This indemnity is in addition to any other rights or remedies which TriMet and the other parties to be indemnified may have under the law or under this Contract. In the event of any claim or demand made against any party which is entitled to be indemnified hereunder, TriMet may in its sole discretion reserve, retain or apply any monies due to the Contractor under the contract for the purpose of resolving such claims; provided, however, that TriMet may release such funds if the Contractor provides TriMet with adequate assurance of the protection of TriMet's interests. TriMet shall be the sole judge of whether such assurances are adequate.

7.5 Force Majeure (07/18)

Neither party is liable for delay or default if such delay or default is the result of an event of Force Majeure, meaning acts of God, acts of the public enemy, acts of the government in its sovereign capacity, fires, floods, earthquake, epidemics, quarantine restrictions, or freight embargoes. Force majeure shall not include the following: an event which, in whole or in part (a) is the result of a labor strike, work stoppage or slowdown, or other labor related issue caused by employees either of the Vendor, its subVendor or supplier, or an affiliate; (b) is the result of a change in the federal revenue or income tax laws; or (c) is or was reasonably within the control of or was caused by the fault or negligence of, the party claiming Force Majeure as an excuse for delay or default.

A party asserting Force Majeure as an excuse for delay or default notify the other party within 24 hours after commencement of the delay or default, take reasonable steps to minimize any delay or damages, and continue to perform all non-excused obligations.

7.6 Prompt Payment (08/19)

The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than ten (10) working days from the receipt of each payment the prime contractor receives from TriMet. The prime contractor agrees further to return retainage payments to each subcontractor within 10 working days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of TriMet. This clause applies to both DBE and non-DBE subcontractors.

Compliance with the prompt payment contract requirement will be part of the Project Managers project meeting with the Prime Contractor and will be monitored on an on- going basis by the DBE Liaison Officer (DBELO).

The contractor must maintain records of all subcontracts entered into with DBEs and records of materials purchased from DBE suppliers. Such records shall show the name and business address of each DBE subcontractor or vendor and the total dollar amount actually paid to each DBE subcontractor or vendor.

The contractor must also submit to the Project Manager's office an affidavit certifying that payment was made to the DBE subcontractor or supplier, to be signed by both the prime contractor and DBE. Such an affidavit must be submitted during the project any time a progress or final payment is made to a DBE, and when any retainage held is returned. A summary certification affidavit must be submitted at the completion of the project.

The participation of a DBE Subcontractor will not be credited towards the prime contractor's DBE achievements, or the overall aspirational goal, until the amount being counted toward the aspirational goal, and any retainage held by the prime contractor has been paid to the DBE

7.7 Payment of Claims by TriMet (08/16)

If Vendor fails, neglects, or refuses to make prompt payment of any claim for labor or services furnished to Vendor or a subVendor by any person in connection with this Contract as the claim becomes due, TriMet may pay the claim to the person furnishing the labor or services and charge the amount of the payment against funds due or to become due to Vendor pursuant to this Contract. TriMet's payment of a claim under this Paragraph shall not relieve Vendor or Vendor's surety from responsibility for such claims.

7.8 Compliance with Laws and Regulations (08/16)

Vendor shall adhere to all applicable federal, state, and local laws, regulations, executive orders and ordinances applicable to the work under this Contract. The Vendor shall comply with the clauses required in every public contract entered into in the State of Oregon as set forth in ORS 279B.220, 279B.225, 279B.230, 279B.235, 279C.505, 279C.510, 279C.515, 279C.520, and 279C.530, which are hereby incorporated by reference.

Vendor acknowledges that the Oregon Government Standards and Practices laws ("Ethics Laws"), as set forth in ORS 244.010 et seq. are applicable to Vendors when performing certain work on behalf of TriMet under contract and that the individual employees and agents of Vendor may be treated as public officials under ORS 244.020 (14). Vendor agrees to determine whether and under what circumstances it or its agents are subject to the Ethics Laws, as referenced herein and incorporated by reference, and shall comply and ensure compliance by those subject to Vendor's control when performing work under this Contract.

Vendor shall make payment promptly, as due, to all persons supplying to the Vendor labor or material for the performance of the work provided for in the contract; pay all contributions or amounts due the Industrial Accident Fund from the Vendor or subVendor incurred in the performance of the contract; and pay to the Department of Revenue all sums withheld from employees under ORS 316.167. ORS 279B.220.

Vendor shall promptly, as due, make payment to any person, co-partnership, association or corporation furnishing medical, surgical and hospital care services or other needed care and attention, incident to sickness or injury, to the employees of the Vendor, of all sums that the Vendor agrees to pay for the services and all moneys and sums that the Vendor collected or deducted from the wages of employees under any law, contract or agreement for the purpose of providing or paying for the services. ORS 279B.230.

All subject employers working under this Contract are either employers that will comply with ORS 656.017 or employers that are exempt under ORS 656.126.

7.9 Liens Prohibited (08/16)

Vendor shall not permit any lien or claim to be filed or prosecuted against TriMet, its property or its right-of-way on account of any labor or material furnished or any other reason for work arising out of this Contract. If any lien shall be filed, Vendor shall satisfy and discharge or cause such lien to be satisfied and discharged immediately at Vendor's sole expense.

7.10 Hours of Labor – Goods and Services Contracts (08/16)

Pursuant to ORS 279B.235, persons employed under this contract shall receive at least time and a half pay for work performed on the legal holidays specified in a collective bargaining agreement or in ORS 279B.020(1)(b)(B) to (G) and for all time worked in excess of 10 hours in any one day or in excess of 40 hours in any one week, whichever is greater.

7.11 Prohibited Interests (08/16)

- A. No TriMet Board member, officer, employee or agent who ceases to hold a position at TriMet shall have any direct beneficial financial interest in this Contract, if they authorized this Contract while acting in their official position at TriMet, for two years after the date the contract was authorized. This precludes working on this Contract as Vendor's employee. The term "authorize" in this provision means that the Board member, officer, employee or agent ("public official") performed a significant role in the selection of the Vendor or the execution of this Contract, including recommending approval or signing of the contract, serving on the selection committee or having the final authorizing authority for this Contract.
- B. No TriMet Board member, officer, employee, or agent (or any member of the immediate family or the partner of any of the aforementioned) shall solicit or accept, and Vendor (including any subVendors) shall not offer or give to any TriMet Board member, officer, employee or agent (or any member of the immediate family or the partner of any of the aforementioned), any gratuities, favors, or anything of monetary value, in connection with the administration of this Contract, except to the extent permitted by applicable law and TriMet policy.

