PROJECT MANAGEMENT PLAN

September 2011

Columbia River CROSSING

Title VI

The Columbia River Crossing project team ensures full compliance with Title VI of the Civil Rights Act of 1964 by prohibiting discrimination against any person on the basis of race, color, national origin or sex in the provision of benefits and services resulting from its federally assisted programs and activities. For questions regarding WSDOT's Title VI Program, you may contact the Department's Title VI Coordinator at (360) 705-7098. For questions regarding ODOT's Title VI Program, you may contact the Department's Civil Rights Office at (503) 986-4350.

Americans with Disabilities Act (ADA) Information

If you would like copies of this document in an alternative format, please call the Columbia River Crossing (CRC) project office at (360) 737-2726 or (503) 256-2726. Persons who are deaf or hard of hearing may contact the CRC project through the Telecommunications Relay Service by dialing 7-1-1.

¿Habla usted español? La informacion en esta publicación se puede traducir para usted. Para solicitar los servicios de traducción favor de llamar al (503) 731-4128.

DOCUMENT REVISION RECORD

Columbia River Crossing – Project Management Plan

Revision Number	Date Issued	Approval	Comments
Rev. 01	June 2006		
Rev. 02	September 2008		
Rev. 03	May 2010		
Rev. 04	September 2011		

This page left blank intentionally.

APPROVAL PAGE

Columbia River Crossing - Project Management Plan

CRC Director Date

Deputy Director Date

This page left blank intentionally.

TABLE OF CONTENTS

1. **INTRODUCTION** **1-1**

1.1 Overview of the Project Management Plan 1-1

1.1.1 Purpose of the Project Management Plan 1-1

1.1.2 Maintenance and Updating of the PMP 1-3

1.2 Program Purpose and Description 1-3

1.2.1 Purpose and Need 1-3

1.2.2 Program Description 1-4

1.3 Program History 1-20

1.4 Program Goals and Objectives 1-24

1.4.1 Goals 1-24

1.4.2 Objectives 1-24

1.5 Governance 1-25

1.5.1 Legal Authority 1-25

1.5.2 Policy and Governing Agency 1-25

2. **ORGANIZATION AND KEY STAFFING** **2-1**

2.1 Overview 2-1

2.2 Agency Organization 2-1

2.2.1 WSDOT Organization 2-1

2.2.2 ODOT Organization 2-2

2.2.3 TriMet Organization 2-2

2.2.4 C-TRAN Organization 2-3

2.3 Agency Responsibility 2-3

2.3.1 WSDOT – Key Responsibilities 2-3

2.3.2 ODOT – Key Responsibilities 2-4

2.3.3 TriMet – Key Responsibilities 2-4

2.3.4 C-TRAN – Key Responsibilities 2-4

2.4 Management Approach 2-5

2.5 Interface with Partnering Federal Agencies 2-6

2.5.1 Federal Transit Agency (FTA) 2-6

2.5.2 Federal Highway Administration (FHWA) 2-7

2.6 Interface with Local Partners 2-8

2.6.1 City of Portland 2-8

2.6.2 City of Vancouver 2-9

2.6.3 RTC 2-9

2.6.4 Metro 2-9

2.7 Program Organization during Final Design and Construction 2-9

2.7.1 Responsibilities – Key Team Members 2-12

2.7.2 Use of Consultants 2-16

3. **MANAGEMENT CONTROL** **3-1**
3.1 Overview 3-1
3.2 Project Control 3-2
3.2.1 Work Breakdown Structure 3-2
3.2.2 Maintenance of WBS 3-3
3.3 Cost Control 3-3
3.3.1 Cost Control Procedure 3-3
3.3.2 Cost Tracking System 3-4
3.3.3 Budget Control Principles 3-6
3.3.4 Budget and Contingency Transfer Procedures 3-6
3.3.5 Budget Revision Procedures 3-6
3.3.6 Cost Allocation Plan 3-7
3.3.7 Invoices and Accounting 3-7
3.3.8 Performance Measurement and Cost Forecasting 3-8
3.4 Scope Control 3-8
3.5 Schedule Control 3-8
3.5.1 Scheduling Procedures 3-9
3.5.2 Baseline Master Program Schedule 3-10
3.5.3 Construction and Supplier Schedule Management and Revisions 3-12
3.6 Change Management 3-13
3.6.1 Administration of Change Management 3-14
3.6.2 Baseline Change Management 3-14
3.6.3 Change Management Procedures 3-15
3.7 Document Control and Records Management 3-17
3.7.1 Organization and Responsibilities 3-17
3.7.2 Controlled Documents 3-17
3.7.3 Records Management 3-18

4. **PROGRAM FUNDING** **4-1**
4.1 Capital Funding Sources 4-1
4.2 Investor Relations 4-1
4.2.1 Grant Administration – FTA 4-2
4.2.2 Grant Administration – FHWA 4-4
4.3 Financial Audits 4-4

5. **RISK MANAGEMENT AND INSURANCE** **5-1**
5.1 Overview 5-1
5.2 Risk Assessment Management 5-1
5.3 Insurance Claims Management 5-3
5.3.1 CRC Insurance 5-4
5.3.2 Pre-Construction Surveys 5-5

6. **REAL ESTATE ACQUISITION AND PROPERTY MANAGEMENT** **6-1**
6.1 Scope and Purpose 6-1

7. **COMMUNITY RELATIONS** **7-1**
7.1 Overview 7-1
7.2 Communications Activities – Outreach 7-1
7.2.1 Policy-related outreach to decision-makers 7-1
7.2.2 Outreach to the Region 7-1
7.2.3 Outreach in the Program Area 7-2
7.2.4 Advisory Groups 7-3
7.2.5 Outreach Materials 7-3
7.2.6 Media Relations 7-4

8. **PROGRAM DELIVERY AND PROCUREMENT** **8-1**
8.1 Overview 8-1
8.2 Program Delivery and Procurement Framework 8-2
8.2.1 Project Sequencing 8-2
8.2.2 Project Packaging 8-3
8.2.3 Delivery Methods 8-5
8.2.4 Procurement Strategy 8-5

9. **LABOR RELATIONS AND POLICY** **9-1**
9.1 Overview 9-1

10. **AGREEMENTS, PERMITS, AND ENVIRONMENTAL MITIGATION** **10-1**
10.1 Overview 10-1
10.2 Funding Agreements 10-2
10.3 Design Services Agreements 10-2
10.4 Federal and State Permits 10-3
10.4.1 Regulatory Agency Coordination 10-3
10.4.2 Obtaining Federal and State Permits 10-4
10.4.3 Federal Permits and Approvals 10-4
10.4.4 State Agency Permits 10-5
10.5 Other Permits and Agreements 10-6
10.6 Private Utility Interface 10-7
10.7 Environmental Mitigation 10-7
10.7.1 Tracking Environmental Commitments 10-8

11. **SAFETY AND SECURITY** **11-1**
11.1 Overview 11-1
11.2 Risk Control (Safety) 11-1
11.2.1 Office Safety 11-1
11.2.2 LRT Safety and Security Verification 11-7
11.2.3 Highway Operational Safety 11-7
11.2.4 Incident Reporting during Field Work 11-9
11.2.5 Construction Safety 11-9
11.2.6 Transit Operations and Maintenance Personnel Training 11-11
11.2.7 Transit Emergency Plans, Rules, and Procedures 11-11

12. **LRT DESIGN** **12-1**
12.1 Overview 12-1
12.2 LRT Design Requirements and Standards 12-1
12.3 LRT Design Management 12-3
12.4 LRT Design Execution 12-4
12.4.1 LRT Preliminary Engineering 12-4
12.4.2 LRT Final Design 12-5
12.4.3 LRT Drawing Management 12-6
12.5 LRT Design Control 12-6
12.5.1 Design Coordination 12-6
12.5.2 Design Review Process 12-8
12.5.3 Value Engineering 12-9
12.5.4 Constructability Reviews 12-10
12.5.5 Operations Reviews 12-12
12.6 System Integration 12-12
12.6.1 Preliminary and Final Design 12-12
12.6.2 Pre-Revenue Testing 12-13
12.6.3 Compatibility with Existing Systems 12-13
12.7 Reliability, Dependability, Safety 12-13
12.7.1 Quality Assurance Reviews 12-13
12.7.2 Safety and Security Reviews 12-14
12.7.3 ADA Reviews 12-14
12.7.4 Peer Reviews 12-14

13. **HIGHWAY DESIGN** **13-1**
13.1 Overview 13-1
13.2 Highway Design Requirements and Standards 13-1
13.3 Highway Design Management 13-3
13.4 Highway Design Execution 13-4
13.4.1 Highway Preliminary Engineering 13-4
13.4.2 Highway Final Design 13-6
13.4.3 Highway Drawing Management 13-9
13.4.4 Highway Design Documentation Management 13-9
13.5 Highway Design Control 13-10
13.5.1 Design Coordination 13-10
13.5.2 Design Review Process 13-11
13.5.3 Value Engineering 13-13
13.5.4 Constructability Reviews 13-14
13.5.5 Operations Reviews 13-15
13.6 Reliability and Dependability 13-16
13.6.1 Quality Assurance Reviews 13-16
13.6.2 ADA Reviews 13-16
13.6.3 Peer Reviews 13-16

14. **DESIGN OVERSIGHT FOR DESIGN-BUILD DELIVERY** **14-1**
14.1 Overview 14-1
14.2 Design Requirements and Standards 14-1
14.3 Design Oversight Execution 14-2
14.3.1 Design Oversight Philosophy 14-2
14.3.2 Design Management Oversight 14-3
14.3.3 Pre-Contract Meeting 14-3
14.3.4 Design Meetings and Over-The-Shoulder Reviews 14-4
14.3.5 Released For Construction (RFC) Document Review 14-4
14.3.6 Drawing Management 14-7
14.3.7 Design Documentation Management 14-7
14.3.8 Change Proposal 14-8
15. **QUALITY ASSURANCE AND QUALITY CONTROL** **15-1**
15.1 Overview 15-1
15.1.1 Management Commitment to Quality 15-1
15.1.2 Quality Assurance Program 15-2
15.1.3 Program Implementation 15-2
15.2 FTA Requirements (15 Elements) 15-2
15.2.1 Management Responsibility 15-3
15.2.2 Documented Quality Management System 15-3
15.2.3 Design Control 15-3
15.2.4 Document Control 15-4
15.2.5 Purchasing 15-4
15.2.6 Product Identification and Traceability 15-4
15.2.7 Process Control 15-4
15.2.8 Inspection and Testing 15-4
15.2.9 Inspection, Measuring, and Test Equipment 15-5
15.2.10 Inspection and Test Status 15-5
15.2.11 Nonconformance 15-5
15.2.12 Corrective Action 15-6
15.2.13 Quality Records 15-6
15.2.14 Quality Audits 15-7
15.2.15 Training 15-7
15.3 Quality Assurance and Quality Control Responsibilities 15-7
15.4 Design Quality Control 15-7
15.5 Construction Quality Control 15-8
15.6 Inspection and Test Plans 15-8
15.7 In-Process Inspections 15-8
15.8 Materials Testing Program 15-9
16. **CONSTRUCTION ADMINISTRATION** **16-1**
16.1 Overview 16-1

17. **PUBLIC ART PROGRAM** **17-1**
17.1 Overview 17-1
17.2 Organization 17-1
17.3 Budget and Funding 17-1
17.4 Art Development and Integration 17-1
17.5 Maintenance of Art Elements 17-2
18. **LRT SYSTEM TESTING AND START-UP** **18-1**
18.1 Overview 18-1
18.2 System Testing Procedures, Analysis, and Results 18-1
18.2.1 Objectives 18-1
18.2.2 Types of Tests 18-1
18.2.3 Test Management Approach 18-2
18.2.4 Establish Requirements 18-3
18.2.5 Perform Tests 18-4
18.2.6 Report Test Status, Document Results 18-6
18.3 Modifications or Retrofits 18-7
18.4 Start-Up Planning 18-7
18.4.1 Start-up Plan 18-8
18.4.2 Start-up Schedule 18-8
18.4.3 Start-Up Target Date 18-9
18.5 Operations Planning 18-9
18.5.1 Basic Operating Plan 18-9
18.5.2 Rail Transportation Plan 18-9
18.5.3 Rail Maintenance Plan 18-9
18.6 Operations Staffing 18-10
18.7 Operations Training 18-10
18.7.1 Contractor Provided Training and Manuals 18-11
18.7.2 TriMet Provided Training 18-13
18.7.3 Orientation for Employees 18-14
18.8 Spare Parts and Inventory Control 18-14
18.9 Pre-Revenue Operations 18-15
18.10 Crossing Order Approvals 18-15
18.11 System Opening and Revenue Service 18-16
18.12 Operations Description 18-16
18.12.1 Routing and Frequencies 18-16
18.12.2 Travel Time and Ridership 18-17

List of Figures

Figure 1-1. LRT Project Map 1-7
Figure 1-2. CRC Highway and Light Rail Transit Improvements 1-15
Figure 2-1. CRC Program Organizational Chart by Function 2-10
Figure 3-1. Master Program Schedule 3-100
Figure 8-1. Procurement Schedule – Under Development 8-11
Figure 11-1. Third Floor Evacuation Plan 11-3
Figure 11-2. Second Floor Evacuation Plan 11-5

List of Tables

Table 4-1 Anticipated Capital Funding Sources: Assumes LPA Phase 1 at 90% CEVP (as of July 2011) 4-1
Table 8-1 Sequencing of Transit and Highway Work Activities 8-3
Table 8-2 Large Project Packages – Under Development 8-4
Table 8-3 Long Lead Project Packages – Under Development 8-4

Appendices

APPENDIX A TECHNICAL CAPACITY AND CAPABILITY PLAN

APPENDIX B PROGRAM COST BREAKDOWN

APPENDIX C RISK AND CONTINGENCY MANAGEMENT PLAN

APPENDIX D PROJECT IMPLEMENTATION PLAN

APPENDIX E QUALITY ASSURANCE MANUAL

APPENDIX F REAL ESTATE ACQUISITION MANAGEMENT PLAN

APPENDIX G SAFETY AND SECURITY MANAGEMENT PLAN

APPENDIX H QUALITY CONTROL PLAN

APPENDIX I TRIMET RAIL FLEET MANAGEMENT PLAN

APPENDIX J TRIMET BUS FLEET MANAGEMENT PLAN

APPENDIX K C-TRAN BUS FLEET MANAGEMENT PLAN

APPENDIX L PROCEDURES MANUAL

This page left blank intentionally.

ACRONYMS

AA/EEO	Affirmative Action/Equal Employment Opportunity
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
AGO	Office of the Attorney General
BIA	Bridge Influence Area
BNSF	Burlington Northern Sante Fe
BRT	Bus Rapid Transit
CADD	Computer-Aided Design and Drafting
CD	Collector-Distributor
CEJG	Community and Environmental Justice Group
CEVP	Cost Estimate Validation Process
CFR	Code of Federal Regulation
CIL	Certifiable Items Lists
CM	Construction Manager
CO	Change Order
CPI	Cost Performance Index
CPM	Critical Path Method
CPMS	Capital Program Management System
CPTED	Crime Prevention Through Environmental Design
CRA	Cost Risk Assessment
CRC	Columbia River Crossing
CREM	Cost Risk and Estimate Management
CSS	Context Sensitive Solutions
C-TRAN	Clark County Public Transportation Benefit Area Authority
CVS	Certified Value Specialist
DAP	Design Approval/Acceptance Process

DBE	Disadvantaged Business Enterprises
DBELO	DBE Liaison Officer
DDP	Design Documentation Package
DEIS	Draft Environmental Impact Statement
DHS	Department of Homeland Security
DMV	Department of Motor Vehicles
DSDC	Design Services During Construction
EAC	Estimate at Completion
ECHO	Electronic Clearing House, Inc.
ECRB	External Civil Rights Branch
EIS	Environmental Impact Statement
ETC	Estimate to Complete
FAA	Federal Aviation Administration
FAI	First Article Inspections
FEIS	Final Environmental Impact Statement
FFGA	Full Funding Grant Agreement
FHWA	Federal Highway Administration
FLSSC	Fire/Life Safety and Security Committee
FTA	Federal Transit Administration
FWG	Freight Working Group
HCT	High Capacity Transit
HOV	High Occupancy Vehicle
HR	Human Resources
InterCEP	Interstate Collaborative Environmental Process
IRP	Independent Review Panel
IT	Information Technology
LPA	Locally Preferred Alternative

LRT	Light Rail Transit
LRV	Light Rail Vehicles
LUFO	Land Use Final Order
MA	Master Agreement
MAX	Metropolitan Area Express
MDSG	Marine Drive Stakeholders Group
MPO	Metropolitan Political Organization
MOT	Maintenance of Traffic
NEPA	National Environmental Policy Act
NHS	National Highway System
OCIP	Owner-Controlled Insurance Program
ODOT	Oregon Department of Transportation
OEO	Office of Equal Opportunity
OFM	Office of Financial Management
ORS	Oregon Revised Statutes
OTC	Oregon Transportation Commission
PBAC	Pedestrian and Bicycle Advisory Committee
PCM	Project Control Manager
PCO	Potential Change Order
PCRF	Project Change Request Form
PCRO	Project Control and Reporting Office
PDA	Project Development Approval
PDT	Project Development Team
PE	Preliminary Engineering
PG	Project Management Oversight Operating Guidance
PHA	Preliminary Hazard Analysis
PMOC	Project Management Oversight Contractor

PMP	Project Management Plan
PNRS	Projects of National and Regional Significance
PS&E	Plan, Specification, and Estimate
PSC	Project Sponsors Council
PTBA	Public Transportation Benefit Authority
PWG	Portland Working Group
QAPM	Quality Assurance Program Manual
QA/QC	Quality Assurance/Quality Control
RACC	Regional Arts and Cultural Council
RAMP	Real Estate Acquisition Management Plan
RCMP	Risk and Contingency Management Plan
RCW	Revised Code of Washington
RE	Resident Engineer
RMO	Risk Management Office
ROD	Record of Decision
ROS	Record of Survey
ROW	Right-of-way
RTC	Regional Transportation Council
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SAPD	Systems Analysis and Program Development
SASS	Sponsor Agency Senior Staff
SAVE	Society for American Value Engineering
SCC	Standard Cost Categories
SEPP	Security and Emergency Preparedness Plan
SPI	Schedule Performance Index
SPUI	Single-Point Urban Interchange
SR	State Route

SSMP	Safety and Security Management Plan
SSPP	System Safety Program Plan
STHB	Stacked Transit/Highway Bridge
TAC	Technical Advisory Committee
TCC	Total Committed Cost
TDD	Transportation Development Division
TEAM	Transportation Electronic Award Management
TES	Traction Electrification System
TriMet	Tri-County Metropolitan Transportation District of Oregon
TSA	Transportation Security Administration
UDAG	Urban Design Advisory Group
USC	United States Code
USDOT	United States Department of Transportation
VE	Value Engineering
VWG	Vancouver Working Group
WAC	Washington Administrative Code
WBS	Work Breakdown Structure
WSDOT	Washington State Department of Transportation
WSTC	Washington State Transportation Commission

This page left blank intentionally.

1. Introduction

1.1 Overview of the Project Management Plan

1.1.1 Purpose of the Project Management Plan

The purpose of the Columbia River Crossing (CRC) Project Management Plan (PMP) is to provide the framework, strategies, processes, and procedures necessary to successfully deliver the CRC Program from preliminary engineering through final design and construction. The PMP is a living document that will be modified throughout the duration of the CRC Program to reflect changes in the program requirements.

The PMP describes the organizational structure, array of roles and responsibilities, project management approach, and procedures to successfully deliver this multi-billion dollar, multimodal, bi-state transportation project. This PMP:

- Addresses the requirements of the Federal Transit Administration (FTA) 5309 New Starts Program.
- Establishes the framework for administering this complex Program in accordance with the requirements of Title 49 United States Code (USC) §5309(e)(1)(A), FTA's Final Rule on Major Capital Investment Projects of September 2001 and FTA Circular 5200.1A, "Full Funding Grant Agreements Guidance."
- Follows reporting instructions for the Section 5309 New Starts Criteria, prepared by the FTA pursuant to the Transportation Equity Act for the 21st Century (Public Law 105-178 as amended by Title IX of Public Law 105-206).
- Addresses Federal Highway Administration (FHWA) requirements for a PMP contained in section 1904(a) of Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), which amends 23 USC 106(h).
- Provides a guideline for the orderly interaction of the multiple agencies, organizations, and staff involved in, and committed to, the CRC Program.
- Establishes standards by which program performance will be measured.

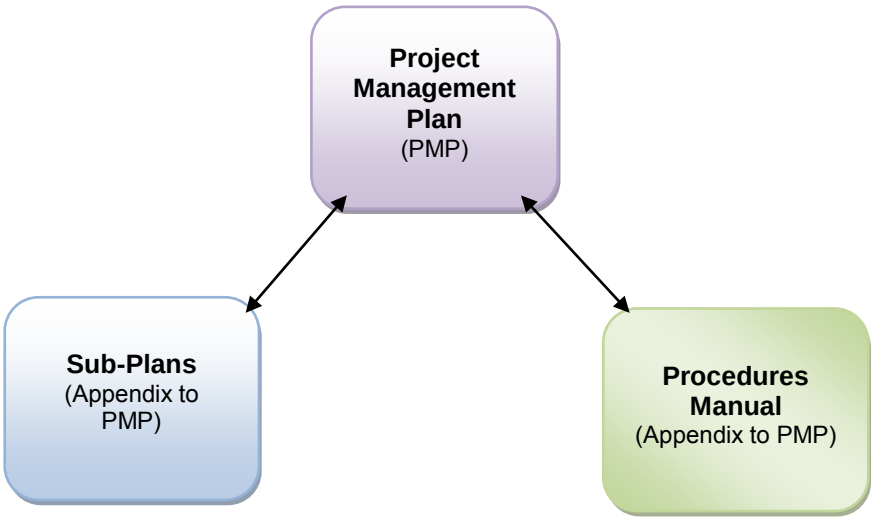
The PMP is composed of three main components as follows:

Program Management Plan (PMP) – This is the overall document that describes the Program's Purpose and Need, background, goals and objectives, roles and responsibilities of key personnel, communication, and reporting for the CRC Team. The PMP highlights to team members (WSDOT, ODOT, TriMet, and C-TRAN, assisted by consultant staff) the design and construction processes and procedures guiding their work on the CRC Program. The PMP includes several Sub-Plans and the Procedures Manual as Appendices A thru M. These Appendices exist as separately bound documents for ease of use and future updating.

Sub-Plans – These are tactical plans that were developed to execute services in key Program areas. Each plan describes the means by which these services will be accomplished in accordance with the strategies and tasks identified in the sub-plan and includes: staffing organization, roles and responsibilities of team members, tasks description, detailed work processes and detailed procedures necessary to deliver the work and associated task deliverables. Sub-Plans have been developed in the following key areas:

- Technical Capacity and Capability Plan
- Risk and Contingency Management Plan
- Project Implementation Plan
- Quality Assurance Manual
- Real Estate Acquisition Management Plan
- Safety and Security Management Plan
- Quality Control Plan
- Rail (TriMet) Fleet Management Plan
- Bus (TriMet and C-TRAN) Fleet Management Plans

Procedures Manual – This document describes the procedures necessary to perform the work in accordance with the tasks identified in the main PMP document. These procedures are consistent with the PMP and are frequently referenced by this document. Each of the sub-plans listed above include detailed procedures necessary to deliver the work described in the sub-plans. The Procedures Manual provides procedures that the CRC Team (WSDOT, ODOT, TriMet, and C-TRAN, assisted by consultant staff) will use to deliver the CRC Program.



1.1.2 Maintenance and Updating of the PMP

The PMP will be reviewed semi-annually for potential updating. CRC's Business Services is responsible for updating and maintaining the PMP. Business Services will work closely with the Management Team and functional managers on each update. Individual functional managers will be responsible for disseminating new PMP information to their staff, as necessary. Hard copy PMP notebooks will be maintained and their distribution controlled by Business Services to ensure that PMP updates are properly maintained.

1.2 Program Purpose and Description

1.2.1 Purpose and Need

As the only continuous north-south Interstate on the West Coast connecting the Canadian and Mexican borders, Interstate 5 (I-5) is vital to the local, regional, and national economies. At the Columbia River, I-5 provides a critical economic connection to two major ports, deep-water shipping, up-river barging, two transcontinental rail lines, and much of the region's industrial land. Truck-hauled freight movement onto, off of, and over the I-5 Columbia River crossing is critical for these industrial centers, for regional employment and to the regional and national economies. The I-5 Crossing provides the primary transportation link between Vancouver and Portland, and the only direct connection between the downtown areas of these cities.

The purpose of the CRC Program is to improve I-5 corridor mobility by addressing present and future travel demand needs in the CRC Bridge Influence Area (BIA). The BIA extends from approximately Columbia Boulevard in the south to State Route (SR) 500 in the north. The CRC Program is intended to achieve the following goals: a) improve travel safety and traffic operations on the I-5 crossing's bridges and associated interchanges; b) improve connectivity, reliability, travel times, and operations of public transportation modal alternatives in the BIA; c) improve highway freight mobility and address interstate travel and commerce needs in the BIA; and d) improve the I-5 river crossing's structural integrity (seismic stability). These goals address the following needs:

- ***Growing Travel Demand and Congestion –*** Existing travel demand exceeds capacity in the I-5 Columbia River crossing and associated interchanges. This corridor experiences heavy congestion and delay lasting 4 to 6 hours during both the morning and afternoon peak travel periods and when traffic accidents, vehicle breakdowns, or bridge lifts occur. Due to excess travel demand and congestion in the I-5 bridge corridor, many trips take the longer, alternative I-205 route across the river. Spillover traffic from I-5 onto parallel arterials such as Martin Luther King Boulevard and Interstate Avenue increases local congestion. The two river crossings currently carry over 260,000 trips across the Columbia River daily. Daily traffic demand over the I-5 crossing is projected to increase by more than 35 percent during the next 20 years, with stop-and-go conditions increasing to approximately 15 hours each day if no improvements are made.

- ***Impaired Freight Movement –*** I-5 is part of the National Truck Network, and is the most important freight freeway on the West Coast, linking international, national, and regional markets in Canada, Mexico, and the Pacific Rim with destinations throughout the western

United States. In the center of the project area, I-5 intersects with the Columbia River's deep water shipping and barging as well as two river-level, transcontinental rail lines. The I-5 crossing provides a direct and important highway connection to the Port of Vancouver and Port of Portland facilities located on the Columbia River, as well as the majority of the area's freight consolidation facilities and distribution terminals. Freight volumes moved by truck to and from the area are projected to more than double over the next 25 years. Vehicle hours of delay on truck routes in the Portland-Vancouver area are projected to increase by more than 90 percent over the next 20 years. Growing demand and congestion will result in increasing delay, costs, and uncertainty for all businesses that rely on this corridor for freight movement.

- ***Limited Public Transportation Operation, Connectivity, and Reliability –*** Due to limited public transportation options, a number of transportation markets are not well served. The key transit markets include trips between the Portland Central City and the City of Vancouver and Clark County, trips between North/Northeast Portland and the City of Vancouver and Clark County, and trips connecting the City of Vancouver and Clark County with the regional transit system in Oregon. Current congestion in the corridor adversely impacts public transportation service reliability and travel speed. Southbound bus travel times across the bridge are currently up to three times longer during parts of the a.m. peak period compared to off-peak periods. Travel times for public transit using general purpose lanes on I-5 in the Bridge Influence Area are expected to increase substantially by 2030.

- ***Safety and Vulnerability to Incidents –*** The I-5 river crossing and its approach sections experience crash rates more than 2 times higher than statewide averages for comparable facilities. Incident evaluations generally attribute these crashes to traffic congestion and weaving movements associated with closely spaced interchanges. Without breakdown lanes or shoulders, even minor traffic accidents or stalls cause severe delay or more serious accidents.

- ***Substandard Bicycle and Pedestrian Facilities –*** The bike/pedestrian lanes on the I-5 Columbia River bridges are about 3.5 to 4 feet wide—narrower than the 10-foot standard—and are located extremely close to traffic lanes, thus impacting safety for pedestrians and bicyclists. Direct pedestrian and bicycle connectivity is poor in the BIA.

- ***Seismic Vulnerability –*** The existing I-5 bridges are located in a seismically active zone. They do not meet current seismic standards and are vulnerable to failure in an earthquake.

1.2.2 Program Description

The CRC Program is a multimodal transit and highway improvement on and near a five-mile segment of I-5. The project area stretches from SR 500 in Vancouver, Washington, to approximately Columbia Boulevard in Portland, Oregon, including the Interstate Bridge across the Columbia River. A light rail transit alignment will also extend across from its current terminus at the Expo Center, Portland, Oregon, to Clark College in Vancouver, Washington. Detailed descriptions of the highway and transit components are found in the subsections below.

Light Rail Transit (LRT) Improvements Description

The Locally Preferred Alternative

The transit element of the Locally Preferred Alternative (LPA) [see Figure 1-1] is primarily an extension of light rail to Clark College in Vancouver from the Expo Center in North Portland, where the MAX Yellow Line currently terminates. To accommodate and complement this major addition to the region's transit system, a variety of additional improvements are also included in the project. These include park-and-ride facilities in Vancouver, expansion of the current TriMet light rail maintenance base in Gresham, changes to C-TRAN local bus routes, and upgrades to the existing Steel Bridge light rail crossing over the Willamette River in Portland.

Light Rail Alignment and Stations

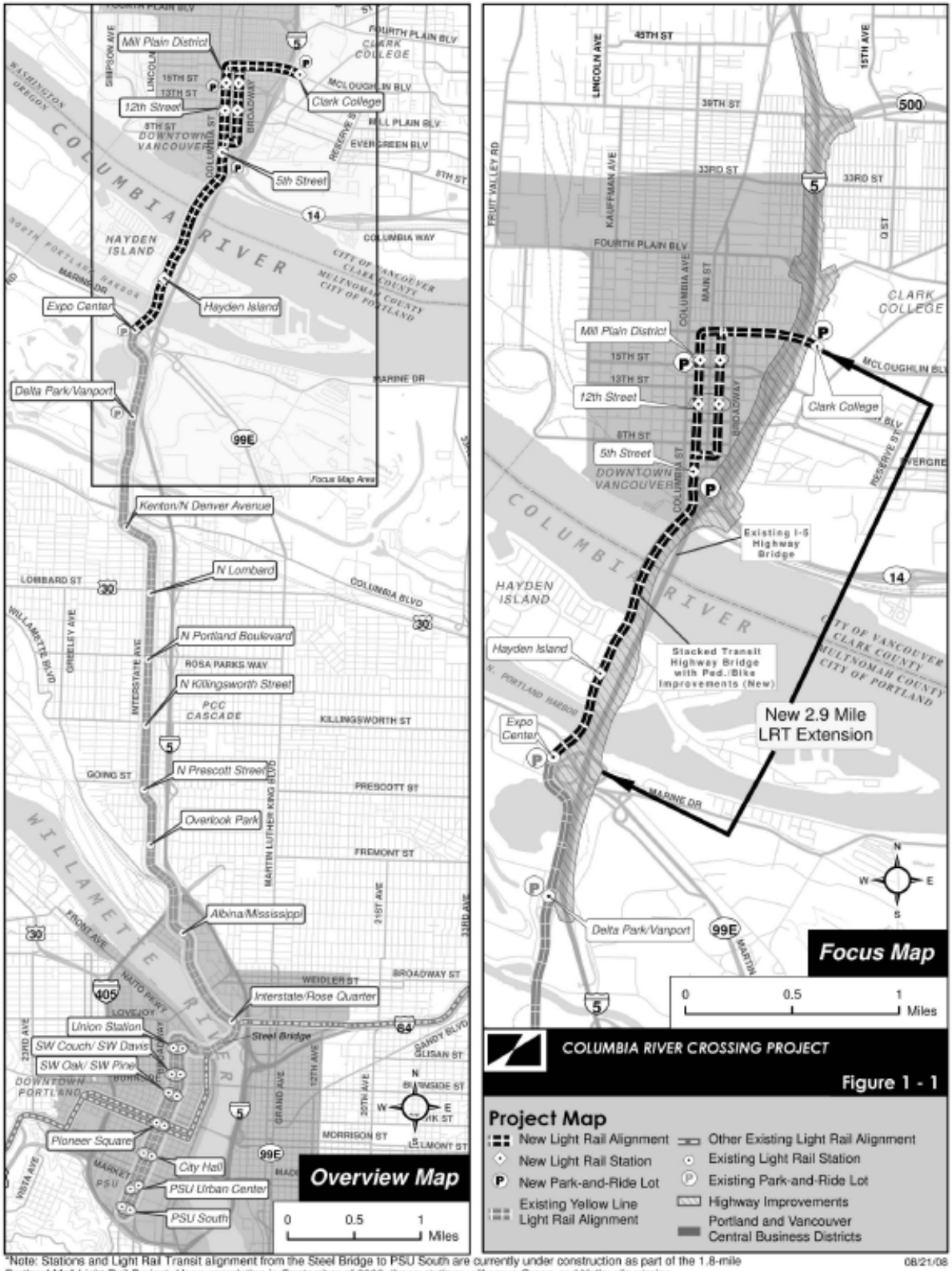
The project would include a 2.9-mile extension of the existing MAX Yellow Line from the Expo Center station across the North Portland Harbor, over Hayden Island, across the Columbia River, and through downtown Vancouver, ending near Clark College. With the LPA, light rail transit vehicles (LRVs) in the new guideway and in the existing Yellow Line alignment would be planned to operate with 7.5-minute headways during the "peak of the peak" (the 2-hour period within the 4-hour morning and afternoon/evening peak periods when demand for transit is the highest) and with 15-minute headways at all other times. This compares to 12-minute headways in "peak of the peak" and 15-minute headways at all other times for the existing Yellow Line (and No-Build Alternative).

