



**Safety Certification Audit  
Issued March 1, 2023 - DRAFT**

**Project: Alstom Cab/Coaches Sounder Commuter Rolling Stock**

**Audit Type: Audit Profile 5000**

**Audit ID: 2022-22**

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Date: *January 25, 2023*

Date: *January 25, 2023*

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Date: *January 31, 2023*

**APPROVED FOR ISSUE (SOUND TRANSIT):**

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Date: *March 7, 2023*

## Safety and Security Certification Audit Report

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## I. PROJECT BACKGROUND

The Central Puget Sound Regional Transit Authority (Sound Transit) entered into a Consortium Agreement with San Joaquin Regional Rail Commission and North County Transit District in December 2019 for the joint procurement of commuter rail coach cars (referred to as West Coast Bi-Level), with Sound Transit acting as the lead Agency for the procurement. The initial agreement for the manufacturing and fabrication of the commuter rail cars which was collectively entered into between the Consortium and Bombardier Transit (Bombardier) is dated May 2020. In January 2021, Bombardier was acquired by Alstom, who assumed responsibilities for manufacturing and fabrication of the procurement. Raul V. Bravo + Associates (RVBA) is providing, on behalf of the Consortium, inspection, testing and owner's representation services.

Sound Transit's procurement of the vehicles consists of three (3) cab cars and eight (8) coach vehicles. Through December 2022, six (6) of the eleven (11) vehicles had shipped to Sound Transit's Seattle maintenance facility while remediation work activities continued on the remaining vehicles at Alstom's Thunder Bay Canada facility.

Excluded from the Consortium Agreement and the procurement agreement with Bombardier (now Alstom) was reference or requirement of Sound Transit's Agency Safety and Security Management Plan (SSMP), Safety and Security Certification Plan (SSCP) and/or the Sounder Commuter Rail System Safety Program (Sounder SSP). In November 2021, Sound Transit Safety and Sounder Operations convened to confirm: i) that there were certain design changes to the vehicles, ii) that Safety had not initially been involved in the procurement of the vehicles, and iii) that although the procurement would meet Federal Railroad Administration Guidelines (FRA) Title 49 CFR Parts 236 and 238, *procurement of the vehicles was out of scope of the Agency requirements for Safety and Security Certification*. Adherence to safety and security process and reporting was anticipated to follow FRA guidelines, American Public Transportation Association (APTA) applicable safety standards, initial Bombardier and subsequently Alstom internal processes, and that Sound Transit Safety, as noted in November 2021 internal communications, would validate safe operations of the vehicles.

## II. EXECUTIVE SUMMARY

Commencing in November 2022 and extending through December 2022, Talson Solutions, LLC (Talson) conducted a Safety & Security Audit in collaboration with Sound Transit's Audit Division for the West Coast Bi-Level vehicles, specifically the procurement and fabrication of Sounder Commuter Rail Cab/Coaches from rolling stock fabricator/manufacturer Alstom. The audit focused on validating safety assurance processes for new equipment fabrication and Sound Transit's Audit Profile (AP) 5000 inclusive of documentation validating Factory Acceptance Testing, Certification for Assembly and Testing, Final Car Shipment & Receiving, and non-conformance reporting and work arounds. The audit assessed adherence with FRA Title 49 CFR Nos. 236 and 238, Alstom's System Safety Program Plan, and alignment with System Safety Certification processes per Sound Transit's Sounder SSP - specifically Section No. 4.1.2, and SSMP and SSCP guidelines.

An onsite portion of the audit was conducted on November 16 – 17, 2022 at the Alstom facility which included interviews with Alstom and RVBA and support from accompanying Sound Transit personnel. Additional virtual interviews were conducted and supplemental documentation was reviewed post onsite audit activities.