7.12 Integration, Modification, and Administrative Changes (08/16)

This Contract includes the entire agreement of the parties and supersedes any prior discussions or agreements regarding the same subject. This Contract may be modified in writing by a modification that has been signed by individuals authorized to bind each of the parties contractually. TriMet reserves the right to make administrative changes to the contract unilaterally. An administrative change means a written contract change that does not affect the substantive rights of the parties.

7.13 Severability/Survivability (08/16)

If any of the provisions contained in this Agreement are held by a court of law or arbitrator to be illegal, invalid or unenforceable, the enforceability of the remaining provisions shall not be impaired, and the parties shall negotiate an equitable adjustment of this Contract so that the purposes of this Contract are affected. All provisions concerning indemnity survive the termination or expiration of this Contract for any cause.

7.14 Waiver and Nonwaiver (08/16)

- A. A waiver by one party of a right to a remedy for breach of this Contract by the other party shall not be deemed to waive the right to a remedy for a subsequent breach by the other party. TriMet's acceptance of goods or services, or payment under this Contract, shall not preclude TriMet from recovering against Vendor or Vendor's surety for damages due to Vendor's failure to comply with this Contract.
- B. Both parties having had the opportunity to consult an attorney regarding the provisions of this Contract, the parties agree to waive the principle of contract interpretation that an ambiguity will be construed against the party that drafted the ambiguous provision.

7.15 Termination for Default (08/16)

- A. TriMet may, by written notice of default to the Vendor, terminate this Contract in whole or in part if the Vendor fails to (i) Deliver the goods or to perform the services within the time specified in this Contract or any extension; (ii) Make progress, so as to endanger performance of this Contract; or (iii) Perform any of the other provisions of this Contract.
- B. TriMet's right to terminate this Contract under subdivision (A) of this clause may only be exercised if the Vendor does not cure such failure within 10 calendar days (or more if authorized in writing by the Contract Administrator) after receipt of the notice from the Contract Administrator specifying the failure.
- C. If TriMet terminates this Contract in whole or in part under the default provisions, it may acquire, under the terms and in the manner the Contracting Officer considers appropriate, goods or services similar to those terminated, and the Vendor will be liable to TriMet for any excess costs for those goods or services. However, the Vendor shall continue the work not terminated.
- D. Vendor shall be paid the contract price only for completed goods or services delivered and accepted. If it is later determined by TriMet that Vendor had an excusable reason for not performing, such as a strike, fire, flood, or other event that is not the fault of, or is beyond the control of, Vendor, TriMet may allow Vendor to continue work, or may treat the termination as a termination for convenience.

- E. The rights and remedies of TriMet in this Article are in addition to any other rights and remedies provided by law or under this Contract.

7.16 Termination for Convenience (08/16)

TriMet may terminate this Contract, in whole or in part, at any time by written notice to the Vendor when it is in TriMet's best interest. The Vendor shall be paid its costs, including contract close-out costs, and profit on work performed up to the time of termination. TriMet will not be responsible for payment for any work performed after the time of termination. After termination, the Vendor shall promptly submit to TriMet its termination claim for payment. If the Vendor has any property in its possession belonging to TriMet, the Vendor will account for the same, and return it to TriMet in the manner that TriMet directs.

7.17 Termination Following Bankruptcy (08/20)

TriMet may terminate any and all of this Agreement and any Task Order(s), effective immediately, by written notice to Contractor if Contractor: (A) is dissolved or liquidated or takes any corporate action for such purpose; (B) becomes insolvent or is generally unable to pay, or fails to pay, its debts as they become due; (C) files or has filed against it a petition for voluntary or involuntary bankruptcy or otherwise becomes subject, voluntarily or involuntarily, to any proceeding under any domestic or foreign bankruptcy or insolvency Law; (D) makes or seeks to make a general assignment for the benefit of its creditors; or (E) applies for or has appointed a receiver, trustee, custodian, or similar agent appointed by order of any court of competent jurisdiction to take charge of or sell any material portion of its property or business.

Effect of Contractor Bankruptcy. All rights and licenses granted by Contractor under this Agreement are and shall be deemed to be rights and licenses to "intellectual property," and the subject matter of this agreement is and shall be deemed to be "embodiment[s]" of "intellectual property" for purposes of and as such terms are used in and interpreted under section 365(n) of the United States Bankruptcy Code (the "**Code**") (11 U.S.C. § 365(n)).

TriMet shall have the right to exercise all rights and elections under the Code and all other applicable bankruptcy, insolvency, and similar laws with respect to this Agreement. Without limiting the generality of the foregoing, if Contractor or its estate becomes subject to any bankruptcy or similar proceeding: (A) subject to TriMet's rights of election, all rights and licenses granted to TriMet under this Agreement will continue subject to the respective terms and conditions hereof and thereof, and will not be affected, even by Contractor's rejection of this Agreement; and (B) TriMet shall be entitled to a complete duplicate of (or complete access to, as appropriate) all such intellectual property and embodiments of intellectual property, and the same, if not already in TriMet's possession, shall be promptly delivered to TriMet, unless Contractor elects to and does in fact continue to perform all of its obligations under this Agreement.

7.18 Intellectual Property (08/16)

Contractor shall hold harmless, defend and indemnify TriMet, its directors, officers, employees and agents from any loss of any kind, based on a claim that the work performed, or products provided hereunder, including material(s) or any part thereof, constitutes infringement of any patent, trademark, trade-name, copyright, trade secret, or other intellectual property infringement,

including but not limited to claims arising out of the manufacture, sale or use of such work, products or materials. Such indemnification shall include all damages and costs incurred by TriMet as the result of the claim, including attorney fees and expert witness fees.