Oregon Light Rail Alignment and Station

A double-track light rail guideway for north and southbound trains would be constructed to extend northward from the existing Expo Center MAX station. The alignment would curve eastward toward I-5 as it passes beneath a newly reconstructed Marine Drive. North of Marine Drive the profile would rise as the guideway transitions onto a bridge structure to cross North Portland Harbor. The two-way guideway over Hayden Island would be elevated at approximately the height of the rebuilt mainline of I-5. A station would be constructed on Hayden Island immediately west of the reconstructed I-5/Hayden Island interchange. The alignment would extend northward on Hayden Island, along the western edge of I-5, until it transitions into the new bridge over the Columbia River. It would be located on the lower deck of the western bridge, which would service southbound highway traffic on the top deck.

This page left blank intentionally.

Figure 1-1. LRT Project Map



*Note: Stations and Light Rail Transit alignment from the Steel Bridge to PSU South are currently under construction as part of the 1.8-mile Portland Mall Light Rail Project. Upon completion in September of 2009, these stations will serve Green and Yellow line trains.

08/21/08

Downtown Vancouver Light Rail Alignment and Stations

After crossing the Columbia River, the light rail alignment would curve slightly west, off of the highway bridge and onto its own smaller structure over the Burlington Northern Santa Fe (BNSF) rail line. The double-track guideway would descend on structure and touch down on Washington Street south of 5th Street, continuing north on Washington Street to 7th Street. The elevation of 5th Street would be raised to allow for an at-grade crossing of the tracks on Washington Street. Between 5th and 7th Streets, the two-way guideway would run down the center of the street. Traffic would not be allowed on Washington between 5th and 6th Streets and would be two-way between 6th and 7th Streets. There would be a station on each side of the street on Washington between 5th and 6th Streets.

At 7th Street, the light rail alignment would divide into a couplet. The single-track northbound guideway would turn east for two blocks, then turn north onto Broadway Street, while the single-track southbound guideway would continue on Washington Street. Seventh Street would be converted to one-way traffic eastbound between Washington and Broadway, with light rail operating on the north side of 7th Street. This couplet would extend north to 17th Street, where the two guideways would join and turn east.

The light rail guideway would run on the east side of Washington Street and the west side of Broadway Street, with one-way traffic southbound on Washington Street and one-way traffic northbound on Broadway Street. On station blocks, the station platform would be on the side of the street at the sidewalk. There would be two stations on the Washington-Broadway couplet, one pair of platforms near Evergreen Boulevard, and one pair near 15th Street.

East-West Light Rail Alignment and Terminus Station

Both north and southbound alignments of the couplet would become a two-way guideway traveling east-west on 17th Street. The double-track, center-running guideway on 17th Street would run until G Street, then curve north to McLoughlin Boulevard, and then continue east through the existing underpass beneath I-5. The underpass would be widened and the road bed lowered to accommodate the light rail trains and overhead catenary system. The guideway would end at a station and park-and-ride structure east of I-5, on the western boundary of Clark College and across from the Marshall Community Center, Luepke Senior Center, and Marshall Park.

Park-and-Rides

Three park-and-rides would be built in Vancouver along the light rail transit alignment.

- **Columbia Park-and-Ride –** A park-and-ride would be located within the block bounded by Washington and Columbia Streets and 4th and 5th Streets. This facility would have five floors above ground and would contain approximately 570 parking spaces. Active uses would be included on the ground floor.

- **Mill Park-and-Ride –** A smaller park-and-ride would be built in the block surrounded by Washington and Main Streets and 15th and 16th Streets. This facility would have four floors, with active use space (which could include retail) on the ground floor. The current design includes 420 parking spaces.

- **Central Park-and-Ride –** The largest park-and-ride would be built at the Clark College terminus. This facility would have five floors, and contain approximately 1,910 parking spaces.

Local Bus Route Changes

As part of the CRC project, several C-TRAN local bus routes would be changed in order to better complement the new light rail transit system and reduce redundancies. Most of these changes truncate bus lines in downtown Vancouver where riders could transfer to light rail transit.

Steel Bridge Improvements

In addition to extending the MAX Yellow line, the CRC project would include minor modifications to a critical element of the existing MAX light rail transit system located outside the main project area. These modifications would improve the existing light rail transit track and electrical system on the Steel Bridge, which is located approximately 4 miles south of the crossing of the Columbia River. These improvements would allow the Yellow Line trains, as well as all other MAX line trains that would use these tracks, to increase their travel speed over the Steel Bridge.

Light Rail Vehicles

Nineteen new LRVs would be purchased as part of the CRC project to operate this extension of the MAX Yellow Line. These vehicles would be similar to those currently used on the MAX light rail transit system. Trains would operate in a two-car configuration.

Maintenance Facility and Operations Control Center

The CRC Project would expand the existing Ruby Junction Maintenance Facility in Gresham, Oregon to accommodate the additional LRVs associated with the operations of the CRC Project. The proposed expansion of the Ruby Junction facility would also accommodate the additional LRVs associated with the separately proposed Portland-Milwaukie Light Rail Project.

Improvements would include additional storage for LRVs, maintenance equipment and materials, an expansion of LRV maintenance bays, and expanded parking for additional personnel. The Portland-Milwaukie Light Rail Project is considering phasing the maintenance facility expansion to first build only the capacity required for their initial operations, as described in the Portland-Milwaukie Final EIS (FTA 2010). Their initial phase would expand the facility to the west but defer the development of some track, internal roadway, parking facilities, and other structures. If the Portland-Milwaukie project implements phased construction, that would not change the total impacts at the site, but it would change the timing of some of the impacts. Phasing will be determined by the Portland-Milwaukie Light Rail Project and its timing relative to the CRC project construction.

A new operations command center would be located at the existing TriMet Center Street location. This would not require any new building construction or expansion of the existing Center Street facility.

Long-Term Service Operations and Maintenance

TriMet will operate the light rail service through an IGA with C-TRAN to be developed prior to service Start Up. Maintenance of facilities such as park-and-rides will be a part of the IGA.

Highway Improvements Description

The BIA stretches from SR 500 in Vancouver, Washington, to approximately Columbia Boulevard in Portland, Oregon, including the Interstate Bridge across the Columbia River. The project will improve the interstate and associated interchanges within the project area.

The Locally Preferred Alternative

The LPA for the highway portion of the CRC includes a replacement river crossing and improvements to five miles of I-5, including seven interchanges. The LPA includes two design options and a construction phasing option. The two design options, referred to as LPA Option A and LPA Option B are the result of substantial public input and additional analysis and design work around the Hayden Island and Marine Drive interchanges. The preferred option, which is described as LPA Option A, includes local vehicular access between Marine Drive and Hayden Island on an arterial bridge. LPA Option B does not have arterial lanes on the light rail bridge, but instead provides direct access between Marine Drive and the island with collector-distributor (CD) lanes on the two new bridges that would be built adjacent to I-5.

River Crossing Structures

The LPA includes construction of new bridges across the main channel of the Columbia River and new structures across North Portland Harbor, along with improvements to the existing I-5 bridges across North Portland Harbor. These improvements are described in detail below.

Columbia River Bridges

The parallel bridges that form the existing I-5 crossing over the Columbia River would be replaced by two new parallel bridges. The eastern structure would accommodate northbound highway traffic on the bridge deck, with a bicycle and pedestrian path underneath; the western structure would carry southbound traffic on the bridge deck, with a two-way light rail guideway below. Whereas the existing bridges have only three lanes each, with virtually no shoulders, each of the new bridges would be wide enough to accommodate three through lanes and two add/drop lanes. Lanes and shoulders would be built to full design standards (i.e., no reduced width lanes or shoulders will be constructed). See the discussion of Highway and Interchange Improvements for additional description of the add/drop lanes.

The southbound (western) bridge would accommodate a two-way guideway for LRVs beneath the highway deck. Similarly, the northbound (eastern) bridge would accommodate a bicycle and pedestrian path approximately 16 to 20 feet wide below the highway deck, located within the support structure under the highway deck. The width of the path will depend on the width of the support structure itself, which could vary slightly depending on bridge type. The proposed bridge type of the two new main river crossing bridges is a composite deck truss design in which the “walls” are constructed of diagonal steel members

This allows for a partially open-sided, covered passage for bicyclists and pedestrians beneath the eastern bridge deck and for light rail transit beneath the western bridge deck. This bridge type would allow for natural light and ventilation as well as views to the east from the bicycle and pedestrian path and views to the west from the light rail trains.

The height of the new bridges was established to give adequate clearance for river traffic below and for air traffic above. The top of deck of the new bridge would range in elevation from approximately 100 to 140 feet (NAVD88) over the Columbia River. The new bridges would be high enough to provide approximately 95 feet of vertical clearance for river traffic beneath, but not so high as to impede take-offs and landings by aircraft using Pearson Field and Portland International Airport (PDX) to the east. Unlike the existing bridge over the Columbia River, the new structures would not include lift spans.

Each of the new bridges over the Columbia River would be built on six pairs of in-water piers plus two pairs of piers on land. Each of these pier sets would be supported by a foundation of approximately sixteen 10-foot-diameter drilled shafts. Each group of shafts would be tied together with a concrete cap measuring approximately 75 feet by 75 feet at the water line. Slender columns would rise from the shaft caps and connect to the superstructure of the bridges.

The improvements to the Columbia River bridges would not differ between LPA Option A and Option B.

North Portland Harbor Bridges

The existing highway structures over North Portland Harbor would not be replaced; instead, they would be retained and would accommodate all mainline I-5 traffic. As discussed at the beginning of this chapter, the Hayden Island and Marine Drive interchanges have been further evaluated based on public involvement and input. From this process two design options have emerged. The preferred option, which is described in this chapter as LPA Option A, includes local vehicular access between Marine Drive and Hayden Island on a local multimodal bridge. LPA Option B does not have traffic lanes on the light rail bridge, but instead provides direct access between Marine Drive and the island with collector-distributor lanes on the two new bridges that would be built adjacent to I-5.

LPA Option A: Four new, narrower parallel structures would be built across the waterway, three on the west side and one on the east side of the existing North Portland Harbor bridge. Option A would not widen or seismically upgrade the existing North Portland Harbor bridge

Three of the new structures would carry on- and off-ramps to mainline I-5. Two structures west of the existing bridges would carry traffic merging onto or exiting off of I-5 southbound. The new structure on the east side of I-5 would serve as an on-ramp for traffic merging onto I-5 northbound and would carry the multi-use path underneath the bridge deck.

The fourth new structure would be built slightly farther west and would include a two-lane multimodal bridge for local traffic to and from Hayden Island, light rail transit, and would include bicycle lanes and sidewalks. The length of each new structure would be between 800 and 1,000 feet, depending on its location and the angle relative to the channel. Spans would vary by bridge, and the existing navigation channel would be preserved. All of the new structures would

have at least as much vertical clearance over the river as the existing North Portland Harbor bridges.

LPA Option B: This option would build the same number of structures over North Portland Harbor as Option A, although the locations of certain functions on those bridges would differ. The existing bridge over North Portland Harbor would be widened and would receive seismic upgrades.

LPA Option B would not have traffic lanes on the light rail/multi-use path bridge. Direct access between Marine Drive and the island would be provided with collector-distributor lanes. The two structures adjacent to the highway bridge would carry traffic merging onto or exiting off of mainline I-5 between the Marine Drive and Hayden Island interchanges. The new structure on the west side of I-5 would serve as a collector-distributor road for southbound traffic. Similarly, the new structure on the east side of I-5 would serve as a CD road for northbound traffic. The multi-use path would be located on the westernmost bridge structure that carries the light rail guideway.

Highway / Interchanges

The LPA includes improvements to seven interchanges along a 5-mile segment of I-5 between Victory Boulevard in Portland and SR 500 in Vancouver. These improvements include some reconfiguration of adjacent local streets to complement the new interchange designs, as well as new facilities for bicyclists and pedestrians.

Victory Boulevard INTERCHANGE

The southern extent of the CRC highway improvements is the Victory Boulevard interchange in Portland. Improvements at this interchange would be limited to two of the ramps. The Marine Drive to I-5 southbound on-ramp would be braided over the I-5 southbound to Victory Boulevard/Denver Avenue off-ramp. Braiding these two movements would eliminate the existing short (substandard) weave distance and improve traffic safety. Braiding the two movements would also eliminate direct access from the Marine Drive interchange to the Victory Boulevard interchange. Motorists would instead use local roads to travel from Marine Drive to Victory Boulevard. Local roads would also connect the Bridgeton Neighborhood to the Kenton Neighborhood. Currently, the existing Victory Boulevard/Denver Avenue on-ramp merges with I-5 mainline northbound traffic; the improvements would bring this ramp on as an add lane, acting as an auxiliary lane within the project limits to provide additional capacity and a safer roadway. The improvements to the Victory Boulevard interchange would not differ between LPA Option A and Option B.

Marine Drive Interchange

All movements within this interchange would be reconfigured to reduce congestion and improve safety for trucks and other motorists entering and exiting I-5. The proposed configuration is a single-point urban interchange (SPUI) with a flyover ramp serving the eastbound to northbound movement. With this configuration, three legs of the interchange would converge at one signalized point on Marine Drive over the I-5 mainline. Specific changes to traffic movements at this interchange include:

- The northbound flyover ramp would allow trucks and motorists to travel from Marine Drive eastbound to I-5 northbound without stopping.

- The Marine Drive eastbound to I-5 southbound ramp would also provide trucks and motorists with access to I-5 southbound without stopping. This ramp would touch down south of Victory Boulevard.

- Motorists traveling on Martin Luther King Jr. Boulevard westbound to I-5 northbound would access I-5 without stopping at the intersection. The new configuration would have less out of direction travel for this movement.

- Travel safety and mobility between the Marine Drive interchange and Hayden Island would be improved by eliminating the local movement between interchanges from the I-5 mainline and accommodating the connection with a local multimodal bridge. Additional safety and mobility improvements would occur by braiding the on- and off-ramps between Marine Drive and Hayden Island.

- The new interchange configuration changes the westbound Marine Drive and westbound Vancouver Way connections to Martin Luther King Jr. Boulevard and to northbound I-5. Rather than merging onto Martin Luther King Jr. Boulevard, which then loops on the west side and back to the east side of I-5 before entering northbound I-5, these two streets would instead access westbound Martin Luther King Jr. Boulevard farther east. Martin Luther King Jr. Boulevard would have a new direct connection to I-5 northbound.

- In the new configuration, the connections from Vancouver Way and Marine Drive would be served, improving the existing connection to Martin Luther King Jr. Boulevard east of the interchange. On the south side of Martin Luther King Jr. Boulevard, the existing loop connection would be replaced with a new connection farther east, connecting to Union Court at Hayden Meadows Drive. A new undercrossing of Martin Luther King Jr. Boulevard would replace the existing one at Marine Way.

LPA Option A: Local traffic between Martin Luther King Jr. Boulevard/Marine Drive and Hayden Island would travel via a local multimodal bridge over North Portland Harbor. There would be some variation in the alignment of local streets in the area of the interchange between Option A and Option B. The most prominent differences are the alignments of Vancouver Way and Union Court.

This page left blank intentionally.


Columbia River
CROSSING
0
200
400
600
SCALE IN FEET
LPA PHASE I
DISCLAIMER:
THIS DRAWING IS FOR INFORMATION PURPOSES AND MAY NOT HAVE BEEN PREPARED FOR LEGAL, ENGINEERING OR SURVEYING PURPOSES. USERS OF THIS INFORMATION SHOULD REVIEW OR CONSULT THE PRIMARY DATA AND INFORMATION SOURCE TO ASCERTAIN THE USABILITY OF THIS INFORMATION.
DRAFT
9 / 23/ 2011
LEGEND:
NEW RETAINING WALL
NEW NOISE WALL
NEW BICYCLE / PEDESTRIAN ROUTE
NEW BRIDGE
NEW TUNNEL
NEW CENTER BARRIER
NEW HCT STATION
NEW ROAD PAVEMENT, STRIPING & SIDEWALK
NEW VEGETATIVE FILTER STRIP
NEW STORMWATER DETENTION FACILITY
TRAFFIC DIRECTION & NUMBER OF LANES
EXISTING BRIDGE REMOVAL
EXISTING PAVEMENT REMOVAL

This page left blank intentionally.

LPA Option B: With this design option, there would be no arterial vehicle lanes on the light rail transit/multi-use path bridge over North Portland Harbor. Instead, vehicles traveling between Martin Luther King Jr. Boulevard/ Marine Drive and Hayden Island would travel on the collector-distributor bridges that would parallel each side of I-5 over North Portland Harbor. Traffic would not need to merge onto mainline I-5 to travel between the island and Martin Luther King Jr. Boulevard/Marine Drive.

Hayden Island Interchange

The Hayden Island interchange would be reconfigured to lengthen the ramps and improve merging speeds by building longer ramps parallel to the highway. The new configuration would be a split tight diamond interchange. Specific changes to traffic movements at this interchange would include:

- Improvements to Jantzen Drive would include additional through, left-turn, and right-turn lanes. Ramp connections are made to Hayden Island Drive and Center Avenue.
- Hayden Island Drive would be improved from a three-lane roadway to a three- to five-lane roadway, depending on the location. Right-turn lanes would be provided at the southbound ramp entrance and at Jantzen Drive, and double left-turn lanes would be provided at the southbound entrance.
- A new local road, Tomahawk Island Drive, located through the middle of the island, would provide an east-west link under the I-5 mainline for travelers to access both sides.

LPA Option A: A proposed arterial bridge with two lanes of traffic, one in each direction, would allow vehicles to travel between Martin Luther King Jr. Boulevard/ Marine Drive and Hayden Island without accessing I-5. There would be a slight variation in the alignment of local streets in the area of the interchange between Option A and Option B.

LPA Option B: With this design option there would be no arterial traffic lanes on the light rail bridge over North Portland Harbor. Instead, vehicles traveling between Martin Luther King Jr. Boulevard/Marine Drive and Hayden Island would travel on the collector-distributor bridges that parallel each side of I-5 over North Portland Harbor. Traffic would not need to merge onto mainline I-5 to travel between the island and Martin Luther King Jr. Boulevard/Marine Drive.

SR 14 Interchange

The basic functions of this interchange would remain largely the same as the existing interchange, but safety would be improved and congestion reduced, as described in the list below. Direct connections between I-5 and SR 14 would be rebuilt. Access to and from downtown would be provided as it is today, but the connection points would be relocated. Specific changes to traffic movements at this interchange include:

- Downtown Vancouver I-5 access to and from the south would be at C Street rather than Washington Street.

- Downtown connections to SR 14 would be via Columbia Street at 4th Street and Main Street. Connections from SR 14 would be made to Washington Street and Columbia Street at 4th Street.

- The southbound I-5 connection to SR 14 would be made with a structure under I-5 and SR 14.

- Both north and southbound movements between the Mill Plain interchange and the SR 14 interchange would be separate from the highway on CD roads, eliminating the substandard weave distances on the I-5 mainline

- Raising I-5 at this interchange would allow for an extension of Main Street beneath the BNSF railroad crossing, from 5th Street south to Columbia Way.

The improvements to the SR 14 interchange would not differ between LPA Option A and Option B.

Mill Plain Boulevard Interchange

This interchange would be reconfigured into a tight diamond, as illustrated in Exhibit 2.2-13. The existing "diamond" configuration requires two traffic signals to move vehicles through the interchange. The tight diamond has two closely spaced ramp terminals run by a single controller or two coordinated controllers improving the efficiency of the interchange. This will minimize queuing between the intersections and keeps traffic flowing through the interchange. All highway exits would be very similar to the existing interchange.

Specific changes to traffic movements at this interchange include:

- Northbound I-5 traffic exiting at Mill Plain would travel on a CD ramp to Mill Plain. The CD would also accommodate the movements from I-5 northbound to Fourth Plain Boulevard and SR 14 to I-5 northbound.

- Mill Plain traffic would enter southbound I-5 from a CD ramp that would also accommodate the movement from southbound I-5 to SR 14.

- Acceleration and deceleration distances would be lengthened.

- The improvements to the Mill Plain Boulevard interchange would not differ between LPA Option A and Option B.

Fourth Plain Boulevard Interchange

The improvements to this interchange would better accommodate freight mobility and access to the Clark Park-and-Ride. Northbound I-5 traffic exiting to Fourth Plain Road would continue to use the off-ramp just north of the SR 14 interchange. Specific changes to traffic movements at this interchange include:

- The southbound I-5 exit to Fourth Plain would be braided under the SR 500 connection to I-5, eliminating the substandard weave between the SR 500 connection and the off-ramp

to Fourth Plain. This braided off-ramp would be in a buried structure between approximately 35th Street and 37th Street.

- This braided exit ramp eliminates the direct connection between westbound SR 500 and Fourth Plain. Traffic currently using this connection would instead access the area by exiting SR 500 at St Johns Road or 15th/P Streets or by traveling south on I-5 and exiting at Mill Plain.
- A southbound road would be added to provide access to the Clark Park-and-Ride from Fourth Plain at the northbound ramp terminal.
- The intersection at the exit from I-5 south would provide double left turns for south to east movements. Double left turns would be provided at the intersection at the entrance to I-5 north for the movements going east to north and west to south into the park-and-ride access road. Two through lanes would be added for the northbound on-ramp to facilitate traffic coming from the park-and-ride.
- The improvements to the Fourth Plain Boulevard interchange would not differ between LPA Option A and Option B.

SR 500 Interchange

Improvements to the SR 500 interchange would add direct connections to and from I-5. Currently, the connections between SR 500 and I-5 to and from the north require exiting the highway, traveling on a local street (39th Street), and then re-entering the highway. As illustrated in Exhibit 2.2-15, on- and off-ramps would be built to directly connect SR 500 and I-5 for both of these connections. I-5 southbound traffic is proposed to connect to SR 500 via a new structure underneath I-5. SR 500 westbound traffic would connect to I-5 northbound on a new ramp. These improvements would eliminate the direct connections between 39th Street and I-5 to and from the north. These connections would instead be made through the I-5/Main Street interchange to the north.

The improvements to the SR 500 interchange would not differ between LPA Option A and Option B.

Maintenance and Operations

Washington State Department of Transportation (WSDOT), Oregon Department of Transportation (ODOT), the city of Vancouver, and the city of Portland have established roadway maintenance and operations programs that are responsible for maintaining elements of the roadway within their respective jurisdictions. The majority of the maintenance and operations resources are already provided for, as the roadway facility already exists and CRC is replacing and updating the facility. However, care and coordination are needed with the respective maintenance program managers to plan and program additional funding or reallocate resources that may be necessary to maintain and operate new features such as stormwater facilities, additional lane miles from widening, fewer personnel needed to operate the bridge, etc.

CRC will coordinate with jurisdictional maintenance managers during final design. Maintenance managers are anticipated to identify existing chronic problems on their facilities so that those

issues will not occur or will be corrected with the new design. Maintenance managers will also provide insight on the development of facilities to ensure access, safety, and the ability to maintain are accounted for in the design. Maintenance managers will be included so they can adequately plan for additional or reduced resources when forecasting budget and workforce. However, the individual agencies will be responsible for planning, requesting, and procuring funds to maintain improvements under their respective jurisdiction.

A detailed summary of maintenance and operations coordination during Final Design phase is discussed in Sections 12.5.5 and 13.5.5 of this PMP.

1.3 Program History

The following is a summary of the Program background:

- **1990-1998: Bi-State High Capacity Transit (HCT) Studies**

  Several HCT studies were performed in the 1990s related to the possibility of providing a form of HCT between Oregon and Washington. The following is a list of those studies:

  - Clark County HCT Analysis – 1990
  - South/North I-5/I-205 HCT Pre-Alternative Analysis – 1993
  - South/North I-5 LRT Draft Environmental Impact Statement (DEIS) – 1996
  - Commuter Rail and High Occupancy Vehicle (HOV) Studies – 1998

- **1999-2000: I-5 Trade Corridor Study**

  In 1999, a preliminary assessment for the I-5 corridor began to evaluate problems on the corridor and a range of solutions. The study ended with the following general conclusions:

  - Unacceptable economic impacts and congestion will result if no corrective action is taken.
  - Solution must be multimodal.
  - Improvements to the I-5 corridor will require new funds.
  - Region must promote transportation-efficient development.

- **2001-2002: I-5 Transportation and Trade Partnership**

  In 2001, the governors of Oregon and Washington formed a bi-state partnership to study transportation problems and possible solutions for the I-5 corridor. The Partnership recommended fixing three bottlenecks in its 2002 Strategic Plan:

  - I-5 at Salmon Creek in Clark County (completed in 2006)
  - I-5 at Delta Park in Portland (completed in 2009)

- I-5 at the Columbia River (this project)

- **Spring 2005: CRC project begins**
  - In late 2004, WSDOT, and ODOT initiated work to begin the CRC project.
  - CRC Project Team formed around a nucleus of WSDOT and ODOT staff to include project partners TriMet, C-TRAN, Regional Transportation Council (RTC), Metro, and the Cities of Vancouver and Portland.
  - The 39-member CRC Task Force was formed in early 2005 by the CRC project team to provide advice on key decisions. The CRC Task Force consists of leaders from a broad cross-section of Oregon and Washington communities, including public agencies, businesses, civic organizations, neighborhoods, freight, commuter, and environmental groups. Fall 2005: Defining the problems and potential solutions.
  - Using data developed by the I-5 Transportation and Trade Partnership, CRC worked with the public to define the problems and needs in the project area. More than 70 different ideas were proposed as solutions, including 23 river crossing and 14 transit concepts. Evaluation criteria were also developed.

- **Spring 2006: Narrowing the ideas**
  - Continuing discussions with the Task Force and community, the CRC project team studied the river crossing and transit ideas. As a result of this discussion and analysis, the ideas were further narrowed to a set of four river crossing options and five public transit options.

- **Spring-Summer 2006: Testing the preliminary alternatives**
  - CRC packaged the most promising bridge and transit options into a dozen preliminary alternatives. Each alternative included several transportation components: bridge, highway, transit, freight, bicycle, and pedestrian improvements, and strategies to reduce travel demand. These preliminary alternatives were tested against the evaluation criteria. The results highlighted the strengths and weaknesses of the components.

- **Fall 2006-Spring 2007: Identifying DEIS alternatives**
  - In collaboration with partner agencies, the CRC worked with the public to identify five project alternatives and recommended these for further analysis in the DEIS.

- **Spring-Fall 2007: Analyzing the five alternatives**
  - The CRC project analyzed each alternative to determine how well it relieves congestion and improves safety and mobility on I-5. The five alternatives were:
    - ✓ Replacement bridge with bus rapid transit (BRT)
    - ✓ Replacement bridge with light rail transit
    - ✓ Supplemental bridge with bus rapid transit

- ✓ Supplemental bridge with light rail transit
- ✓ No build (for comparison purposes)

- **Spring 2008: DEIS was released on May 2, 2008**
  - The DEIS was released on May 2, 2008, with a 60-day comment period. Over 1,600 comments were received during this period.
- **Summer 2008: LPA selected**
  - The partnering agencies: TriMet, C-TRAN, City of Vancouver, City of Portland, Metro, and RTC, selected an LPA in late July 2008 that consists of a replacement bridge with light rail transit ending at Clark College.
  - Metro Council amended the 2035 Regional Transportation Plan, Appendix 1.1, Financially Constrained System to include the CRC Program, on July 17, 2008 (Metro Resolution 08-3960B).
  - RTC adopted the Metropolitan Transportation Plan to include the LPA on July 22, 2008 (RTC Resolution 07-08-10).
- **Fall 2008: 2010: Refining Designs and Reviewing Work to Date**
  - The Governors of Oregon and Washington formed the Project Sponsors Council (PSC), to advise the departments of transportation on completion of the Environmental Impact Statement, project design, project timeline, sustainable construction methods, compliance with greenhouse gas emission reduction goals, and the financial plan. PSC began meeting in November 2008 and is composed of two citizen co-chairs and representatives from each sponsoring agency.
  - PSC considered several items related to bridge design in 2009. Discussions by the Urban Design Advisory Group, Pedestrian and Bicycle Advisory Group and regulatory and partner agencies resulted in a PSC recommendation for a two-bridge facility.
  - Two independent review panels were convened and delivered assessments on green house gases and travel demand estimates. Both panels found CRC's analyses to be valid.
  - PSC supported a concept in spring 2009 for a regional Mobility Council that would establish a local body to advise the state departments of transportation and transit districts on the optimal long-term performance of the Columbia River crossings. The primary purpose of the Mobility Council is to help maximize the long-term benefits of the project for all users and affected stakeholders in an equitable manner by recommending the implementation of the agreed upon goals.
  - In early 2010, the Vancouver City Council and C-TRAN Board of Directors adopted the light rail alignment for downtown Vancouver, with trains traveling north on Broadway Street, south on Washington Street and east and west on 17th Street to the terminus station near the Marshall/Luepke Center and Clark College.

- The Governors convened an Independent Review Panel (IRP) for the Columbia River Crossing Project to assess the implementation plan for the CRC project, review the financial plan for the project and review and evaluate post-construction performance measures. The panel reported its findings and 30 recommendations to the Governors July 30, 2010. All recommendations were accepted by the departments of transportation.

- In August 2010, the PSC unanimously agreed on a set of recommendations to the governors of Washington and Oregon for moving ahead with development and construction of the project. The recommendations include a permanent 10-lane I-5 bridge and changing the Hayden Island interchange design to address several community concerns. These recommendations were supported by Metro's updated land use model that found the CRC project would not induce sprawl in the region.

- In 2010, CRC convened a Bridge Panel Review to evaluate the bridge type under consideration for the project. In February 2011, the panel released a report that offered three feasible bridge type options for the crossing over the Columbia River than the bridge type under consideration at that time. The governors of Oregon and Washington responded to the panel's report by asking their Departments of Transportation to conduct an expedited review of the three bridge types and make a recommendation considering affordability, project schedule, environmental impacts, commitments made to stakeholders and risk. Based on these criteria, the states conducted further evaluations and made the draft recommendation of a deck truss bridge type for the crossing. After reviewing many different factors, including public comments, the governors found the deck truss bridge type to best meet multimodal transportation needs of the project while also being the most affordable and presenting the least risk to budget and schedule overruns. The governors identified in their recommendation the need to add an architect to the project team and establish architectural specifications for the design build contractor to follow and to engage the design community and public in the process.