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Talson, along with concurrence of Sound Transit’s Transportation Safety and Security Specialist, confirmed that adequate safety assurances and analysis efforts were undertaken by Alstom during the work. System safety procedures were noted, including those associated with hazard identification/mitigation, inspection, testing, and overall safety administration protocols. The assurances of systematic gathering and examination of safety requirements was noted within the issuance of Alstom System Safety Program Report (dated October 14, 2022 Revision No. 4). The purpose of the System Safety Program Report was intended to provide assurances with respect to the safety of the vehicles as it summarized and concluded on the safety analysis efforts done with respect to the West Coast Bi-Level procurement. Talson found that the Alstom System Safety Program Report was detailed and aligned with Sound Transit Safety and Security Certification processes, specifically those found with the Agency’s SSMP, SSCP and the Sounder SSP with limited deviation. Alignment with FRA Title 49 CFR Nos. 236 and 238 was also observed and noted.

The audit resulted in the identification of five (5) observations relating to lack of clear explanation supporting non-certification under Agency SSCP and Sounder SSP requirements, lack of current and/or revised safety and security documents being readily accessible from RVBA and opportunities for enhancement of Safety and Security Certification contractual obligations for future vehicle procurements. Preliminary audit observations were discussed on site with Alstom and presented formally during the December 2022 Audit Closeout Briefing.

During the audit, Talson and Sound Transit were advised of an on-going remediation that is in process due to “delamination and paint adherence” issues noted on the exterior of all eleven (11) vehicles fabricated for Sound Transit. Talson understands that Sound Transit was aware of the remediation efforts and agreement of corrective actions were pending at the time of the audit.

### III. SCOPE AND METHODOLOGY

The intent of the audit was to verify that system safety aspects of the equipment testing and inspection considerations are sufficiently completed and documented properly accordingly to Agency and Alstom specific requirements. The audit sought to validate alignment with (and compliance to as obligated) the following notable documents and/or procedures:

- Sound Transit’s Sounder SSP
- Sound Transit’s SSCP and SSMP
- U.S.C. Title 49 CFR Parts 236, 238, 270, 611 and 633
- Sound Transit Audit Profile 5000
- APTA applicable Safety Standards
- Alstom’s Safety System Standards (and associated documents)

As part of the audit reported in this document, Talson utilized Sound Transit AP 5000 to test safety and security readiness of Sound Transit’s new Bi-Level Commuter Coaches and Cab control cars. Testing scope details for AP 5000 is provided in Appendix A. The audit included detailed examination of established inspection and testing procedures, vehicle history books, quality non-conformance logs, preliminary hazard identification and mitigation analysis along with virtual interviews with Sound Transit and Alstom personnel, on-site interviews and inspections at Alstom’s plant in Thunder Bay, and additional supplemental document reviews. Notable documents reviewed is provided in Appendix B and listing of interviews is provided in Appendix C.

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### V. AUDIT OBSERVATIONS

Talson identified five (5) observations which correlate to Agency certification and validation processes.

#### **Observation No. 1**

Sound Transit's Sounder Vehicle Procurement Safety and Security Management Memo (Safety Memo), issued in November 2021<sup>1</sup> did not clearly articulate why Safety and Security Certification was not required as outlined in the Sounder SSP Section 4.1.2. The Safety Memo noted that the procurement was "out of scope" of SSCP and SSMP requirements. The Safety Memo also noted that Safety was not initially involved in the procurement of the Sounder Cab and Coaches and that safety validation activities would be undertaken to ensure FRA requirements were achieved for safe operation of the vehicles. Further details include:

