Southern California Regional Rail Authority (Metrolink)

SCRRA/Metrolink Interoperable Electronic Train Management System (I-ETMS®) Positive Train Control Safety Plan (PTCSP)

December 30, 2015

VOLUME II – APPENDICES ONLY
Version 2.0
PUBLIC VERSION
(REDACTED MATERIAL REMOVED)

This document is the PTC Safety Plan (PTCSP) for the Metrolink PTC system. This Plan is submitted to the Federal Railroad Administration (FRA) for FRA approval pursuant to 49 CFR 236, Subpart I, §236.1015, as mandated by the Rail Safety Improvement Act of 2008 (RSIA 08) for PTC system certification

Revision History

Date	Revision	Description	Author
9/6/13	0.4	Revised to JRST 2.1 template Contains sections 1-10, 12, 13, 21-28, 31-36. Contains Appendices G.1-G.8, Q, X, Y, AA, HH	RSC
9/30/13	0.5	Volume I Contains above plus additional Sections 11, 14-20, 27, 29, and 30 and Volume II contains above plus additional appendices A, B, D, D.1, D.2, E, F, G.4, G.10, H.1, H.2, O, P.1, T, U, BB, EE, FF, GG, LL, and MM.	RSC
6/1/15	0.6	Volume 1 complete and revised. All appendices complete in Volume II. Draft complete. Redacted versions to follow.	RSC
6/26/15	1.0	Pre-release Confidential Revision of PTCSP with All appendices complete in Volume II.	RSC/SCRRA
6/30/15	1.1	Final edits for release	SCRRA
6/30/15	1.2	Appendix separated into multiple files for uploading to FRA SIR site	SCRRA
7/2/15	1.3	SSI Markings removed from confidential version	RSC/SCRRA
7/17/15	1.4	Version with redactions highlighted. For FRA use only – confidential and proprietary data still visible. Version not released to FRA.	RSC/SCRRA
7/24/15	1.5	Redactions changed for Appendices: I, J, K, M, N, FF, JJ.1, LL: Appendices K, FF, and LL updated. For FRA use only – confidential and proprietary data still visible	RSC/SCRRA

9/15/15	1.6	Correction of formatting errors in the following Appendices: C.1, D.2, E, G.4, G.10, H, I, J, K, M, N, O, P.1, BB, CC, DD, II, JJ.1, LL, and NN. For FRA use only – confidential and proprietary data still visible	RSC/SCRRA
9/17/15	1.7	Correction of formatting errors in the following Appendices: C.1, D.2, E, G.4, G.10, H, I, J, K, M, N, O, P.1, BB, CC, DD, II, JJ.1, LL, and NN. For FRA use only – confidential and proprietary data still visible	RSC/SCRRA
12/30/15	2.0	Corrections based on FRA comments on version 1.7 and guidance from the FRA. Updated to reflect six months of fleetwide, systemwide RSD experience. Appendix section has been reorganized and re-formatted for ease of navigation, including use of hyperlinks to individual Appendix reference files.	RSC/SCRRA

Table of Contents

Appendix A Safety Assurance Concepts 1
Appendix B Type Approval for I-ETMS and PTCDP 2
Appendix C Final Human Factor Analysis 3
Appendix D I-ETMS Hazard Log 4
Appendix E MTTHE Calculations 5
Appendix F Risk Assessment Final Report 6
Appendix G Safety Analysis Documentation 7
Appendix H Safety Verification 10
Appendix I Lab Safety Verification Test Procedures 11
Appendix J Lab Safety Verification Test Results 12
Appendix K Metrolink Training Plan 13
Appendix L Metrolink Operations and Maintenance Manual 14
Appendix M PTC System Implementation Field Functionality Test Plans and Procedures 16
Appendix N PTC System Field Functionality Test Results 17
Appendix O Industry Configuration Management Plan 18
Appendix P Configuration Control and Record Retention 19
Appendix Q Metrolink Integration of Hazard Detectors 20
Appendix R Management Plan for Emergency/Maintenance Rerouting of Trains on PTC Territory <Reserved> 21
Appendix S Communication Restoration Plan 22
Appendix T Test Equipment for PTC <Reserved> 23
Appendix U Initial Implementation Test Procedures <Reserved> 24
Appendix V WIU Safety Case 25
Appendix W Post-Implementation Safety Testing and Monitoring Plans and Processes 26

Appendix X PTC Data Captured in Event Recorder (I-ETMS Logging – Recording Data Dictionary) 27
Appendix Y Licensing Information <Reserved> 28
Appendix Z Safety Audits 29
Appendix AA Novel Technology Employed in Highway Crossing-Protection for PTC <Reserved> 30
Appendix BB Warning and Warning Labels 31
Appendix CC Metrolink Security Management Plan 32
Appendix DD Protection of Wireless Communications 33
Appendix EE Service Restoration Plan 34
Appendix FF Parsons System Reliability 35
Appendix GG System Safety Integration Document 36
Appendix HH System Safety Program Plan 37
Appendix II Interoperable Train Control Messaging Requirements 38
Appendix JJ Track Database Verification and Validation Plan 39
Appendix KK Track Database Verification and Validation Reports 40
Appendix LL I-ETMS Configurable Items 41
Appendix MM PTC Product Vendor List 42
Appendix NN Justification for Non-Vital Emergency Brake Control 44

Appendix A Safety Assurance Concepts

Table A – List of Appendix A Documents

Doc. No.	Document Name	Description	Link
A	IETMS Safety Assurance Concepts; WCR-SAF-1365; Rev. H; 10/14/2015	This document is the I-ETMS "Safety Assurance Concepts" authored by Wabtec.	 Safety Assurance Concepts-FULL...