- **2011: Land Use Final Order Adopted**

  - Metro Council adopted the Land Use Final Order (LUFO) on August 11, 2011 (Metro Resolution 11-4280)

- **2011: FEIS Signed and Published**

  - FEIS was published on September 23, 2011

  - Metro Council signed the FEIS on September 8, 2011

  - C-TRAN signed the FEIS on September 8, 2011

  - FHWA Washington Division signed the FEIS on September 7, 2011

  - FHWA Oregon Division signed the FEIS on September 7, 2011

  - FTA Region 10 signed the FEIS on September 7, 2011

  - ODOT signed the FEIS on September 7, 2011

- WSDOT signed the FEIS on September 6, 2011
- TriMet signed the FEIS on September 6, 2011
- RTC signed the FEIS on September 6, 2011

1.4 Program Goals and Objectives

1.4.1 Goals

To address the transportation problems on I-5, a mix of public transit and highway solutions that optimize the transportation system are needed. The goal of the CRC Program is to improve:

- Travel safety and traffic operations at the I-5 river crossing and nearby interchanges.
- Connectivity, reliability, travel times, and operations of the public transportation systems in the project area.
- Freight mobility and address interstate travel and commerce needs in the project area.
- Structural integrity of the I-5 river crossing.

1.4.2 Objectives

The objectives of the CRC Program are to:

- Develop a financially feasible design that enhances public safety and long term operations of I-5 while being sensitive to aesthetic, cultural, and environmental resources, and reflecting community values.
- Identify realistic and achievable approaches to contracting construction and Program financing.
- Complete the Program:
  - On time
  - Within budget
  - Without litigated claims
  - In a safe manner for both the individuals working on the Program and for the traveling public
  - In a manner in which the public trust, support, and confidence in the Program will be maintained

1.5 Governance

1.5.1 Legal Authority

Metro on July 17, 2008 passed Resolution no. 08- 3960b endorsing the LPA for the Columbia River Crossing Project and amending the Metro 2035 Regional Transportation Plan, Appendix 1.1, Financially Constrained System, to include the Locally Preferred Alternative.

The Southwest Washington Regional Transportation Council passed on July 22, 2010 Resolution 07-08-10 endorsing the LPA for the Columbia River Crossing Project and amending the RTC Metropolitan Transportation Plan to include the Locally Preferred Alternative.

WSDOT and ODOT are lead agencies for this multimodal project. WSDOT and ODOT entered into a partnership to jointly develop and manage the CRC Program, WSDOT, acting by and through the Secretary of Transportation, and ODOT acting by and through the Oregon Transportation Commission. WSDOT is the FTA Grantee for transit grants on the Program. TriMet and C-TRAN will operate and maintain the new LRT extension.

WSDOT is authorized by:

- The Revised Code of Washington (RCW) 47.52.020, Powers of Highway authorities — State facility, county road crossings.
- RCW 39.34.030, Joint powers – Agreements for joint or cooperative action, requisites, effect on responsibilities of component agencies – financing of joint projects.

ODOT is authorized by:

- The Oregon Revised Statutes (ORS) 190.410 to 190.440 – 190.420, Authority of public agency to make agreements with public agencies in other states; contents of agreement; liability of public agency.
- ORS 381.005 to 381.820, Interstate bridges under state jurisdiction.

TriMet is authorized by:

- ORS 267.010 though and including 267.430.
- Code of Tri-County Metropolitan Transportation District of Oregon.

C-TRAN is authorized by:

- RCW 36.57A, Public Transportation Benefit Areas (PTBA).

1.5.2 Policy and Governing Agency

WSDOT and ODOT operate as stewards for the National Highway System and their respective state routes. FHWA provides oversight to WSDOT and ODOT for projects associated with the National Highway System and/or projects that utilize funding provided by FHWA. FTA provides oversight to WSDOT, the FTA Grantee for transit grants on the CRC Program.

WSDOT is a cabinet agency under the Washington State Governor, and reports directly to the Governor, Washington State Legislature, and the Washington State OFM. The Washington State Transportation Commission (WSTC) makes policy recommendations to the Governor and the Legislature. The Transportation Commission is composed of seven commissioners appointed by the Governor. Policy is implemented by the Secretary of Transportation.

ODOT reports to the Oregon State Governor, the Oregon Transportation Commission (OTC), and the Oregon State Legislature. OTC is composed of five commissioners appointed by the Governor, and is responsible for establishing state transportation policy. Policy is implemented by the ODOT Director.

Overall policy direction for the CRC Program will be provided by an Executive Management Team comprised of Senior/executive level principals from WSDOT and ODOT. Overall management of the Program will be provided by a Director from WSDOT and a Deputy Director from ODOT. The organization and reporting lines of the CRC Team are described in Chapter 2 below.

2. Organization and Key Staffing

2.1 Overview

This section discusses Agency organization, Agency responsibilities, management approach, interface with lead federal agencies and local jurisdictional partners. It also discusses the CRC Program organization, responsibilities of key personnel and staffing during Final Design and Construction.

2.2 Agency Organization

The CRC Program is a bi-state multimodal Program. WSDOT is the grantee for the transit grants and the lead agency for the overall Program. ODOT is co-lead for the overall Program. TriMet and C-TRAN will operate and maintain the new LRT extension between the Expo Center in Portland and Clark College in Vancouver. A summary description of the WSDOT, ODOT, TriMet and C-TRAN organizations follow below.

2.2.1 WSDOT Organization

WSDOT is composed of 14 operating divisions to cover an array of the state's transportation needs. The following is a list of the WSDOT divisions:

- Strategic Planning & Finance
- Administration
- Audit Office
- Engineering and Regional Operations
- Highways and Local Programs
- Public Transportation
- Aviation
- Freight Systems
- Governmental Relations
- Communications
- Ombudsman
- Washington State Ferries
- Equal Opportunity Office

- Washington State Office of the Attorney General (AGO)

A description of the responsibilities of these divisions, potential role on the Program, and WSDOT and Southwest Region organizational charts are detailed in Section 3 of Appendix A, *Technical Capacity and Capability Plan*.

2.2.2 ODOT Organization

ODOT is composed of nine operating divisions to cover an array of the state's transportation needs. The following is a list of the ODOT divisions:

- Central Services
- Communications
- Department of Motor Vehicle (DMV) Services
- Highway
- Motor Carrier
- Public Transit
- Rail
- Transportation Development Division (TDD)
- Transportation Safety

A description of the responsibilities of these divisions, potential role on the Program, and ODOT and Region 1 organizational charts are detailed in Section 3 of Appendix A, *Technical Capacity and Capability Plan*.

2.2.3 TriMet Organization

TriMet is organized into six divisions, as shown below. An executive director manages each division and reports to the General Manager. The following is a list of the six divisions:

- Office of the General Manager
- Communications and Technology
- Finance and Administration
- Operations
- Capital Projects and Facilities
- General Counsel/Human Resources

A description of the Capital Projects and Facilities division responsible for the planning, design, and construction of LRT projects and organizational charts are is detailed in Section 3 of Appendix A, *Technical Capacity and Capability Plan*.

2.2.4 C-TRAN Organization

C-TRAN is organized into four divisions, as shown below. A director manages each division and reports to the Executive Director. The following is a list of the four divisions:

- Operations
- Maintenance and Technology
- Development and Public Affairs
- Administrative Services

A description of the Development and Public Affairs division responsible for LRT planning and design and organizational charts are detailed in Section 3 of Appendix A, *Technical Capacity and Capability Plan*.

2.3 Agency Responsibility

Key Agency responsibilities described below recognize: 1) WSDOT and ODOT are co-leads, 2) WSDOT is the grantee for transit grants, 3) TriMet and C-TRAN will operate and maintain the new LRT extension, and 4) TriMet brings extensive FTA New Starts planning and implementation experience.

2.3.1 WSDOT – Key Responsibilities

- Co-lead agency, providing overall management of preparation of the National Environmental Policy Act (NEPA) document and final design and construction of the Main Bridge Elements, Bridge Approach Elements (Highway) in Washington, and Transit Elements in Oregon and Washington.
- Providing overall management of the FTA grant and overall responsibility for design and construction of the transit elements.
- Together with ODOT, managing the CRC environmental compliance.
- Establishing highway toll rates with ODOT; sharing in toll revenues.
- Executing design and construction phase-contracts with A&E consultants to assist in design and construction management of the CRC Program.
- Executing construction contracts for the Main Bridge Elements, Bridge Approach Elements (Highway) and Transit Elements in Washington.

- Together with ODOT performing construction administration of the Main Bridge Elements, and Bridge Approach Elements (Highway) in Washington and in Oregon.
- Together with TriMet performing construction administration of the Transit Elements in Washington and in Oregon.

2.3.2 ODOT – Key Responsibilities

- Co-lead agency, providing day-to-day management of preparation of the NEPA document and management assistance in the design of the Bridge Approach Elements (highway) in Oregon.
- Together with WSDOT, managing the CRC environmental compliance.
- Establishing highway toll rates with WSDOT; sharing in toll revenues.
- Executing construction contracts for the Bridge Approach Elements (highway) in Oregon.
- Together with WSDOT performing construction administration of the Main Bridge Elements, and Bridge Approach Elements (Highway) in Washington and in Oregon.

2.3.3 TriMet – Key Responsibilities

- Sub-recipient under WSDOT (grantee). Advising WSDOT on grantee requirements for FTA New Starts Application and Full Funding Grant Agreement (FFGA) process.
- Together with C-TRAN, providing day-to-day management of design development of the transit elements.
- Together with C-TRAN, determining maintenance and operations requirements of the transit elements.
- Executing construction (and procurement of equipment/material) contracts for the transit work in Oregon. The CRC Program will provide administration oversight on all executed procurement contracts.
- Together with WSDOT performing construction administration of the Transit Elements in Washington and in Oregon.

2.3.4 C-TRAN – Key Responsibilities

- Together with TriMet, day-to-day management of design development of the transit elements.
- Together with TriMet, determining maintenance and operations requirements of the transit elements.

2.4 Management Approach

The overall success of the CRC Program will rely on WSDOT's and ODOT's highway design, contracting, and construction experience. It will also rely on utilizing TriMet's staff extensive experience in LRT planning, design and construction. Listed below are key management principles for the CRC Program:

- The CRC Program will be funded, managed, and constructed as a single, multimodal Program.
- All material decisions regarding the funding, design, construction, and operation of the CRC Program will require mutual agreement of the DOTs.
- WSDOT and ODOT staff supported by TriMet and C-TRAN staff will have total management involvement and retain control over all aspects and phases of the work. This includes self-performing the management functions of the Program, including, but not limited to, project controls, safety and security, procurement, financial management, real property acquisition management, design management, construction management, and operations of the LRT system.
- Overall policy direction for the CRC Program will be provided by an Executive Management Team comprised of Senior/executive level principals from WSDOT and ODOT.
- Overall management of the CRC Program will be provided by one Director from WSDOT and a Deputy Director from ODOT who will be jointly responsible for developing and implementing a multimodal program that achieves the CRC's goals and objectives.
- Day-to-day management responsibilities of program management and administration, design oversight, preparation of procurement documents, administration of procurement contracts for equipment and materials, and construction administration including mitigation monitoring will reside with functional managers from WSDOT, ODOT, TriMet, and C-TRAN under the direction of the CRC Director and Deputy Director.
- TriMet will advise WSDOT on grantee requirements for FTA New Starts Application and FFGA process.
- Consultants will act as an extension of WSDOT, ODOT, TriMet and C-TRAN staff. They will jointly locate with WSDOT, ODOT, TriMet, and C-TRAN staff in the project office.
- CRC's Project Controls is responsible for developing and maintaining all scheduling updates and cost estimating review risk management, A/E contract management and CRC budget. Business Services is responsible for document control management, change management, overall quality management, policy, procedures and project management plan management, office information technology management, public disclosure management, and office administrative support management.

- Document control procedures have been established and will be strictly observed by all WSDOT, ODOT, TriMet, C-TRAN and consultant staff working on the project.

The following describes the compositions and interrelationship of the several high management and advisory groups that the CRC Team relies upon support, approval and input:

- **Executive Management Team –** The Executive Management Team is an internal group composed of WSDOT and ODOT top management, including the ODOT Director and the WSDOT Secretary of Transportation. Its focus is providing overall policy and management guidance to the CRC Team on policy and strategy to accomplish Program's goals and objectives. The Executive Management Team defines the Program position on matters of importance. Appendix A, *Technical Capacity and Capability Plan,* describes the composition and responsibilities of the Executive Management Team.

- **Integrated Project Sponsors Staff –** Stakeholder agencies each appointed a staff delegate to meet on a regular basis as the Integrated Project Sponsors Staff (IPS) to discuss and resolve outstanding Program issues timely in a collaborative manner. They are charged with:

  - Coordination and communication of all policy and Program issues which may affect the agencies.

  - Make recommendations to stakeholder agencies on issues of regional significance.

  - Work with the CRC Team at resolving technical issues.

- **Advisory Groups –** They are external advisory groups established to provide input on corridor and local improvements as the project advances from preliminary planning to refining designs for the corridor, bridge and local elements and pre-construction planning. The groups are facilitated by consultant staff with ODOT, WSDOT, TriMet, and C-TRAN staff providing oversight and communication. Section 7.2.4 of this PMP discusses the anticipated work plan for advisory groups starting in late 2011.

2.5 Interface with Partnering Federal Agencies

The success of the CRC Program requires close partnering between the two state DOT's and the two co-lead federal oversight agencies, FHWA and the FTA. The individual responsibilities of the co-lead federal agencies are listed below.

2.5.1 Federal Transit Agency (FTA)

Responsibilities

- Oversight for Transit planning, preliminary and final design, and construction

- Together with FWHA, oversight and approval for CRC environmental compliance

Project Management Oversight Contractor (PMOC)

FTA utilizes transit industry consultants to assist in monitoring grantee compliance with all applicable FTA requirements. The PMOC reports directly to the FTA on project progress and issues and serves as an extension of FTA staff. Typically, the PMOC conducts monthly on-site reviews, with other subject-specific reviews (Spot Reports) taking place as needed. The PMOC is expected to focus its assessment on scope, schedule, cost, and Grantee technical capacity and capability, with an emphasis on risk identification and mitigation. The PMOC consultant also participates in quarterly review meetings jointly held with FTA and FHWA. The PMOC conducts its work in accordance with the FTA's Project Management Oversight Operating Procedures.

Quarterly Reviews

Each quarter, the FHWA and FTA, assisted by the PMOC, jointly conduct a program review. Appropriate senior members of the CRC Team, are responsible for organizing the meetings, preparing the agenda with input from FTA and PMOC, and preparing meeting materials. At the meetings, CRC Program staff presents a review of the progress of the preceding quarter and the activities planned for the upcoming quarter. Discussions from the quarterly review are recorded in minutes of the meeting prepared by PMOC and distributed to all parties. Consistent with FTA requirements, Project Controls prepares and submit quarterly electronic reports on Program activities, budget, and schedule in the Transportation Electronic Award Management (TEAM) system.

2.5.2 Federal Highway Administration (FHWA)

Responsibilities

- Oversight for the Highway planning, preliminary and final design, and construction
- Together with FTA, oversight and approval for CRC environmental compliance

FHWA Mega-Project

FHWA and the two DOT's have longstanding relationships that span the entire spectrum of project development and implementation from planning, to construction, and to maintaining roadway facilities. FHWA maintains an oversight role but has delegated the stewardship for development and maintenance of the interstate system to the respective DOTs. Typically, a regional FHWA Area Engineer provides oversight and approval for projects either scoped on the interstate system and/or state and local projects with an allocation of federal funding. Due to the size of the CRC Program, FHWA has assigned a Major Projects Manager dedicated full time to the CRC who is co-located in the CRC Program office to facilitate daily coordination, including attending regular staff meetings. Additional details regarding roles and responsibilities between FHWA and state DOTs is found in the FHWA Stewardship and Oversight Agreement (Feb. 19, 2008).

FHWA Reviews

As discussed in Section 2.4.1, each quarter, the FHWA and FTA jointly conduct a program review. As the Program advances into final design, FHWA will establish a formal schedule of reviews. FHWA will review and provide comments on all environmental documentation, MOA/Us, Agreements, and design criteria. A structured three-tiered design review is anticipated with FHWA approval at each tier. This design review process is as follows:

- Design Approval/Design Acceptance: (~30% design) for scope, schedule, budget, geometric design, known deviations/exceptions, and intersection and interchange plans.
- Project Development Approval: (~60% design) for scope, schedule, budget design documentation, advanced roadway design, and review of current design decisions.
- Final Plan, Specification, and Estimate (PS&E) Approval: for concurrence on final plans, provisions, and estimate.

Additionally, FHWA has requirements on best project management practices that the CRC Program will need to meet, including:

- Preparing and implementing a Project Management Plan
  - Required by SAFETEA-LU
  - Guidance is found at http://www.fhwa.dot.gov/programadmin/mega/
- Preparing and implementing a Financial Management Plan
  - Required by SAFETEA-LU
  - Guidance is found at http://www.fhwa.dot.gov/programadmin/mega/
- Conducting Value Engineering Studies

2.6 Interface with Local Partners

The CRC Program is a partnership between the two DOT's and the Portland-Vancouver local jurisdictions comprised of the cities of Portland and Vancouver, the transit agencies, TriMet and C-TRAN, and the two metropolitan planning organizations (Metro and RTC). Key responsibilities of TriMet and C-TRAN were described earlier under Section 2.3. Key responsibilities of the cities of Portland and Vancouver, Metro and RTC are as follows:

2.6.1 City of Portland

- Provide input and guidance related to local facility design in Portland.
- Concurrence and approval of design elements affecting their jurisdiction.
- Provide input and guidance for local coordination and community involvement in Portland.

- Provide input for transit planning in Portland.

2.6.2 City of Vancouver

- Provide input and guidance related to local facility design in Vancouver.
- Concurrence and approval of design elements affecting their jurisdiction.
- Provide input and guidance for local coordination and community involvement in Vancouver.
- Provide input for transit planning in Vancouver.

2.6.3 RTC

- Together with Metro, provide oversight and concurrence for traffic modeling and travel demand forecasts.

2.6.4 Metro

- Together with RTC, provide oversight and concurrence for traffic modeling and travel demand forecasts.

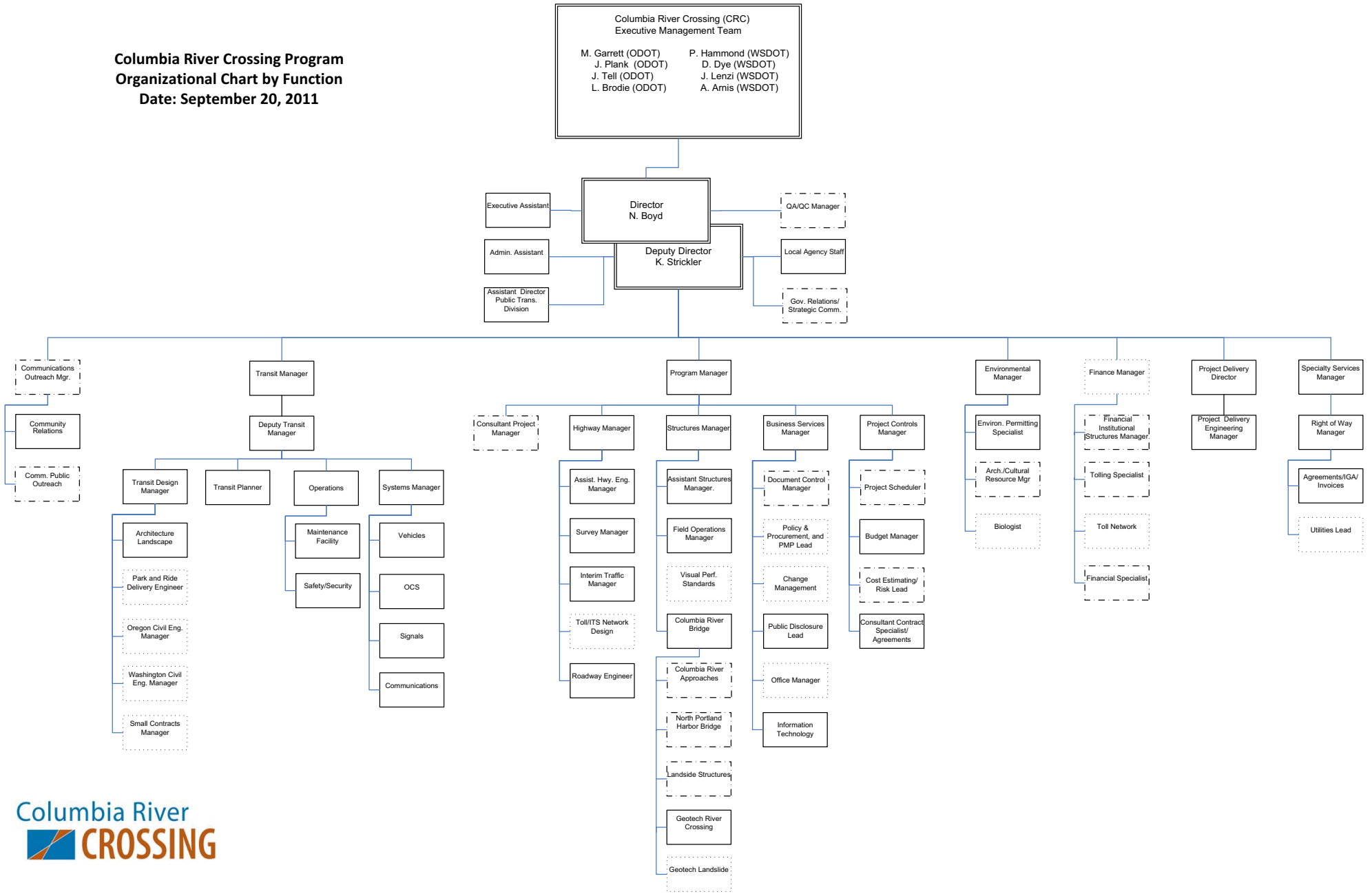
2.7 Program Organization during Final Design and Construction

The Program organization discussed below provides for one Director from WSDOT and one Deputy Director from ODOT who will be jointly responsible to both DOTs for the implementation of the Program to approved scope and budget. The CRC Director and the Deputy Director will report to the Executive Management Team (as described above in Section 2.4) and coordinate the Program with local jurisdictional partners. The Program organization provides for key managers who are responsible for all day-to-day engineering, administration, project controls, environmental, construction and community outreach.

The management of final design and construction of the Program will rely heavily on integrating WSDOT, ODOT, TriMet, C-TRAN and consultant staff to deliver multimodal highway and transit designs that meets FHWA and FTA requirements and the Program goals and objectives. WSDOT and ODOT will deliver the CRC Program with a combination of agency and consultant staff under the direction of the CRC Director and the Deputy Director. The number of agency and consultant staff engaged in the project will vary with the phase in progress, the specialties required for that phase, and the selected delivery method (i.e., traditional Design-Bid-Build, Design/Build, General Contractor / Construction Manager). A summary of the Program organizational chart by function is shown on Figure 2-1.

This page left blank intentionally.

Columbia River Crossing Program
Organizational Chart by Function
Date: September 20, 2011



Columbia River CROSSING

This page left blank intentionally.

2.7.1 Responsibilities – Key Team Members

As presented in Figure 2-1, the organizational structure of the Program includes an Executive Management Team, one Director (from WSDOT), one Deputy Director (from ODOT), and Integrated Project Sponsor Council Staff from Sponsor Agencies (TriMet, C-TRAN, City of Portland, City of Vancouver, Metro, and RTC) who advise the CRC Team on project issues which may affect the agencies.

The CRC Director and Deputy Director are supported by the following Management Team members: Program Manager, Transit Manager, Environmental Manager, Business Services Manager, Project Delivery Director, Specialty Services Manager, Finance Manager, and Communications Outreach Manager. The Management Team is supported by discipline managers that manage technical staff from WSDOT, ODOT, TriMet and C-TRAN assisted by consultant staff with expertise in developing and executing large, complex multimodal public projects. The discipline managers provide day-to-day project leadership to project staff and are responsible for project development.

Key responsibilities of the CRC Executive Management Team and the CRC Management Team members are summarized below.

Executive Management Team

- Providing policy and management guidance to the CRC Team.
- Defining the CRC Program position on matters of importance.

CRC Director

- Developing a program which attains the design and construction objectives of the DOTs.
- Keeping each DOT fully informed of all material design issues, and all material decisions are properly approved by both DOTs. Obligate WSDOT and ODOT resources.
- Ensuring the transit-related design and construction objectives are achieved, and C-TRAN and TriMet are kept fully informed of all material transit design and construction issues, and all material transit decisions are approved by both transit agencies.
- Achieving the CRC Program goals, objectives, and schedule milestones.
- Coordinating and communicate policy and technical issues to partnering local jurisdictions, and obtaining approvals where required.
- Providing effective communication to the Executive Management Team.
- Representing WSDOT and ODOT, respectively to outside agencies and interests including federal, state, and local governments. Serve as agency representative on the Project Sponsors Council.

- Developing the team organization presented on Figure 2-1; Project staffing; definition of project scopes; consultant selection; and contractor procurement.
- Making all approvals required of WSDOT throughout Final Design and Construction phases per the limit of execution authority.

Deputy Director

- In collaboration with the CRC Director, developing a program which attains the design and construction objectives of the DOTs.
- Keeping each DOT informed of all material design issues, and all material decisions are properly approved by both DOTs.
- Responsible for developing and implementing a government relations and strategic communications strategy to support achieving the Program goals, objectives, and schedule milestones.
- In collaboration with the CRC Director developing the team organization presented on Figure 2-1; project staffing; definition of project scopes; consultant selection; and contractor procurement.
- Making all approvals required of ODOT throughout Final Design and Construction phases.
- Providing effective communication to the Executive Management Team.
- Ensuring applicable ODOT procedures and protocols, by reference in this PMP, are followed.

Program Manager

- Providing leadership to the Structures and Highway Design teams, Project Controls, and Business Services including consultant staff.
- Monitoring work progress; ensuring change management procedures are implemented; and ensuring open communications among the team's functional managers. Prioritize agency resources.
- Assisting the CRC Director in: developing the team organization presented on Figure 2-1; project staffing; definition of project scopes; consultant selection; and contractor procurement.
- Achieving the CRC's goals, objectives, and schedule milestones.
- Overseeing the preparation and implementation to Risk and Contingency Management Plan, preparation and updates to Technical Capacity and Capability Plan, and reviews/updates to PMP and Procedures Manual.

Transit Manager

- Providing leadership and day-to-day coordination and management of the Transit Team completing the FEIS, the FTA New Starts/PE application, Final Design, and construction documents. Monitors work plans for all Transit Engineering activities to ensure performance to approved scope, schedule and budget.

- Assisting the CRC Director in: definition of transit project scopes and their implementation; project staffing; consultant selection; and contractor procurement.

- Overseeing the development and implementation of the CRC's Safety and Security Management Plan including the tracking of all hazards from identification through resolution.

- Overseeing the preparation of procurement documents for transit project packages to applicable design criteria, standards and policies for WSDOT, TriMet, C-TRAN, cities of Portland and Vancouver. Support the delivery schedule for letting construction contracts.

- Ensuring qualified LRT operations and maintenance personnel are trained and have the resources needed prior to taking maintenance and operational responsibility of the new CRC facilities and line.

- Serving as liaison with the two transit agencies.

- Coordinating and presenting transit design and cost estimates to project stakeholders, FHWA, FTA, and the public.

- Implementation of the QC Plan.

Specialty Services Manager

- Providing leadership and management to the Right-of-Way (ROW) team responsible for ROW appraisals and acquisition in both states, Monitors work plans to ensure performance to approved schedule.

- Providing leadership and day-to-day management of the Agreements/IGA and Utilities team activities to ensure performance to approved schedule.

- Overseeing the preparation and implementation of the Real Estate Acquisition Management Plan to Program schedule.

Finance Manager

- Providing leadership and guidance to the Financial and Institutional Structures Team developing the CRC Program's Finance Plan.

- Tolling coordination with WSDOT's Toll Division to integrate tolled facility cash flow forecasts including alternative toll rate structures into the Finance Plan.

- Monitoring work plans for all Finance Team activities to ensure performance to approved scope, schedule and budget.

Environmental Manager

- Overseeing the environmental Team, including development of the FEIS, ROD, and supporting technical documents.
- Overseeing the environmental staffing, budget, and workload planning. Managing Environmental activities to approved scope, schedule and budget.
- Overseeing preparation of environmental permit applications and negotiations with regulatory agencies.
- Maintaining the Mitigation Measures matrix and manages compliance with commitments in the NEPA documents and federal, state, and local environmental permits.

Communications Outreach Manager

- Directing external outreach efforts for the Program including community relations effort focused on residents, businesses, and neighborhoods along the alignment.
- Monitoring work plans for all Communications Outreach activities to ensure performance to approved scope, schedule and budget.
- Coordinating participation by special interest groups in final design activities and staffing advisory groups.

Project Delivery Director

- Overseeing the preparation of procurement documents for Design-Build project packages in compliance with applicable state and federal (FHWA/FTA) procurement laws and policies. Ensures performance to approved bid let schedule milestones.
- Providing leadership and directing the activities of the CRC Construction Administration Team overseeing the construction of the Transit and Highway components of the CRC Program.
- Overseeing the safety, quality, cost, schedule, scope, and day-to-day administration of construction contracts.
- Providing leadership to staff preparing and implementing the Project Implementation (procurement) Plan defining project packaging, delivery methods and procurement strategy to meet the Program performance goals.
- Monitoring compliance with AA/EEO and DBE contract requirements, construction claim action, and contract close out.
- Facilitating field communication between the design team and construction staff to enhance the attainment of facility and environmental project commitments.

- Assisting the CRC Director in: construction project staffing, consultant selection, and contractor procurement.
- During the design phase, participate in developing specifications and special provisions for project contracts; respond to questions during the bid ad period; conduct and participate in pre-bid meetings.
- Overseeing the preparation and implementation of the Project Implementation Plan and updates, as necessary.

A detailed organizational chart including roles and responsibilities of key Project staff can be found in Appendix A, *Technical Capacity and Capability Plan*.

2.7.2 Use of Consultants

WSDOT and ODOT will develop and construct the CRC Program with an integrated team composed of agency staff and consultants. Consultants are an extension of agency staff providing critical support and performing functions as follows:

- For specialized expertise.
- For short-term staff augmentation to assist staff during peak work periods.
- Events and conditions where the CRC Program may benefit from outside perspective and objectivity.
- Smaller consulting contracts for specialized services during various stages.
- Legal/claims support, environmental, consulting, materials testing, operations planning, real estate acquisition support, computer, support, partnering, safety and security, and public relations, among others.
- For long-term design services in support of major Program elements (e.g., transit elements), which can be more efficiently performed by outside services. This could include the following areas:
    - Civil Engineering – provide design services in the areas of civil and structural facilities, trackwork, utilities, architecture, and landscaping. These contracts also include design services during construction.
    - Right-of-Way – provide right-of-way services in the areas of title, acquisition, appraisal, appraisal review, relocation, and property management.
    - Systems Engineering – provide design services in the areas of operations facility revisions, electrification system, train signal system, train-to-central control communications system, LRVs, and fare collection system. These contracts also include systems design services during construction.
    - Program Management – provide assistance in risk assessment, scheduling, database development, and cost estimating during Final Design and Construction phases.

- Construction Management Consulting – provide staff augmentation, including resident engineering, office engineering, and inspection.

Preparation, negotiations and execution of Consultant agreements will follow applicable procedures outlined in the WSDOT Agreements Manual, M 22-99.01, November 2009. ..\Procedures - WSDOT\Agreements Manual.pdf or the ODOT Procurement Manual.

3. Management Control

3.1 Overview

The Management Team shall execute the CRC Program during the Final Design and Construction phases within clearly defined program parameters as well as manage individual project packages, discussed in Chapter 8 – Program Delivery and Procurement, to approved scope, schedule and budget baselines that will be established at completion of the Preliminary Engineering (PE) phase.

Program Management team members will monitor work progress against established scope, budget and schedule baselines, and all CRC Program managers will implement procedures that accurately document changes following completion of the PE Phase. Program Management will prepare and disseminate status reports frequently to the Management Team to allow timely and pro-active response to project issues with potential impacts to approved scope, budget and schedule.

Management and administration of the CRC Program will comply with all federal, state and local regulations. Management and administration procedures are based on those already in use at WSDOT and ODOT with new or revised procedures developed, as needed, specifically for the CRC Program. Procedures in place will ensure compatibility with the framework of the Project Management Plan (PMP) and effective management control.