- a) The Safety Memo lacked adequate references to written policy and details supporting that the \$42 million-dollar procurement of vehicles was "out of scope." After review of the SSCP, SSMP, = Sounder SSP, U. S. C. Title 49, and recent precedence of light rail vehicle procurement Safety and Security Certification, Talson could not verify a reasonable basis within the written standards to conclude that the procurement was outside the parameters for consideration of Safety and Security Certification.
- b) SSCP Section 1.6, *Scope*, has a defined scope separate from the certification requirements of B) "Major Capital Projects" from D) "Sounder Vehicles and on-track equipment" and E) "Link Light Rail Vehicles" each referring the reader to a different document for written requirements. For Sounder vehicles, this should be referencing the Sounder SSP, dated 2021, which is post-dated to the SSCP, issued in 2018. Further, SSCP section 1.8. B, requires an effort to "demonstrate conformance with safety and security certification procedures", not solely FRA requirements outlined in CFRs 236 and 238. FRA had established requirements for safety and security certification outlined in CFR 270, *System Safety Program*, effective August 2016 and amended in March 2020 which were not addressed in the memo for the May 2020 procurement.
- c) Although the Sounder SSP defines a "typical" "Major Project" within page 13, *Definitions*, it intentionally excludes purchases solely for vehicles from that potential threshold of "typically" "\$100 million." Talson notes almost identical language and exclusion of sole vehicle purchases in 49 CFR 633.5 *Definitions* which sets a threshold of \$300 million for FTA funding purposes. Sounder SSP Section 4.1.2 does not provide a threshold for the formal safety and certification requirement for vehicles and system components, nor does it reference "Major projects" but does state "Formal Safety Certification is required for all new, extended, rehabilitated or modified systems or components including replacement vehicles and equipment." Talson also notes that this statement excludes the word "major" and is subject to FRA approval as it demonstrates compliance to CFR 270.103 (s) (3).

Talson notes that the Safety Memo was relatively compliant to the SSCP Section 1.8, A., giving authority to the Director of Construction Safety and Security (authority now switched to Director of Transit Safety and Security) and applicable personnel to "determine the level of certification for each project", but lacked demonstration of alignment to 49 CFR 270.103 as referenced in the Sounder SSP, which requires Safety Certification.

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<sup>1</sup> The Safety Memo was undated, but does reference meetings in September 2021 and November 15, 2021.

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### **Observation No. 2**

Current revisions of select project documents (Preliminary Hazard Analysis, Fire Life Safety Hazard Analysis, Alstom's System Safety Program Report, Alstom's Testing Program Plan) were not available or accessible from RVBA's SharePoint site. Current revisions of the noted documentation were made available to Talson and Sound Transit from Alstom (e.g., RVBA Preliminary Hazard Analysis was noted as Revision No. 2, however Alstom was working off of Revision No. 9).

### **Observation No. 3**

Sound Transit relied on RVBA's Sharepoint site for document retention in lieu of the utilizing the Agency's SSIMS platform; use of SSIMS is an Agency requirement (Section 5.1 of the SSCP), inclusive of maintaining a list of elements and certifiable items. This audit notes that the level of Safety and Security Certification was decreased to Safety Validation pursuant SSCP Section 1.6, A. and the Safety Memo.

### **Observation No. 4**

Summarized Alstom Safety and Security Reporting (i.e., System Safety Program Report) was not made available to RVBA for review or input prior to issuance. Talson notes it was not a contractual requirement

### **Observation No. 5**

The Consortium Agreement does not contain any provision to link or obligate Alstom to provide a Safety and Security Certification Verification process, report or supporting documentation that aligns with Sound Transit Agency documentation (specifically the SSCP or Sounder SSP).

Talson did observe that Alstom Safety and Security Certification requirements were an adequate substitute and aligned with Sound Transit Safety and Security processes. Notable scope areas assessed during the audit included the following which resulted in adequate implementation strategies that aligned with industry standards and/or complied with correlating processes for Safety and Security validation.