7.19 Work Product (08/20)

Contractor shall own and retain all title, copyright, patents, trademarks, trade secrets, and other proprietary rights in the Software, documentation and deliverables, including but not limited to bug patches, fixes, updates, upgrades, enhancements, modifications and all derivatives and all other manifestations of Contractor's intellectual property. Aside from the license granted hereunder, TriMet nor any third party, acquire any right, express or implied, in any Contractor's intellectual property.

Contractor warrants that it owns the Software and has title to and all rights necessary to deliver the software to TriMet, and has obtained rights to deliver other software to TriMet from any third party software included in Contractor's Solution. No title, ownership or interest in Contractor's Software or any of its parts, in any third party software incorporated into Contractor's Solution, or applicable rights therein such as patents, copyrights and trade secrets, shall be transferred to TriMet.

With respect to Contractor owned intellectual property under this contract or included in a deliverable under a SOW, Contractor grants the TriMet a non-exclusive, non-transferable, irrevocable, perpetual license for the sole purpose of allowing TriMet to make use of thereof for its own internal purposes in the manner contemplated in the applicable SOW. Such license is subject to the TriMet's payment of all fees and expenses under the related SOW.

TriMet and Contractor agree that all custom software developed for TriMet (if any) produced pursuant to this Contract ("Custom Content") shall not be considered work made for hire under the U.S. Copyright Act, 17 U.S.C. §101 et seq., but shall be covered by the license provisions of this Contract.

TriMet and Contractor agree that all Custom Content created pursuant to this Agreement shall be owned by Contractor. Contractor shall provide TriMet with a non-exclusive, non-transferable, non-sub licensable perpetual license to use such Custom Content.

TriMet shall retain ownership, custody, and control of all TriMet Content. "TriMet Content" means any and all information, trademarks, service marks, logos, files, images, text, files data, materials, works, expressions, or other content, including any that are (a) uploaded, submitted, posted, transferred, transmitted, or otherwise provided or made available by or on behalf of TriMet for processing by or through the services provide by this contract, or (b) collected, downloaded, or otherwise received by TriMet or any authorized user pursuant to this Agreement. All output, copies, reproductions, improvements, modifications, adaptations, translations, and other derivative works of, based on, derived from, or otherwise using any TriMet Content are themselves also TriMet Content. For the avoidance of doubt, TriMet Content includes all user data and personal information

Contractor shall use TriMet Content only to provide and maintain the services provided under this Contract. Contractor will not capture, maintain, scan, index, share or use TriMet Content stored

or transmitted by such Services, or otherwise use any data-mining technology, except as authorized or required by this Contract. Contractor shall not use TriMet Content stored or transmitted by such Services for any advertising or other commercial purpose of Contractor or any third party.

Each party is and shall remain the owner of all right, title and interest in and to any and all data that it owned prior to the effective date of this agreement, and in and to any data to which it may hereafter acquire ownership. Without limiting the generality of the foregoing, TriMet shall own all right, title and interest in and to TriMet Content. Except as otherwise provided in this Contract, no party shall be obligated to convey any right, title and/or interest in any data to the other. Subject to the terms of Contract, including the license rights granted to TriMet, each party, upon request of the other, promptly shall return to the other any data owned by the other that may have been disclosed.

7.20 Paragraph Headings and Other Titles (08/16)

The parties agree that paragraph headings and other titles used in this Contract are for convenience only, and are not to be used to interpret this Contract.

7.21 Audit and Inspection of Records (08/16)

- A. Vendor shall maintain a complete set of records relating to this Contract in accordance with generally accepted accounting procedures. Vendor shall permit the authorized representatives of TriMet, the U.S. Department of Transportation, the Oregon Secretary of State and the Comptroller General of the United States to inspect and audit all work, materials, payrolls, books, accounts, and other data and records of Vendor relating to its performance under this contract until the expiration of three (3) years after final payment under this Contract.
- B. Vendor further agrees to include in all of its subcontracts under this Contract a provision to the effect that the subVendor agrees that TriMet, the U.S. Department of Transportation, the Oregon Secretary of State and the Comptroller General of the United States, or any of their duly authorized representatives shall, until the expiration of three (3) years after final payment under the subcontract, have access to and the right to examine any directly pertinent books, documents, papers, and other records of the subVendor. The term "subcontract" as used in this Section excludes (1) purchase orders not exceeding \$10,000.00 and (2) subcontracts or purchase orders for public utility services at rates established for uniform applicability to the general public.
- C. The periods of access and examination described in subparagraphs A and B of this Section for records that relate to (1) disputes between TriMet and Vendor, (2) litigation or settlement of claims arising out of the performance of this Contract, or (3) costs and expenses of this Contract as to which exception has been taken by the Comptroller General or any of his or her duly authorized representatives, shall continue until all disputes, claims, litigation, appeals, and exceptions have been resolved.

7.22 Mediation (08/16)

Should any dispute arise between the parties concerning this agreement that is not resolved by mutual agreement, it is agreed that it will be submitted to mediated negotiation prior to any party commencing litigation. In such an event, the parties to this agreement agree to participate in good faith in a non-binding mediation process. The mediation shall take place in Portland, Oregon. The mediator shall be selected by mutual agreement of the parties, but in the absence of such agreement each party shall select a temporary mediator and those mediators shall jointly select the permanent mediator. The mediator's fees and costs shall be borne equally by the parties.

7.23 Applicable Law and Jurisdiction (08/16)

This Contract shall be governed by Oregon law, without resort to any jurisdiction's conflicts of law principles, rules or doctrines. Any suit or action arising from this Contract shall be commenced and prosecuted in the courts of Multnomah County, Oregon or the U.S. District Court for the District of Oregon, in Portland, Oregon, as applicable. The parties agree to submit to the jurisdiction and venue of these courts.

7.24 Nondiscrimination (08/16)

During the term of this Contract, Vendor shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, age, sexual orientation, disability, or national origin.