Throughout all phases of the CRC Program, there is a need to have consistency in the manner in which various physical and technical aspects of the program are defined and recorded. During Final Design and Construction phases, this definition ensures the program's baseline (scope, budget and schedule), approved at completion of the PE phase, is followed and that completed program components will function as designed. The CRC Program has developed procedures for identifying, evaluating, accommodating and capturing changes that may occur during Final Design and Construction phases which have an impact to the approved baseline. Change management procedures for design and construction control discussed in Section 3.6 below specify responsibilities to initiate and approve changes, permit results to be achieved rapidly, provide for full evaluation of the impact of the changes, and specify the documentation of the changes.

The CRC Program's cost, schedule and scope objectives will be accomplished by instituting a framework for tracking the program's status as provided for with the Work Breakdown Structure (WBS). The CRC Program will use: a) the WBS to define and monitor project costs; b) procedures for ensuring traceability of scope, schedule and budget supported by the Change Management process described in this PMP; c) a drawing management system for design control; d) a document management system for control of records; and, e) a quality assurance/quality control program for audit of management control procedures.

3.2 Project Control

Project control refers to established processes employed to manage cost and schedule goals for the CRC Program. The development, implementation, and enforcement of project control activities are the responsibility of the Project Controls Manager under the direction of the Program Manager.

Project control provides accurate and timely project cost and schedule information for the Management Team, as well as regular analyses and review of projections and variances. Project control also develops and employs procedures to uniformly document changes made during the design and construction phases of the CRC Program. This information facilitates on-going review of individual contract performance as well as analyses of overall CRC Program trends. The goal is to assure that all scope, schedule and cost goals are met.

3.2.1 Work Breakdown Structure

The CRC Work Breakdown Structure (WBS) provides consistent treatment of similar project costs and schedule tasks. The WBS tracks all Program costs and each project package described in Chapter 8 - Program Delivery and Procurement while accommodating agreements, tasks, and subtasks, providing powerful reporting capabilities. The WBS is deliverable-oriented and can be reported in any combination of the following nine levels.

The WBS is composed of eight levels. Each level is hierarchical and are dependent on one another. These levels are defined below:

- Level I (Program) – The program is the entire CRC Program and is a summary of all lower level WBS components. There is only one program level that captures the entire CRC Program.
- Level II (Project) – The Project level includes work elements that are naturally grouped together and will likely be managed by similar or complimentary teams. These program elements include: Transit, Highway Or., Highway Wa., and Main River Crossing. All elements combine to form the entire program
- Level III (Phase) – The Phase level breaks the work elements further into specific phase for each Project level activity, including individual project packages that would be sequenced (for procurement purposes) to meet projected cash flow and will likely have a designated project manager, budget and contract.
- Level IV (Sub-Project) – This level includes identification of individual agreements and contracts. It can be reported on in any combination such as across the entire program, a major element or a project.
- Level V (Task Order/Sub Phase) – Breakdown of all major areas of work associated with all projects by Task Order/Sub Phase so that every project can be viewed similarly.
- Level VI (Task) – Task defines the specific work element under each Task Order. Each activity is defined from the scope/deliverables defined in each Task Order.

- Level VII (Sub-Task) – This is a more detailed breakdown of each task capturing.
- Level VIII (Activity/Deliverable) – This is to differentiate between direct expenditures to the program such as travel and labor costs. The Activity/deliverable is the specific work item for the Sub-Task. Costs and schedule are assigned to each Sub-Task as defined in the original scope for the Task Order.
- SCC Codes or subtasks are activities that further delineate the major categories of work. In many cases, there are multiple SCC categories in relationship to one Category. Examples would include a roll up of all Construction would necessitate multiple SCC categories. SCC Codes are mandated by FTA. For purposes of the current phase of work, all activities of the project fall within one SCC code 0.80 Professional Services.

All expenditures, budgets, and commitments will be entered based on all of the above described WBS structure. All contracts, including construction, will track all potential change orders (PCOs) or project risks or pressures to the Program.

3.2.2 Maintenance of WBS

The WBS represents the organization of the CRC Program and any changes to WBS require the approval of the Program Manager. This would likely require system and process changes so the implementation of any change should ultimately be used to best reflect the direction and structure of the Program as it evolves. Implementation of any WBS approved changes will be performed by Project Controls staff under the direction of the Project Controls Manager.

3.3 Cost Control

Chapter 8 – Program Delivery and Procurement discusses the project delivery strategy that would divide the CRC Program, following completion of the PE phase, into separate and distinct project packages. Baseline budgets would then be established for each project package based on engineers' cost estimate and the schedulers' forecast durations to account for the effects of inflation and potential interim finance cost. Subsequently, all changes in scope and schedule with potential impact to budget baselines will follow the Change Management procedures discussed in this PMP.

The Business Services Manager ensures baseline documentation is available for the approved program and project package scope; matching it to baseline budgets that coordinate with the program and project WBS, including any budget transfers between project packages; and, track and report on the status of the budget and costs.

3.3.1 Cost Control Procedure

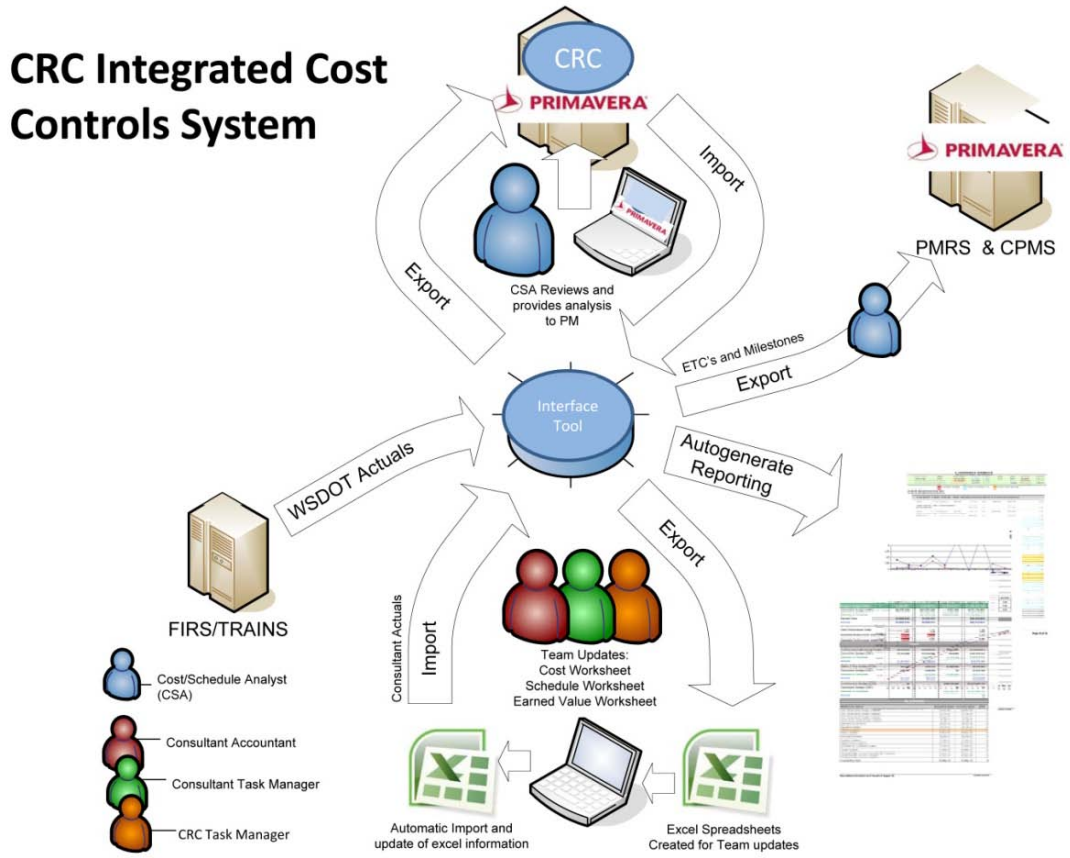
The objective is to conduct program delivery activities throughout Final Design and Construction phases to approved scope, budget and schedule established at completion of the PE phase. Construction cost estimates will be closely tracked and adjusted based on actual design progress that recognizes increased definition of design elements and associated risks. The tracking of project packages against established aggregate level budgets allows early identification of design

elements with cost variances and to mitigate issues before they cause significant risks, and keep the CRC Program within the overall budget.

The same cost-tracking system organized by WBS numbers will be used during the construction of a project package or the procurement of equipment and material. The cost tracking system will be updated after construction bids are received, and actual bid items and costs tracked so that cost variances can be identified and corrective action taken to keep the overall Program within budget. Cost tracking will include monitoring of progress payments to contractors; tracking executed construction change orders (CO's); and monitoring potential cost pressures that could result in CO's. The cost tracking system will track the cumulative effect of construction changes at the project package and Program levels.

3.3.2 Cost Tracking System

The CRC Team is working to upgrade the program's cost tracking system before entering into Final Design. The objective is to implement an interface software tool (yet to be determined) that would operate on CRC's local area network and integrate the suite of software tools currently under deployment at CRC (e.g., Primavera and other cost tracking tools) with itemized costs imported directly from WSDOT Firs and Trains financial systems, as depicted graphically below. The integrated cost tracking system would provide timely information at a sufficient level of detail to accurately assess budget category and contract status, forecast budget impacts, and measure overall financial performance using the new interface software tool to help produce earned value, actual, program budget, and estimate at complete graphs. It will also provide a means for tracking contract change orders, estimates to complete, remaining contingency, progress payments, and budget variances.



Project Controls staff is responsible for all data entry of budget-related information, ensuring that appropriate accounting and project control procedures are followed. CRC Program managers will be able to view up-to-date cost information for each contract package or budget category from their workstations.

Basic Elements of the Cost Tracking System

The cost tracking system will track program costs by: WBS element (contract-focused), Standard Cost Categories (SCC), as well as by contract and funding source. This flexibility allows CRC Team discipline managers / Project Engineers (Resident Engineers) to track details at the project package/contract level while the Management Team focuses on the overall CRC Program.

The upgraded cost tracking system would provide CRC functional managers the ability to regularly track different levels of budget, including:

- Budget information will be tracked by WBS/SCC in a manner that complies with cost category requirements as defined by FTA and FHWA. Information stored against each WBS and SCC will include the baseline engineering estimate developed at completion of the PE Phase and changes of scope or budget transfers as they occur.

- A second level of budget information will be entered against individual project packages as procurement contracts are developed and committed. Pay items making up a contract are each assigned to a specific WBS/ SCC element and allocated a portion of that WBS/ SCC budget. A summary of the Program's cost breakdown in WBS/ SCC code is included in Appendix B, *Program Cost Breakdown*.

- "Committed" cost is the time phased budget authorized for use, either by an approved task order or executed construction contracts, including equipment and materials procurement contracts. Each commitment may be further broken down into pay items that are linked to WBS/ SCC and funding codes.

- "Estimate at Complete" (EAC) are the actual plus all the task managers' estimates to complete the remaining items.

- "Estimate to Complete" (ETC) are the forecast of the cost remaining before the work is complete. The ETC value reflects the amount of Purchase Orders, contracts, etc. not yet placed.

- "Earned Value" measures project performance. It reports on how much of the budget should have been spent relative to the amount of work complete, comparing progress to the baseline cost for a task or resource.

- "Actual" costs are the cost accrued in the periods described.

- "Forecasted Program Risks" are estimates of pressures or potential budget and schedule impacts that have been identified that are not included in the budget and their anticipated outcome is still uncertain.

- "Funding Sources" are the names of funding partner and the percentage or dollar amount of participation. Funding and WBS/SCC codes are assigned for each commitment record. The codes will be linked to a table identifying funding partners and the percentage or amount which each contributes, and the rate of funding drawn down per each source

The cost tracking system will provide the ability to enter, view, access, and distribute information in a manner that is conducive to the uniform understanding of the scope by stakeholders at differing levels, while also providing the ability to provide accountability on outstanding and underperforming elements of work through the current reporting period. From this information, the cost (and schedule) performance can be measured at the Program and project package level.

3.3.3 Budget Control Principles

At the completion of the PE phase, budgets for each contract package described in Chapter 8 – Project Delivery and Procurement (and in future updates) will be established. Subsequently, all budget changes between contract packages- or between contract packages and contingency- will be supported by written documentation approved by Program Management and follow the change control procedures discussed in this PMP.

3.3.4 Budget and Contingency Transfer Procedures

The CRC Director (or designees) shall approve all budget transfers between contingency and individual project packages approved for procurement as described in Chapter 8 - Program Delivery And Procurement of this PMP, and in future updates.

Budget transfers between line items within individual project packages may be requested by the CRC Program discipline managers and made with the approval of the CRC Director (or designees).

Procedures for developing the contingency reserve and for transferring funds from the reserve are described in Appendix C, *Risk and Contingency Management Plan*.

3.3.5 Budget Revision Procedures

The CRC team will prepare budget revision procedures before entering into Final Design that recognize the following:

- Project Management prepares budget revision documentation and present proposed budget revisions to the CRC Director and Deputy Director for review and approval.

- Change Management procedures described in this PMP clearly specifies responsibilities to initiate and approve changes by individual project package and cumulative change effect at the Program level.

- Budget revision approval requirements may differ depending on the source of funding and the level of required approval. For example, on contract packages procured through

WSDOT, change orders that cannot be accommodated within established construction contract authority would require approval by:

- Director of Project Control and Reporting Office (PCRO), if programmatically-budgeted project package; or
- Office of Financial Management (OFM), when legislature is not in session, or Legislature (through budget action), if Line-item budgeted project package.

3.3.6 Cost Allocation Plan

Project Controls will prepare an indirect cost plan to distribute central service (finance and human resource), project management, and administration costs of grantee support. The plan facilitates the consistent and fair distribution of the CRC's share of common costs to the program's account(s). Project Controls is responsible for annual updates. Any plan changes that exceed the amounts and rate approved for the previous year(s) by more than 20 percent or a change in the Grantee's accounting system, thereby affecting the previously approved CAP/Indirect Cost Rate Proposal and its basis of application will also require resubmitting an updated plan for FTA approval. Costs commonly included in a cost allocation plan include:

- **Indirect Materials and Services** – Costs incurred by CRC that are determined to be allowable under the guidelines of 2 CFR Part 225, allocated per FTA Circular 5010.1D will be considered joint costs.
- **Direct Personnel** – Personnel costs reflect the positions identified in the organizational chart and position descriptions in this PMP (and associated sub plan, Appendix A, *Technical Capacity and Capability Plan*), and direct time charges by WSDOT, ODOT, TriMet and C-TRAN staff working on the Program. Costs include base salary and fringe benefits. These costs are usually recorded via employee timesheets or other time record.
- **Direct Materials and Services** – Costs that are determined to be allowable under the guidelines of 2 CFR Part 225 and that specifically benefit the LRT will be recorded as direct costs.

3.3.7 Invoices and Accounting

The Project Controls Manager is responsible to ensure that Consultant invoicing costs conform to the applicable state and federal regulations. Procedure 3.3.7 - Consultant Invoice Review/Payment describes in detail the review, approval and signature process of consultant invoices for work completed.

Project Controls provides information to WSDOT Program Management detailing payments and amounts of all dispersed funds as directed. This process allows reconciliation of requests for payment with actual disbursement of funds. Detailed records of work performed are kept, and cost trends and overall contract progress are reviewed with the task managers.

3.3.8 Performance Measurement and Cost Forecasting

The CRC Program utilizes formalized ongoing reporting for the purpose of communicating timely information about key program developments as work progresses through all program phases. It is the expectation of the CRC Director that reports will focus on performance during the specific time-reporting period, describe challenges encountered and corrective actions planned and taken while also previewing the work plan for the next reporting period. The principal tool for communicating this progress is monthly and quarterly progress reports. These reports include cost and schedule information, performance details, problems and issues as well as proposed and approved changes to Program plan.

Cost reports may include detailed line item reports as well as various levels of summary reports, such as Earned Value and Cost Performance Index (CPI) to monitor and control budgets, and Schedule Performance Index (SPI) to monitor schedules. Reports generated by the cost tracking system described above help identify cost trends and forecast project performance allowing CRC managers to focus on exceptional events or negative trends. The metrics are then used to identify and proactively address challenges to eliminate surprises, and make the most informed decisions possible, including mitigation strategies, should negative final costs be forecasted. As the need arises, Program Management will produce special studies and analyses of particular situations. The format and distribution of such reports will be tailored to the specific needs of the situation.

3.4 Scope Control

Scope control for the CRC Program will encompass the following elements:

- A clear listing of measurable, comprehensive, and definitive tasks will be created for each phase of the CRC Program.
- The required tasks will be developed from the written project scope into an understandable format through the use of the WBS.
- Project deliverables that are products of the tasks will be identified as benchmarks in the schedule and monitored very closely for slippage.
- Modifications to the baseline scope will be identified as changes consistent with accepted change standards, followed by re-establishing the baseline as needed for future reporting.

Any change which could affect or potentially change the project scope and WBS is managed through the change control process described below.

3.5 Schedule Control

Project Controls is responsible for schedule management with input from all participants of the CRC Program. Schedule management is accomplished through the use of schedules, a change control process, and a monitoring and reporting system.

The Project Scheduler has primary responsibility for schedule management and the development of the overall Master Program Schedule and updates. All schedule updates including updates to

the schedule's basis and assumptions (B&A's) shall be reviewed by the discipline managers and recommended for approval by the Deputy Director before publishing the updated schedule. The Project Scheduler, and assigned Cost/Schedule Analysts, will generally cover several contracts, providing scheduling support to the CRC Program functional managers and to the Project Engineers (Resident Engineers) overseeing construction contracts. Detailed information relating to Earned Value, CPI and SPI as well as reporting relating to risks will be provided and discussed at monthly confidence meetings.

3.5.1 Scheduling Procedures

Scheduling procedures, described in detail in CRC Procedure 3.5.1 Schedule Control, have been established to provide efficient, timely, and accurate methods of schedule and cost control, monitoring, and reporting. The Project Schedule provides a planning framework for Program Team staff, public and private utility companies, railroads, transit agencies, local community groups, businesses, consultants, suppliers, contractors, and federal, state and local agencies.

The Project scheduler and assigned Cost/Schedule Analysts are versed in the use of Critical Path Method (CPM) scheduling techniques. Primavera Project Management Release 6.2 (P6) software package is used as the scheduling package for monitoring and analysis of the Program Master Schedule and subprojects within the master schedule. This software has the capabilities to control and monitor program work and costs.

A CPM schedule has been developed and will continue to be updated for the CRC Program with emphasis on production timelines of key deliverables.

Schedule management for all phases of project development and during construction, will maintain the following elements:

- A well-defined project scope or WBS which forms the backbone for schedule development and the key to effective schedule management/control.
- Development of the baseline schedule with clearly delineated B&A's.
- A process of obtaining and accepting revisions to the baseline schedule and B&A's including establishment of regular periodic updates.
- Contractor provided schedules would be reviewed regularly by the Project Scheduler, assigned Cost/Schedule Analysts, Project Engineer (Resident Engineer) and other assigned staff managing particular construction contracts.

Master Summary Schedule

The Project Scheduler is responsible for the development and maintenance of the Program's Master Summary Schedule. This is the first and highest schedule level. The Master Summary Schedule is a Level of Effort schedule overview of the Program (includes key milestones) for use by the Executive Management Team, the CRC Director and Deputy Director, executive level management of external agencies, and at public meetings.

Detailed schedule information that supports the Master Summary Schedule is included in the Master Program Schedule discussed below.

Master Program Schedule

The Project Scheduler is responsible for developing and maintaining the Master Program Schedule. This is the second scheduling level. The Master Program Schedule includes design, bid, award, and construction/installation activities for each major construction or procurement contract described in Chapter 8 – Program Delivery and Procurement. This schedule is the primary tool used by the Management Team to track the schedule performance of the entire Program.

The Master Program Schedule includes activities for utility relocation, right-of-way acquisition, agreements, environmental permitting, testing, startup, pre-revenue training, and certification up to the date of revenue operation. It also shows specific dates for internal quality control, design review and approval, as applicable, by WSDOT or ODOT HQs, as well as local and federal agencies with jurisdiction.

The Master Program Schedule follows the scope of work breakdown by task and budget, as outlined in the work breakdown structure shown in Figure 3-1.

Figure 3-1. Master Program Schedule

Level	Work Description
1	Program
1.1	Project
1.1.0	Phase
1.1.0.1	Sub-Project
1.1.0.1.01	Task Order/Sub-Phase
1.1.0.1.02	Task
1.1.0.1.03	Sub-Task
1.1.0.1.04	Activity / Deliverable

3.5.2 Baseline Master Program Schedule

The Project Scheduler will develop a Baseline Master Program Schedule at the conclusion of the PE Phase. The Baseline Master Program Schedule will include major Program milestones including procurement activities to track interim completion targets within the CRC Program, providing a means of performance measurement to ensure overall Program completion. It is anticipated that costs and task orders will also be part of the Master Program Schedule. Progress would then be measured against the approved baseline schedule and schedule performance, cost performance and earned value would be tracked on a monthly basis for each project package and for the entire program. This would dovetail with the cost tracking system upgrade discussed in

Section 3.3.2 above to form the integrated project controls system that the CRC Team would use following completion of the PE phase.

Schedule Updates

The intent of the monthly Schedule Update process is to reflect the most accurate information available of the progress achieved by all levels (engineering and later construction) involved in the CRC Program, and to demonstrate the effect of this progress as compared to the overall Master Schedule.

The Project Scheduler will issue each month a "schedule worksheet" to the discipline-specific Task Leads responsible for updating their portions of the schedule. This includes Engineering, Environmental, Construction, ROW, Tolling, and Communications Outreach disciplines. Task Leads update their respective "schedule worksheet' and return the information to the Project Scheduler including percentage complete, remaining duration, and any changes to actual start and finish of each task. Upon receiving current progress information from the various Task Leads, the Project Scheduler will review the results with each Task Lead to verify accuracy and consider changes, if necessary. Once this review is complete, the Project Scheduler will update the Master Program Schedule ensuring the various "schedule worksheets" "dovetail" accurately into the Master Program Schedule providing for effective work flow. The Project Scheduler will also compare the updated Master Program Schedule against the approved baseline.

If discrepancies exist between any update to the Master Program Schedule and the current approved Baseline Master Program Schedule, the Project Scheduler will identify the impact(s) to the schedule. In some cases, a projected delay might be critical and steps must be taken to recover lost time. In other cases, a schedule slippage to certain activities may not be critical to the overall Program outcome and a complete remedy may cost more than the recovery is worth. These situations will be discussed with the Program's functional managers as applicable.

These updates provide a consistent vehicle for evaluating work progress, allowing the various managers to focus on exceptional events and negative trend, and for schedule reporting, discussed below.

Schedule Monitoring

Pro-active schedule monitoring provides a clear indication of performance and early warning of adverse schedule and cost trends to allow quick initiation of corrective action.

The Project Scheduler and assigned Cost/Schedule Analysts regularly monitor the Program's critical path for any delays and adverse trends in administrative, design, or construction activities after execution of construction contracts. The Project Scheduler provides the information to the Program's functional managers and discipline-specific Task Leads for their immediate review, and development and implementation of corrective action to ensure schedule recovery. CRC Procedure 3.5.1 Schedule Control provides efficient, timely and accurate schedule monitoring, including weekly and monthly progress reviews, monthly management team meetings and quarterly reviews of the work plan with task managers.

Schedule Reporting

The Project Scheduler has the primary responsibility for coordinating and preparing monthly Project Schedule status information with input from the Program's functional managers responsible for design and construction activities. The Project Scheduler, and assigned Cost/Schedule Analysts, prepare and distribute monthly schedule reports that show project status, schedule conflicts (if any), changes, and delays. This information is included in the CRC Program monthly and quarterly reports. As the need arises, Project Controls will produce special schedule analyses of particular situations.

Program Schedule Revisions

Situations may arise in which a delay is determined to be irrecoverable during Final Design and later Construction and Start-up phases. In such cases, the Program Manager and/or the Project Delivery Director, depending on the cause of the delay, may recommend to the CRC Director that a revision be made to the approved Baseline Master Project Schedule.

As potential delays become apparent to Program Management and Delivery, the Project Scheduler will initiate a schedule review to determine if the lost time can be made up. The Project Scheduler will enlist the aid of the functional managers and Task Leads to research the delay and recommend strategies to recover the time. No revisions affecting the critical path of the approved Baseline Master Program Schedule will be allowed without written approval authorization from the CRC Director.

Additional approvals of schedule revisions may be required to address different state requirements during Final Design and Construction phases. For example, on contract packages procured through WSDOT, change orders that impact the operationally complete milestone ("substantial completion") would require approval by:

- Director of Project Control and Reporting Office (PCRO), if programmatically-budgeted project package; or
- Office of Financial Management (OFM), when legislature is not in session, or Legislature (through budget action), if Line-item budgeted project package.

3.5.3 Construction and Supplier Schedule Management and Revisions

During the design and contract procurement phases, the approved baseline schedule will reflect general, summary-level estimates of the construction schedule. The CRC Program will structure the construction schedule specifications to address the size and complexity of contract packages discussed in Chapter 8. Project packages with large budgets, long durations and/or complicated construction or procurement needs require more schedule control than projects with small budgets, short durations and/or simple construction. As a result, the CRC Program anticipates that schedule specifications for larger procurement packages would be based on CPM scheduling, while schedule specifications for smaller projects may not require CPM scheduling, but could require the contractor to regularly submit horizontal bar chart type schedules.

The Project Scheduler will review schedule updates received from the contractor and incorporate this information into the Master Program Schedule updates after approval by the Project Delivery Director, or representative.

Together with the contractor, the Project Scheduler will review the schedule when construction delays occur, particularly whenever the contract falls behind the contractor's schedule by a specified number of days (taking into account all time extensions granted to date). The CRC Program may ask the contractor to prepare a recovery plan. This recovery plan may become the basis for a revision to the approved Baseline Master Program Schedule.

Time extensions affecting schedule completion dates may be granted to specific contracts for a variety of reasons, including, but not limited to:

- Changes in contract scope.
- Resolution of a dispute or claim.
- Weather delays (if more adverse than could have been anticipated).

Before any extension of time is considered, the Project Scheduler will conduct an analysis of the contemplated extension to determine the impact. Time extensions can have a "ripple" effect to follow-on contractors, systems installation, testing, and eventually to the revenue service date.

If a time extension is warranted without a significant effect on the Master Project Schedule, then a contract change order may be prepared granting the time extension. A revision to that particular element of the Master Project Schedule would then be made. If, however, the time extension is significant and will impact the schedule milestone date or critical path, options other than an extension of time will be considered. Examples of such options would be re-sequencing of construction activities, weekend work, or additional crews or other resources.

3.6 Change Management

The CRC Team shall execute the Program during the Final Design, Construction and Start-up (Transit) phases within clearly defined program parameters as well as manage individual project packages to approved scope, schedule and budget baselines, established at the end of the PE phase. WSDOT and ODOT Executives recognize that changes are inevitable on a mega program such as the CRC. It is their expectation, however, that changes cannot exceed limits specified in budgets, schedules or documents which have been approved and authorized by the executives without their prior approval.

The Change Management process is designed to ensure that the project scope, schedule, budget, and quality objectives committed to at completion of the PE phase are achieved. Where this is not feasible, the Change Management process provides a consistent and well documented means of managing individual change and cumulative change in a manner that provides for evaluating, approving and documenting changes while minimizing the risk to program scope, schedule and budget baselines.

The Change Management process will be implemented at the start of the Final Design phase and continue for the remainder of the program including Construction and Start-up (Transit) phases.

It will apply to program management and administration, and individual project packages discussed in Chapter 8 - Program Delivery And Procurement and delivered by alternative delivery methods (e.g., Design-Build) or traditional delivery method (Design-Bid-Build).

The Change Management activities encompass:

- Monitoring progress against the established scope, budget and schedule plan baselines.
- Identifying, coordinating, and controlling variances from plan baselines.
- Evaluating and documenting plan variances including scope, budget and schedule impacts.
- Processing in a timely manner scope, budget or schedule changes through the required approvals and execution authority levels prior to proceeding with the change.

3.6.1 Administration of Change Management

Business Services is responsible for ensuring project changes during Final Design, Construction, and Start-up phases are thoroughly documented and communicated using the Change Management procedures described in this PMP, and scope, budget or schedule changes are processed in a timely manner through the required approvals and execution authority levels prior to proceeding with the change.

The Change Management Manager is responsible for maintaining a consolidated data base and tracking project changes by individual project package and cumulative change effect at the Program level. The Structures, Highway, Transit managers and Project Delivery Director are responsible for documenting project changes in their respective areas throughout Final Design and Construction phases.

It is the responsibility of all CRC managers and team members to execute the Change Management process and to execute their daily responsibilities while minimizing the risk to approved scope, schedule and budget baselines.

3.6.2 Baseline Change Management

The baseline scope is both represented by the Transit and Highway improvements approved at completion of the PE phase at which time a scope, budget and schedule would be established for each project package described in Appendix D, *Project Implementation Plan*, and summarized in Chapter 8 – Program Delivery And Procurement. The baseline for the Transit scope will also be described in the documentation submitted to the FTA in support of the Program's application to enter into Final Design. This baseline documentation will become the basis by which performance will be tracked and reported during the Final Design, Construction, and Start-up phases of the CRC Program.

3.6.3 Change Management Procedures

Change management procedures discussed in the following sections and described in detail in CRC Procedures 3.6.3-A through 3.6.3-J have been established to provide for the timely evaluation and approval, or disapproval of: a) changes in the Final Design of work elements (Highway and Transit), and b) change orders to construction (Highway and Transit) or system installation or equipment (Transit) contracts after their baselines have been approved. They also provide guidelines for review and approval of scope and budget changes to Consultant agreements.

The CRC Team will implement a Change Management system that will use a Work Breakdown Structure to document the approved baseline scope, schedule and budget established at the end of the PE phase for each project package, and procedures for identifying, evaluating, approving and capturing significant changes that may occur during project design, construction and start-up which have an impact to the approved baseline.

The change management procedures clearly specify responsibility to initiate and approve changes, permit results to be achieved rapidly, provide for full evaluation of the impact of the changes, and specify the documentation of the changes. Change Management will provide a record of changes deemed significant to affect the scope, budget and schedule of each project package including:

- Deletion, modification, or combination with other work elements,
- Increase or decrease in cost or schedule,
- Unforeseen project conditions and change in governing regulations,
- Change in funding source or project package, or
- Any other change materially affecting the approved scope, cost or schedule baselines including project de-scoping, if secondary mitigation becomes necessary to avoid cost overruns.

The Business Services Manager is responsible for reporting on all changes at project package and program levels throughout Final Design, Construction and Start-up phases. Business Services will prepare monthly and quarterly reports to address FTA requirements and, if needed, the reporting will be aligned to coincide with WSDOT's development of the quarterly Gray Notebook update.

Design Change Management

The Highway, Structures and Transit Managers are responsible for documenting and justifying any substantial design changes that impact the approved scope, budget and schedule baselines during Final Design on project packages implemented using the Design-Bid-Build (D-B-B) or General Construction / Construction Manager (GC / CM) delivery methods, and during the Request For Proposal (RFP) phase on all project packages implemented using the Design-Build (D-B) delivery method. The Project Delivery Director is responsible for coordinating with the Highway, Structures and Transit Managers documenting and justifying any substantial design

changes to scope, budget and schedule baselines during construction execution. Collectively, they are also responsible for ensuring that design changes are approved and communicated using the process described in detail in CRC Procedure 3.6.3-A - Design Change Management.

Construction Change Management

The Project Delivery Director assisted by the Project Delivery Engineering Manager is responsible for the consistent implementation of the change management procedures on all contract packages. The Project Engineer (Resident Engineer) leading the construction administration on executed construction contracts, including Design-Build and procurement contracts for equipment and materials, prepares the required documentation and justifies contract changes including design related using the applicable change order (CO) procedures as follows:

- For WSDOT procured contract packages:
    - Procedure 3.6.3-B Construction Change Orders
    - Procedure 3.6.3-C Administrator Approval For Construction Change Orders
    - Procedure 3.6.3-D State Construction Engineer Approval For Construction Change Orders
- For TriMet procured contract packages:
    - Procedure 3.6.3-E (pending development)
    - Procedure 3.6.3-F (pending development)
    - Procedure 3.6.3-G (pending development)
- For ODOT procured contract packages:
    - Procedure 3.6.3-H (pending development)
    - Procedure 3.6.3-I (pending development)

Each Project Engineer (Resident Engineer) is also responsible for ensuring that changes are approved and executed by those authorized to execute a CO up to their respective limit of execution authority as described in the applicable CO procedure.