#### **1) QA/QC Plans and Inspection Process: – Implemented & Deemed Adequate**

Alstom Quality Assurance is responsible for monitoring and controlling the manufacturing and assembly activities. Alstom's Inspection and Test Plan is developed to reflect the type and flow of the manufacturing activities performed in each Activity Center with all the associated control, test and inspection points. The Inspection and Test Plan defines the inspection hold points in the inspection and routine test planning. Inspection hold points are used to ensure that both Alstom and the Customer are satisfied with the quality level of the work performed up to that manufacturing point. The car or sub-assembly cannot move to the next manufacturing step until the Alstom's quality representative has signed off on the inspection hold point. Any work discrepancy needs to be resolved before any hold point inspection can be approved.

The majority of the in-process inspection is performed through the self-verification method of inspection implemented in Alstom's Activity Centers. The process is defined in procedure AME-012010 (Self Verification Program). When issues are found, they are documented and corrected as per procedure AME-012112 (Discrepancy Management). Each person performing self-verification activities has received the training for the activities under their responsibilities. Quality Assurance provides each worker / station with the necessary standards or criteria. Each station also contains a Key Performance Indicator board where results and feedback on self-verification activities are logged. Quality Assurance performs in-process audits of the self-verification inspection performed. The frequency and records of these audits are detailed in the Inspection and Test Plan.

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First Article Inspections are performed on all major assemblies per Alstom's procedure GRP-000148. The purpose is to validate that the first product/s produced under serial conditions, meet the requirements presented and agreed during the Final Design Review, and where appropriate, confirmed/clarified/re-defined during PMR (Pre-Manufacturing Review), requirements clarification meetings or as part of the change management process. This assessment is carried out with the support of the Parts Approval Checklist (GRP-015766) and includes, but is not limited to, validation of compliance with process parameters and controls, validation of internal FAI performed by the supplier, validation of critical characteristics, witnessing, sampling or re-performing elements of the functional testing carried out by supplier, validation of dimensional measurement carried out by the supplier, validation of traceability to operator (including qualification), equipment (including measurement and test equipment), tooling, machinery, environmental conditions, material, validation of configuration of the product against the as-designed baseline.

### **2) Car History Books Testing: – Implemented & Deemed Adequate**

The Operation Quality Assurance Representative, in each Activity Center, is responsible for the preparation of their portion of the Car History Book and to ensure that each one of them is complete and in conformity with the approved Car History Book template. The final assembly site is responsible to perform the review and verification of the Car History Book prior to submittal to Alstom's Customer Service. A copy of the final Car History Book is retained at the final assembly site until delivery. Product Introduction receives the original copy of the Car History Book, updates the Car History Book with data/reports generated during commissioning and transmits the Car History Book to the Customer along with the car. The Car History Book control process is defined in Alstom's procedure AME-012114.

### **3) Inspection Activities and Reports: – Implemented & Deemed Adequate**

In-process Inspection and test status are identified either with a "quality indicator" placed on the part or on the traveling document. All products found to be nonconforming are identified by means of a "Suspension" quality indicator and segregated to prevent unauthorized use. The indicator remains on the product until final disposition has been carried out and accepted by Quality Assurance. Repetitive quality issues found during assembly or inspection are identified as a Quality Workmanship Issue and logged in a database. Repetitive issues are reviewed to determine if they are quality/workmanship or design issues. These issues are assigned to the appropriate Quality Assurance function for root cause analysis, corrective action and preventive action implementation. Final inspection is performed at manufacturing site by an Operation Quality Assurance representative. Any discrepancy is reported as a snag and flagged for correction.

### **4) Safety and Security Certification Requirements: – Implemented & Deemed Adequate**

The scope of the Alstom System Safety Program Plan details all activities and responsibilities related to the safety assurance and documentation for the work and scope of supply of Alstom under the provisions of the Bilevel New Generation Car, Customer Technical Specification. It encompasses for all contracting parties, the safety management and technical activities which occur during this procurement.