7.25 Changes (08/16)

- A. TriMet may at any time, by written order, make changes within the general scope of this Contract in any one or more of the following:
 - 1. Description of services to be performed.
 - 2. Time of performance (i.e., hours of the day, days of the week, etc.).
 - 3. Place of performance of the services.
- B. If any such change causes an increase or decrease in the cost of, or the time required for, performance of any part of the work under this Contract, whether or not changed by the order, TriMet shall make an equitable adjustment in the contract price, the delivery schedule, or both, and shall modify the contract.
- C. The Vendor must assert its right to any adjustment under this clause within 30 days from the date of receipt of the written order. However, if TriMet decides that the facts justify it, TriMet may receive and act upon a proposal submitted before final payment of the contract.

7.25 Confidentiality (08/16)

All information, written or oral, disclosed or made available to the Vendor, directly or indirectly, through any means of communication or observation by the Vendor or any of its affiliates or representatives to or for the benefit of the Vendor shall remain confidential between Vendor and

TriMet. The Vendor shall hold all Confidential Information in confidence in accordance with the terms of this agreement and use only for the purpose of providing the Services hereunder.

7.26 Advertising or Publicity (08/16)

Vendor shall not disclose, use or refer to this Agreement or any of its terms, or the name of TriMet in any advertising, publicity release, promotional materials or materials distributed to existing or prospective customers, without the prior written consent of TriMet.

8.0 DRUG AND ALCOHOL PROGRAM REQUIREMENTS (08/16)

Language omitted for this contract.

9.0 AUTHORITY (08/16)

The representatives signing on behalf of the parties certify that they are duly authorized by the party for whom they sign to make this Contract.

VENDOR

TRI-COUNTY METROPOLITAN TRANSPORTATION DISTRICT OF OREGON

By: _____

(signature)

Name: _____

Title: _____

Date: _____

By: _____

(signature)

Name: _____

Title: _____

Date: _____

APPROVED AS TO FORM

Zach Cooper
Contract Manager
Procurement & Supply Chain Mgmt.

END OF SECTION 3 – SAMPLE CONTRACT

EXHIBIT A – FEDERAL REQUIREMENTS (02/19)

This Contract is funded in part under a financial assistance agreement between TriMet and the U.S. Department of Transportation, Federal Transit Administration (FTA) and Federal Highway Administration (FHWA). This Contract is subject to all provisions prescribed for third party contracts by that financial assistance agreement, including, but not necessarily limited to, the provisions below. Unless otherwise specified, all terms of this Section shall be included all supplier and subVendor agreements.

Except as FTA or FHWA determines otherwise in writing Vendor must comply with all applicable federal laws, regulations, and requirements, and should follow applicable federal guidance. FTA and/or FHWA may take enforcement action if Vendor violates an applicable federal law, regulation, or requirement, or does not follow applicable federal guidance.

1. Incorporation of Federal Transit Administration Terms

All contractual provisions required by DOT, as set forth in FTA Circular 4220.1F, dated November 1, 2008, are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Contract. The Vendor shall not perform any act, fail to perform any act, or refuse to comply with any TriMet requests which would cause TriMet to be in violation of the FTA terms and conditions.

2. Changes to Federal Requirements

Federal requirements may change due to changes in federal law, regulation, other requirements, or guidance, or changes in the FTA funding agreement, including any information incorporated by reference and made part of that agreement. Applicable changes to those federal requirements or the FTA funding agreement will apply to the Contract and parties hereto at any tier.

3. No Federal Government Commitment or Liability to Third Parties

Notwithstanding any concurrence by the Federal Government in or approval of this solicitation or Contract, except as the Federal Government expressly consents in writing, the Federal Government does not and shall not have any commitment or liability related to Vendor or its subVendors at any tier, or to any other person or entity that is not a party to the FTA/TriMet Master Agreement.

4. Record Retention and Access to Sites of Performance

Vendor and subVendors shall retain, complete and readily accessible records related to this Contract, including, but not limited to, data, documents, reports, statistics, subagreements, leases, third party contracts, arrangements, other third party agreements of any type, and supporting materials related to those records. Such records shall be maintained for at least three years after the final payment under this Contract or until any disputes, litigation, claims, appeals or exceptions have been resolved, whichever is later.

Vendor and all subVendors shall:

- a. provide sufficient access to inspect and audit records and information related to this Contract to the U.S. Secretary of Transportation or the Secretary's duly authorized representatives, to the Comptroller General of the United States, and the Comptroller General's duly authorized;
- b. permit those individuals listed above to inspect all work and materials related to the Contract and to audit any related information under the control of the TriMet, Vendor or subVendor within books, records, accounts, or other locations; and
- c. otherwise comply with 49 U.S.C. § 5325(g), and federal access to records requirements as set forth in the applicable U.S. DOT Common Rules.

Vendor and all subVendors shall permit FTA to have access to the sites of performance of the Contract and related work and to make site visits as needed in compliance with the U.S. DOT Common Rules. Subcontracts under this section do not include purchase orders not exceeding \$10,000 or subcontracts or purchase orders of public utility services at rates established for uniform applicability to the general public.

5. False or Fraudulent Statements or Claims

The provisions of the Program Fraud Civil Remedies Act of 1986 as amended, 31 U.S.C 3801 et seq. and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 CFR Part 31, apply to this Contract. Vendor certifies or affirms the truthfulness of any statement it has made, it makes, or causes to be made, pertaining to this Contract or the FTA assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, if Vendor makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the Vendor to the extent the Federal Government deems appropriate. If Vendor makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government under a contract connected with a project that is financed in whole or in part with Federal assistance originally awarded by FTA under the authority of 49 U.S.C. 5307, the Government reserves the right to impose the penalties of 18 U.S.C. 1001 and 49 U.S.C. 5307 (n)(1) on the Vendor, to the extent the Federal Government deems appropriate.