Appendix B Type Approval for I-ETMS and PTCDP

Table B – List of Appendix B Documents

Doc. No.	Document Name	Description	Link
B.1	Interoperable Electronic Train Management System (I-ETMS) Positive Train Control Development Plan (PTCDP); Version 3.0; 13 November 2014	This document is the I-ETMS PTCDP referenced in this PTCSP. This PTCDP was submitted to the FRA by the UP, NS and CSX to obtain the associated PTC Type Approval in accordance with 49 CFR Part 236 Subpart I.	 I-ETMS PTCDP ver 3_0 2014-11-13 Clear
B.2	FRA file: 15-024198 Final Letter.pdf	This document is the Type Approval letter addressed to UP. NS, and CSX signed by FRA Associate Administrator for Railroad Safety. [FRA file: 15-024198 Final Letter.pdf]	 FRA-Final_letter.pdf
B.2a	FRA file: 15-024198 Signed Type Approval FRA-TA-2011-02-C.pdf	This document is the Type Approval signed by the FRA Associate Administrator for Railroad Safety [FRA file: 15-024198 Signed Type Approval FRA-TA-2011-02-C.pdf]	 FRA-Signed_Type_Approval.PDF
B.2b	FRA file: 15-024198 Enclosure.pdf	This document is the “Enclosure 1” to the Type Approval letter [FRA file: 15-024198 Enclosure.pdf]	 FRA-Enclosure.pdf

Appendix C Final Human Factor Analysis

Table C – List of Appendix C Documents

Doc. No.	Document Name	Description	Link
C.1	I-ETMS Positive Train Control Human Factors Evaluation; with Railroad Responses; V.1.4; 11/26/2013	This document contains the Final Human Factors analysis conducted by Daedalus, annotated with responses from the railroads.	C1 I-ETMS HFA plus Comments...
C.2	Metrolink Human Factors/Ergonomic Evaluation of CDU Placement; Rev. 1; February 21, 2012	This document contains a description of the process and analysis involved in determining the optimum location of the CDU for each Metrolink locomotive type.	CDU Mounting Human Factors

Appendix D I-ETMS Hazard Log

The I-ETMS Hazard Log is a living document. The current revision available for this PTCSP is revision J. The Hazard log consists of a text document front end and a separate table file.

Table D – List of Appendix D Documents

Doc. No.	Document Name	Description	Link
D	**I-ETMS Hazard Log**		
D.a	Hazard Log; Rev J	This document contains the Hazard Log authored by Wabtec.	Hazard Log Rev J.pdf
D.b	Hazard Log Table 36.8.Metrolink	This document is a tabulation of the hazard log items as applicable to Metrolink's specific implementation of I-ETMS	hazard log table 36.8.METROLINK.pdf
D.1	**Operating & Support Checklist Applicable to Railroads (OSCAR) Resolutions for Metrolink**		
D.1a	OSCAR List, I-ETMS Operating & Support Hazard Mitigation Review Tabulation	This document is a tabulation of the OSCAR Requirements	OSCAR_List.pdf
D.1b	Metrolink OSCAR Verification Document; Version 1; May 21, 2015	This document provides a framework for the implementation verification of the operating and support hazard mitigations associated with the deployment of I-ETMS on the METROLINK PTC Project.	Metrolink OSCAR Verification Document
D.2	**Safety Requirements Document**		
D.2a	Safety Requirements; WCR-SAF-1366; Rev. J; 10/15/2015	This document provides the complete list of Safety Requirements (SAFs) defined to mitigate hazards identified in the Hazard Log Database.	Safety Requirements-I...
D.2b	RP1.0030 Dated 09/06/2013	This document is a listing of the SAFs	Safety Requirements Document Appendix A
D.3	I-ETMS Safety Critical Requirement Verification and Validation Report, Rev 1.0; 10/23/2015	This report describes the verification and validation tasks performed on the Interoperable Electronic Train Management System (I-ETMS) safety critical requirements and summarizes the results of those tasks.	I-ETMS Safety Critical Requirm...

Appendix E MTTHE Calculations

Table E – List of MTTHE Calculations

Function #	System Function	Unsafe Failure Rate (events/hr)	MTTHE (hrs)
[redacted]			

Appendix F Risk Assessment Final Report

Table F – List of Appendix F Documents

Doc. No.	Document Name	Description	Link
F	I-ETMS Risk Assessment Report; Revision 1.2; 11/12/2015	This document is the I-ETMS Risk Assessment Report conducted by Battelle Memorial Institute.	 I-ETMS Risk Assessment Rep...