Alstom is responsible for the development and the coordination of the implementation of the overall System Safety Program Plan and Safety as well as for the integration of all safety documentation and verification. Each subcontracting party is responsible, under Alstom's coordination, for the complete implementation of this System Safety Program Plan for the scope of supply for which they have prime responsibility. This implementation covers all tasks and responsibilities during design, construction,

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tests, verification, and documentation through all project phases. This safety documentation is to be provided to Alstom for integration with the design documentation.

Alstom's System Safety Program Report provided assurances with respect to the safety of the vehicles as it summarized and concluded on the safety analysis efforts done with respect to the West Coast Bi-Level procurement.

### V. CONCLUSIONS

The audit validated that adequate safety assurances and analysis efforts were undertaken and reported by Alstom. System safety procedures were noted by Alstom, including those associated with hazard identification /mitigation, inspection, testing, and overall safety administration protocols. Obligating Safety and Security requirements within future contracts and improved document control will enhance future vehicle procurement activities.

Safety and Security Certification requirements for major capital projects and vehicle procurement should be evaluated and updated for correlation to the SSCP, SSMP and Sounder SSP accordingly. Further definition within Agency documents regarding Safety and Security Certification will aid in the clarification of when Safety and Security Certification is required and/or deemed not necessary.

### VI. AUDIT RESPONSE

Observations require management responses and/or correlating corrective actions to be submitted within 30 days of the final distribution of this report and the corresponding Audit Response Form (ARF). Verification of conforming corrective action and root cause explanation will be reviewed by Talson upon submission of the completed ARF.

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### VII. DISTRIBUTION

- Safety Audit Dates: November 15 – 18, 2022 (On-Site)
- Organization: Sound Transit
- Responsible Party:
  - Branden Porter, Director, Transportation Safety & Security Division
  - Martin Young, ST Deputy Director, Commuter Rail Operations *(Auditee)*
- Talson Auditor(s):
  - Ken Brzozowski
  - Robert Bright
  - Norman Jones
  - Daniel Hauber *(Auditors)*
- Sound Transit Audit Representation
  - JR Schuhmann, ST Transportation Safety and Security Specialist
- Report To:
  - Branden Porter, Director, Transportation Safety & Security Division
- Distribution List:
  - Julie Timm, Chief Executive Officer
  - Mary Cummings, ST DCEO & Chief Administrative Officer
  - Kimberly Farley, ST DCEO & Chief Systems Officer
  - David Wright, ST Chief Safety Officer
  - Ted Lucas, ST Chief Procurement & Contracts Officer
  - Suraj Shetty, ST Executive Director, Operations
  - Robin Braziel, Director, Commuter Rail, Bus, and Paratransit
  - Paul Denison, ST Deputy Executive Director, Transp. & Maintenance
  - Steve Mischuk, ST Manager Transportation Safety and Security
  - Nick George, ST Senior Transportation Safety and Security Specialist
  - Heather Wright, ST Deputy Director, Audit Division
  - Erin Brumbaugh, ST Deputy Director, Transp. Safety & Security Division
  - Mike Flood, ST Senior Auditor, Audit Division
  - Nicki Doucette, Alstom Project Director
  - Pal Graham, Alstom Project Manager
  - Molly Hughes, WSDOT State Safety Oversight Program Administrator
  - Andrew Royer, WSDOT State Safety Oversight Program Administrator

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### Sound Transit – Alstom Cab/Coaches Sounder Commuter Rolling Stock

#### Appendix A: Sound Transit AP 5000 Scope

Vehicle Configuration Audits (AP 5000) verify compliance to rolling-stock Manufacturer /Fabricator's System Safety Plans and other applicable reference documents. Through execution of AP 5000, Talson, along with Sound Transit's Audit Division, assesses the application and effectiveness of compliance with federal, state, and Sound Transit requirements and guidelines.