6. Equal Employment and Civil Rights

- a. Nondiscrimination in Federal Public Transportation Programs

Vendor and subVendors shall:

1. prohibit discrimination based on race, color, religion, national origin, sex (including gender identity), disability, or age;

2. prohibit the exclusion from participation in employment or a business opportunity for reasons identified in 49 U.S.C. § 5332, denial of program benefits in employment or a business opportunity identified in 49 U.S.C. § 5332, or discrimination identified in 49 U.S.C. § 5332, including discrimination in employment or a business opportunity identified in 49 U.S.C. § 5332; and
3. follow the most recent edition of FTA Circular 4702.1, "Title VI Requirements and Guidelines for Federal Transit Administration Recipients," to the extent consistent with applicable federal laws, regulations, requirements, and guidance.

b. Nondiscrimination – Title VI of the Civil Rights Act

Vendor and subVendors shall:

1. prohibit discrimination based on race, color, or national origin; comply with: Title VI of the Civil Rights Act of 1964, as amended, 42 U.S.C. § 2000d et seq., U.S. DOT regulations, "Nondiscrimination in Federally-Assisted Programs of the Department of Transportation – Effectuation of Title VI of the Civil Rights Act of 1964," 49 C.F.R. part 21, and federal transit law, specifically 49 U.S.C. § 5332, and
2. follow the most recent edition of FTA Circular 4702.1, "Title VI Requirements and Guidelines for Federal Transit Administration Recipients," to the extent consistent with applicable federal laws, regulations, requirements, and guidance, U.S. DOJ, "Guidelines for the enforcement of Title VI, Civil Rights Act of 1964," 28 C.F.R. § 50.3, and all other applicable federal guidance that may be issued.

c. Equal Employment Opportunity

Vendor and subVendors shall:

1. prohibit discrimination based on race, color, religion, sex, sexual orientation, gender identity, or national origin;
2. comply with Title VII of the Civil Rights Act of 1964, as amended, 42 U.S.C. § 2000e et seq.;
3. facilitate compliance with Executive Order No. 11246, "Equal Employment Opportunity" September 24, 1965 (42 U.S.C. § 2000e note), as amended by any later Executive Order that amends or supersedes it in part and is applicable to federal assistance programs;
4. comply with federal transit law, specifically 49 U.S.C. § 5332, FTA Circular 4704.1 "Equal Employment Opportunity (EEO) Requirements and Guidelines for Federal Transit Administration Recipients," and other federal guidance pertaining to EEO laws, regulations, and requirements, and prohibitions against discrimination on the basis of disability;

5. ensure that applicants for employment are employed and employees are treated during employment without discrimination based on their race, color, religion, national origin, disability, age, sexual orientation, gender identity, or status as a parent, as provided in Executive Order No. 11246 and by any later Executive Order that amends or supersedes it, and as specified by U.S. Department of Labor regulations; and
6. take affirmative action that includes, but is not limited to: Recruitment advertising, recruitment, and employment; Rates of pay and other forms of compensation; Selection for training, including apprenticeship, and upgrading, and; transfers, demotions, layoffs, and terminations.

In accordance with section 4 of the Age Discrimination in Employment Act of 1967, as amended, 29 U.S.C. § 623 and Federal transit law at 49 U.S.C. § 5332, the Vendor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Vendor agrees to comply with any implementing requirements FTA may issue.

In accordance with section 102 of the Americans with Disabilities Act, as amended, 42 U.S.C. § 12112, the Vendor agrees that it will comply with the requirements of U.S. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 C.F.R. Part 1630, pertaining to employment of persons with disabilities. In addition, the Vendor agrees to comply with any implementing requirements FTA may issue.

7. Americans with Disabilities Act & Section 504 of the Rehabilitation Act

The Vendor and any of its Subsuppliers under the Contract agree to comply with all applicable requirements of the Americans with Disabilities Act of 1990 (ADA), 42 USC §§ 12101 *et seq.*; Section 504 of the Rehabilitation Act of 1973, as amended, 29 USC § 794; 49 USC § 5301(d); and the following regulations and any amendments thereto:

DOT regulations, "Transportation Services for Individuals with Disabilities (ADA)," 49 CFR Part 37;

- a. DOT regulations, "Nondiscrimination on the Basis of Handicap in Programs and Activities Receiving or Benefiting from Federal Financial Assistance," 49 CFR Part 27;
- b. Joint U.S. Architectural and Transportation Barriers Compliance Board (U.S. ATBCB)/U.S. DOT regulations, "American With Disabilities (ADA) Accessibility Specifications for Transportation Vehicles," 36 CFR Part 1192 and 49 CFR Part 38;
- c. Department of Justice (DOJ) regulations, "Nondiscrimination on the Basis of Disability in State and Local Government Services," 28 CFR Part 35;
- d. DOJ regulations, "Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities," 28 CFR Part 36;

- e. General Services Administration regulations, "Accommodations for the Physically Handicapped," 41 CFR Subpart 101-19;
- f. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 CFR Part 1630;
- g. Federal Communications Commission regulations, "Telecommunications Relay Services and Related Customer Premises Equipment for Persons with Disabilities," 47 CFR Part 64, Subpart F;
- h. FTA regulations, "Transportation for Elderly and Handicapped Persons," 49 CFR Part 609;
- i. U.S. ATBCB regulations, "Electronic and Information Technology Accessibility Standards," 36 CFR Part 1194; and
- j. Any implementing requirements FTA may issue.

8. Disadvantaged Business Enterprise

TriMet has established a Disadvantaged Business Enterprise (DBE) Program in accordance with regulations of the U.S. Department of Transportation (DOT), 49 CFR Part 26. TriMet has received Federal financial assistance from the Department of Transportation, and as a condition of receiving this assistance, TriMet has signed an assurance that it will comply with 49 CFR Part 26. It is the policy of TriMet to ensure that DBEs, as defined in part 26, have an equal opportunity to receive and participate in DOT-assisted contracts. To the extent authorized by applicable federal laws, regulations, or requirements, Vendor and its subVendors shall facilitate participation by small business concerns owned and controlled by socially and economically disadvantaged individuals, also referred to as "Disadvantaged Business Enterprises" (DBEs).

Vendor and subVendors shall not discriminate based on race, color, national origin, or sex in the award and performance of any FTA or U.S. DOT-assisted subagreement, third party contract, and third party subcontract, as applicable, and the administration of its DBE program or the requirements of 49 C.F.R. part 26. The Vendor and its subVendors shall take all necessary and reasonable steps under 49 C.F.R. part 26 to ensure nondiscrimination in the award and administration of U.S. DOT-assisted subagreements, third party contracts, and third party subcontracts, as applicable.