Appendix G Safety Analysis Documentation

Table G – List of Appendix G Documents

Doc. No.	Document Name	Description	Link
G.1	I-ETMS Preliminary Hazard Assessment (PHA); Rev K; August 17, 2013	This document provides an initial review of potential system segment failures and their effect.	PHA REV K
G.2	I-ETMS Locomotive Segment Subsystem Hazard Analysis (LSSHA); WCR-SAF-1356; Rev. M; 10/28/2015	This document provides the analysis conducted to identify hazards associated with failures of the locomotive subsystem and their effects.	Locomotive Segment SSHA-...
G.3	I-ETMS Office Segment Subsystem Hazard Analysis (OSSHA); WCR-SAF-1456; Rev. E; 10/28/2015	This document provides the analysis conducted to identify hazards associated with failures of the office subsystem and their effects.	Office Segment SSHA-FULL.pdf
G.4	Operating & Support Hazard Analysis (O&SHA); Revision 2.0 [DRAFT]; 9/15/2015	This document captures the I-ETMS PTC System Operating and Support Hazard Analysis (O&SHA) conducted by Battelle Memorial Institute and later modified by Rail Safety Consulting (RSC).	RAILROAD I-ETMS Operatin...
G.5	I-ETMS Functional Fault Trees (FFT); Rev D; June 15, 2011	This FFT document provides a description of the methodology used in the creation of the FFT diagrams and includes FFT diagrams showing the relationships of the terminal events to the top-level system hazards identified.	FFT-Rev D v1.5.pdf
G.6	I-ETMS Fault Tree Analysis (FTA); Rev C; June 17, 2011	The FTA document examines hazards of the I-ETMS terminal events identified during the Functional Fault Tree (FFT) analysis and listed as FFT Terminal Events of the FFT.	FTA-Rev C v1.3.pdf
G.7	Failure Mode and Effects Analysis (FMEA)		
G.7a	FMEA Detail TMC-04; WCR-SAF-1356; Rev. F; 10/16/2015	This Wabtec-authored document provides the EBI-300 piece part FMEA.	FMEA Detail TMC-04-FULL.pdf
G.7b	FMEA Failure Mode Distribution TMC-04; WCR-SAF-1356; Rev. F; 10/16/2015	This Wabtec-authored document contains the FMEA failure mode table.	FMEA Failure Mode Distributi...

Doc. No.	Document Name	Description	Link
G.7c	FMEA Summary TMC-04; WCR-SAF-1356; Rev. F; 10/16/2015	This Wabtec authored document lists descriptions of potential EBI-300 failure effects, and the associated sum of the failure rates.	FMEA Summary TMC-04-FULL.pdf
G.8	I-ETMS TMC Platform Safety Analysis (PSA); WCR-SAF-1356; Rev. F; 11/10/2015	This document presents the I-ETMS TMC Platform Safety Analysis (PSA) conducted by Wabtec.	Platform Analysis-FULL.pdf
G.9	System Hazard Analysis (SHA)	This document presents the System Hazard Analysis (SHA) conducted by Wabtec.	System SHA Rev D.pdf
G.10	I-ETMS Summary of Environmental Qualification Tests (EQT)	No additional document is provided herein. Refer to table below.	
G.11	I-ETMS Electromagnetic Interference Test Summary (EMI)	This document provides a summary of I-ETMS electromagnetic interference testing.	Electromagnetic Interference Test Sur

I-ETMS Summary of Environmental Qualification Tests (EQT)

Test	Parameters	Results
Random Vibration and Temperature Cycling	[redacted]	Passed Test
Sinusoidal Vibration		Passed Test
Mechanical Shock – Operating		Passed Test
Mechanical Shock – Shipping		Passed Test
High Temp Storage		Passed Test
High Temp Operational		Passed Test

Test	[redacted]	Results
Low Temp Storage		Passed Test
Low Temp Operational		Passed Test
Temperature Cycling		Passed Test
Humidity		Passed Test
Dust		Passed Test

Information contained in this table is proprietary and confidential to, and the trade secret of, Wabtec Railway Electronics, of Germantown, Maryland. No part or the whole of this table may be disclosed to third parties, or copied without the prior written permission of Wabtec Railway Electronics. Details of the report summarized in the table above are available to FRA on request.

Appendix H Safety Verification

Table H – List of Appendix H Documents

Doc. No.	Document Name	Description	Link
H.1	I-ETMS Master PTC Test Strategy (used by Metrolink); RP-9457; Adopted 2012	This document is AAR Recommended Practice RP-9457 used by Metrolink in developing its Test Plans and Procedures.	RP-9457 I-ETMS Master Test Strategy
H.2	**Safety Verification Plan**		
H.2a	I-ETMS Locomotive Segment Software Verification and Validation Plan; Revision 1.2; 08/28/2014	This document is the Wabtec authored SVVP for the locomotive segment.	Locomotive Segment VV Pla...
H.2b	I-ETMS TMDS Use Cases; Rev. 2.0; 11/17/2014	This document identifies the messages exchanged between the TMDS CAD, TMDS BOS, and the On-board segments and external entities of I-ETMS.	H2b [illegible]
H.2c	Test Results: CAD-BOS-TMC End-to-End Tests; Revision 02-01; 06/18/2015	This document lists the End-to-End lab tests conducted by Metrolink between the CAD, BOS and TMC.	PTC_SP_ML CAD-BOS-TMC TstRpt

Appendix I Lab Safety Verification Test Procedures

Table I – List of Appendix I Documents

A complete set of Test Procedures and Reports is kept on file by Metrolink. These files have been provided to the FRA via their SIR Site, but will also be made available for examination upon request. The attachments contained herein are samples from typical Test Books.

Doc. No.	Document Name	Description	Link
I.1	Sample Lab Test Procedure Book 1 ML.INT53 – Verify Initialization Sequence With Success – Without Departure Test	This document is a sample Test Case taken from Book 1 of the FIT/FQT series of tests. Book 1 includes Initialization, Departure Test, and other non-mainline functionality types of tests.	 Sample Lab Test Procedure Book...
I.2	Sample Lab Test Procedure Book 2 ML.SGL3 – Absolute Stop Enforcement	This document is a sample Test Case taken from Book 2 of the FIT/FQT series of tests. Book 2 includes Signal, Switch, Forms, and other mainline functionality type tests.	 Sample Lab Test Procedure Book...
I.3	Lab Safety Verification Test Procedures	No additional document is provided herein. Detailed documentation is available upon request.	

Appendix J Lab Safety Verification Test Results

Table J – List of Appendix J Documents

A complete set of Test Procedures and Reports is kept on file by Metrolink. These files have been provided to the FRA via their SIR Site, but will also be made available for examination upon request. The attachments contained herein are samples from typical Test Books.