**Specific focus includes assessing:**

- 1) Safety aspects of new vehicles are designed, manufactured, tested, and completed according to requirements and specifications.
- 2) QA/QC plans and inspection forms;
- 3) First Article Inspection results;
- 4) Car History Books or documents containing verification testing;
- 5) Processes through documentation review, and interview of key program staff to ensure work activities meet Sound Transit's and Federal Railroad Association safety requirements and specifications as expected from the manufacturer;
- 6) Assess inspection activities and reports;
- 7) Requirements documentation currently available, as related to corresponding safety and security certification requirements.

**AP 5000 documentation reviewed will include but not be limited to:**

- Completed Compliance Matrix / Safety & Security Certification Verification /Report
- Pre-revenue testing reports
- FRA inspections of new equipment
- Sound Transit's on-site certification for assembly and testing
- Equipment Specifications
- Change Orders / Configuration Management
- Fire/Life Safety Hazard Analysis
- Compliance to Sounder Commuter Rail System Safety Program Plan (specific for this audit)

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### Sound Transit – Alstom Cab/Coaches Sounder Commuter Rolling Stock

#### Appendix B: Interviews Conducted

Participant(s)	Position	Affiliation
Martin Young	Deputy Director, Commuter Rail	Sound Transit
George Nicholas	Sr. Transportation Safety & Security Specialist	Sound Transit
Francis Schuhmann	Transportation Safety & Security Specialist	Sound Transit
Nicole Doucette	Project Director	Alstom
Graham PAL	Project Manager	Alstom
Filip Luczak	Quality Assurance & Control	Alstom
Jean-Baptiste Grente	Head of Vehicle Performance & Safety	Alstom
Avani Bhatt	Program Manager	RVBA
Richard Clark	Vehicle Engineering	RVBA
David Gallo	Vice President	RVBA

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### Sound Transit – Alstom Cab/Coaches Sounder Commuter Rolling Stock

#### Appendix C: Documents Reviewed

##### From Alston:

- 1) BTWC-1414 (Revised Test Program Plan\_ Document 27617-TPP-0001, Rev 5)
- 2) BTWC-1382 (Educational and Training Program Outline and Schedule)
- 3) BTWC-1434 (Issuance of updated versions for VFSA and Vehicle FST Material Report documents)
- 4) BE-PLA-0002\_System Safety Plan\_rev5\_signed
- 5) 27617-PQMP-0001\_Project Quality Management Plan\_rev1
- 6) 27617-PLA-0004 Rev6 TRAINING
- 7) 27617-BRA-0031 System Safety Program Report - Rev 4
- 8) 27617-BRA-0012\_rev9\_Preliminary Hazard Analysis
- 9) Vehicle Shipping Status Rail Thunder Bay-Sound Transit
- 10) 617 PRM-030 INTERNAL Draft Minutes
- 11) 617 STM-134 INTERNAL Draft Minutes Rev
- 12) 27617-FAI-0001\_rev1\_2021-03\_customer view
- 13) 27617-PQMP-0001\_Project Quality Management Plan\_rev1

##### From RVBA:

- 1) 27617-BRA-0012 Rev 2 PHA
- 2) Car Commissioning and Qualification Test Procedure Dates
- 3) CFR Compliance Matrix filtered 236 and 238 Requirements
- 4) CFR Compliance Matrix
- 5) RVB+A's review comments to 617 CFR Compliance Matrix AT Answers\_2 DTH

##### From Sound Transit:

- 1) 617 PRM-029 Draft Minutes for WCB Review
- 2) 617 STM-115 Draft Minutes for WCB Review
- 3) 617 STM-116 Draft Minutes for WCB Review
- 4) 617 STM-117 Draft Minutes for WCB Review
- 5) 617 STM-125 Draft Minutes for WCB Review
- 6) SC5.Draft.Rev3.202202 (Audit Profile 5000)
- 7) Sounder Rail Vehicle Procurement Memo TSS, dated November 2021
- 8) Sounder Rail Safety Validation Email (Brandon Porter), dated November 23, 2021
- 9) RP 0281-19 Contract - Sound Transit and Bombardier - Fully executed