Failure by the Vendor or its subVendors to carry out the requirements of this subparagraph is a material breach of this subagreement, third party contract, or third party subcontract, as applicable. The following remedies, or such other remedy as TriMet deems appropriate, include, but are not limited to, withholding monthly progress payments, assessing sanctions, liquidated damages, and/or disqualifying the Vendor or subVendor from future bidding as non-responsible.

9. Veterans Preference

For construction contracts, Vendors shall, to the extent practicable, give a hiring preference to veterans, as defined in 5 U.S.C § 2108, who have the skills and abilities required to perform the

work except in the case of preference over a member of any racial or ethnic minority, female, an individual with a disability, or a former employee.

10. Debarment and Suspension

Neither TriMet nor Vendor or its subVendors shall make an award to a party listed on U.S. GSA "System for Award Management – Lists of Parties Excluded from Federal Procurement and Nonprocurement Programs" (SAM) in accordance with OMB guidelines at 2 CFR 180. Proposer shall complete the debarment certification, Proposal Form 1.3. This certification is a material representation of fact relied on by TriMet. If it is later determined that the bidder or proposer knowingly rendered an erroneous certification, in addition to remedies available to TriMet, the federal government may pursue available remedies, including but not limited to suspension and/or debarment.

Vendor shall ensure that it and all subVendors comply with federal debarment and suspension requirements, and review the SAM at <https://www.sam.gov> prior to award.

11. Solid Waste

Vendor and subVendors shall comply with all applicable standards, orders or regulations issued pursuant to section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 C.F.R. part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

12. Recycled Products

The Vendor agrees to comply with all the requirements of section 6002 of the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6962), including but not limited to the regulatory provisions of 40 CFR Part 247, and Executive Order 12873, as they apply to the procurement of the items designated in Subpart B of 40 CFR Part 247

13. Procurement of Recovered Materials

TriMet and its Vendors must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired by the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

14. Lobbying Restrictions

Vendor and subVendors shall not use federal assistance to influence any officer or employee of a federal agency, member of Congress or an employee of a member of Congress, or officer or employee of Congress on matters that involve any federal contract, grant, or any other award covered under by 31 U.S.C. § 1352 , including any extension or modification, as set forth in the Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352, as amended, U.S. DOT regulations, "New Restrictions on Lobbying," 49 C.F.R. part 20, to the extent consistent with 31 U.S.C. § 1352, as amended, and other applicable federal laws, regulations, requirements, and guidance prohibiting the use of federal assistance for any activity concerning legislation or appropriations designed to influence the U.S. Congress or a state legislature. Provided, however, that if permitted by applicable federal law, regulations, requirements, or guidance, such lobbying activities described above may be undertaken through TriMet's proper official channels.

Vendors who apply or bid for an award of \$100,000 or more shall file the certification required by 49 CFR Part 20, "New Restrictions on Lobbying." Each tier certifies to the tier above that it will not and has not used federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any Agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any federal contract, grant or any other award covered by 31 USC 1352. Each tier shall also disclose the name of any registrant under the Lobbying Disclosure Act of 1995 who has made lobbying contacts on its behalf with non-federal funds with respect to that federal contract, grant or award covered by 31 USC 1352. Such disclosures are forwarded from tier to tier up to the recipient.

15. Dispute Resolution and Remedies

Should any dispute arise between the parties concerning this Contract that is not resolved by mutual agreement, it is agreed that it will be submitted to mediated negotiation prior to any party commencing litigation. In such an event, the parties to this agreement agree to participate in good faith in a non-binding mediation process. The mediation shall take place in Portland, Oregon. The mediator shall be selected by mutual agreement of the parties, but in the absence of such agreement each party shall select a temporary mediator and those mediators shall jointly select the permanent mediator. The mediator's fees and costs shall be borne equally by the parties.

Unless otherwise directed by TriMet, Vendor shall continue performance under this Contract while matters in dispute are being resolved.

All claims, counterclaims, disputes and other matters in question between TriMet and the Vendor arising out of or relating to this agreement or its breach will be decided by arbitration if the parties mutually agree, or in a court of competent jurisdiction within the State of Oregon in which TriMet is located.

The duties and obligations imposed by the Contract documents and the rights and remedies available there under shall be in addition to and not a limitation of any duties, obligations, rights, and remedies otherwise imposed or available by law. In the event that TriMet or Vendor fail to act, such failure shall not constitute a waiver of any right or obligation afforded to either party

under the Vendor or by law, nor shall any such action or failure to act constitute an approval of or acceptance of any breach there under, except as may be specifically agreed in writing by both parties.

16. Clean Air Act

The Vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 USC §§ 7401 *et seq.* The Vendor agrees to report each violation to the Agency and understands and agrees that the Agency will, in turn, report each violation as required to ensure notification to FTA and the appropriate EPA Regional Office. The Vendor also agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with federal assistance provided by FTA.

17. Federal Water Pollution Control Act

The Vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 USC 1251 *et seq.* The Vendor agrees to report each violation to the Agency and understands and agrees that the Agency will, in turn, report each violation as required to ensure notification to FTA and the appropriate Environmental Protection Agency (EPA) Regional Office.

The Vendor also agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with federal assistance provided by FTA.

18. Environmental Violations

For all contracts and subcontracts in excess of \$100,000.00, Vendor agrees to comply with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 USC 1857(h)), section 508 of the Clean Water Act (33 USC 1368), Executive Order 11378, and Environmental Protection Agency regulations (40 CFR, Part 15), which prohibit the use under nonexempt Federal contracts, grants, or loans, of facilities included on the EPA List for Violating Facilities. Vendor shall report violations to FTA and to the USEPA Assistant Administrator for Enforcement (ENO329).

19. Energy Conservation

Vendor and subVendors shall comply with mandatory standards and policies relating to energy efficiency which are contained in the State energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 USC section 6321, *et seq.*).

20. Privacy Act

The following requirements apply to the Vendor, any subVendor, and those employees that administer any system of records on behalf of the Federal Government under any contract. The Vendor agrees to comply with, and assures the compliance of its employees with, the information restrictions and other applicable requirements of the Privacy Act of 1974, 5 U.S.C. § 552a. Among other things, the Vendor agrees to obtain the express consent of the Federal Government before the Vendor or its employees operate a system of records on behalf of the

Federal Government. The Vendor understands that the requirements of the Privacy Act, including the civil and criminal penalties for violation of that Act, apply to those individuals involved, and that failure to comply with the terms of the Privacy Act may result in termination of the underlying contract.