Doc. No.	Document Name	Description	Link
J.1	Sample Lab Test Report Book 1 ML.INT19 – Verify Locomotive Movement During Crew Logon Process – Employee ID Screen	This document is a sample of a test case taken from Test Book 1. It describes the step-by-step process in conducting an end-to-end test of the PTC Initialization function INT19.	
J.2	Sample Lab Test Report Book 2 ML.SGL3 – Dark Intermediate Within T&T Enforcement	This document is a sample of a test case taken from Test Book 2. It describes the step-by-step process in conducting an end-to-end test of the PTC operational function SGL3.	
J.3	Lab Safety Verification Test Reports	No additional document is provided herein. Detailed documentation is available upon request.	

Appendix K Metrolink Training Plan

Table K – List of Appendix K Documents

In addition to the PTC System Training Plan that is provide herewith, a complete set of PTC Training Materials is kept on file by Metrolink. The PTC Training documents available for review upon request are as listed below:

Doc. No.	Document Name	Description	Link
K.1	Metrolink I-ETMS PTC Training Plan; Rev. 3.0; Dec, 15, 2015	This document is Metrolink's Training Plan as related to PTC.	
K.2	PTC Training Material	No additional document is provided herein. Detailed documentation is available upon request.	

PTC Training Material:

1. I-ETMS Operating Crew Training Course Materials
2. Metrolink I-ETMS® Training System Maintenance and Troubleshooting
3. Lilee Systems and the PTC Product Offering – WMS training
4. WAYSIDE & BASE STATION PTC EQUIPMENT GUIDE
5. PTC ITCM Training
6. Wayside Status Relay Service (WSRS) Users Manual
7. Electro Logic-1A Positive Train Control Quick Start Guide
8. Electrocode 4 Positive Train Control Quick Start Guide
9. VHLC Positive Train Control Quick Start Guide
10. ElectroLogIXS VLC, EC5 &XP4 Positive Train Control Quick Start Guide
11. TMDS Workstation Users Manual
12. Train Management & Dispatch System Back Office Server (BOS) – User's Manual MDS Administration Client for Customer
13. Train Management & Dispatch System Smart Mobile Client (SMC) Application Users Manual
14. Train Management & Dispatch System Mobile Device Manager Requirement Specification
15. ITCR Wayside Radio Installation and Field Service Guide
16. ITCR Base Radio Installation and Field Service Guide
17. ITCM ARCHITECTURE AND DESIGN
18. ITC 220 Base Station, Locomotive & Wayside
19. RADIO TRANSCEIVER FOR RAILROAD PTC
20. Positive Train Control Configuration & Change Management

Appendix L Metrolink Operations and Maintenance Manual

Table L – List of Appendix L Documents

A complete set of Operations and Maintenance (O&M) Manuals is kept on file by Metrolink. The O&M documents available for review upon request are as follows:

On-Board

1. I-ETMS® Quick Reference Card
2. I-ETMS Human Machine ETMS Human Machine ETMS Human Machine ETMS Human Machine WPN 28771P
3. Locomotive Onboard PTC Troubleshooting Recommended Practices
4. F40 Final Design Installation Specification
5. F59PH Final Design Installation Specification
6. F59PH Tier II Final Design Supplemental Installation Specification
7. F59PHI Final Design Installation Specification
8. MP36PH Final Design Installation Specification
9. Rotem Cab Car Final Design Installation Specification
10. Maintenance & Overhaul Manual
11. Electrical Wiring and Integrated Schematics Manual
12. PTC Recorder DAS III Utility Software for Dual- Stream Operation and Users Manual
13. I-ETMS® On-Board System Operations Manual
14. SLOT10 ADMINISTRATION GUIDE
15. Simulator Maintenance Manual Set
16. Simulator User Manual Set

Communications

1. Wayside & Base Station Troubleshooting Guide
2. ITCR Wayside Radio Installation & Field Service Guide
3. PTC 220MHz Base Radio ITCR Base Radio Installation & Field Service Guide
4. Interoperable Train Control Radio (ITCR) Radio Management Guide
5. ITCR System Architecture
6. ITCR 220 MHz Network Design Guidelines
7. RADIO TRANSCEIVER FOR RAILROAD PTC
8. TransAir WMS-2000 Quick Start Guide
9. TransAir WMS-2000 Command Reference Guide
10. TransAir WMS-2000 Software Configuration Guide
11. TransAir WMS-2000 Hardware User Manual

WIU

1. WIU Electro Code 4 PTC Quick Start Guide
2. WIU Electro Code 4 Operating & Service Manual

3. WIU Electro Logic 1A PTC Quick Start Guide
4. WIU Electro Logic 1A Field & Maint. Technical Manual
5. WIU ElctroLoglXS VLC EC5 XP4 PTC Quick Start Guide
6. WIU ElctroLoglXS VLC EC5 XP4 Configuration Description Supplement
7. WIU VHLC PTC Quick Start Guide
8. WIU VHLC PTC Manual Supplement
9. VITAL HARMON LOGIC CONTROLLER VHLC - Solid state Interlocking controller Retesting Guide

Back Office – ITCM, WSRS, CAD, BOS

1. ITCM Back Office Installation Guide
2. ITCM Configuration Guide
3. ITCM Deployment Guide
4. ITCM Deployment Tool Installation Guide
5. ITCM Deployment Tool User's Guide
6. ITCM Operations Guide
7. ITCM Systems Management Utility Manual
8. ITCM Application Interface Guide
9. ITCM Chassis Setup
10. ITCM Administration Guide
11. Wayside Status Relay Service (WSRS) Users Manual
12. TMDS Workstation Users Manual
13. Train Management & Dispatch System Back Office Server (BOS) – User's Manual TMDS Administration Client for Customer
14. Train Management & Dispatch System Smart Mobile Client (SMC) Application Users Manual
15. Train Management & Dispatch System Mobile Device Manager Requirement Specification
16. PTC Supplement to the Train Dispatcher's Manual

Table L – List of Appendix L Documents

Doc. No.	Document Name	Description	Link
L		No separate document(s) are provided herein.	