Business Services is responsible for tracking costs of all approved or pending CO’s including costs of potential changes that may have a cost impact in the future. A summary of that information will be recorded in the cost tracking system for each project package. The cost tracking system accumulates all CO’s to show individual change and cumulative change for comparison against the budget and contingency at the project package and program levels.

Consultant Change Orders

When a change in scope for Final Design or Construction phase services is defined and the price for the additional or deleted services is agreed upon, the Consultant Project Manager initiates a contract amendment that is administered by the Consultant Contract Specialist/Agreements.

Contract modifications may involve changes in scope, time, deliverables, etc. without a change in budget. The CRC Director approves all consultant contract modifications after verifying sufficient funds are available. The process to amend consultant contracts is described in detail in CRC Procedure 3.6.3-J Consultant Agreement Amendments.

3.7 Document Control and Records Management

This section describes the manner in which CRC Program records will be managed, controlled and maintained in accordance with technical, management and legal requirements. Document control and records management procedures are used to handle, maintain, and manage all documents and supporting information, as well as contractual documents, financial and grant related records throughout the design and construction phases of the Program. Document control and records management tasks include: receipt, storage, retrieval and distribution of all project documents, including key project documents classified as "controlled documents."

The CRC's document control and records management system includes the Prolog database to monitor dates of receipt, transmittal, and final disposition of project management, financial, procurement, right-of Way, quality, environmental compliance, reference documents and legal records. It also includes ProjectWise software for the purpose of managing, retrieving and sharing original engineering CAD drawings, as-built drawings, and various design records.

3.7.1 Organization and Responsibilities

The Document Control Manager reports to the Business Services Manager and is responsible for document control and record management of the official project files, with the exception of engineering design drawings classified "controlled documents" as described below. The Document Control Manager oversees the day-to-day document control and record management duties including the facilitation of capturing, properly indexing, securing, archiving, versioning, and keeping the project documents current. Document Control files and codes controlled documents and their updates into Prolog. The Public Disclosure Lead reports to the Business Services Manager and is responsible for responding to public records requests.

The CAD Manager is responsible for the day-to-day management of CRC engineering design drawings designated as "controlled documents." The CAD Manager maintains full-sized and half-sized hardcopy drawings.

3.7.2 Controlled Documents

Certain key project documents will be classified as "controlled documents." They are documents that are either developed or used during the implementation and management of the CRC Program. These controlled documents include technical and engineering, environmental compliance, procurement, as well as management-approved plans, procedures, and manuals. Controlled-distribution documents will be prepared and administered at various levels of the Program.

General Controlled Documents Guidelines

The following controlled document guidelines have been established on the CRC Program:

- Each discipline-specific task manager is responsible for identifying Program-specific controlled documents that are either developed internally or acquired from external sources, and require controlled distribution.
- The discipline producing a controlled document is responsible for any necessary updates, approvals and subsequent redistribution of that controlled document.
- Controlled documents prepared by contractors shall be prepared in accordance with CRC requirements and procedures, and approved or accepted by the responsible discipline manager.

The CRC Program has established a matrix of Controlled Documents that are subject to controlled distribution. The matrix identifies the discipline-specific Task Leads that are responsible for tracking and updating program-specific controlled documents that are either developed internally or externally issued reference documents used in the development of the CRC Program.

Controlled-Distribution Procedure

Many documents will be subject to controlled distribution to see that changes and updates are made in a systematic manner, and that all parties are working on the latest version of the documents. Controlled-distribution procedures involve controlling or regulating the creation, approval and modifications to key documents that are either developed by the CRC team or used during the implementation and management of the Program.

Administrative assistants who report to the Highway, Structures, Transit and Delivery Managers are responsible for coordinating the administration of key documents and records produced internally within their respective discipline and those acquired from external sources and used as authoritative references by CRC staff. Appendix E, *Quality Assurance Manual*, describes in detail the controlled-distribution procedures for internally produced and external reference documents.

3.7.3 Records Management

Records management generally refers to the management of records as they are created or received and used and maintained, which may not be subject to formal document control, as well as the proper disposition of inactive documents when they are no longer needed and the retention periods have lapsed. This section describes records management processes and responsibilities that will be followed and/or executed by the CRC Program. Procedure 3.7.3 – Document Control and Record Management describes in detail the document control and record management work flow process for all active CRC Program records.

Active Records

Active records include those documents, records, and supporting information which are produced or received during the development, planning, design, construction, and closeout of the CRC Program. A variety of documents are subject to formal controlled distribution, as specified in Section 3.7.2. In addition, supporting information such as calculations and analysis, and other documentation must also be maintained. In some cases, records are maintained separately for

legal and regulatory reasons. The following describes general records management processes that must be followed on the CRC Program.

All project files will be maintained at the CRC office. To ensure adherence with the overall document control goals, staff identified three primary types of documents:

- Reference material.
- Project work papers.
- Official project files.

Reference Material

Reference material includes any document (electronic or physical) that is not a direct product of the CRC Team or not produced for the CRC Program, but is helpful or necessary in order to perform project functions. Reference material may be subject to formal controlled distribution, as specified in Section 3.7.2. Reference material will be included in its own section of the Program filing structure and will not follow the traditional WBS structure as designated for official Program files.

The initiator of the reference material should coordinate with Document Control to determine the most appropriate placement of the information within the project library, thereby making the material available for all team members.

Project Work Papers

Project work papers include any document or file that is a direct product of the CRC Program, but that is not in its final or distribution draft format. Project work papers generally require further collaboration or processing among team members.

Official Project Files

An official project file is generally a product of the CRC Program. It can be either electronic or paper, and is in its final form. Final form includes drafts that are issued for review. Common, well known examples of official project files include:

- ***Project Management Records*** – Schedules, transmittal documents, Project Management Plan (PMP), Procedures Manual, reports, correspondence, analysis, and other records related to the management of the CRC Program.
- ***Financial Records*** – Financial and grant related records and those associated with payments, accounts payable, accounts receivable, accounting, and financial reporting.
- ***Procurement Records*** – Pre-solicitation documents, solicitation/addenda/amendments, statements of work/scopes of service, notices of award, records of any protest, bid/performance/ payment, or other bond documents and notices to sureties, notices to proceed, contract amendments and subcontract modifications, and construction administration records.

- ***Right-of-Way Records*** – Records will be maintained both electronically and in hard copy format, as appropriate.
- ***Design Records*** – Engineering and design reports including supporting analysis and records whether prepared on-site or by off-site consultants and contractors.
- ***Construction Records*** – Construction-related records and documents will be maintained by the responsible resident engineer within the appropriate project package.
- ***Quality Records*** – Objective evidence of quality, in accordance with FHWA and FTA QA/QC guidelines, during design and construction.
- ***Environmental Compliance Records*** – Analysis, correspondence, reports and other documents associated with environmental site assessments, environmental analysis, environmental impact statements, environmental mitigation, and submittals to federal, state, and local regulatory agencies. CRC will maintain a controlled file, which will contain official environmental permits, Biological Opinion, and compliance records and reports.
- ***Other Records*** – Other important records and documents produced by outside or internal sources including e-mail communications, photos, and presentations. Generally, these documents are distributed, as appropriate.

Document Security

In order to ensure the integrity of project files, the CRC Program has developed permissions that enable users to view, edit, and delete certain documents depending on where these documents are located and what user group the individual is assigned to. The table below summarizes the basic users and their related permissions:

Location	Group	Default Permissions
Workpaper Files	All CRC Users	Add, Modify, Delete
Project Files (except DOT folder)	All CRC Users	Read Only
	Administrators, Document Control	Add, Modify, Delete
Project Files DOT Folders	All CRC Users	No Access
	DOT & Mgt Group	Read Only
	Administrators, Document Control	Add, Modify, Delete
Controlled Documents	All CRC Users	Read Only
	Administrators, Document Control	Add, Modify, Delete
Reference Files	All CRC Users	Read Only
	Administrators, Document Control	Add, Modify, Delete
Document Control In-Box	All CRC Users	Add
	Administrators, Document Control	Add, Modify, Delete

In order to be assigned to a user group, the person must have a CRC network login. Some files that have contents that are not considered to be appropriate for widespread distribution are kept in the DOT folders.

4. Program Funding

4.1 Capital Funding Sources

The Program seeks funding through Section 5309 New Starts (transit) program and Federal Discretionary Highway Funds from the Projects of National and Regional Significance (PNRS) program established under Section 1301 of SAFETEA-LU. The capital finance plan for the CRC Program also depends on toll revenues (i.e., toll bond proceeds and net toll revenues) and state transportation funds from ODOT and WSDOT, to cover a portion of project costs. A separate Section 5309 New Starts update report includes a detailed financial plan that describes the Program's expected resources and requirements. Continued refinements to this plan can be expected through Final Design. In summary, the funding plan:

- Draw on a combination of local, state, and federal funds, as shown in Table 4-1.
- Include an interim borrowing program to insure cash flow supports the most cost effective development schedule.
- Benefit from placing cost responsibilities with those most able to manage them.

Table 4-1 Anticipated Capital Funding Sources: Assumes LPA Phase 1 at 90% CEVP (as of July 2011)

Funding Source	Amount
Federal Discretionary Highway Funds	$400.0 M
ODOT/WSDOT: Existing Funding	$147.4 M
ODOT/WSDOT: Additional Funding	$900.0 M
Post Completion Toll Bond Proceeds	$1,004.8 M
Residual Toll Revenues	$1.2 M
Pre-Completion Toll Revenues	$204.4 M
Section 5309 New Start Funds	$850.0 M
Total Revenues	**$3,507.8 M**

4.2 Investor Relations

As described above, the funding plan relies on numerous investors. The CRC Team will lead efforts to communicate, collaborate, and coordinate with investors including but not limited to:

- FTA
- FHWA

- Executive and elected officials
- Financial Institutions associated with interim financing

These efforts will be supplemented, as needed, by experts from the project as well as partnering agencies to best respond to particular questions as they arise. The CRC's Finance Manager will disseminate information to the CRC stakeholders and Management Team.

4.2.1 Grant Administration – FTA

Overview

WSDOT, the FTA Grantee for transit grants, in collaboration with TriMet and C-TRAN, as needed, will administer grants in accordance with FTA Circular 5010.1D, Grant Management Requirements.

Grant Analysis and Administration

The CRC Director and the WSDOT Assistant Director Public Transit Division, with assistance from Project Controls, are responsible to FTA for grant-related project issues. Areas of responsibility include the following:

- Coordination of the development of the grant applications and amendments.
- Coordination of grant application-related required activities.
- Coordination of response to FTA application review comments.
- Facilitation and execution of grant agreements, and notification of approval to Program staff.
- Maintenance of grant files, including all grant applications, grant agreements, grant-related correspondence, quarterly reports, grant budgets, and revisions.
- Coordination of FTA quarterly report submittals and budget revisions.
- Distribution of Grant Status Reports and Labor Distribution Reports to Program staff and stakeholders.
- Distribution of information to appropriate Program staff about new or changing federal grant-related requirements or regulations.
- Guidance to Program staff on grant eligibility issues, budget management, and most appropriate use of grant resources.
- Preparation and distribution of monthly report with details on activities, schedule, forecast cost, and overall completion.

Grant Accounting

Project Controls performs the following accounting functions for grant management:

- Establishing all grant accounting information within the general ledger system.
- Processing grant-funded project invoices and charges.
- Producing monthly grant status reports and labor distribution reports.
- Preparing financial status reports for quarterly reports.
- Processing grant draw-down transactions.

Cash Management

WSDOT as the FTA Grantee for transit grants, is responsible for receiving and dispersing all transit funds. CRC staff will be certified users of the WSDOT TEAM system. The Project Controls Manager is an authorized user of TEAM.

The CRC Program intends to follow the most expeditious and cost effective development schedule, that is, progress on the Program will not be delayed awaiting federal funds. Following Electronic Clearing House, Inc. (ECHO) procedures, the CRC Program will draw on federal funds to reimburse costs already incurred, or, in some instances, in advance, for large expenditures that will be made within three days. When federal funds are not available due to appropriation cycles, local funds and/or interim financing will pay expenditures.

Grants Closeout

Upon completion of the Program, CRC staff will prepare a report stating the actual expenditures on the Program broken down by contract and FTA line item code. Other reports will be prepared in accordance with all appropriate rules and regulations.

Full Funding Grant Agreement Reporting

The CRC Director is responsible for ensuring that the CRC Program prepares quarterly reports in FTA's electronic grant management system, against each element of the budget indicating physical progress. The Project Controls Manager will provide a report of actual cash draw-down against approved grants. Explanation of any existing or potential problems will be noted.

Force Account

Project Controls is preparing a force account plan in accordance with FTA Circular 5010.1C. Grantees are required to prepare such a plan, report on it quarterly, and keep it on file. Prior FTA approval is required if the value of the force account work will exceed $10 million. The plan will include a discussion on use of WSDOT, ODOT, TriMet or C-TRAN forces for design and construction purposes and other activities that may be identified during final design.

4.2.2 Grant Administration – FHWA

Overview

CRC staff will administer highway grants in accordance with FHWA Guidelines.

Grant Analysis and Administration

WSDOT and ODOT will manage highway grant-related aspects of the Program as a normal course of business.

Grant Accounting

Currently, the WSDOT Office of Highways and Local Programs oversee the following accounting functions for grant management:

- Establishing all grant accounting information within the general ledger system.
- Processing grant-funded project invoices and charges.
- Producing monthly grant status reports and labor distribution reports.
- Preparing financial status reports for quarterly reports.
- Processing grant draw-down transactions.

Grants Closeout

WSDOT and ODOT will manage closeout work for the Program as a normal course of business.

4.3 Financial Audits

In addition to state audits, audit verification of expenditures by outside independent and federal auditors, usually conducted annually within four months of the close of the fiscal year would be incorporated into WSDOT's annual independent audit of federal grant-related projects. The audits will verify compliance with procurement policies and procedures as outlined in WSDOT's procurement certification and accepted cost principles. The Director of Internal Audits at WSDOT's Audit Office is responsible for coordination of the annual independent audit with assistance from the Project Controls Manager. The Program's transit-related activities will also be subject to FTA's Triennial Review.

5. Risk Management and Insurance

5.1 Overview

WSDOT is the FTA Grantee for transit grants and lead agency for the overall multimodal project. Project Controls is responsible for the administration of risk management for the CRC Program. The Risk Lead provides leadership and guidance to various agency staff from WSDOT and ODOT (co-lead agencies) and partnering transit agencies, TriMet and C-TRAN, responsible for the day-to-day coordination of the following activities:

- Identifying the best method to protect WSDOT, ODOT, TriMet, and C-TRAN from risk exposures due to the CRC Program.
- Determining the degree of indemnification and/or insurance protection requirements for consultants and contractors providing services to the CRC.
- Preparing and implementing the Risk and Contingency Management Plan (RCMP).

5.2 Risk Assessment Management

The planning steps to a risk review process and development of a risk management plan include the following steps:

- Identification of risks
- Evaluation of risks
- Analyses of risk treatment alternatives, i.e., avoidance, prevention, mitigation/cost control, and insurance
- Assignment of risk
- Selection of risk treatment
- Monitoring and evaluating performance of treatments implemented

The overall objective of risk management for the CRC Program is to maximize the probability of success by responding to identified threat risks and making the most of opportunities. The CRC Team will identify and manage pro-actively risks for the CRC Program. The CRC Team will effectively manage project risks for each of its project packages and provide rapid ready retrieval of the following information throughout Program delivery:

- Risk profile (program level and project level)
- Status of key significant risks (monitor and control capabilities)
    - Response actions taken

  - Cost of response actions
  - Results of response actions
  - Current status of risk (active, retired)
  - Summary of risk management efforts and outcomes (for specific risks and overall)

Appendix C, *Risk and Contingency Management Plan*, describes in detail the specific areas of risk assessment focus identified through the risk review process completed during the Preliminary Engineering phase and that will continue to be implemented during Final Design. The Risk and Contingency Management Plan for the CRC Program is consistent with:

- Washington State Department of Transportation (WSDOT)
  - Project Risk Management, Guidance for WSDOT Projects
  - Guidelines for Cost Risk Assessment-Cost Estimate Validation Process Workshops
- Oregon Department of Transportation (ODOT)
- Federal Transit Administration (FTA)
  - Risk Review Process
  - Risk and Contingency Management Requirements

The main components of the Risk and Contingency Management Plan are:

- ***Project Risk Management Strategies*** – references the formally adopted risk management process to continuously identify, assess, and implement and carry-out response actions to key identified CRC Project risks;
- ***Primary Risk Response Actions*** – an iterative process and the result of developing planned activities to act on identified key CRC Project risks during the earliest possible project phase. The primary response actions consist of implementing planned responses by integrating them into the project work plan. Responses may require managerial, administrative, and/or technical action;
- ***Secondary Risk Response Actions*** – action taken if the primary responses, and the phase contingency values of time and money, are inadequate to maintain contingency levels within established ranges and avoid cost overruns and/or schedule delays;
- ***Project Packaging and Delivery Methods*** – an overview of the proposed project packages and the delivery methods for a project to be completed on time and within budget as outlined in the PMP; and
- ***Contingency Management*** – discusses plans for managing the CRC cost and schedule contingencies to maintain contingency levels within established ranges.

Risk analysis, will continue to be treated separately from the base cost estimates during Final Design. This enables a more rigorous and objective approach to this important component of the project, and includes anticipated variances in the base cost (for example, in unit costs and quantities) and impact of risk events.

Active risk management will follow the procedures detailed in Appendix C, *Risk and Contingency Management Plan*. This includes holding Cost Estimate Validation Process (CEVP) and Cost Risk Assessment (CRA) workshops, as needed, to update the risk register, identify/quantify new uncertainties and risks, and ensure that risk mitigation strategies are being successfully implemented. The task manager assigned to each risk will monitor the effectiveness of the current risk management strategy, assess any unanticipated effects, and recommend to CRC Management Team any mid-course corrections.

Risk tracking will occur using a spreadsheet developed by the WSDOT Cost Risk and Estimate Management (CREM) office and modified for transit elements. This spreadsheet offers a straightforward tool for tracking risks and a preliminary understanding of how to avoid or mitigate for risks if they occur. An example of this spreadsheet can be found in the Risk and Contingency Management Plan. Proper tracking and maintenance of risks enables internal and external communication of risks among partners, stakeholders, CRC managers, and staff. Risk tracking provide effective communication of identified risks to independent teams during CEVP/CRA risk assessment workshops.

5.3 Insurance Claims Management

WSDOT's Enterprise Risk Management Office (ERMO) has responsibility for directing and coordinating the following risk functions:

- Tort Claims Adjusting
- Property Damage Recoveries
- Risk Analysis
- Tort Self-Insurance Management
- Attorney General Tort Defense Cost Management
- Tort Claim Reporting

The ERMO's Administrative Risk Manager will coordinate information and act in an advisory capacity to the CRC Program with regard to resolving torts, purchasing insurance, obtaining certificates of insurance for requesters, reporting tort claim information, and analyzing risk aspects of contracts, leases, agreements, or other legal documents.

The CRC Director is responsible for ensuring that the CRC Team conducts operations in accordance with departmental standards and statutory requirements. The CRC Director will determine the degree of indemnification and/or insurance protection necessary in consultation with the Office of Attorney General/WSDOT Division or the ERMO's Administrative Risk

Manager, and will report losses or claims in accordance with requirements in Chapters 5 and 8 of the WSDOT Risk Management Manual.

The CRC Program will coordinate with the ERMO's Administrative Risk Manager and with ODOT, C-TRAN and/or TriMet Insurance Administrators to identify those areas of exposure that place the agencies at risk. The CRC Program will take the necessary actions to protect against that risk in a fiscally responsible manner and to harmonize insurance needs of the agencies during the preparation of procurement documents for approved project packages.

5.3.1 CRC Insurance

Washington State policy, as expressed in Chapter 43.19, RCW, is to assume risks to the maximum extent possible, but to purchase commercial insurance when, among other reasons: the size and nature of potential loss make it in the State's best interest; coverage is cost effective; or it's required by a fiduciary arrangement. WSDOT's risk exposures are financed by various combinations of self-assumption, self-insurance, and commercial insurance.

Consultant Insurance

Prior to commencing work, the consultant shall obtain, furnish and keep in force during the terms of their Agreement with WSDOT certificates of insurance and endorsements with companies or through sources approved by the Washington State Insurance Commissioner pursuant to Title 48 RCW. The certificates of insurance must show the following minimum limits of insurance coverage:

- Worker's Compensation and employer's liability insurance as required by WSDOT.
- Commercial general liability insurance with minimum limits of one million dollars ($1,000,000) per occurrence and two million dollars ($2,000,000) in the aggregate for each policy period.
- Business auto liability insurance providing coverage for any Auto used in an amount not less than one million dollars ($1,000,000) combined single limit each occurrence.

Excepting the Worker's Compensation Insurance and any Professional Liability Insurance secured by the Consultant, the State of Washington, and WSDOT shall be named as an additional insured.

The Consultants professional liability to WSDOT will be limited to the accumulative amount of the authorized task order(s) or one million ($1,000,000) dollars, whichever is the greater.

Contractor Insurance

Each Contractor or supplier performing CRC related work inside the project site will obtain, at its expense, and keep in effect during the term of the contract, a Commercial General Liability Insurance and other insurance coverage, as indicated in the contract Special provisions, covering bodily injury and property damage in a form and with coverage that meet the requirements of the contract Special provisions. In addition, each Contractor or supplier will be responsible for their own insurance outside the project site.

Contractors with executed contracts that involve both design and construction activities under alternative delivery procurement, such as Design-Build, will have both exposures insured under their own (or subcontractor) liability coverage.

Railroad Protective Insurance

Construction of the Program requires execution of a Construction and Maintenance (C&M) Agreement between WSDOT and BNSF Railroad prior to any construction on BNSF right-of-way. The C&M Agreement will include insurance and indemnification requirements. Each CRC project package with BNSF interface shall include contract Special Provisions that detail the Contractor's responsibilities including, without limitation, compliance with all Railroad requirements, Federal, State and Local Laws and applicable county or municipal ordinances and regulations. Railroad requirements include insurance coverage that the Contractor is responsible for and must provide before performing any work on BNSF right-of-way. Coverage levels and specific requirements will be finalized in the executed C&M Agreement and most likely include the following coverage:

- **Railroad protective liability** – Coverage may be $2M single, $6M aggregate or $5M single, $10M aggregate.
- **Commercial General Liability** – This insurance contains broad form contractual liability with a combined single limit of a minimum of $2,000,000 each occurrence and an aggregate limit of at least $4,000,000 but in no event less than the amount otherwise carried by the Contractor. Coverage must be purchased on a post 1998 ISO occurrence form or equivalent and include coverage for, but not limit to the following:
    - Bodily Injury and Property Damage
    - Personal Injury and Advertising Injury
    - Fire legal liability
    - Products and completed operations

5.3.2 Pre-Construction Surveys

A pre-construction survey will examine select building, utilities and underground structures within areas potentially influenced by CRC construction activities. The pre-construction survey will assess and record any existing cracks or damages, and to provide a pre-construction record of the facilities in the event any damage is claimed due to CRC construction activities. If any deep excavations adjacent to existing structures are required, ground movement monitoring instrumentation may be used during construction. The need for any such instrumentation will be determined through discussions with the project engineer and the structural engineer.

A pre-construction survey of select facilities is planned for the CRC Program with partial implementation completed during PE at several select locations and additional ones anticipated to be carried as the Program progresses into Final Design. Post-construction surveys may also be conducted if there are reasons to believe damage may have occurred or a claim is filed.

Other types of surveys will also occur as required by Washington and Oregon statutes. ODOT requires a pre-construction record of survey (ROS) prior to bid-letting. WSDOT requires either an ROS or stamped and signed monumentation map prior to property acquisitions occurring. For project consistency, a full pre-construction ROS will be produced for the Project. Both departments require a post-construction ROS once the Program is complete. The following statues, policy, and regulations apply:

- Washington Administrative Code (WAC)
  - WAC 196 – Licensing
  - WAC 332-120 – Survey Monuments – removal or destruction
  - WAC 332-130 – Minimum Standards for land boundary surveys and geodetic control surveys and guidelines for the preparation of land descriptions
- Revised Code of Washington
  - RCW 58 – Boundaries and Plats
- Oregon Revised Statues
  - ORS 209 – County Surveyors
- Washington State Department of Transportation
  - Highway Surveying Manual M22-97
  - Plans Preparation Manual M22-31
- Oregon Department of Transportation
  - Pre-Construction Survey Standards and Procedures
  - ODOT R/W Monumentation Policy
  - Right of Way Monumentation Surveys
  - Control Recovery and Retracement Surveys

6. Real Estate Acquisition and Property Management

6.1 Scope and Purpose

Two key elements of the Right of Way (ROW) function are the early identification of the needed property rights by the transit and highway design teams and to schedule adequate time for the ROW process to operate. Through early identification of temporary and permanent ROW limits by the Program designers, the ROW)team can then acquire rights to those properties. The objective of this approach is to provide necessary time to perform the acquisition program and ensure that all acquisition and relocations are performed in conformance with all applicable federal, state, and local regulations. Careful consideration of all the steps from appraisal to property management will allow for timely availability of property, and reduce the risks of costly delays to the CRC Program.

The Right of Way Manager will manage the ROW function on the Program supported by ROW staff from ODOT, WSDOT and qualified consulting staff. During each stage of the project, the Right of Way Manager will identify key staff responsible for coordinating the ROW tasks and secure added staff from WSDOT, ODOT, or qualified consulting firms, as needed. The Right of Way Manager will certify necessary rights have been acquired, or how they will be acquired, prior to the time a project package proceeds to construction bid letting.

For the highway parcels needed in Washington and Oregon, the property acquisition will be performed in accordance with applicable provisions and procedures of the current version of WSDOT's and ODOT's Right of Way Manuals, respectively. The Right of Way Team recognizes that acquisition timelines in Oregon and Washington are different. For example, in Oregon the project can start the condemnation proceedings and may obtain occupancy as soon as 30 days after the offer is made, provided there is no relocation. The Right of Way Manager (Coordinator) will coordinate with the project Scheduler to ensure that the acquisition timelines of highway parcels in Oregon and Washington are incorporated, and carefully tracked, in the project master schedule.

For the transit portion of the Program, the property acquisition and management functions are described in Appendix F, *Real Estate Acquisition Management Plan (RAMP)*. The overall goal of the RAMP is to guide the Right of Way Team, as well as other project personnel, in a common effort to secure real property needed for construction and operation of the light rail extension to Vancouver, WA, including track way, stations, overhead power lines, substation sites, operator facilities, park–and-ride lots, utility relocations, and any other project needs.

The ROW team's approach will follow established best practices and all applicable federal, state, and local requirements. The RAMP serves as a guide for implementing the real estate acquisition requirements for the transit portion of the Program. The intent of the RAMP is to:

- Provide a description of the project and background.

- Define the roles of Right-of-Way Team staff and their coordination with other staff and consultants, including, but not limited to, title reports, appraisal and appraisal review, acquisition, relocation, property management, environmental review, and demolition services.
- Outline acquisition priorities and strategies.
- Define property rights to be acquired for the transit portion of the Program.
- Define tasks necessary to advance the transit portion of the Program through the acquisition process.
- Describe the reports and tracking systems to monitor the progress of the acquisition schedule.
- Provide a framework to advance through the acquisition process and remain in compliance with applicable laws, regulations, and procedures.

The RAMP is presented in several sections that follow and address the elements listed in the table of contents provided in Appendix A of FTA's Operating Procedure 23.

Some acquisitions, especially those necessary for partial acquisitions, construction easements, and staging areas may not be identified until final design nears completion.

7. Community Relations

7.1 Overview

The CRC Program is employing an extensive community relations strategy to provide consistent, timely and accurate information to interested parties, facilitate dependable lines of communication with the public and build broad support for the project. Community relations and engagement activities support the planning, design and construction of the Program.

The CRC Management Team has assembled an integrated inter-agency communications team to educate and involve the public and stakeholders in Program decisions. The team is composed of WSDOT, ODOT, C-TRAN, TriMet, and consultant communication and public information staff to provide accurate and consistent messages to a variety of audiences. The CRC Director has ultimate authority to direct the communications program and strategic approach. The CRC Communications Outreach Manager reports to the CRC Director and approves implementation of Program public materials, events, workshops and communications.

7.2 Communications Activities – Outreach

The activities outlined below are representative examples of community involvement efforts that have been and will continue to be undertaken on the CRC Program. An annual communications plan will be written and approved by the CRC Director and Deputy Director that include detailed messages and strategies. Records are kept to document outreach activities, contacts made with the public, and comments that are received.

7.2.1 Policy-related outreach to decision-makers

- *Integrated Project Sponsors Staff (IPS) meetings.* The Integrated Project Sponsors Staff works collaboratively with the CRC Team to discuss and resolve outstanding technical issues.

- *Jurisdictional, institutional, and elected official briefings, community, business, and employer organization briefings.* CRC provides regular briefings on project status and schedule to state government, community and business leaders, especially elected officials. For example, the Program provides periodic updates to the councils or boards of its local project partners, to individual members and committees of the state legislatures, and to the federal congressional delegations of both states.

7.2.2 Outreach to the Region

- *Fairs, festivals, and community events.* Staffed information booths are used to provide information at local community events, generally held in the summer months. This informal outreach allows CRC to reach thousands of people at locations that are convenient for them.

- *Open houses and workshops*. Public open houses and workshops are held for the general public, advisory group members and project stakeholders before key project decisions and milestones. Open houses are typically held in sets of two across the project area (one in Portland and one in Vancouver). Design workshops tend to focus on a specific issue and provide area residents with hands-on opportunities to learn about, and make recommendations on, project elements interchange design, transit location and station design.

- *Public hearings*. Public hearings, sometimes held in conjunction with an open house event or advisory group meeting, to provide an opportunity for the public to submit verbal and/or written testimony.

- *Social service, civic and business group updates and briefings.* Small group discussions or individual briefings are used to respond to requests from groups for current project information.

- *Drop-in events*. Informal meetings will be held in and out of the project area with detailed project information available for review and discussion with project staff.

- *Project information.* Current information about the project is published in project newsletters and fact sheets (see *Outreach Materials,* below), as well as on the project website. Information available to the public includes a project overview, current schedule, advisory group materials and technical resources. Outreach materials include translated pieces targeted to several known populations within the project area with limited English proficiency.

- *Constituent contacts*. Public comments and questions received by phone, email and in writing are tracked and responded to.

- *Surveys.* Responses to surveys are provided online, by mail or in-person and designed to inform project or advisory group deliberation on specific topics.

- *Social media.* Timely updates on project news are provided via social media outlets.

- *Media.* More information in the section “Media Relations,” below.

7.2.3 Outreach in the Program Area

- *Property owners, business owners and managers, and residents.* Periodic one-on-one contact will be made with property or business owners, managers and residents along the transit and highway alignment by phone, email and in-person to share information and solicit comments. Owners of properties with potential impacts on bridge/transit/highway alignment have been offered one-on-one meetings with staff since the project began.

- *Neighborhood and community outreach.* The Program will maintain and build relationship with residents in neighborhoods in Portland and Vancouver directly affected by the project, as well as to social service and advocacy organizations that serve populations within the project area. Neighborhoods within the project area include the

following: (Portland) Hayden Island, Bridgeton, East Columbia and Kenton neighborhoods; (Vancouver) Esther Short, Arnada, Hudson's Bay, Shumway, Lincoln, and the Rosemere/Rose Village neighborhoods. The project team will continue to expand information sharing and coordination with Clark County and City of Portland neighborhoods and community and social service coalitions to ensure project emails and print materials receive wider distribution in the metropolitan region.

- *Environmental justice communities.* Outreach to environmental justice populations within the Program area and related organizations to provide information on project plans, potential impacts, and mitigation measures, as necessary.