21. Contract Work Hours and Safety Standards Act

Under 40 U.S.C. 3702 of the Act, each Vendor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

- a. Overtime requirements - No Vendor or subVendor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- b. Violation; liability for unpaid wages; liquidated damages - In the event of any violation of the clause set forth in paragraph (1) of this section the Vendor and any subVendor responsible therefore shall be liable for the unpaid wages. In addition, such Vendor and subVendor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this section.
- c. Withholding for unpaid wages and liquidated damages - The (write in the name of the grantee) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Vendor or subVendor under any such contract or any other Federal contract with the same prime Vendor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Vendor, such sums as may be determined to be necessary to satisfy any liabilities of such Vendor or subVendor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.

- d. Subcontracts - The Vendor or subVendor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) of this section and also a clause requiring the subVendors to include these clauses in any lower tier subcontracts. The prime Vendor shall be responsible for compliance by any subVendor or lower tier subVendor with the clauses set forth in paragraphs (1) through (4) of this section.

22. Cargo Preference

Vendor and subVendors whose agreements under this Contract involve the transport of equipment, material, or commodities by ocean vessel shall:

- a. use privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, materials, or commodities pursuant to this section, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.
- b. furnish within 20 working days following the date of loading for shipments originating within the United States, or within 30 working days following the date of loading for shipment originating outside the United States, a legible copy of a rated, "on-board" commercial ocean bill-of-lading in English for each shipment of cargo described in the preceding paragraph to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590, and to TriMet (through the Vendor in the case of a subVendor's bill-of-lading) marked with appropriate identification of the Project.

23. Fly America

If this contract involves the international transportation of goods, equipment, or personnel by air, Vendor agrees 1) to use U.S. flag carriers, to the extent service by these carriers is available and 2) to include this requirement in subcontracts at every tier. The Vendor shall submit, if a foreign carrier was used, an appropriate certification or memorandum adequately explaining why service by a U.S. flag carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event provide a certificate of compliance with Fly America Requirements 41 CFR Part 301-10.

24. Davis-Bacon and Copeland Anti-Kickback Acts – Reserved

25. Seismic Safety - Reserved

26. Transit Employee Protective Arrangements - Reserved

27. Charter Service Operations – Reserved

28. School Bus Operations - Reserved

29. Fair Labor Standards Act (Awards Involving Commerce)

Vendor and subVendors shall comply with the Fair Labor Standards Act (FLSA), 29 U.S.C. § 201 et seq. to the extent that the FLSA applies to employees performing work with federal assistance.

30. Buy America

Vendor shall comply with 49 U.S.C. 5323 (j) and 49 CFR Part 661 as amended, which provides that Federal funds may not be obligated unless steel, iron, and manufactured products used in FTA-funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 CFR 661.7. and include, microcomputer equipment, software, and small purchases made with capital, operating, or planning funds.

For procurements of rolling stock, which includes train control, communication, traction power equipment, and rolling stock prototypes, the cost of the components and subcomponents produced in the U.S. must be: more than 60 percent for FY2016 and FY2017; more than 65 percent for FY2018 and FY2019; more than 70 percent for FY2020 and beyond. Final assembly for rolling stock also must occur in the U.S. Additionally, rolling stock procurements are subject to the pre-award and post-delivery Buy America audit provisions set forth in 49 U.S.C. § 5323(m) and 49 CFR part 663.

For all other contracts, manufactured goods must be 100-percent produced in the U.S.A. Manufactured good is considered produced in the United States if: (1) All of the manufacturing processes for the product take place in the United States; and (2) All of the components of the product are of U.S. origin. A component is considered of U.S. origin if it is manufactured in the United States, regardless of the origin of its subcomponents. 49 CFR 661.5(d).

As a condition of responsiveness, the bidder or offeror submit with the bid or offer a completed Buy America certificate in accordance with 49 CFR §§661.6 or 661.12. This requirement does not apply to lower tier subVendors.

Vendor and subVendors shall comply with all federal laws, regulations, and requirements providing wage and hour protections for nonconstruction employees, including Section 102 of the Contract Work Hours and Safety Standards Act, as amended, 40 U.S.C. § 3702, and other relevant parts of that Act, 40 U.S.C. § 3701 et seq., and U.S. DOL regulations, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction (also Labor Standards Provisions Applicable to Nonconstruction Contracts Subject to the Contract Work Hours and Safety Standards Act)," 29 C.F.R. part 5.

31. Patent and Rights in Data (05/17) – Reserved

32. Drug & Alcohol Program Requirements - Reserved

END OF EXHIBIT A – FEDERAL REQUIREMENTS

EXHIBIT C – TRIMET IT SECURITY REQUIREMENTS

Attachments in this Appendix:

- Exhibit C.1 TriMet - Network Connection Policy
- Exhibit C.2 TriMet IT Policies for RFP

EXHIBIT C.1 TRIMET - NETWORK CONNECTION POLICY 2020-09-09

Untrusted or otherwise non-certified applications are considered a security and stability risk to TriMet network and application operations and must by default start in their own Security Zone. A Security Zone shall consist of:

1a. A single copper or fiber connection, running at min/max supported speeds and duplex according to network module:

Enterprise: 1Gb / 10Gb full

Datacenter: 1Gb / 10Gb full

Rail Operations: 10Mb half or full; 100Mb / 1Gb full

LMR: 10Mb half or full; 100Mb / 1Gb full

1b. WiFi - 802.11n or newer. No custom SSIDs will be created or supported

2. A single broadcast VLAN which will not be extended past the edge of the security zone

3a. A single RFC 1918 IPv4 broadcast network which will connect to the TriMet network via a Layer 3 routed Security Zone interface on a module-appropriate TriMet firewall

3b. Network Address Translation (NAT) on an as-needed basis, defined and configured on a case-by-case basis

4. No assumed access to internal TriMet network services or segments. Examples: DNS, DHCP, or "the Datacenter." Access to internal TriMet services must be explicitly approved and configured on the firewall

5. No assumed access to external non-TriMet network services or segments. Examples: Internet, cloud, or 3rd-party sites. Access to external services must be explicitly approved and configured on the firewall. Application owners are responsible for understanding application requirements and submitting clear vendor-approved documentation supporting such

6. No assumed access to other Security Zones

7. No assumed Service Level Agreements (SLAs). All TriMet network connection services are provided on a best-effort basis

Circumvention of approved physical, network, and Security Zone connections and policies is prohibited. Examples: Out of band management, backdoor cabling or cross-connects into other segments, dual-homed hosts terminating outside the Security Zone.