Appendix M PTC System Implementation Field Functionality Test Plans and Procedures

Table M – List of Appendix M Documents

A complete set of Test Procedures and Reports is kept on file by Metrolink. These files have been provided to the FRA via their SIR Site, but will also be made available for examination upon request. The attachments contained herein are samples of typical Test Books.

Doc. No.	Document Name	Description	Link
M.1	I-ETMS FIT/FQT Test Procedures Book 1 of 2;	This document is the compilation of Test Cases conducted by Metrolink in the field on a specific Locomotive type for verification of the Initialization related functionality of I-ETMS.	
M.2	I-ETMS FIT/FQT Test Procedures Book 2 of 2;	This document is the compilation of Test Cases conducted by Metrolink in the field on a specific Locomotive type for verification of the operational related functionality of I-ETMS.	

The following additional FIT/FQT Test Procedure documents are available for review upon request.

M.a	I-ETMS FIT/FQT Test Procedures Book 1 of 2; F59PH Locomotive
M.b	I-ETMS FIT/FQT Test Procedures Book 1 of 2; F59PHI Locomotive
M.c	I-ETMS FIT/FQT Test Procedures Book 1 of 2; F40 Locomotive
M.d	I-ETMS FIT/FQT Test Procedures Book 1 of 2; Rotem Cab Car
M.e	I-ETMS FIT/FQT Test Procedures Book 2 of 2; MP36 Locomotive
M.f	I-ETMS FIT/FQT Test Procedures Book 2 of 2; F59PH Locomotive
M.g	I-ETMS FIT/FQT Test Procedures Book 2 of 2; F59PHI Locomotive
M.h	I-ETMS FIT/FQT Test Procedures Book 2 of 2; F40 Locomotive

Appendix N PTC System Field Functionality Test Results

Table N – List of Appendix N Documents

A complete set of Test Procedures and Reports is kept on file by Metrolink. These files have been provided to the FRA via their SIR Site, but will also be made available for examination upon request. The attachments contained herein are samples of typical Test Books.

Doc. No.	Document Name	Description	Link
N.1	I-ETMS FIT/FQT Test Procedures Book 1 of 2; MP36 Locomotive; ML-DPT13	This document is a sample test case taken from Book 1 of tests conducted by Metrolink in the field on a specific Locomotive type for verification of the Initialization related functionality of I-ETMS. See below for a listing of additional documents available for review upon request.	 Sample Field Test Report Book....
N.2	I-ETMS FIT/FQT Test Procedures Book 2 of 2; Rotem Cab Car; ML-SGL18	This document is a sample test case taken from Book 1 of tests conducted by Metrolink in the field on a specific Locomotive type for verification of the Initialization related functionality of I-ETMS. See below for a listing of additional documents available for review upon request.	 Sample Field Test Report Book....

The following additional FIT/FQT Test Procedure documents are available for review upon request.

N.a	I-ETMS FIT/FQT Test Procedures Book 1 of 2; MP36 Locomotive
N.b	I-ETMS FIT/FQT Test Procedures Book 1 of 2; F59PH Locomotive
N.c	I-ETMS FIT/FQT Test Procedures Book 1 of 2; F59PHI Locomotive
N.d	I-ETMS FIT/FQT Test Procedures Book 1 of 2; F40 Locomotive
N.e	I-ETMS FIT/FQT Test Procedures Book 1 of 2; Rotem Cab Car
N.f	I-ETMS FIT/FQT Test Procedures Book 2 of 2; MP36 Locomotive
N.g	I-ETMS FIT/FQT Test Procedures Book 2 of 2; F59PH Locomotive
N.h	I-ETMS FIT/FQT Test Procedures Book 2 of 2; F59PHI Locomotive
N.i	I-ETMS FIT/FQT Test Procedures Book 2 of 2; F40 Locomotive
N.j	I-ETMS FIT/FQT Test Procedures Book 2 of 2; Rotem Cab Car

Appendix O Industry Configuration Management Plan

Table O – List of Appendix O Documents

Doc. No.	Document Name	Description	Link
O	PTCSP CM Draft V2.3; 07/13/2015	This document is the industry recommended Configuration Management Plan that has been adopted by Metrolink for I-ETMS. This is a living document and Metrolink will update its own procedures and policies accordingly.	Appx O ITC Industry CM Dft rev 2.3.pdf

Appendix P Configuration Control and Record Retention

Table P – List of Appendix P Documents

Doc. No.	Document Name	Description	Link
P.1	Metrolink Positive Train Control Configuration & Change Management; Version 1.1; May 23, 2014	This document is a Metrolink Standard Operating Procedure defining the framework for Configuration Management and the related processes for PTC.	PTC Configuration & Change Mgmt.
P.2	**Metrolink Record Retention Policy**		
P.2a	SCRRA Administrative Policies and Procedures manual No. ADM-4; Revision 1; 12/01/07	This document provides guidelines for the generation, maintenance and disposition of SCRRA records.	Records_Management_ADM4.pdf
P.2b	Attachment A; SCRRA Records Retention Schedule; Rev. 6; 09/30/09	This document is a schedule for retention of SCRRA documents over various departments and disciplines.	Records_Retention_Schedule_Rev_6.pdf

Appendix Q Metrolink Integration of Hazard Detectors

Table Q – List of Appendix Q Documents

Doc. No.	Document Name	Description	Link
Q	Signal Circuit Plan; CP Las Posas – CP Madera; VN 426-432; Sheets 5&6	This document is a sample circuit plan showing the interconnection of a High-Water Detector with the wayside signaling system.	 Circuit of High Water Detector

Appendix R Management Plan for Emergency/Maintenance Rerouting of Trains on PTC Territory <Reserved>

Since Metrolink does not have a Rerouting Plan for PTC Territory, this Appendix is <reserved>. Rerouting of Metrolink trains is not practical based on the structure of the system territory.