7.2.4 Advisory Groups

The work of the Program's advisory groups will continue throughout the project development process. In late 2011, existing topic-based advisory groups will be concluded. Recruitment will begin to form a Bi-State Citizen Advisory Committee (CAC) that consists of two state-based 12-15 member subgroups. The Bi-State CAC will provide input on corridor and local improvements as the project advances from preliminary planning to refining designs for the corridor, bridge and local elements and pre-construction planning.

Previous advisory groups were active in earlier phases of project development. They have included:

- Task Force, 2005-2008
- Marine Drive Stakeholder Group, 2009
- Community and Environmental Justice Group, 2006-2009
- Vancouver Working Group, 2009
- Pedestrian and Bicycle Advisory Committee (2007-2011)
- Freight Working Group (2006-2011)
- Urban Design Advisory Group (2006-2011)
- Portland Working Group (2009-2011)
- Vancouver Transit Advisory Committee (2010-2011)

7.2.5 Outreach Materials

The materials outlined below are representative examples of the various information tools that are utilized on the Program. The form and content of outreach materials vary according to application and the target audience, including translated materials for predominant non-English languages spoken within the Program area.

- *Monthly email updates*

- *Website*
- *Fact sheets* (including translated materials)
- *Presentation materials* (including PowerPoint presentations, display boards, maps, slides or static displays)
- *Newsletters*
- *Advertising* (including display ads, web banner ads, postcards, posters and fliers)
- *Public comment forms*

7.2.6 Media Relations

Communications with media will be led by the director, who may appoint media spokespeople for the Program. Coordination with WSDOT/ODOT communications managers and other project sponsors will occur on an ongoing basis.

- *Reporter briefings and materials*. Members of the media will receive project briefings at key milestones. Press kits could include Program descriptions, graphics, timelines and key decision dates. The press kits will serve as a tool for the accurate and updated transmittal of new Program information and details.
- *Media releases.* Media releases will coincide with significant Program events and milestones, including public meetings, findings and decisions.
- *Editorial board briefings.* Editorial board meetings will be scheduled with a variety of publications within Clark and Multnomah Counties in an effort to inform the editorial boards and their reporters of the Program. A team of trained project staff will be formed to provide these types of briefings to the media.
- *Minority and small press.* Minority and neighborhood-based media will be kept informed about the Program through the distribution of press materials, reporter and editorial briefings and monthly email updates. Press releases will be translated as needed.

8. Program Delivery and Procurement

8.1 Overview

The delivery of the CRC Program will follow the framework developed during the PE phase to advance the Program post-NEPA – into final design and construction. The framework optimally divides the Program into separate and distinct functional project packages that meet broad technical and financial needs. The framework also identifies the delivery method (Design-Bid-Build, Design-Build, or General Contractor/Construction Manager) that optimally assigns roles and responsibilities for the performance of each project package activities – design and construction – and facilitates the optimal performance of these activities, with respect to the Program objectives.

Appendix D, *Project Implementation Plan (PIP),* describes the major procurements for final design and construction of the CRC Program. The plan identifies the preferred project packages; preferred delivery methods to perform the design and construction activities of each project package; procurement options (e.g. Best Value) to be utilized in combination with the delivery methods; the procuring agencies; and the procurement schedule.

The PIP builds on earlier work undertaken during preliminary engineering (PE) Phase, including the Bridge Review Panel, the Cost Estimate Validation Process (CEVP), Project Sequencing workshops (PIP Part I – Appendix Report), Constructability Review, Project Packaging and Delivery Method workshop (PIP Part II – Appendix Report), Construction Contractor Open House, and Construction Trade Survey Questionnaire. Two significant decisions that were discussed in the PIP are summarized below.

- **Columbia River Bridge – Type**

  A deck truss bridge type has been selected as the preferred design for the Columbia River Bridge. Earlier studies assumed an Open Web Box Girder design. In February 2011 a Bridge Review Panel recommended selecting a new bridge type from three options: composite deck truss, cable-stayed and tied arch to reduce schedule and construction risks. The CRC staff conducted an expedited review of the three bridge types and recommended to the governors a deck truss bridge type. The analysis presented to the governors considered cost, schedule, environmental impact, stakeholder commitments, and risk. The governors accepted the CRC Program recommendation of a deck truss bridge type for the Columbia River Bridge.

- **Columbia River Bridge – Delivery Method**

  A Design-Build delivery has been selected as the preferred delivery model for the Columbia River Bridge and its touchdowns (which are yet to be defined). An early evaluation of delivery models was conducted in the fall of 2010 (Part II – Appendix Report). It determined the design would be driven by the Open Web Box Girder connection details and testing to validate the design (before fabrication) and that this would introduce high cost and schedule risks under non-traditional delivery models. This early evaluation recognized the Design-Build model would optimize the delivery of the

Columbia River Bridge if design constraints associated with engineering details and testing of the Open Web Box connections were resolved. Since then, the deck truss bridge type has been selected as the preferred design. The Design-Build delivery has been selected as the preferred delivery model to increase schedule certainty, control cost growth, and provide the highest likelihood of timely opening of the bridge to start generation of tolling revenues and minimize impact to follow-on LRT Systems work.

Procurement of architectural/engineering (A&E) design services will comply with applicable WSDOT and Federal procurement rules.

Procurement of construction contracts, equipment and materials whether by sealed bid or by negotiation, will be governed by applicable WSDOT, ODOT or TriMet's contracting rules, and will be conducted in a manner that provides maximum open and free competition consistent with applicable state and federal procurement requirements.

WSDOT complies with FTA guidelines regarding "self-certification" from FTA in accordance with FTA Circular 4220.1E. All CRC staff involved in project procurements shall strictly comply with the governing requirements of the publications referenced in Appendix D, *Project Implementation Plan (PIP)*.

8.2 Program Delivery and Procurement Framework

The CRC Program framework for delivery and procurement of construction contracts addresses four key needs:

- **Project Sequencing Strategy** – that recognizes the changing economic realities and fits the anticipated cash flow.
- **Project Packaging Strategy** – that would optimally divide the Program into separate and distinct functional construction packages that meet broad technical, political, and financial needs;
- **Delivery Method Strategy** – that would optimally assign roles and responsibilities for the performance of each project package activities – design and construction – and facilitate the optimal performance of these activities, with respect to the owner's project objectives;
- **Procurement Strategy** – that is most suitable in combination with the delivery methods where evaluation and selection of contractors would optimally deliver each project package and would be based on price, technical qualifications, or on a combination of price, technical qualifications, time, and other factors.

8.2.1 Project Sequencing

Recognizing the changing economic realities, the CRC Team adjusted the Program's tolling financial projections to account for the depth and length of the current economic recession. The CRC Team also has been overlaying the sequencing of work activities (Transit and Highway) with anticipated cash flow. The goal is to have a Program implementation strategy that adapts to

available resources and fits into today's economic reality. The sequencing strategy road map that the CRC Team is currently evaluating would sequence the Transit and Highway work as follows:

- "***Early LPA Phase 1 Construction Activities***" – implement Transit and Highway work activities that extend light rail from the Expo Center to Clark College and complete the new Columbia River Bridges to start tolling revenue generation and operation of light rail; and

- "***Subsequent LPA Phase 1 Construction Activities***" – implement Highway work activities that would be implemented concurrent with or after construction of *Early Phase 1 Construction Activities*, depending on cash flow, to meet the CRC's Purpose and Need.

Table 8-1 is a summary of the sequencing of Transit and Highway work elements. The *Project Implementation Plan* (Appendix D) describes in details the sequencing of work elements to meet anticipated cash flow. The CRC Program will finalize the project sequencing strategy with input from the Management Executive Team and local partners based on cash flow projections. The CRC Program will also have this work reviewed by the interim legislative committees in both states.

Table 8-1 Sequencing of Transit and Highway Work Activities

Summary of "Early LPA Phase 1 Construction Activities":
Information under development

Summary of "Early LPA Phase 1 Construction Activities":
Information under development

8.2.2 Project Packaging

The project sequencing strategy informs the Program's framework for project packaging. Key factors influencing project packaging include: consideration of level of design, inherent risks, interdependencies, and schedule criticality for each project package*;* oversight required for multiple interfaces among packages; urban features and jurisdictional change along the alignment; financial cash flow; early packages to reduce schedule risks; separate packages for long lead items; separate packages for specialty work; maximize the opportunities for Oregon and Washington contractors to participate; and contracting opportunities for DBEs.

Appendix D, *Project Implementation Plan (PIP),* describes in detail the project packaging strategy and the assignment of project packages to three categories:

- Large Project Packages (Highway and Transit)

- Small / Early / Specialty Project Packages (Highway and Transit)
- Long Lead Project Packages (Transit)

Table 8-2 and Table 8-3 below each include a listing of the large and long lead project packages identified in the PIP, and corresponding contracting agency (for contract bid letting and contract execution.

Table 8-2 Large Project Packages

Project Packages	Contracting Agency
Information under development	

Table 8-3 Long Lead Project Packages

Project Packages	Contracting Agency
Information under development	

8.2.3 Delivery Methods

The Project Implementation Plan describes the delivery methods to execute the CRC Program delivery. This includes the following delivery methods:

- Design-Bid-Build (D-B-B),
- Design-Build (D-B), and
- General Contractor / Construction Manager (GC/CM).

The D-B and GC/CM delivery techniques provide opportunities for alternative methods of delivery along with the more traditional D-B-B method. The D-B method of project delivery allows the CRC Program to execute a single contract with one design-build entity ("Design-Builder") for the design, construction, and quality management necessary to deliver a completed project package. The D-B method can expedite schedules and, with proper planning and controls, save total project costs.

The GC/CM method enables the CRC Program to select contractors to perform work on the basis of a variety of selection factors in addition to price, such as experience in similar complex work, schedule performance, and cost control. The selection of contractors under the GC/CM delivery normally occurs after completion of the PE phase and allows the CRC Program to integrate value engineering into the Final Design phase thru maximum synergy between the "Designer" and the "Builder" to accomplish higher schedule and budget certainty.

Table 8-2 and Table 8-3 above (under development) include a listing of large and long lead project packages and the corresponding delivery method for each project package.

8.2.4 Procurement Strategy

The CRC Team is finalizing its procurement strategy for each highway and transit project package listed in the Project Implementation Plan during the PE phase. The procurement strategy for each project package is the most suitable in combination with the delivery method assigned to that package, meets the project schedule and budget, satisfies applicable federal and state procurement requirements, and results in the best value to the Program.

The CRC Program's procurement strategy recognizes three contract categories:

1. Architectural and Engineering (A&E) and Personal Services contracts
2. Construction contracts
3. Equipment, Material and Supplies contracts

Procurement of contracts in the three categories varies according to the type of goods or services, the estimated dollar value of the contract, market conditions, or other factors. The CRC Team will choose the method of procurement that will maximize competition and will result in the best value to the CRC Program.

The procurement for a D-B contract includes two steps: (1) the request for qualifications (RFQ), and (2) the request for proposals (RFP). The qualifications are basic in nature and are intended to confirm that a contractor has demonstrated ability to perform the required work. The proposals require greater focus on schedule, design innovation, project price and other selection factors. The RFP phase typically includes instructions to proposers, conceptual design and reports, general specifications and performance standards. Once selected based on best value (highest score), the Design-Builder will advance the design with allowance to start early construction on select work elements concurrent with other design activities.

The procurement for a GC/CM contract includes two steps: (1) the request for proposals (RFP), and (2) negotiation of a Guaranteed Maximum Price (GMP). The proposals step is to select a contractor based on a demonstrated ability to perform the required work, and a percent fee on the estimated maximum allowable construction cost and the fixed fee amount for the general conditions work specified in the request for proposal for the life of the project. The negotiations step is based preferably on a 100% completed design reducing the estimation involved in developing the GMP and to allow the contractor to lock in subcontractors. If the CRC Program is unable to negotiate a satisfactory GMP with the selected contractor, negotiations will be formally terminated and the CRC Program shall negotiate with the next highest scored contractor.

Laws and Policies Governing CRC Procurement Contracts

The CRC Program anticipates procuring Architectural and Engineering (A&E) services through WSDOT, ODOT, and possibly TriMet. These services would support preparing final construction documents for project packages delivered using the traditional D-B-B and GC/CM delivery models, prepare project configurations and specifications that support D-B procurements, and provide design oversight reviews on construction documents prepared under the D-B delivery model.. Procurement of architectural/engineering (A&E) design and construction services will comply with applicable state and Federal procurement rules.

The procurement of construction services, equipment and materials will be divided between WSDOT, ODOT and TriMet. Such procurements will be governed by applicable WSDOT, ODOT or TriMet contracting rules, and conducted in a manner that provides maximum open and free competition consistent with FTA Circular 4220.1F, Third-Party Contracting Guidelines, and the Department of Transportation 49 of the CFR Part 18, Employees' Code of Ethics. The CRC Program will provide administration oversight on all executed procurement contracts.

The CRC Program procurement practices will conform to applicable statutes and governing publications detailed in Appendix D, *Project Implementation Plan (PIP).* It is anticipated that FTA will audit WSDOT's compliance at the Triennial Procurement review.

Grantee's Self-Certification

WSDOT receives FTA funding for the Ferry Division as well as the Public Transportation Programs. Each year the WSDOT Public Transportation Division completes the annual self-certification by completing the certifications and assurances electronically. The certifications and assurances deal with a variety of compliance areas including procurement. Appendix D, *Project Implementation Plan (PIP),* includes a detailed listing of compliance areas covered under WSDOT's self-certification.

Architectural and Engineering (A&E) and Personal Service Contracts

The CRC Program will procure Architectural and Engineering (A&E) Services and Personal Service contracts by approval from the CRC Director. Personal Service contracts are used to obtain specialized services requiring formal training and technical experience. Personal Service contracts include, but are not limited to, contracts for Project Management Services (including construction management, estimating and scheduling assistance), and Legal Services.

The CRC Program will procure A&E and Personal services to supplement agency staff during the PE, Final Design, and Construction and Start-up (Transit) phases through one or a combination of the following options:

- Extensions to existing CRC A&E consultant agreements.
- Existing WSDOT Statewide On-Call Services Agreements.
- Selection of A&E consultants through WSDOT, ODOT and possibly TriMet procurement services using a Qualification Based Selection (QBS) process to support preparation of final design documents on project packages designated for D-B-B and/or GC/CM procurements.
- Selection of Design Builders through WSDOT or ODOT procurement services using a Best Value Selection (BVS) process to deliver construction ready plans and specifications for project packages designated for D-B procurement.

The procurement of A&E design and construction services for each project package will match the delivery method identified in the Project Implementation Plan. The CRC Program will utilize the procedures outlined in the applicable WSDOT Consultant Programs Division Procedures Manual (http://www.wsdot.wa.gov/Business/Consulting/ProceduresManual.htm), the ODOT Procurement Manual, or the TriMet Procurement Manual which set forth the minimum standards for procuring professional service contracts that CRC staff shall follow to ensure the CRC Program is compliant with state and federal laws.

WSDOT's Toll Division will directly contract on behalf of the CRC Program the planning, design development and procurement documents for the tolling facilities.

Construction Contracts

The CRC Program will follow applicable federal and state procurement rules and procedures of the agency advertizing and procuring construction contracts on behalf of the CRC Program for approved project packages listed in Appendix D, *Project Implementation Plan*. The CRC Team will draw upon existing best management practices from the procuring agency. The CRC Team anticipates implementing the following contracting strategy:

- WSDOT will execute one or multiple procurement contracts for the Main Bridge Elements including associated approaches in Hayden Island (Oregon) and SR 14 (Washington).
- WSDOT will execute procurement contracts for highway and transit construction in Washington.

- ODOT will execute procurement contracts for highway construction in Oregon.
- TriMet will execute procurement contracts for transit construction in Oregon, LRT Systems, Light Rail Vehicles and miscellaneous small transit contracts. WSDOT, as Grantee, will provide oversight on all executed contracts.

The CRC Program will coordinate with the procurement administrator of the agency responsible for publication of a specific CRC contract advertisement as described above. Contracts will be advertised on WSDOT's, ODOT's, or TriMet's electronic advertising system, as appropriate.

Table 8-2 and Table 8-3 above each include a listing of the large and long lead project packages identified in Appendix D, *Project Implementation Plan (PIP),* and corresponding contracting agency (for contract bid letting and contract execution).

Non Low-Bid Competitive Procurement for Highway and Transit Civil Work

Non low-bid competitive contracting techniques deviate from the competitive bidding provisions in 23 USC 112 or use a method of award other than lowest responsible bidder. They may include Design-Build (Best Value where price and other factors are considered in the selection process), General Contractor / Construction Manager (Qualifications-based bidding first, following by price negotiations), or modified Design-Bid-Build (e.g., A+B or A+B+C bidding where price and other factors are considered in the selection process).

CRC team members understand that state laws governing the use of non low-bid competitive procurement vary between the two states. Washington state law has special rules for alternative procurement, specifically allowing public agencies to become certified and use Design-Build (D-B) and General Contractor / Construction Manager (GC/CM) delivery methods. WSDOT is certified to use D-B and has implemented this alternative delivery on many projects using best value selection (price and qualifications) to select contractors. Washington's RCW 39.10.390 code requirements on GC/CM delivery are limiting for the highway construction industry (work performed and equipment and materials supplied by the prime contractor may not exceed 30% of the negotiated maximum allowable construction cost) and, therefore, GC/CM has not been used to date by WSDOT on highway projects.

In contrast, Oregon state law requirements on GC/CM procurement are less limiting for the highway construction industry with no maximum limit placed on work performed and equipment and materials supplied by the prime contractor, except as required to meet DBE goals. The rules governing non low-bid competitive procurement in Oregon include development of formal Findings of Fact for Exemption (FFE) from the competitive bidding requirements, publication of the availability of the findings, conducting a public hearing, adoption of the FFE by ODOT's Director (on work procured thru ODOT) or the TriMet Board (on work procured thru TriMet) consistent with Oregon Revised Statutes (ORS) 279C.335, and post-contract evaluation. Additionally, Oregon law permits use of best value selection (price and qualifications) with the traditional Design-Bid-Build (D-B-B) delivery, consistent with ORS 279C.335. Washington law, however, requires low bid procurement (best value is not allowed) with the traditional Design-Bid-Build (D-B-B) delivery.

It is the responsibility of the Project Delivery Director assisted by the Project Delivery Engineering Manager to prepare the necessary documentation to obtain approval for any non

low-bid competitive procurement that deviates from the competitive bidding provisions in 23 USC 112 or use a method of award other than lowest responsive bidder. They will ensure that the following is undertaken:

- For each Highway or Transit project package that ODOT or TriMet procures, respectively, using the non low-bid competitive procurement complete the following activities consistent with the requirements of ORS 279C.330 and .335:
    - Prepare the necessary documentation for the Findings of Fact for Exemption (FFE) from the competitive bidding requirements. Seek and obtain review comments from agency staff and the Department of Justice. Incorporate the review comments and advertize the draft FFE.
    - Prepare and publish Notice of Public Hearing in at least one trade newspaper of general statewide circulation a minimum of 14 days before the hearing.
    - Organize and hold a public hearing to accept oral and written comments on ODOT's or TriMet's draft findings in support of an exemption from competitive bidding.
    - Incorporate relevant comments or information obtained from the public hearing into the final FFE document. Prepare the documentation required for ODOT's Director of Transportation's or TriMet Board's adoption of the FFE.
- For each Highway project package that ODOT or WSDOT procures using the non low-bid competitive procurement:
    - Prepare the necessary documentation and seek FHWA approval under Special Experimental Projects (SEP-14).
- For Transit project packages that WSDOT procures using the non low-bid competitive procurement (e.g. GC/CM) complete the following activities:
    - (under development).

Light Rail Vehicle Procurement

The CRC Program will draw upon TriMet's success with Light Rail Vehicle Procurement on past projects. The light rail vehicle procurement will follow a competitive negotiation type process with WSDOT, TriMet, and C-TRAN coordinating and preparing a detailed Technical Specification and a Request for Proposals that TriMet would advertize on behalf of the CRC Program. An evaluation committee will review and score the proposals on a combination of technical factors and price, and establish a competitive range. In the second step, proposers in the competitive range will meet with the evaluation committee to explore ways to improve their proposed designs, and then submit Best-and-Final Offers. The evaluation committee will make a final selection using a combination of technical factors and price, including pricing of any options. This Best value procurement strategy to procure the vehicles will be performed thru TriMet's procurement system. The contract will include applicable federal procurement requirements. Details associated with the design manufacture of light rail vehicles will be finalized following a negotiated procurement.

Buy-America Requirements

The CRC Program evaluated the need to pursue a waiver from FTA's Buy America requirements for Girder Rail procurement. At the time of preparing this PMP update, the CRC Team has not identified any items that would require a waiver.

Equipment, Material, and Supplies Contracts

Equipment, materials and supplies will be procured through competitive low bid procurement, unless circumstances justify an alternative procurement method. Materials and equipment contracts include, but are not limited to, contracts for permanent materials and system components.

Procurement Schedule

The CRC Team will develop a critical path schedule that meets the Program's cash flow needs to advertise and procure construction (and design) services when the project packaging strategy and associated project packages are finalized.

Figure 8-1. Procurement Schedule – Under Development

[INSERT FIGURE]

This page left blank intentionally.

9. Labor Relations and Policy

9.1 Overview

[Update pending]

This page left blank intentionally.

10. Agreements, Permits, and Environmental Mitigation

10.1 Overview

The CRC Program encompasses two states, two cities, two county jurisdictions, and two Metropolitan Political Organizations (MPO's). It is subject to both Oregon and Washington regulations, as well as many federal requirements. Completion of the Program requires agreements between finance partners, agreements for services from some of these authorities, and permits from federal and state agencies some of which may include:

- Agreements between finance partners for delivery of project funds (State of Oregon, State of Washington, FTA, etc.).
- Agreements for design and construction services between partner agencies (ODOT, WSDOT, C-TRAN, and TriMet).
- Agreements for design support services from jurisdictions (cities of Portland and Vancouver).
- Permits related to rail and utility rights of way (Burlington Northern Santa Fe (BNSF), etc.).
- Federal and State permits such as the Clean Water Act Section 404, Section 9 & 10 of the Rivers and Harbors Act, and Clean Water Act National Pollutant Discharge Elimination System 402 (U.S. Army Corps of Engineers, Washington and Oregon state agencies, etc.).

The Specialty Services Manager is responsible to ensure that all agreements and permits (federal, state, local jurisdictions, rail and private utilities) are obtained within the timelines identified in the Program schedule. Various CRC staff will be tasked with day-to-day coordination of establishing agreements and negotiating permits. CRC staff from all disciplines will provide support within their areas of expertise.

The CRC Team has identified all agreements and permits, and established a tracking matrix to monitor progress with assigned responsibilities, and expected dates to execute necessary agreements and secure permits.

CRC Procedures 10.3A - Term Sheets Preparation and Approval and 10.3B - Agreement Development and Approval (*Public Entities*) each describe in detail the process for drafting, reviewing and approving term sheets and agreements, respectively, between the dot's, with partner agencies (TriMet, C-TRAN) and Local Jurisdictions (cities of Portland and Vancouver, and Metro and RTC).

10.2 Funding Agreements

The funding plan will be finalized towards the end of the PE phase and followed with execution of a bi-state agreement between the leading partners, WSDOT and ODOT. Detailed information on the current funding plan can be found in the capital finance plan for the CRC Program.

The bi-state agreement between the leading partners, WSDOT and ODOT, will be prepared in accordance with the WSDOT Agreements Manual (M 22-99.01, November 2009, Chapter 4: GCA Agreements – Agreements with Government Agencies) and as described in CRC Procedure 10.3B - Agreement Development and Approval (*Public Entities)*

10.3 Design Services Agreements

Negotiations between WSDOT, ODOT, TriMet, C-TRAN and local jurisdictions (cities of Portland and Vancouver) are on-going to define the process and fee structure for obtaining permits and services related to utility relocations and reconstruction, land use, construction management, inspections, street lighting, traffic engineering, parks, street trees, planning and plan reviews, fire permits, and all other permits/procedures required by the respective local jurisdiction.

WSDOT will negotiate separate agreements with partner agencies and local jurisdictions including, but not limited to:

- C-TRAN
- TriMet
- City of Portland
- City of Vancouver
- Metro
- RTC

The terms and conditions of such cost reimbursement agreements will be in writing, incorporate required FTA contract requirements, if using FTA grant funds, and identify the correct federal cost standards applicable to the work.

CRC Procedure 10.3A - Term Sheets Preparation and Approval and CRC Procedure 10.3B - Agreement Development and Approval (*Public Entities*) each describe in detail the process for drafting, reviewing and approving Term Sheets and agreements, respectively, with partner agencies (TriMet, C-TRAN) and Local Jurisdictions (cities of Portland and Vancouver, and Metro and RTC).

In general, the design service agreements establish a project manager from each agency who will act as the “point of contact” for the duration of the agreements. The agreements also establish the mechanisms by which partner agencies and local jurisdictions will accept improvements in their rights-of-way for local maintenance.

Partner agencies performing work for the CRC Program under executed design service agreements will submit invoices to the Agreements/IGA/Invoices Lead under the terms of the agreements. These invoices are subject to the same review and approval process as other contracts.

10.4 Federal and State Permits

Any project that has impacts to Federal and State managed or owned lands, waters or resources will require environmental permitting prior to construction. As discussed in detail below, the Environmental Manager is responsible for obtaining and tracking regulatory permits. Environmental Procedures Manuals from WSDOT and ODOT were used as guidance in producing this section of the PMP.

10.4.1 Regulatory Agency Coordination

As a bi-state project the CRC Program is subject to both Oregon and Washington regulations, as well as many federal requirements. The Project team worked with state and federal agencies to develop an effective approach for coordinating their involvement, and streamlining regulatory reviews and permits during the NEPA phase. The result is explained in the Interstate Collaborative Environmental Process (InterCEP) Agreement.

InterCEP allows the CRC Program to efficiently plan, design, and build a solution that successfully addresses the Program's goals and meets state and federal environmental regulations. The following regulatory agencies signed the InterCEP Agreement:

- National Marine Fisheries Service
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- Washington State Department of Ecology
- Washington State Department of Fish and Wildlife
- Washington State Department of Archaeology and Historic Preservation
- Oregon Department of Fish and Wildlife
- Oregon Department of Land Conservation and Development
- Oregon Department of State Lands
- Oregon State Historic Preservation Office
- Oregon Department of Environmental Quality

The main goal of this process is to ensure the project development team is aware of any potential concerns that could complicate the permitting process in the final proposed project. In addition, the project team engages in an ongoing dialogue with the necessary state and federal agencies prior to making major decisions. By getting concurrence and comments at key milestones, CRC can work toward reducing environmental impacts and avoid delays often associated with large scale projects.

InterCEP serves as a key advisory group to the CRC, providing formal feedback to the project development team at milestones including, but not limited to:

- Project Purpose and Need
- Screening Criteria for Alternatives
- Methods for analyzing impacts
- Range of Alternatives to carry into the DEIS
- Preliminary Draft EIS
- Draft EIS
- Biological Assessment
- Final EIS

According to the InterCEP Agreement, the contract terminates when a Final EIS and ROD have been issued for the Program. However, it is suggested the Signatory Agencies may use the collaborative framework as a model through the environmental permitting and construction.

10.4.2 Obtaining Federal and State Permits

The Environmental Manager is responsible for the day-to-day coordination of negotiating the permits with federal and state agencies to Program schedule. The Environmental Manager created during the PE phase a work plan outlining all necessary information to be submitted to obtain the permit and schedule for its submittal. The process for obtaining permits generally consists of a pre-application meeting, production of the necessary information for the permit, an application completeness review, submittal of additional information to complete the application, public notice/comment, agency review, public appeal period, applicant appeal period, and a post-appeal decision. The Specialty Services Manager is responsible for monitoring status to ensure timely execution of federal and state permits to Program schedule.

10.4.3 Federal Permits and Approvals

Some approvals were granted from federal agencies prior to publication of the FEIS or through the ROD on the FEIS. Some of which include:

- Air quality conformity determination in RTP and MTIP.

- National Historic Preservation Act Section 106 Memorandum of Agreement.
- Department of the Interior Section 4(f) Report - Formal approval for mitigation measures addressing impacts on historic resources and parklands will be outlined in the ROD.
- Biological Opinion – Federal Endangered Species Act, Magnuson-Stevens Act.

Various post-ROD environmental permits and approvals from federal agencies will be required. These permits will be obtained during the Final Design phase prior to construction:

- Clean Water Act Section 404 Permit
- Section 9 & 10 of the Rivers and Harbors Act
- Section 14 of the Rivers and Harbors Act
- Federal Aviation Administration 7460 Permit
- Marine Mammal Protection Act Letter of Authorization

10.4.4 State Agency Permits

Permits from both Washington and Oregon state agencies will be required regarding issues under their respective jurisdictions. These permits will be obtained during the Final Design phase:

- Clean Water Act Section 401 Certification (OR and WA)
- Clean Water Act National Pollutant Discharge Elimination System 402 Permit (OR and WA)
- Construction Stormwater 1200-C Permit - Oregon Department of Environmental Quality (OR)
- Construction Stormwater General Permit – Washington Department of Ecology (WA)
- Stationary Source Permit – (OR and WA)
- Hydraulic Project Approval (WA)
- Shoreline Management Act Permit (WA)
- Critical Areas Protection Permit (WA)
- Removal-Fill Permit – Oregon Department of State Lands (OR)
- Lease-Easement Application (OR and WA)

10.5 Other Permits and Agreements

Local jurisdiction permits will be required by the cities of Vancouver and Portland including land use permits and environmental reviews. Agreements with Burlington Northern Santa Fe (BNSF) railroad and utilities to relocate individual utilities are also required, as well as agreement with Multnomah County Drainage District (MCDD) to modify portions of the MCDD levee system. The Specialty Services Manager is responsible to monitor status and ensure timely issuance of all Project permits to Program schedule. These will be obtained during Final Design and include:

- Numerous land use permits from the cities of Portland and Vancouver to locate facilities. The Environmental Manager is responsible for coordinating preparation of land use permit application documents and securing approval from local agencies to Project schedule.

- Building permits from the Cities of Portland and Vancouver to build the CRC facilities. The Transit, Highway and Structures Managers are responsible for the coordination of securing Building permits from the cities to Project schedule.

- Demolition permits from the City of Portland for removal of the existing bridges. The Structures Manager is responsible for the coordination of securing the permits to Project schedule.

- Agreement/MOU with the BNSF railroad to locate the new grade-separated crossing of BNSF at the south end of downtown Vancouver, where the freeway bridge and light rail will pass over the freight tracks. The Structures Manager is responsible for the day-to-day coordination of securing the Agreement/MOU with the BNSF railroad to Project schedule. The agreement will reflect indemnification and operations and maintenance of the crossings. The WSDOT Utilities Manual (G:\CRC\CRC Workpaper Files\1.0 Project Management\CRC Project Controls Procedures\CRC Procedure Manual - 2011\2011 - Term Sheets\References\Utilities Manual.pdf), Chapter 3: Railroads, describes in detail the procedure for drafting, reviewing and approving the agreement with BNSF.

- Agreement/MOU with MCDD to modify the levee system. The Agreement/MOU specifics will be determined when design details are developed.

- Continuing Control Agreements will be established between each of the two state and their respective local jurisdictions whose right-of-way is necessary for the construction, operation, and maintenance of the new facilities. These agreements will establish the respective responsibilities of the jurisdictions and each state with regard to continuing control. CRC Procedure 10.3B - Agreement Development and Approval (*Public Entities*) describe in detail the procedure for drafting, reviewing, and approving Continuing Control Agreements. Agreements will be required between:

    - ODOT
    - WSDOT
    - City of Vancouver

  - City of Portland
  - C-TRAN
  - TriMet

- Utility agreements to relocate individual utilities in advance of CRC work in their area. The Utilities Lead with support from the Washington and Oregon State Attorney General offices is responsible for day-to-day coordination with utilities for preparation of permit documents and securing approval from each utility. CRC Procedure 10.3C - Agreement Development and Approval (Utilities) describes in detail the procedure for drafting, reviewing and approving agreements with utilities.