In addition to the above, the following protocol types are explicitly prohibited from exiting the Security Zone onto TriMet's network without prior written approval:

1. Multicast protocols. Examples: IGMP, PIM, MSDP

2. Tunneling protocols. Examples: GRE, IPSEC, L2TP, PPTP, VxLAN

3. Non-TCP/IP protocols. Examples: IPX, AppleTalk, NetBEUI
4. Atypical or known problematic TCP/IP protocols. Examples: Bittorrent, Telnet
5. IP versions other than version 4. Example: IPv6

All exceptions to above must be documented and approved in writing by the Network Communications team (manager?) prior to system deployment. Approved deployment changes are subject to ongoing standard change management procedures.

TriMet's Preferred Network Architecture Elements:

1. 1Gb or 10Gb full duplex fiber or copper
2. Routing Protocols: BGP, OSPF, Static
3. VPN: IPSEC DH5 AES-128

EXHIBIT C.2 TRIMET IT POLICIES FOR RFP

<u>OConnor, A.J.</u>	<u>Fouts, Matt</u>	<u>Lang, Rich</u>	<u>Chang, Mary</u>	<u>Martin, Chris</u>	Rev 1.0A Draft 9/19/2020
Policy Category		Policy Description			
Vendor Remote Access		All remote access from non-TriMet provided equipment will be granted only via VDI			
Change Advisory Board		All changes made to TriMet IT components require a change advisory board submittal, an approval, impact analysis, change configuration details, release plan			
Rogue WAP detection		All TriMet Wireless solutions requires rogue access point monitoring and detection			
Nonrepudiation activity monitoring		All user actions shall be logged to central syslog with source IP address, username, action performed			
WAP IDS		All WAPS shall be required to include intrusion detection and intrusion prevention with centralized logging, security event alerts will be on with coordinated tuning			
Wireless Encryption		Wireless encryption shall be required, configured, tested and meet FIPS 140-2			
Hidden SSID		All Service Set Identifiers (SSID) are restricted, non-published, unique from default			
Guest Self Registration Portal		The guest self registration portal will be configured to autopurge credentials, allow self registration, provide SMS msgs			
Patching		The vendor shall provide a system to patch and maintain firmware where TriMet can deploy new firmware without downtime.			
Isolation OCS, ICS, Enterprise, Guest		All OCS, ICS, SCADA wireless communication will be segmented in an OCS zone from enterprise VLAN communications, guest WLAN segmented in untrusted zone with Internet Egress			

WAF	Web applications or exposed web services shall be protected with configured Web Application Firewalls (WAF) to protect against top ten OWASP vulnerabilities
Physical Connection Security	Physical network interfaces are restricted by MAC address or equivalent physical network port security i.e., 802.1x
TriMet Agent Proxy	If a Vendor needs access to support a TriMet application access will be controlled by TriMet personnel who will a)collect a written request For the work to be performed and b) when access is no longer needed for that purpose so the account can be disabled
Application Segmentation	Applications that require 3rd party support must be placed in a segregated part of the network from TriMet internally supported applications
Data Handling	Applications that contain PII or PHI or confidential data must encrypt data in transmission and at rest using current protocols and ciphers
Restricted Remote Access	No backdoor software such as LogMeIn or VNC shall be allowed on any TriMet resource
Corporate ID management	Identity management must be handled by AD or SAML 2.0 which is the TriMet standard
Privileged account use	Privileged accounts should be separate from AD User network credentials and should only be granted to individuals that support a team
Privileged account use	Privileged accounts by policy cannot access the Internet , two-factor is preferred for admins
Default Passwords	All default passwords are identified, changed to TriMet's standard, monitored
Password Complexity rotation policy	Passwords must align with TriMet's standards and use all 4 character classes with a minimum length of 12 characters. These should be rotated every 90 days. Under no circumstance should any account have a password that never expires

General acceptable standards	Applications must comply with the standards required by the networking, server, wireless, and devop teams to allow interoperability.
IT Governance Admin	Every Application will have a TriMet admin and backup admin appointed regardless whether the app is on-Prem or in the cloud
General monitoring	Every application will subscribe to Monitoring services and PagerDuty
Data Inspection	If an application will be sending data offsite a review of the service is required. The service must allow TriMet to pull its data back out in a common format without penalty
Vendor Viability Selection Criteria	Application selection should also factor in viability of the vendor who supports the application—how long have they been in business, how are their financials etc
Patch Window Requirement	Applications selected should be capable of having flaws patched within a maximum time window of 90 days. Exceptions to this may include SCADA equipment in which a mitigation plan must be filed
System Security Plan	All applications should have a documented SSP or confluence operations page
Exception Process	Exceptions to any of these policies will require 3 signatures a) the director of the individual making the request b) the director of information security and c) CIO
Least Required Access	All network connections should follow the principle of least privilege. Connection can initiate from a more trusted zone to a less trusted zone. Connections from a less trusted zone should not initiate connections to a more trusted zone
Software Agents	All devices that are capable of accepting an agent for edr(anti-virus), rapid7, and any monitoring must have these installed
Change Mgmt	All changes to infrastructure components, applications on premises or in the cloud will abide by TriMet Change Management policies

Enterprise Grade Software	Applications selected should be enterprise/business versions, not personal
Enterprise Architecture	All new software, hardware proposed shall be reviewed, and vetted by EA
Centralized Syslogs	All logs from applications, servers, devices should forward to a central syslog server where both security events and operational events can be mined

END OF EXHIBIT C – TRIMET SECURITY REQUIREMENTS