Table R – List of Appendix R Documents

Doc. No.	Document Name	Description	Link
R		No separate document(s) are provided herein.	

Appendix S Communication Restoration Plan

SCRRA's communications system in support of PTC includes the Communications management system in the back office, 168 wayside 220 MHz radios and associated antennas, 14 base station locations which include 20 base station radios, and a robust backhaul system. The backhaul system consists of fiber optic lines, microwave, Ethernet radio and commercial MPLS. Each base station has a minimum of two paths to the back office. Each wayside location has two paths to the train – peer to peer 220 MHz radio, or via the Wayside Status Relay Service (WSRS) from the wayside to the back office (usually over fiber optic lines or a cell modem integrated in the Wayside Message Server) then to the base station, then to the locomotive.

The PTC base stations are part of the regional PTC radio network, and as such an outage of a base station will not solely affect SCRRA, but may have an adverse impact to PTC operation on the neighbor railroads in the LA Basin. No attempt will be made to capture every combination of communications outages and prioritize them.

There are planned and unplanned outages. A planned outage may take place for a software update, or for reprogramming of a device. To the extent possible, planned outages will be staged so as not to disrupt PTC operation. If some disruption is inevitable, it will be minimized.

An unplanned outage is by definition unpredictable. An antenna can be damaged by weather, vandalism or accident. Cables may be severed. Equipment may fail.

The system has been designed and built to minimize single points of failure. There is an extensive network management system which provides access to every PTC radio site, and thus the ability for remote diagnostics and software upgrades. As a rule of thumb multiple disruptions would be weighted in terms of traffic affected. Thus an outage in the back office could have a global impact and would be weighted accordingly. A base station would, in general have a greater impact than a single wayside. The back office is supported continuously, as is the communications and signal system.

Any disruption to the communications system which disrupts PTC operation will be responded to in the same fashion as any impact to railroad operations. Response will take place upon notification, it will not be deferred for "convenience".

In the unlikely event of multiple simultaneous communication failures, the response will be situational using basic principles of triage to reinstate PTC operation for the maximum number of trains as expeditiously as possible. The collateral effects of a Metrolink outage on the neighbor railroads will be weighted very heavily in the prioritization.

Table S – List of Appendix S Documents

Doc. No.	Document Name	Description	Link
S		No separate document(s) are provided herein.	

Appendix T Test Equipment for PTC <Reserved>

Other than the common contingent of meters and hand tools required for making physical and electrical adjustments to electronic equipment, the only tools required for troubleshooting and maintenance of the PTC systems are software based. These tools are addressed in the various Manuals listed in Appendix L. Therefore, this Appendix is <reserved>. Copies of the manuals are available upon request.

Table T – List of Appendix T Documents

Doc. No.	Document Name	Description	Link
T		No separate document(s) are provided herein.	

Appendix U Initial Implementation Test Procedures <Reserved>

Test Waiver and RSD Applications for the Metrolink Subdivisions operating under RSD and ERSD are on file at the FRA. Copies of these documents are available on request if needed.

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Table U – List of Appendix U Documents

Doc. No.	Document Name	Description	Link
U		No separate document(s) are provided herein.	

Appendix V WIU Safety Case

Table V – List of Appendix V Documents

Doc. No.	Document Name	Description	Link
V.1	EC4 Product Safety Management & MTTHE; Document 083140-160; Revision A02; July 3, 2014	This document provides and overview of the process methodology GETSGS applied to arrive at the MTTHE noted in Section 8.	GE EC4 Safety Document
V.2	EL1A Product Safety Management & MTTHE; Document 083141-160; Revision A02; July 3, 2014	This document provides and overview of the process methodology GETSGS applied to arrive at the MTTHE noted in Section 8.	GE EL1A Safety Document
V.3	ElectroLogIXS Product Safety Management & MTTHE; Document 082806-908; Revision A02; July 3, 2014	This document provides and overview of the process methodology GETSGS applied to arrive at the MTTHE noted in Section 8.	ElectroLogIXS Product Safety Mana
V.4	ElectroLogIXS FRA 236 Exclusion Letter; May 12, 2006	This document is a letter issued by FRA addressing the exclusion requirements for the GE ElectroLogIXS product.	ElectroLogIXS FRA 236 Exclusio...

Appendix W Post-Implementation Safety Testing and Monitoring Plans and Processes

Table W – List of Appendix W Documents

Doc. No.	Document Name	Description	Link
W.1	I-ETMS On-board System Inspection, Test, and Maintenance Recommendations; Document ID: WCR-MAN-1056; January 18, 2013	This document specifies WRE's recommendations for inspection, test, and maintenance of I-ETMS On-board PTC systems.	Wabtec onboard System inspection tes
W.2	PTC System Anomaly Analysis Procedure; SCRRA-PTC-PROC-0100; 12/08/2015	This document is a description of the PTC anomaly procedure.	SCRRA-PTC-PTC System Anomal...