10.6 Private Utility Interface

Numerous private utility companies maintain facilities that will be affected by construction activities or permanent facilities. During PE, composite utility base maps were created based on information gathered in meetings with the individual utilities and other means. Preliminary relocation plans and schedules are being developed in consultation with the specific utilities.

During Final Design, the CRC Team will continue working with the individual utilities to agree on specific details establishing the impacts to the utilities' facilities. Each utility will be responsible to prepare relocation plans and relocate their infrastructure in advance of CRC work in their area.

The Utilities Lead is responsible for the day-to-day coordination with private utilities preparing relocation plans and ensuring utility relocation is completed to Program budget and schedule. The Specialty Services Manager is responsible to monitor status and execution to Program budget and schedule.

10.7 Environmental Mitigation

The CRC Program is scheduled to publish the FEIS on September 23, 2011, with the Record of Decision (ROD) expected in late fall of 2011.

The FEIS identifies specific measures to mitigate Program impacts. The mitigation measures address:

- Neighborhood impacts.
- Residential and commercial displacements.
- Property acquisitions.
- Public service impacts.
- Visual and aesthetic impacts.
- Noise and vibration impacts.

- Impacts to fish and aquatic habitat.
- Water quality impacts.
- Wetlands impacts.
- Geologic impacts.
- Hazardous materials.
- Construction impacts.
- Transportation impacts.
- Historic and archaeological resources impacts.
- Public parks and recreation areas

The Environmental Manager will coordinate with regulatory agencies and local jurisdictions to further develop appropriate mitigation measures. The commitments to mitigation measures are documented in the ROD. The Environmental Manager is responsible for monitoring the Program's compliance with those measures.

10.7.1 Tracking Environmental Commitments

This section outlines the processes used to track environmental commitments. Related procedures will be adopted by the Environmental Manager during Final Design and Construction phases.

The Environmental commitments are entered into a commitment tracking database matrix with the following information: FEIS references, a description of the measure, and the responsible party. Commitments that are the responsibility of the Contractor will be written in the contract provisions in language that is biddable by the Contractor, buildable in practice, and enforceable. Once responsibilities are assigned, the progress against each measure is tracked in the commitment tracking system. This ensures that the Contractor and the CRC staff clearly know their respective responsibilities and assures the permitting agency that the CRC is fulfilling its commitments. The tracking database matrix will be updated and submitted quarterly to the FTA.

Implementation of Environmental Commitments during Final Design Phase

The Environmental Manager is responsible for ensuring, during Final Design, that the environmental commitments are included in the design plans and contract provisions. The following steps will be taken to verify the fulfillment of environmental commitments in the Record of Decision, environmental permits, and other environmental approvals:

- The Environmental Permitting Specialist shall enter the environmental commitments into the commitment tracking database matrix, and regularly monitor compliance. The database matrix will function as the CRC's single point of environmental compliance tracking. The status of each environmental commitment will be updated regularly by the

Environmental Permitting Specialist and the database matrix submitted quarterly to the FTA.

- The Environmental Manager will determine at the beginning of Final Design the risk level for each environmental commitment. This risk level (low/moderate/high) is based on how likely it is for project design to violate environmental regulations or permit conditions. Risk is based on a number of factors, including, proximity to resource, sensitivity of resource, nature of work, etc.
- The Environmental Manager will meet on a regular basis with design staff to ensure coordination of design development with environmental commitments.
- The Environmental Manager will regularly review project designs to ensure that the environmental commitments continue to be incorporated into design documents.
- If surveying of property occurs during Final Design, the environmental resources that are at risk of impact should be fully delineated and surveyed.
- The Environmental Manager will proactively coordinate with the resource agencies to ensure early and constant communications of issues and requirements.
- As permits are acquired, incorporate any new environmental commitments described in permit terms and conditions into design plans and contract provisions.
- Design plan sets will include Environmental Compliance Plan and Environmental Compliance Notes plan sheets to identify sensitive areas, cross-referenced to environmental commitment type.
- The Environmental Manager will maintain constant contact with resource agencies and a working knowledge of environmental issues to ensure that the FEIS and permit commitments are addressed.
- The Environmental Manager will attend the pre-construction conferences and will present the environmental issues using the Environmental Compliance Plan, Environmental Compliance Notes and commitment tracking system as the basis.

Implementation of Environmental Commitments during Construction Phase

During the Construction phase, the CRC Program will use a proactive approach for monitoring and inspecting field work to help guard against environmental violations that could potentially introduce cost and schedule impacts. Requirements and procedures will be developed during Final Design and described in contract provisions. An outline of key requirements and procedures during the construction phase follows:

- Require the Contractor to prepare and submit an Environmental Compliance Plan.
- Include a listing of Environmental Commitments in the construction contract.
- Designation of the party responsible for acquiring permits to be described in detail in the contract provisions.

- Include a listing of permits conditions in the contract provisions.
- Develop record keeping and reporting procedures that CRC staff will use during Final Design and Construction phases.
- Include requirements for environmental protection training for the Contractor's staff and subcontractors before field work begins.
- Include a requirement that the Contractor shall submit, before field work begins, required environmental plans for review by the Environmental Manager.
- Develop procedures for permit modification during construction, if deemed necessary, including strategies for guarding against cost and schedule impacts while still acting as a good steward to the environment.
- Continue updating the commitment tracking database matrix with quarterly reporting to FTA.
- Monitor Contractor activities that may affect the environment.
- Coordinate CRC's environmental monitoring staff's daily activities with the CRC's Construction Team.
- Identify fluctuating work schedules among the environmental monitoring staff members to ensure constant coverage of field activities that may affect the environment.

11. Safety and Security

11.1 Overview

WSDOT, ODOT, and partnering transit agencies, TriMet and C-TRAN will strive to design and build a safe and secure multimodal project that delivers the needed highway and LRT improvements to the growing Vancouver and Portland metropolitan areas. Safety (and security) is a value that affects all levels of the highway and transit activities, including planning, design, construction, testing, and operations.

Safety is not optional. All CRC Program staff and contractors are charged with the responsibility of following applicable safety and health standards of the State Department of Labor and Industries or other regulatory agencies. It is the responsibility of every CRC Program staff to provide for workplace safety utilizing safe work practices, employing applicable WSDOT or ODOT standards and procedures regarding public safety in work zones, and for providing a cooperative working environment for all fellow CRC staff. Prompt reporting of unsafe conditions, incidents and accidents, and discriminating or harassing behavior is required to their immediate supervisor and/or the applicable safety office or Office of Equal Opportunity (OEO) representative.

The CRC Program established the Safety and Security Committee during the PE phase to develop, implement, and administer a comprehensive and integrated safety and security program in compliance with the requirements of Federal Transit Administration (FTA) Circular C5800.1. The committee is made up of representatives from WSDOT, ODOT, C-TRAN, and TriMet that are part of Fire, Life, Safety. Appendix G, *Safety and Security Management Plan*, details the specific strategies to identify, prevent, and control hazardous conditions affecting LRT elements of the CRC Program, its customers, and those who come in contact with it.

11.2 Risk Control (Safety)

WSDOT and ODOT are committed to the safety of their employees. Providing CRC staff (both agency and co-located consultant staff) a safe environment in which to work is WSDOT's and ODOT's top priority. CRC staff operating at CRC offices in Vancouver, WA is covered by the policies and procedures in the WSDOT *Safety Procedures and Guidelines Manual* (http://www.wsdot.wa.gov/publications/manuals/fulltext/M75-01/Safety.pdf), and other related policy documents. CRC staff operating in the field is covered by the applicable WSDOT *Safety Procedures and Guidelines Manual or* ODOT Safety *and Health Manual* depending on location of field work in Washington or Oregon, respectively.

11.2.1 Office Safety

The following is a site specific building evacuation plan that describes steps to be performed by all CRC staff and visitors immediately when a fire alarm is activated at the CRC office in downtown Vancouver.

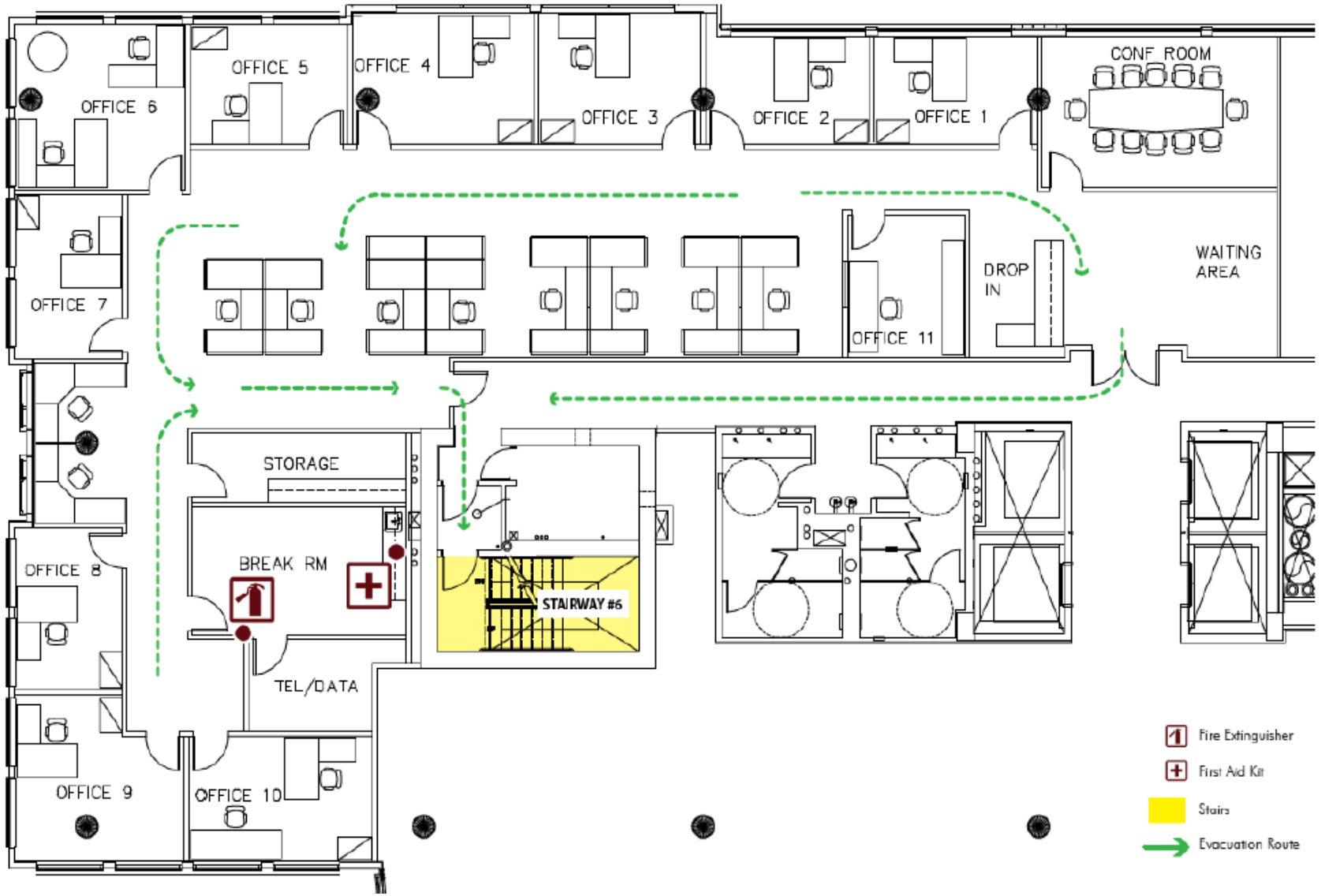
CRC Building Evacuation Plan

- All CRC staff and visitors must evacuate the building immediately when a fire alarm is activated, using the north and south stairwells. Do not use the elevators. (See Figure 11-1 and Figure 11-2 below for a diagram of the evacuation plan.)
    - The egress map in the elevator lobby shows the direction to the two stairwells from the lobby.
        - ✓ Stairwell #6 is the north stairwell, just north of the bathrooms.
        - ✓ Stairwell #7 is the south stairwell, just south of the lunchroom.
    - The two doors to the elevator lobby will automatically be unlocked in case of emergency.
    - For those with a disability, please wait at the landing area of the two stairwells for assistance to go down the stairs.
    - Two designated sweepers will walk around the office to ensure that all CRC staff has evacuated the office. The sweepers shall take the visitors log, a copy of the staff roster, and CRC emergency contact list with them to the designated meeting area (see below).
    - All visitors must sign in and sign out on the visitors' log at the front desk. CRC staff shall be responsible for escorting their visitors out of the building.
- Proceed to the first floor (street level) and exit the building.
- All CRC staff and visitors are to meet at the designated meeting area, which is the gazebo in Esther Short Park, located just south of 8th Street and just west of W. Columbia Street (across the street from Starbucks – 1 block west of Vancouver Center). The designated sweepers will meet with all evacuees and conduct a head count in this waiting area. Do not leave this waiting area until you have been authorized to do so by the designated sweepers.
    - The key contact for WSDOT is Keith Daly (the alternate is Ray Barker). The key contact for ODOT is Aaron Myton (alternate is Marilyn Webb). The key contact for the consultants is Dann Horowitz (alternate is Lyn Wylder). For TriMet, the key contact is Steve Witter and for C-Tran the key contact is Wesley King.
    - The designated 3rd floor sweepers, Keith Daly and Devin Reck, will meet with key contacts of WSDOT and ODOT to conduct head counts.
    - The designated 2nd floor sweepers, Lynn Rust and Frank Green, will meet with key contacts of WSDOT and ODOT to conduct head counts.

Figure 11-1. Third Floor Evacuation Plan

This page left blank intentionally.

Figure 11-2. Second Floor Evacuation Plan



This page left blank intentionally.

11.2.2 LRT Safety and Security Verification

The CRC Program developed the Safety and Security Management Plan (SSMP) that lays out strategies to identify, prevent, and control hazardous conditions affecting the LRT elements of the CRC. The SSMP describes the integration of safety and security activities to reduce the potential for incidents and accidents and increase the efficiency of LRT operations. It establishes accountability and responsibility for safety and security during each CRC phase – preliminary engineering through start-up, integrates the safety and security functions and activities throughout the CRC, C-TRAN, and TriMet's organizational structure, and identifies parties responsible for operating and maintaining the CRC's LRT facilities and equipment. The Transit Manager, assisted by the Transit Safety and Security Lead is responsible for implementing the SSMP in collaboration with the TriMet's Director of Safety and Security and C-TRAN's Director of Operations. The draft SSMP was reviewed by the PMOC, and comments have been addressed and incorporated in the September 2011 update.

Preliminary Hazard Analysis (PHA) and Threat and Vulnerability Analysis

The Transit Manager is responsible to ensure that a Hazard Analysis (HA) and a Threat and Vulnerability Assessment (TVA) are conducted during the Final Design phase. The PHA and TVA will incorporate the elements of the FHWA Threat and Vulnerability Analysis for both states, Oregon and Washington. The analyses will help determine security enhancement needs for the new main river crossing, at new station locations, and park-and-ride facilities. Once the PHA and TVA risk level (criticality) matrices have been developed, the Transit Design Manager shall track their respective items through design, construction and startup for resolution. Details of the Preliminary Hazard Analysis (PHA) and Threat and Vulnerability Analysis process can be found in Appendix G, *Safety and Security Management Plan*.

Safety and Security Certification

The Transit Safety and Security Lead will coordinate with TriMet's Director of Safety and Security and C-TRAN's Director of Operations the development of Certifiable Elements, Certifiable Items Lists (CILs) and conformance checklists, followed by verification of design conformance, construction conformance and operational conformance, including Certificates of Conformance for each Certifiable Element as completed. Details of the design safety and security certification procedure, including Design Criteria Verification, Testing/Inspection Verification, Hazard and Vulnerability Resolution Verification, Operational Readiness Verification, are included in Appendix G, *Safety and Security Management Plan*.

11.2.3 Highway Operational Safety

The CRC Program encompasses the states of Washington and Oregon and is subject to applicable DOT's safety requirements depending on work zone location. CRC staff (both agency and consultant staff) in the field will be routinely exposed to a variety of hazards. They must take adequate safety precautions at all times. The following items represent common activities that CRC staff may encounter, and should be addressed in pre-activity safety plans, as needed.

- When traffic control measures are necessary, approved Traffic Control Plans (TCPs) should be used in conformance with the *Manual on Uniform Traffic Control Devices,* as adopted by WSDOT or ODOT. CRC staff should ensure that the appropriate TCP is used and that the necessary signs, devices and equipment are available.

- Parking of CRC vehicles too close to the path of construction equipment, behind standing equipment, or in other hazardous locations is not permitted.

- Where traffic is maintained in work zones, care must be taken to avoid approaching traffic when it is necessary for CRC staff to step onto or cross the traveled portion of the roadway. Whenever possible, work activities, ingress and egress, should be conducted within the relative safety of the work zone.

- CRC staff working on foot in the highway right of way and other areas exposed to vehicular traffic must comply with the high visibility clothing requirements of the applicable WSDOT *Safety Procedures and Guidelines Manual* or the ODOT Safety *and Health Manual*.

- Where CRC staff is working adjacent to traffic, without positive barriers, the work area should be marked with proper signs and traffic control devices as shown on the appropriate Traffic Control Plan (TCP). CRC staff should use a spotter as needed.

- When CRC staff is working under the protection of the Contractor's flaggers and signs, other signs may not be needed. Good communication with the Contractor and Flagger is needed to ensure that they are aware of CRC staff activities within the work zone.

- A survey crew is typically exposed to traffic hazards and should conduct survey work under approved TCPs from the applicable WSDOT's *Work Zone Traffic Control Guidelines* or ODOT's *Oregon Temporary Traffic Control Handbook.*

- CRC staff shall ensure that an area is safe before entering it for the purpose of inspection. For example, a deep trench must be adequately shored and braced before entering it.

- Aggregate production and material processing plants should be inspected for safety hazards. Corrective measures should be called to the attention of the Contractor or producer. Corrections must be completed before CRC staff will be permitted to proceed with entry or work upon the premises.

- CRC staff must, at all times, watch for backing trucks and not depend upon hearing alone for warning. The noise of plants and other equipment often make it impossible to hear trucks approaching and the truck driver's vision area is restricted when backing a truck.

- When CRC staff is injured during field work to the extent that the services of a doctor are required, the Safety Manager, and applicable WSDOT or ODOT Regional Safety Officer shall be notified immediately.

11.2.4 Incident Reporting during Field Work

The CRC Procedure 11.2.4 - Field Incident Notification - Internal Staff describes how information is distributed to appropriate CRC managers in the event of an incident during field work. Each CRC field crew has a plan that includes safety and notification information related to situations which could emerge during their field work. CRC field crews are responsible for notifying any necessary permitting, regulatory or other responsible agency as dictated in their scope of work. CRC field crews are also responsible for notifying the Safety Manager, CRC in-office field staff for internal distribution of information, Communications Outreach Manager, CRC Director and Deputy Director.

11.2.5 Construction Safety

General

Contractors doing work for the CRC Program must provide safety controls for the protection of life and health of the Contractor's employees and other persons, for the prevention of property damage, and for the avoidance of interruptions in the performance of the work under each CRC executed construction contract. WSDOT, ODOT or TriMet, as contracting agencies, represented by CRC staff performing day-to-day contract administration have the responsibility for enforcement of the provisions of each CRC construction contract, however, provisions and regulations which are by law the fundamental responsibility of other agencies, both from the standpoint of interpretation and enforcement, should be monitored by CRC staff, but with full recognition as to the responsibilities and authorities of those agencies. The Project Delivery Director, Project Delivery Engineering Manager, and Project Engineers (Resident Engineers) with support from the Safety Manager will cooperate fully with the responsible agency.

Any violations noticed by the Project Delivery Director (or representatives) will be brought to the attention of the Contractor for correction. The Project Delivery Director(or representatives) will also notify the responsible agency (if that action is deemed necessary) and utilize such sanctions as are consistent with contract terms in assisting the responsible agency in enforcing laws, rules, and regulations.

Pre-Contract Preparation

- The CRC field staff shall review contract plans and contract provisions to identify those aspects of the work meriting special attention from the standpoint of potentially dangerous types of work and hazard elimination.
- The CRC field staff shall review the project site to identify those aspects of the location that present hazards such as limited sight distance, confined spaces, difficult terrain, extreme temperatures, illegal encampments, or exposure to biological and physical hazards associated with animals or humans.
- The CRC field staff shall review and become familiar with the requirements of the LRT Construction Safety and Security Manual (CSSM), developed during the Final Design phase and included as part of the contract provisions on Transit contracts.

Preconstruction Duties

As part of the Preconstruction Meeting, the Contractor's safety program should be discussed. Some key items that the CRC Delivery Manager, or representative, should highlight include:

- The contractual obligation of the Contractor for complying with State and Federal construction safety standards.
- The availability of the safety standards that apply to the contract including the LRT Construction Safety and Security Manual (CSSM), if applicable.
- The Contractor's site specific Construction Safety and Security Plan (CSSP), if applicable, must be submitted for review before any physical work on LRT contracts will be allowed.
- The accident prevention program of the Contractor — organization, staff, names of responsible individuals, meetings, training, reports, etc. A review of specific areas for which plans are required (especially those also affecting CRC field staff). These might include Fall Protection, Confined Spaces, Respirators, Hearing, and Hazardous Materials plans. Implementing a mechanism for employees to report "near misses" and/or work zone accidents.
- The Contractor's responsibility for seeing that subcontractors comply with safety regulations.
- The Contractor's plans for meeting specific safety requirements and for eliminating potentially critical hazards on the project for all Contractor employees, CRC field staff, and the public.

Project Engineer (Resident Engineer)'s Role in Safety on the Program

It is difficult to generalize about safety. It's a judgment call which is dependent on risk, knowledge, authority to direct corrections, etc. As people, professionals and representatives of the states of Washington and Oregon, the Project Engineers (Resident Engineers), as representatives of the Project Delivery Director, and their supporting field staff have an obligation to take action if they become aware of a situation that presents an immediate threat. CRC Procedure 11.2.4 - Field Incident Notification - Internal Staff describes to CRC field staff the internal lines of communication and the process for alerting the responsible agencies, Safety Manager and Project Delivery Director with regard to serious safety hazards.

CRC field staff will be made aware that the Contractor is obligated to make the work-site safe, to their satisfaction, for inspection activities. CRC field staff uncomfortable with access for inspection will inform the Contractor of the situation and expect resolution. CRC field staff will also be made aware of project specific hazards and trained in specific areas as the work zone warrants. For example; fall protection and confined space requirements. The Safety Manager is responsible to ensure that each CRC field staff has the proper safety training.

CRC field staff will be made aware that the construction contract requires the Contractor to perform any measures or actions the Project Engineer (Resident Engineer) may deem necessary

to protect the public, and that the Project Engineer (Resident Engineer) may suspend work if the Contractor fails to correct unsafe conditions. Additionally, they will be made aware that Transit contracts require the Contractor to perform specific job hazard analysis (JHA) for Transit construction activities and to submit these JHAs to the Project Engineer (Resident Engineer) for review and comment. CRC field staff will continuously monitor the Contractors' work activities for potential violations of legal safety requirements, and for any condition that poses an immediate threat to the health of any person. CRC field staff will immediately notify the Contractor upon becoming aware of any such condition.

11.2.6 Transit Operations and Maintenance Personnel Training

The Transit Manager is responsible for ensuring that qualified LRT operations and maintenance personnel are trained and have the resources needed prior to taking maintenance and operational responsibility of the new CRC facilities and line. A timeline for when resources should be hired and their training needs completed by will be developed during the Final Design phase, including specific job classifications and numbers of personnel that will be required in each. This information will be included in the Safety and Security Management Plan update submitted with the Program's FFGA application. Details of the training program are included in Appendix G, *Safety and Security Management Plan*.

11.2.7 Transit Emergency Plans, Rules, and Procedures

The Transit Safety and Security Lead will coordinate with TriMet and C-TRAN the update of their existing Security and Emergency Preparedness Plan (SEPP) during the Final Design phase and succeeding phases. The updates generally occur on an annual basis in accordance with agency commitments contained within the SEPP, with consideration for, and acknowledgement of the CRC Program, as appropriate.

The Transit Safety and Security Lead will ensure that TriMet and C-TRAN develop new plans, rules, and procedures to close any gaps that may exist in the updated materials. New and updated procedures will be included in training programs for the effected personnel. Emergency responders that could be involved in a response to an incident involving the CRC's LRT alignment will also receive familiarization training of the alignment, vehicles, right-of-way equipment, and emergency procedures. Unique areas of the alignment will be given special attention to ensure response protocol and procedures are developed for those particular areas. Details are included in Appendix G, *Safety and Security Management Plan*.

This page left blank intentionally.

12. **LRT Design**

12.1 **Overview**

This section summarizes the design requirements, design management, and design activities for the Transit portion of the CRC Program. The definition of “Design” function will normally vary by delivery method used to execute the project packaging strategy discussed in Chapter 8 of this PMP. The "Design" function discussed in this chapter is defined as follows:

- Preliminary engineering (PE) and Final Design phase activities (including system integration) in support of developing procurement documents (100% plans, specifications and bid values) to select a contractor(s) to build specific portions of the Transit elements of the CRC Program under the traditional Design-Bid-Build (D-B-B) delivery model.

- Preliminary engineering (PE) and Final Design phase activities (including system integration) to support negotiating a Guaranteed Maximum Price (GMP) lump sum price agreement with the contractor selected at the start of the Final Design phase to build specific portions of the Transit elements of the CRC Program under the General Contractor / Construction Manager (GC/CM) delivery model; and

- Conceptual engineering activities (varies from 10 to 30% level design) during the PE phase to support preparation of the project package configuration and related procurement documents, and the selection of a Design-Builder using Best Value procurement to build specific portions of the Transit elements of the CRC Program. This definition applies to the Request for Qualifications (RFQ) and Request for Proposals (RFP) phases of the Design- Build (D-B) delivery model.

Chapter 14 - Design Oversight For Design-Build Delivery discusses in details the Design Oversight post-selection of a Design-Builder to ensure satisfactory development and management of work plans, products conform to the “Design Work” portion of executed D-B contracts, satisfactory compliance with the design deviation process, and verifying Design-Builder compliance with design QC and QA requirements.

The CRC Transit Team (agency and consultant staff) will manage Transit design activities toward minimum feasible costs for design, construction, capital facilities, operating expense, minimum energy consumption, and minimum disruption of local facilities and communities. The design shall be consistent with maximum passenger safety, system reliability, service comfort, mode of operation, type of LRT vehicle to be used, sustainability and ease of maintenance.

12.2 **LRT Design Requirements and Standards**

The Transit Team has prepared a Transit Design Criteria Technical Memorandum that defines applicable design standards, technical requirements and design references for the LRT portion of the CRC Program. The criteria leverages TriMet’s extensive design experience on several LRT extensions completed and opened to service in the Portland metropolitan area, and reflects lessons learned on previous work as well as industry advances. The CRC’s Transit Design

Criteria Technical Memorandum establishes the basic criteria to be used in the design of the LRT system and facilities and will take precedence over other existing design standards which may have been used on other LRT projects prior to the CRC Program.

The Transit Team has updated the Transit Design Criteria during the PE phase, and will update individual design criterion on an as-needed basis during the Final Design phase. The Transit Design Manager maintains the Transit Design Criteria throughout the life of the project. The Transit Design Manager shall coordinate with the Systems Manager any necessary updates with input from the Civil, Park-and-Ride, Vehicles, Signals, Communications and TES/OCS Engineering Managers. Updates to the criteria will be documented as described in CRC Procedure 12.2 - Design Criteria Approval and Modifications. The Transit Manager, with concurrence from the Deputy Transit Manager, shall approve any updates to the design criteria in writing, before it can be used in the design. In addition, drafting standards have been prepared to standardize and guide design activities and preparation of contract documents.

The CRC Transit Design Criteria covers the following LRT work elements:

- Civil Engineering
- Small Buildings
- Track Geometry and Trackwork
- Parking Facilities
- Utilities
- Sustainability
- Landscaping
- Public Art
- Stations
- Electrical System
- Noise and Vibration
- Structures Arts and Amenities
- Fare Collection
- Light Rail Vehicles
- Clearances
- Operations Facilities
- Bus Facilities
- Traction Electrification
- System Security
- Signal System
- Elevators
- Communications
- Lighting
- Stray Current/Corrosion Control
- Amenities
- Light Rail Crossing Safety
- Signage and Graphics

The Transit Team shall prepare drawings and technical specifications for each LRT project package designated for delivery under the traditional D-B-B or the GC/CM method in accordance with the design requirements in the Transit Design Criteria Technical Memorandum as follows:

- Within the State of Oregon, LRT design will be governed by the TriMet Design Criteria (Revised June, 2010) with the exceptions documented in the most current CRC Transit Design Criteria Technical Memorandum (May 2009).

- Within the State of Washington, LRT design will be governed by the TriMet Design Criteria (Revised June, 2010) with the exceptions documented in the most current CRC Transit Design Criteria Technical Memorandum (May 2009).

- Structural and seismic LRT bridge design related to the Main River Crossing and the Vancouver Touchdown Bridge (from the northern interface with the Main River Crossing

to the north) will be governed by the WSDOT Bridge Design Manual (BDM) and Geotechnical Design Manual (GDM), and the AASHTO Guide Specifications for Load Resistance Factor Design (LRFD) as modified by the most current CRC Structural Design Criteria for the River Crossing Report (May 2008).

- Structural and seismic LRT bridge design related to the Hayden Island and North Portland Harbor structure (from the southern interface with the main river crossing to the south) will be governed by the TriMet Design Criteria (Revised June, 2010).

Deviations from the approved Transit Design Criteria may be made in particular situations. The Transit Design and Systems Managers shall each identify, explain, and justify any deviation from established design criteria in their respective areas.

CRC Procedure 12.2 Design Criteria Approval and Modifications describes in details the process to modify and receive approval for design deviations from established CRC Design Criteria. This includes approval by the Transit Manager, with concurrence from the Deputy Transit Manager, of any design deviation in writing, before it can be included in the design.

12.3 LRT Design Management

The CRC Program has developed a project implementation strategy summarized in Chapter 8 - Program Delivery and Procurement of this PMP and discussed in detail in Appendix D, *Project Implementation Plan*. The Project Implementation Plan divides the LRT portion of the CRC Program into separate and distinct project packages. It also identifies the delivery method that would optimally assign roles and responsibilities for the performance of each project package activities – design and construction. During PE and Final Design, the Transit Manager will oversee all activities of the Transit Team including track and systems engineering, parking garages, station design, LRT vehicles procurement, signals and communications, and equipment installation and testing. The Transit Manager will be assisted by the Deputy Transit Manager and supported by the Transit Design and Systems Managers who oversee:

- The day-to-day conceptual engineering activities to support preparation of the project configuration and procurement documents for any Design-Build procurement package(s), and

- The production of the LRT final design plans including production of construction documents for all other Transit improvements.

Civil Engineering Managers for Oregon and Washington Transit packages and a Small Contract (Transit) Manager will report to the Transit Design Manager and lead the preparation of final design plans in their respective work areas to approved scope, schedule and budget.

A Park-and-Ride Delivery Engineer will lead the preparation of conceptual plans for the Parking Garages to support any D-B procurement, or to prepare final design plans if D-B-B procurement.

The design managers for Vehicles, Signals, Communications and TES/OCS will report to the Systems Manager and lead the preparation of final design plans in their respective work areas to approved scope, schedule and budget. Appendix A, *Technical Capacity and Capability Plan,*

discusses in detail the design management organization of the CRC Transit Team during the Final Design phase.

12.4 LRT Design Execution

Transit design execution encompasses preliminary engineering (PE) and Final Design phases. The PE phase is part of the project development phase, and through this process several design alternatives were developed and analyzed, the project definition was determined, and the environmental documents (DEIS and FEIS) were prepared.

The PE phase also includes developing the project configuration and procurement documents to support issuance of the Request for Qualifications (RFQ) and Request for Proposals (RFP) to select a Design-Builder for any project package designated for D-B delivery, and developing procurement documents to select a contractor for GC/CM delivery.

The Final Design phase is the process to develop 100% design plans and specifications for Transit project packages designated for D-B-B or GC/CM delivery.