Appendix X PTC Data Captured in Event Recorder (I-ETMS Logging – Recording Data Dictionary)

Table X – List of Appendix X Documents

Doc. No.	Document Name	Description	Link
X	I-ETMS Logging/Recording Data Dictionary; Document No. WCR-SYR-1057; Revision 1.6; 5.9.2014	This document defines the information and format the I-ETMS application logs and records on-board the locomotive.	 I-ETMS Event Recorder PTC Data R

Appendix Y Licensing Information <Reserved>

Metrolink provides an index to the existing hardware and software licenses for PTC equipment it has procured in Section 4.4 of this PTCSP "Applicable Licensing Information". Metrolink does not utilize a separate appendix to incorporate this information. The appropriate contractual language to show Metrolink's compliance with §236.1023 (b)(1) is based on §236.1015(b)(3). Therefore this appendix is <reserved>.

Table Y – List of Appendix Y Documents

Doc. No.	Document Name	Description	Link
Y		No separate document(s) are provided herein.	

Appendix Z Safety Audits

Table Z – List of Appendix Z Documents

Doc. No.	Document Name	Description	Link
Z.1	Turner Engineering Corporation (Tenco) Software Development Process Audit; May 14, 2014	This document is and audit of the development process WRE utilized in developing I-ETMS.	Turner Safety Audit of WRE Summary Let
Z.2	CMMI Institute Appraisal Results of PARSONS PTC program; June 24, 2014	This document is an appraisal of the PARSONS PTC program.	CMMI audit of Parsons.pdf
Z.3	Parsons-Metrolink PTC System Subcontractor Audit Log;	This document is a log of the Audits performed by Parsons on its subcontractors.	Parsons-Metrolink PTC System_C...

Appendix AA Novel Technology Employed in Highway Crossing-Protection for PTC <Reserved>

Metrolink is not employing novel technology in highway crossing protection for PTC. Therefore, this appendix is <reserved>.

Table AA – List of Appendix AA Documents

Doc. No.	Document Name	Description	Link
AA		No document(s) are provided herein.	

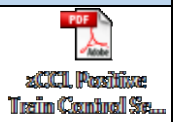
Appendix BB Warning and Warning Labels

Table BB – List of Appendix BB Documents

Doc. No.	Document Name	Description	Link
BB	Warnings and Warning Labels [§236.1015(d)(8)]	This document is a summary of railroad and vendor warnings and warning labels applicable to Metrolink's implementation of PTC.	Warnings and Warning Labels for M

Appendix CC Metrolink Security Management Plan

Table CC – List of Appendix CC Documents

Doc. No.	Document Name	Description	Link
CC.1	SCRRA PTC System Security Framework	This document provides a framework that describes the security measures deployed to protect PTC applications on the SCRRA rail network.	
CC.2	PTC Security Clearance Plan; Rev. 0.2; June 1, 2015	This document provides an overview of the security clearance requirements of the SCRRA train control, communications and PTC systems.	
CC.3	Metrolink PTC System Security Concepts (SSC); Revision 1.1; Nov, 2015	This document is the Metrolink SSC which provides a plan for preventing unauthorized users from accessing the PTC system..	

Appendix DD Protection of Wireless Communications

For completeness, the reader is also referred to Appendix CC, Document CC.1.

Table DD – List of Appendix DD Documents

Doc. No.	Document Name	Description	Link
DD	Individual and Composite CRC Calculator (IC3) Design Summary; Doc. No. WCR-DZN-1305, Revision 1.0; 2/19/2015	This document describes the I-ETMS design of a solution to mitigate hazards that could occur in the transmission of mandatory directives from Railroad systems through a BOS to a locomotive.	

Appendix EE Service Restoration Plan

In addition to the ability to reconfigure the Communication System to mitigate failures as explained in Appendix S of this PTCSP, Metrolink also can manage dispatch and BOS functions in response to any failure of CAD system or PTC BOS. To achieve this redundancy for failure support, SCRRA has implemented two (2) separate Operations and Control Centers (OCC) to house CAD systems and the PTC BOS.

Each Operations Center is fully redundant in its own right. A CAD or BOS failure within a center will immediately and seamlessly fail to a redundant server. Commercial power is backed up by a generator. It would require multiple failures or a facility incident (such as a fire) to generate a failure which moves staff to the back-up facility.

One OCC is located at the existing Metrolink Operations Center (MOC) in Pomona. A CAD system is also installed forming an Operation Control Center (OCC) at the new Dispatching and Operation Center (DOC) which is located near the MOC in Pomona. The DOC is also equipped with PTC Back Office Systems, Network Management System and other required PTC components and communications connections as necessary. This allows for scheduled or unscheduled fallback of dispatch operations from the DOC primary facility to the first tier backup MOC facility as needed for continuity of operations.

When a CAD or BOS failure requiring a move between the separate facilities occurs, Metrolink dispatchers move to the alternate location as quickly as possible. Full functionality of dispatching is quickly restored as the two facilities are both kept fully up to date, monitoring the onboard, wayside, and communications segment condition and status for the entire railroad.

Table EE – List of Appendix EE Documents

Doc. No.	Document Name	Description	Link
EE		No additional document(s) are provided herein.	

Appendix FF Parsons System Reliability

The Reliability Report furnished herein is a work-in-progress as the prescribed 120 day reliability period upon which much of the documentation is dependent has not been completed and results analyzed at the time of this PTCSP submission.

Table FF – List of Appendix FF Documents

Doc. No.	Document Name	Description	Link
FF	Reliability Report – July 2015; Rev 0; 10/2/2015	This document is the system reliability report documenting the system reliability study that was conducted.	

Appendix GG System Safety Integration Document

Table GG – List of Appendix GG Documents

Doc. No.	Document Name	Description	Link
GG	System Safety Integration Document (SSID); Revision F; 12/29/2014	This Wabtec document provides functional descriptions including content to demonstrate that safety has been designed into the functional behavior of the I-ETMS system under normal and failure conditions as prescribed by Appendix C of 49 CFR 236.	 System Safety Integration Document

Appendix HH System Safety Program Plan

This Appendix contains the System Safety Program Plan, representing the major I-ETMS supplier's (Wabtec) approach to the Safety Program. Since several vendors are supporting the installation of the Metrolink PTC system and Wabtec is not the system integrator, this SSPP focuses on the locomotive segment of the system. This approach is valid because the I-ETMS is a locomotive-centric PTC system.

Table HH – List of Appendix HH Documents

Doc. No.	Document Name	Description	Link
HH	I-ETMS System Safety Program Plan (SSPP); WCR-SAF-1357; Rev I; 10/28/2015	This document identifies and describes the process which provides uniform requirements and standards for developing and implementing a system safety program.	

Appendix II Interoperable Train Control Messaging Requirements

Messaging system requirements are identified in AAR-ITC Messaging (ITCM) specification S-9350, available from the Association of American Railroads.

Table II – List of Appendix II Documents

Doc. No.	Document Name	Description	Link
II		No document(s) are provided herein.	

Appendix JJ Track Database Verification and Validation Plan

Table JJ – List of Appendix JJ Documents

Doc. No.	Document Name	Description	Link
JJ	Metrolink Track Database Development, Verification and Validation Procedure; Version 0.3; May 23, 2012	This document describes the procedures for development and validation of track databases for the PTC system.	Track Database V&V Plan

Appendix KK Track Database Verification and Validation Reports

Track database V&V Reports for all Metrolink subdivisions have been submitted to FRA and are on file at the FRA. Reports are available on request if needed.

Table KK – List of Appendix KK Documents

Doc. No.	Document Name	Description	Link
KK.1	San Gabriel Subdivision Signal (WIU) V&V Track Verify Report	This document is an abbreviated copy of the Wabrax Track Verify Report for the San Gabriel Subdivision	
KK.2	San Gabriel Subdivision Signal (WIU) V&V Test Report	This document is an abbreviated copy of the Signal V&V Test Report for the San Gabriel Subdivision	
KK.3		No additional documents are provided herein. Detailed documentation for all subdivisions is available upon request.	

Appendix LL I-ETMS Configurable Items

Table LL – List of Appendix LL Documents

Doc. No.	Document Name	Description	Link
LL.1	I-ETMS Configurable Parameter Assessment; Rev 1.5; 9/24/2015	This document is a listing of configurable parameters for the On-board segment of the I-ETMS system with Safety Criticality assignments	
LL.2	I-ETMS Parameters Configuration Guide; SCRRA-PTC-GDE-0101 Rev 1.14; 8/20/2015	This document is a listing of all configurable parameters for the On-board segment of the I-ETMS system. The values assigned by ITC are shown.	
LL.3	Metrolink Specific I-ETMS Parameter Configuration Guide System; Rev 1.1; 12/16/2015	This document is a tabulation of configurable parameters that Metrolink has adopted for the On-board segment of the I-ETMS system	

Appendix MM PTC Product Vendor List

Segment	System	Vendor	Address	Phone	Website
Wayside	PTC 220MHz Wayside Radio	CalAmp	1401 N. Rice Avenue Oxnard, CA 93030	(805) 987-9000	www.calamp.com
Wayside	Wayside COTS Equipment	Tessco	375 W Padonia Road Timonium, MD 21093	(410) 229-1000	www.tessco.com
Wayside	Wayside Messaging Server	Lilee Systems	2905 Stender Way Santa Clara, CA 95054	(408) 988-8672	www.lileesystems.com
Wayside	Wayside Interface Units	General Electric Transportation Systems	2712 S. Dillingham Road Grain Valley, MO 94029	(800) 825-7090	www.getransportation.com/
On-Board	Wabtec On-Board PTC System	Wabtec	21200 Dorsey Mill Road Germantown, MD 20876	(301) 515-2000	www.wabtec.com
On-Board	PTC 220 MHz Locomotive Radio	CalAmp	1401 N. Rice Avenue Oxnard, CA 93030	(805) 987-9000	www.calamp.com
Office	Back Office System	Wabtec	21200 Dorsey Mill Road Germantown, MD 20876	(301) 515-2000	www.wabtec.com
Office	Computer Aided Dispatching System TDMS	Wabtec	21200 Dorsey Mill Road Germantown, MD 20876	(301) 515-2000	www.wabtec.com
Office	Interoperable Train Control Messaging	MeteorComm	1201 SW 7th Street Renton, WA 98057	(253) 872-2521	www.meteorcomm.com
Communications	PTC 220MHz Base Radio	CalAmp	1401 N. Rice Avenue Oxnard, CA 93030	(805) 987-9000	www.calamp.com

Segment	System	Vendor	Address	Phone	Website
Communications	Communications COTS Equipment	Tessco	375 W Padonia Road Timonium, MD 21093	(410) 229-1000	www.tessco.com

Table MM – List of Appendix MM Documents

Doc. No.	Document Name	Description	Link
MM		No additional document(s) are provided herein.	

Appendix NN Justification for Non-Vital Emergency Brake Control

Table NN – List of Appendix NN Documents

Doc. No.	Document Name	Description	Link
NN	Justification of Non-Vital Implementation of Emergency Brake; Doc. No. WCR-SAF-1236; Revision B;	This Wabtec document provides the justification for implementing non-vital emergency braking under the I-ETMS system.	

END OF DOCUMENT