Chapter 14 - Design Oversight For Design-Build Delivery discusses in details design oversight post-selection of a Design-Builder.

12.4.1 LRT Preliminary Engineering

The goal of the PE phase is to define all transit work elements sufficient to “freeze” the design and establish the project definition prior to entering the final design phase. The preliminary engineering design of transit work elements was developed to the generally accepted industry standard level of PE phase design of approximately 30%. Because the ultimate project cost was also determined by the completion of the PE phase, emphasis was placed on development of the elements that may be of the highest inherent risk in order to minimize cost uncertainties. The scope of the PE design effort and the corresponding milestones and deliverables are described in the contract documents with the design consultants.

During the PE phase, the preparation of the FEIS was also in progress requiring close coordination between preliminary design and environmental efforts. Upon successful completion of the FEIS, the FTA awards a Record of Decision (ROD), which allows the project to move into final design. At the conclusion of the PE phase, the following had been determined:

- Project definition that establishes the baseline scope, baseline schedule and baseline budget, including a WBS structure;
- Existing conditions of the proposed site for the project including geotechnical conditions, utilities, hazardous materials and archaeological conditions;
- Type, Size and Location of all major structures;
- Limits of cuts and fills, and right of way impacts including a complete breakdown of partial and full takes;

- Conceptual design report to support the CRC's application to FTA to enter into Final Design;
- PE drawing set;
- Prepared project configuration and procurement documents to support issuance of the Request for Qualifications (RFQ) and Request for Proposals (RFP) to select a Design-Builder for any project package designated for D-B delivery;
- Developed procurement documents to advertise and select a contractor for any project package designated for GC/CM delivery;
- Identification of and mitigation strategies for environmentally sensitive areas;
- Updated and fully integrated master project schedule;
- Updated the cost estimate for each Transit project package to carry forward for the remainder of the Program;
- Updated design criteria and standard drawing and specification templates;
- Developed a Risk and Contingency Management Plan (RCMP) that includes primary and secondary mitigation activities to address Transit-related Program risks;
- Updated the Project Management Plan that meets the approval of the FTA and provides clear direction on agency policies and procedures to enable capable management of final design and construction phases.

12.4.2 LRT Final Design

The goal of the Final Design phase is to elevate the preliminary plans to 100% level of design, refine project quantities, identify bid items for all work activities reflected in the 100% plans, prepare special contract provisions, and assemble biddable documents to:

- Advertize specific project packages for the purpose of selecting contractors to implement Transit project construction under the D-B-B delivery; and
- Support negotiating a Guaranteed Maximum Price (GMP) price agreement with the contractor selected at the start of the Final Design phase to implement Transit project construction under the GC/CM delivery, if any.

The Transit Manager assisted by the Deputy Transit Manager and supported by the Transit Design Manager and the Systems Manager will oversee preparation of contract bid documents including plans and specifications for Transit project packages identified for D-B-B and GC/CM delivery, if any. During the Final Design phase, the Transit Team will:

- Control the scope, schedule, cost and quality of the transit work;
- Coordinate regular design reviews and incorporate input from the GC/CM contractor as final design progresses on any project package identified for GC/CM delivery. Develop

an independent cost estimate at the end of Final Design and negotiate with the GC/CM contractor a Guaranteed Maximum Price (GMP) price agreement;

- Manage formal transit design reviews at prescribed milestones and to Design Review procedures discussed in Appendix H, *Quality Control Plan (QCP)*;
- Manage the deviation from approved design criteria and standards and ensure the traceability of scope, schedule and budget against the project definition;
- Implement procedures related to quality assurance and quality control, design reviews, constructability reviews, VE studies, and changes to in-progress designs.
- Manage, review and approve the packaging of transit construction and procurement contracts, their scopes, sequencing, schedules and interfaces;
- Manage, review and approve each set of transit contract bid documents including plans and specifications;
- Assist the Agreements/IGA Lead in developing third-party agreements and related relocation designs for impacted facilities and systems;

12.4.3 LRT Drawing Management

The CADD Manager will oversee the drawing management system for the project's transit drawings. Detailed procedures for accessing and managing the development of Architectural and Engineering drawings that are controlled documents are described in CRC Procedure 12.4.3 - ProjectWise Architectural and Engineering Drawing Management. The CRC designers and technicians will comply with established ProjectWise procedures for preparing and delivering electronic engineering data for Transit project packages. The Transit Design Manager and the Systems Manager are expected to manage CRC's transit designers and technicians to established protocols and procedures.

The QA/QC Manager will perform periodic audits of the drawing management process, the as-built drawing process, and on performed design work.

12.5 LRT Design Control

A critical element to successful delivery of PE and final design phases is ensuring that the design criteria and other specified requirements including requirements of the relevant regulatory agencies are met. The CRC Team shall give important management considerations to the following design control activities: design coordination, design reviews, value engineering, constructability reviews, operations and maintenance reviews, system integration, peer reviews, and reliability and safety.

12.5.1 Design Coordination

The Transit Team will institute regular internal design coordination meetings and coordinate closely with partnering local jurisdictions, advisory groups established during the preliminary

design phase, and third party stakeholders to communicate project information and work through final design issues.

Internal Coordination

The Transit Team will hold internal design coordination meetings during the PE and Final Design phases to discuss project issues, review design production progress, project schedule and upcoming delivery milestones. These meetings are the responsibility of the Transit Design Manager.

The Transit Manager and Deputy Transit Manager attend weekly task managers meetings to discuss interface issues between transit, highway and bridge design functions, to coordinate with the Project Controls Manager on schedule, budget and scope interface issues, and to coordinate with the Communications Outreach Manager on upcoming public meetings. Design meetings will be held weekly with the contractor during Final Design of any project package identified for GC/CM delivery to maximize CRC design staff and contractor synergy.

Local Jurisdictions Coordination

Local jurisdictions (cities of Portland and Vancouver) involved in the project will be invited to participate in regularly scheduled external coordination meetings attended by the CRC's transit staff to discuss various project issues, seek consensus, and provide informal guidance to project staff. The meetings will be the primary forum for Local jurisdictions coordination and exchange of views on design issues. Local jurisdictions design coordination meetings are the responsibility of the Transit Manager, Deputy Transit Manager and Transit Design Manager.

State and Federal Coordination

The Transit Team will interface with state and federal, as required by law and administration procedures. Such agencies include FTA for all transit funding and grant matters, the Department of the Interior for 4(f) and 106 considerations, the U.S. Army Corps of Engineers for water permit concerns (such as 404 permits), the State Department of Environmental Quality (DEQ) for various environmental matters, and various other regulatory agencies.

Advisory Groups Coordination

The Transit Manager, assisted by the Communications Outreach Manager are responsible for coordination with the appropriate external interface groups during Final Design phase to communicate project information and seek informal guidance to project staff on design issues:

Third Party Coordination

The Transit Team will interface with the BNSF to address and reach agreement on operations and maintenance (O&M) of a new transit crossing in Vancouver, WA. The CRC will hold regular coordination meetings with BNSF to ensure timely design input and reviews, resolution of any issues, and execution of the O&M agreement to project schedule.

The Utilities Lead is responsible for ensuring utilities within the Program area (Transit and Highway areas) are properly located, impacts identified, and relocation (or protection) designs developed and implemented to ensure timely relocation to the Program schedule. This work

effort requires close coordination between the Utilities Lead, the Transit Team, and all known utility companies and agencies within the Program area. Policies and procedures specific to utility relocation in Washington and Oregon are described in detail in Section 13.5.1 under *Third Party Coordination*. The Transit Team will build on the extensive mapping of utility networks in project areas prepared during the PE phase and continue coordination with jurisdictional utility districts and utility companies through the Utilities Lead during the Final Design phase to produce the necessary relocation plans.

12.5.2 Design Review Process

The Transit Team will conduct, and document, quality control (QC) design reviews at major milestones during PE and Final Design phases in accordance with written procedures in the QCP. The Transit Team will coordinate formal design reviews by internal and external stakeholders following the completion of a QC review.

Quality Control Design Review Process

Milestones for QC design reviews of transit work elements will be included in the project schedule. QC design reviews will begin no later than five business days before the submittal date. The following defines the major milestone submittals for the PE phase: 15% and 25% and 30% Design. Major milestone submittals for the Final Design phase include: 60%, 90%, and 100%.

The Transit Team will perform QC design reviews to the approved engineering criteria, applicable codes and standards, and regulatory requirements. Quality-related activities will be documented and records maintained as discussed in Section 15.4 - Design Quality Control and in accordance with CRC's quality control procedures described in the QCP.

Stakeholders Design Review Process

The Transit Team will distribute the 15%, 25%, 60% and 90% design documents (following completion of QC design reviews) to internal and external stakeholders along with comments sheets on which reviewers may record their comments on the documents. Reviewers will include representatives from the cities of Portland and Vancouver, FTA and its PMOC representative, and internal TriMet and C-TRAN divisions representatives (Facilities Management, Project Planning, Real Property, Safety and Security, etc), WSDOT and ODOT.

The design review process allows internal reviewers and FTA and its PMOC representative to evaluate the design products (i.e., plans, specifications, and estimates) as they progress. The Transit Manager will conduct plans-in-hand review sessions with internal reviewers following each distribution of the design documents. The Transit Design Manager and Systems Manager will compile and maintain a list of all comments received and will distribute written responses to those comments in a timely manner. All comments will be tracked through resolution. The Transit Engineering Leads in specific subject matters (e.g. civil engineering, signals, and communications) will be responsible for the resolution of those comments in their respective areas.

The cities of Portland and Vancouver will review the design from the perspective of local code and ordinance compliance and compatibility with existing facilities or planned development. The

Transit Team will pay special attention to design comments that may impact the project schedule or budget. The Transit Design Manager will meet with the cities representatives to resolve any issues identified. All design service agreements will specify the participation of the cities of Portland and Vancouver in the design review process and the required time frames for submitting comments to CRC.

The Transit Design Manager and Systems Manager review any external comments that the Transit Engineering Leads believe would be a change to the scope of work. They may determine that the change is minor and necessary, and direct that the design documents be revised. Comments that the Transit Design Manager and Systems Manager believe could pose a threat to the Project's budget or schedule are discussed with the Transit Manager and CRC Director. The CRC Director determines if the issue needs to be brought before the Integrated Project Sponsor Council Staff for discussion as described in Section 2.3 of this PMP if it is a potential change to the project definition.

12.5.3 Value Engineering

The CRC Program places a high degree of importance on VE studies. VE is a systematic process of review and analysis by a multi-disciplined team of persons not involved in the project. VE studies ensure that essential functions are procured at the lowest capital and life cycle cost, and that costs are consistent with needed performance, quality, reliability, aesthetics, safety, and operation. The CRC Team will coordinate VE studies through WSDOT's Value Engineering Program and comply with federal requirements. The CRC's process will be compatible with FTA guidance and practice.

WSDOT's program emphasizes participation from interdisciplinary industry experts and construction contractors independent of the CRC Team to ensure an unbiased interest in the project design. VE Team make-up may vary depending on the scope of the study. VE of transit design work elements may be done by independent teams of qualified professionals.

The VE Facilitator (a Certified Value Specialist through the Society for American Value Engineering (SAVE) International) submits a plan outlining the VE study phases and time allotment following WSDOT's VE policy and SAVE International best practices, for approval by CRC's Highway, Structures and Transit Managers. Each VE study will include investigation, speculation (brainstorm), evaluation, development, and presentation phases. The presentation phase results in a report and presentation from the VE Study Team.

The CRC Team completed several VE studies to date, and several more are planned. Below is a list of studies conducted and planned:

- Study No. 1 – Transit Options – May 21-25, 2007
- Study No. 2 – River Crossing Options – May 21-25, 2007
- Study No. 3 – Washington Approach – June 4-8, 2007
- Study No. 4 – Oregon Approach – June 4-8, 2007
- Study No. 5 – 25% Design Evaluation – *Date and Content To be Determined*

- Study No. 6 – 60% Design Evaluation – *As needed - Date and Content To be Determined*
- Studies No. 7 and 8 – Design/Construction Specific – *As needed - Date and Content To be Determined*

The Transit Manager is responsible for reviewing and preparing a formal response to VE recommendations specific to the Transit portion of the Program, and indicating adoption or an explanation why CRC disagrees with any particular recommendations. Adoption of recommendations will only occur with appropriate notification to WSDOT and ODOT Executives and CRC Director on scope and budget revisions.

During final design, the Transit Manager is responsible for ensuring that all agreed upon VE proposals specific to the Transit portion of the Program are tracked and incorporated into the design documents.

12.5.4 Constructability Reviews

Constructability is a matter of continual evaluation of the technical details of the engineering solutions to the overall CRC Program components during the design process for the purpose of ensuring that each project package is readily biddable, buildable, and maintainable. It concerns both the engineering attributes and the possible means and methods by which the project components can be constructed. Given the complexity of the multimodal CRC Program, constructability reviews will occur at key process steps during PE and Final Design phases. Additionally, the reviews will focus on maintainability to assure that quality CRC facilities are provided continuously throughout the operational phase. Specifically, maintainability will assess ease of maintenance, workability, accessibility, and minimizing, wherever possible, operational conflicts and the exposure of maintenance staff and equipment to moving traffic.

Constructability reviews will occur during the phases of work described below and will focus on raising issues, resolve problems, recommend modifications, suggest actions and provide guidance that is endorsed by the CRC Team before moving further with the PS&E development.

- ***Conceptual/Schematic*** – A conceptual constructability review was held from June 16, 2008 to June 20, 2008. The constructability review panel provided feedback on several areas including staging, schedule durations, cost, risk identification, and ideas for improvement. A final report was prepared detailing findings of the study.
- ***25% Design Review*** – The 25% constructability review would mainly focus on a constructability assessment of the project's primary geometric features. Geometric details would be reviewed, and guidelines/directions would be given to the Transit Team so that it could develop the required/ultimate design details for the PS&E during Final Design phase. This review could be conducted concurrent with the 25% VE Study.
- ***60% Design Review*** – The 60% constructability review would focus on several features and details and would address all items that would be critical to the completion of a constructible maintainable project. Reviews include plans, costs and structural requirements including special foundation considerations or materials involved,

construction staging and traffic control requirements, details of hydraulics requirements and special drainage structures.

- ***90% Design Review*** – The 90% constructability review would be the review of the contract plans and the special provisions as the project design is being completed and advertisement for construction being readied. The review also would include any design modifications or variations from the agreements reached at the 60% constructability review. (For project packages procured through TriMet also perform a biddability review as described under PS&E below.)

- ***PS&E Review*** – Near the completion of the final design phase (for project packages procured through WSDOT), a biddability review will be conducted for major civil, structures and systems contract(s). This review of the plans, specifications and estimates will focus on the following elements:

    - Completeness of scope
    - Correctness of cross-references from drawing to drawing and detail clarity
    - Agreement of intent between general conditions, special provisions, and technical sections of the specifications
    - Compatibility between drawings and schedule of bid items
    - Compatibility of civil, structures and systems construction
    - Expectations for construction schedule

The Highway Engineering Manager coordinates the scheduling of constructability reviews for the CRC Program including transit elements. The reviews for transit and highway elements may be held concurrently since both are constructed within the same area, therefore, aiding in identifying potential issues and overlapping construction problems. The Highway Engineering Manager, with input from the Transit Manager, is responsible for developing the agenda, times for each segment of the review meeting, and background information to provide to reviewers prior to any meeting. He/she will also ensure that all disciplines involved have checked the applicable documents and plans, and completed the applicable checklists.

At each constructability review meeting, the CRC staff will distribute the design documents along with constructability review checklists for various project features. Reviewers may include outside professional consultants, construction trade experts, or any other agency discipline as necessary, depending on the expertise required. The review should be recorded by a designated note keeper. At a minimum, all decisions and agreements and all directions should be documented. A brief report should be developed outlining the results of the review (issues raised, decisions or solutions) and documenting the direction discussed and agreed to for the next phase of project development. The Highway Engineering Manager is responsible for coordinating with the Transit Manager to address any resolved transit-related issues that remain at the conclusion of the review meeting and ensuring expedited resolution of any outstanding problems that affect PS&E progress. The noted action or response will be audited by the QA/QC Manager to ensure compliance with the final set of contract documents.

12.5.5 Operations Reviews

The Transit Team will coordinate with TriMet and C-TRAN's operations, safety, security and maintenance staff to review and provide input to the preliminary and final design documents as described below to ensure that new CRC transit facilities and equipment mesh seamlessly with those already in place and to support coordinated LRT operation linking Portland and Vancouver communities:

- Participate in constructability reviews to ensure operability, maintainability, safety, and convenience.
- Participate in the CRC's Safety and Security Committee to develop, implement, and administer a comprehensive, integrated, and coordinated System Safety and Security Program that identifies, prevents, and controls hazardous conditions affecting LRT resources and customers.
- Review all designs for compatibility of bus-rail passenger transfer facilities.
- Participate in establishing test requirements and provide requirements on test summary sheets for on-site tests (acceptance, systems, and pre-revenue).
- Provide support to on-site acceptance testing as required.
- Allocate operations and maintenance personnel and equipment resources as identified on test summary sheets.
- Actively participate in the planning, test procedure writing, management, and implementation of LRT systems and pre-revenue tests.
- Establish test procedures. These will include: Project safety rules for test operations; general operating rules for conducting test operations; equipment operating procedures; and test scheduling procedures.

12.6 System Integration

The purpose of this management function is to ensure compatibility and seamless integration of new and existing light rail systems. The Transit Manager is responsible for ensuring system integration within CRC's transit contract elements, as they relate to other concurrent or follow-on CRC contracts and with TriMet's existing operating systems. The Systems Manager oversees the day-to-day management of the overall integration effort.

12.6.1 Preliminary and Final Design

The Systems Manager supported by the Vehicles, Signals, Communications and TES/OCS Leads will work closely with TriMet and C-TRAN operations and maintenance representatives to verify that:

- Documents under review fulfill the functional requirements of the design criteria, and are consistent with operating plans, procedures, and rules; and

- Train signaling, traffic signal, vehicle traction power, fare machine, and communication system documents are mutually compatible and coordinated. At the same time, verify that the right-of-way, trackwork, stations and storage, maintenance, and other permanent facilities defined in the documents under review will accommodate the system elements.

12.6.2 Pre-Revenue Testing

The Systems Manager will coordinate with TriMet and C-TRAN operations and maintenance personnel to perform pre-revenue testing. The purpose of the testing is to insure compatibility between various elements of systems and to make sure they work together. Also the test provides assurance that there are no conflicts between the civil and systems installations that would interfere with transit operations. The pre-revenue test program will be developed by TriMet's Test Program Coordinator in conjunction with TriMet's System Safety Manager, operations and maintenance representatives and contractors as described in detail in Chapter 18 - LRT System Testing And Start-Up.

12.6.3 Compatibility with Existing Systems

The Systems Manager oversees systems integration activities to ensure that the new facilities and systems are compatible with the existing system. Civil, Vehicles, Signals, Communications, OCS and TVM Leads will pay special attention to development of final design plans and specifications for the civil line sections, system-wide elements, and the LRVs that share certain characteristics with the existing equipment and facilities. Among these characteristics are:

- Traction power voltage compatibility with the existing system
- Communication and signal systems features including automatic train stop and train-to-wayside
- Car body crush strength, collision post and anti-climber strength/location, and clearance envelope
- Vehicle performance such as motoring and braking rates, train line commands, mechanical and electrical coupling
- Consistent station platforms to enable all riders to board and depart
- An integrated approach to the provision of service to elderly and disabled patrons

12.7 Reliability, Dependability, Safety

Quality, safety, and other review processes are described below.

12.7.1 Quality Assurance Reviews

The QA/QC Manager, as described in Appendix E, *Quality Assurance Manual*, shall conduct formal quality assurance audits after major design submittals. These audits will assess

compliance with CRC's quality control program requirements described in detail in Appendix H, *Quality Control Plan.*

12.7.2 Safety and Security Reviews

The Transit Manager is responsible for implementing the components of the *Safety and Security Management Plan* (Appendix G). This will be carried in close collaboration with TriMet's Director of Safety and Security and C-TRAN's Director of Operations.

The Transit Design Manager is responsible to coordinate design reviews of proposed LRT facilities and equipment designs by TriMet's operations and safety staff in coordination with C-TRAN, ODOT, and WSDOT. These reviews will be conducted in accordance to the Safety and Security Management Plan and will focus on operational safety and security of the completed system for passengers, automobile drivers, bicyclists and pedestrians, and ensure designs comply with TriMet's safety and security requirements, and give full consideration to concerns unique to C-TRAN's operating environment. Contracted safety specialists may also be included in the reviews depending on the special features of the design under study.

Changes or exceptions to critical safety and security components of the design criteria during the course of the design and construction of CRC's LRT elements will be brought to the attention of CRC's Safety and Security Committee for review and approval. The Committee will review the information and either approve or not approve the exception. If the exception is not approved, the Committee may require project staff to return with additional alternatives to review until an acceptable solution is found. This process will be in place throughout the design and construction of the LRT elements. For further details see Appendix G, *Safety and Security Management Plan*.

12.7.3 ADA Reviews

The CRC Program will conduct design reviews to ensure compliance with the requirements of the Americans with Disabilities Act (ADA). ADA compliance specialists may also be brought in for design reviews.

12.7.4 Peer Reviews

A peer review involves the focused review of selected project elements by a group of specialists (professionals and/or construction experts) experienced in the affected type of work. Such reviews generally entail a comprehensive study of a particularly challenging matter, subject or problem, for example, the complexities of construction of a major new river crossing, as recently done by the Bridge Expert Review Panel convened by CRC Management to evaluate Columbia River Bridge types and configurations.

The CRC Program will use peer reviews to provide technical and constructability guidance to staff where appropriate. Some LRT elements that are potential candidates for peer review include:

- Track sections
- Maintenance facility modifications

- Major structures
- Safety, security, signal, and communication systems
- New technologies being considered for use

Peer review panels will be composed of experienced design team personnel, experienced managers or operators from similar transit systems, and independent professionals and/or construction experts. Peer reviewers will be selected based upon several general guidelines:

- Experience in the specific areas under review
- Experience in the design and construction of other light rail systems
- Experience with the start-up period and actual operation of a similar system.

The Transit Manager coordinates with the Highway and Structures Engineering Managers the staffing and scheduling of peer reviews. The Transit Manager, assisted by the Transit Design and Systems Managers, is responsible for developing the transit portion of daily agendas for the meetings and the background information to provide to peer review members prior to any meetings so they can develop a familiarity with the purpose of the meetings, the subject matter, and the project. A brief report should be developed outlining the results of the review (issues raised, solutions, and recommendations). The Transit Manager coordinates with the Highway and Structures Engineering Managers to address recommendations in the report and ensures expedited response to avoid affecting PS&E progress.

This page left blank intentionally.

13. **Highway Design**

13.1 **Overview**

This section summarizes the design requirements, design management, and design activities for the Highway (roadway and structures) portion of the CRC Program. Chapter 8 discusses the project packaging and delivery model strategy for the CRC Program. The Highway packages will be delivered using a combination of Design-Build (D-B) and traditional Design-Bid-Build (D-B-B) delivery.

The definition of “Design” function will normally vary by delivery method used to execute a project package. The "Design" function discussed in this chapter is defined as follows:

- Preliminary engineering (PE) and Final Design (FD) phase activities in support of developing procurement documents (100% plans, specifications and bid values) to select a contractor(s) to build specific portions of the Highway (roadway and structures) elements of the CRC Program. This definition applies to the traditional D-B-B delivery model; and

- Conceptual engineering activities (varies from 10 to 30% level design) to support preparation of the project package configuration and related procurement documents, and the selection of a Design-Builder(s) using Best Value procurement to build specific portions of the Highway elements of the CRC Program. This definition applies to the Request for Qualifications (RFQ) and Request for Proposals (RFP) phases of the D-B delivery model.

Chapter 14 - Design Oversight For Design-Build Delivery discusses in details the Design Oversight post-selection of a Design-Builder to ensure satisfactory development and management of work plans, products conform to the “Design Work” portion of executed D-B contracts, satisfactory compliance with the design documentation process, and verify Design-Builder compliance with design QC and QA requirements.

The CRC Highway and Structures Teams (agency and consultant staff) will manage and direct Highway (roadway and structures) design activities toward minimum feasible costs for design and construction, minimum disruption to interstate commerce and the traveling public, and minimum impacts of local facilities and communities. The design shall be consistent with maximum freight mobility, passenger safety, system reliability, environmental commitments, sustainability and ease of maintenance.

13.2 **Highway Design Requirements and Standards**

The CRC Highway and Structures Teams have developed design standards and technical requirements (“design criteria”) documentation for the roadway and structures portion of the CRC Program. The design criteria recognize the Program spans two states and two separate local jurisdictions (cities of Portland and Vancouver). The design criteria defines applicable design standards and design references based on published engineering design standards from the

Oregon and Washington DOTs for the area influenced by the crossing structure, defined as the main structure and approach spans. It also summarizes critical design standards for areas outside of the immediate crossing area for both the Oregon and Washington DOTs and the cities of Portland and Vancouver. The Highway and Structures Teams have updated the roadway and structures design criteria, respectively, during the PE phase, and will update individual design criterion on an as-needed basis during the Final Design phase.

The CRC Highway and Structures Managers maintain the CRC's roadway and structures design criteria throughout the life of the Program. The Highway and Structures Managers shall coordinate any necessary updates to the design criteria with their respective engineering managers who will document design criteria update recommendations and confirm they are consistent with the appropriate State DOT's manuals and current engineering practices and procedures. Updates to the criteria will be documented as described in CRC Procedure 12.2 - Design Criteria Approval and Modifications. The Highway and Structures Managers shall approve any updates in writing, before they can be used in the design. In addition, drafting standards have been prepared to standardize and guide design activities and preparation of contract documents.

The CRC's roadway and structures design criteria covers the following major design features:

- Major Route and Functional Classification
- Speed Design
- Structures design standards including seismic considerations (bridge, retaining wall soundwall, and culvert)
- Horizontal and vertical clearances
- Highway and local street geometrics (lane width, shoulder width, cross slope, max. super-elevation, spiral curve, vert. curves, stopping site distance, etc.)
- Pedestrian/Bicycle Path design requirements
- Stormwater runoff and discharge
- Geotechnical design standards including seismic considerations for foundations (footings, piles, and shafts); and, earth structures (retaining walls, slopes, and embankments)
- Special design standards - Aviation clearance, marine navigation clearances

The Highway and Structures Teams shall prepare drawings and technical specifications for each Highway project package in accordance with the design requirements in the most current roadway and structures design criteria as follows:

- Roadway design shall be governed by ODOT and WSDOT Highway Design Manuals, for project packages in Oregon and Washington, respectively, supplemented by CRC's Final Design Criteria Technical Memorandum and amendments including Design Criteria Worksheets and Design Decision Memos.
- Within the State of Oregon, structures design shall be governed by ODOT Bridge Design and Drafting Manual (BDDM) and Geotechnical Design Manual (GDM), and AASHTO

Guide Specifications for Load Resistance Factor Design (LRFD) seismic bridge design, supplemented and/or updated by CRC's Structural Design Criteria for the River Crossing Report (May 2008).

- Within the State of Washington, structures design shall be governed by WSDOT Bridge Design Manual (BDM) and Geotechnical Design Manual (GDM), and AASHTO Guide Specifications for Load Resistance Factor Design (LRFD) seismic bridge design, supplemented and/or updated by CRC's Structural Design Criteria for the River Crossing Report (May 2008).

- Structural and seismic LRT bridge design of the Main River Crossing shall be governed by the WSDOT Bridge Design Manual (BDM) and Geotechnical Design Manual (GDM), ODOT Bridge Design and Drafting Manual (BDDM) and Geotechnical Design Manual (GDM), and AASHTO Guide Specifications for Load Resistance Factor Design (LRFD), supplemented and/or updated by CRC's Structural Design Criteria for the River Crossing Report (May 2008).

- Structural and seismic LRT bridge design of the Vancouver Touchdown Bridge (from the northern interface with the Main River Crossing to the north) shall be governed by the WSDOT Bridge Design Manual (BDM) and Geotechnical Design Manual (GDM), and the AASHTO Guide Specifications for Load Resistance Factor Design (LRFD), supplemented and/or updated by CRC's Structural Design Criteria for the River Crossing Report (May 2008).

- Structural and seismic LRT bridge design of the Hayden Island and North Portland Harbor structures (from the southern interface with the main river crossing south) shall be governed by the TriMet Design Criteria (Revised June, 2010).

Deviations or exceptions from the approved CRC roadway and structures design criteria may be made in particular situations. The CRC's discipline-specific roadway and structures engineering managers shall identify, explain, and justify any deviation or exception from the established criteria in their respective area.

CRC Procedure 12.2 Design Criteria Approval and Modifications describes in details the process to modify and receive approval for design deviations or exceptions from established CRC Design Criteria. This includes approval by the Highway and Structures Managers, and approval by WSDOT or ODOT HQ's, as applicable.

13.3 Highway Design Management

The CRC Team has developed a project implementation strategy summarized in Chapter 8 - Program Delivery and Procurement of this PMP and discussed in detail in Appendix D, *Project Implementation Plan*. The Project Implementation Plan divides the Highway portion of the CRC Program into separate and distinct project packages. It also identifies the delivery method that would optimally assign roles and responsibilities for the performance of each project package activities – design and construction.

During Final Design, the Program Manager supported by the Highway and Structures Engineering Managers will oversee all activities of the Highway and Structures Teams. The Highway and Structures Engineering Managers are assisted by their respective Assistant Manager and supported by discipline-specific task leaders in various areas including: roadway, structures, stormwater, geotechnical, traffic, landscaping, erosion and sediment control, right-of way, survey and utilities. The discipline-specific engineering managers oversee:

- The day-to-day conceptual engineering activities to support preparation of the project configuration and procurement documents for the Columbia River Bridge and any approaches, and other project packages designated for implementation under the D-B delivery.

- The production of roadway and structures final design plans including production of construction documents to approved scope, schedule and budget for all other Highway packages designated for implementation under the D-B-B delivery.

Appendix A, *Technical Capacity and Capability Plan*. discusses in detail the design management organization of the CRC Highway and Structures Teams during Final Design.

13.4 Highway Design Execution

Highway design execution encompasses preliminary engineering (PE) and Final Design phases. The PE phase is part of the project development phase, and through this process several design alternatives were developed and analyzed, the project definition was determined, and the environmental documents (DEIS and FEIS) were prepared.

The PE phase also includes developing the project configuration and procurement documents to support issuance of Request for Qualifications (RFQ's) and Request for Proposals (RFP's) to select Design-Builders for specific project packages designated for D-B delivery.

The Final Design phase is the process to develop 100% design plans and specifications to procure construction services to implement specific portions of the Program using the traditional Design-Bid-Build delivery method.

Chapter 14 – Design Oversight For Design-Build Delivery discusses in details design oversight activities post-selection of a Design-Builder.

13.4.1 Highway Preliminary Engineering

The goal of the PE phase is to define all roadway and structures work elements including associated Design Decisions sufficient to "freeze" the design and establish the project definition prior to entering the Final Design phase. The preliminary engineering design of roadway (and to a lesser extent of structures) work elements was developed to approximately 20 to 30%. Because the ultimate project cost was also determined by the completion of the PE phase, emphasis was placed on development of the elements that may be of the highest inherent risk in order to minimize cost uncertainties. The scope of the PE design effort and the corresponding milestones and deliverables are described in the contract documents with the design consultants.

During the PE phase, the preparation of the FEIS was also in progress requiring close coordination between preliminary design and environmental efforts. Upon successful completion of the FEIS, the FHWA and FTA jointly issue a Record of Decision (ROD), which allows the project to move into Final Design. At the conclusion of the PE phase, the CRC's Highway and Structures Managers, assisted by their respective Assistant Manager shall ensure the following had been determined:

- Project definition that establishes the baseline scope, baseline schedule and baseline budget, including a WBS structure for the Program and approved project packages;
- Existing conditions of the proposed site for the Program including geotechnical conditions, utilities, hazardous materials and archaeological conditions;
- Type, Size and Location of all major structures including stormwater treatment facilities;
- Limits of cuts and fills, and right of way (ROW) impacts including a complete breakdown of partial and full ROW takes;
- PE drawing set for project packages designated for D-B-B;
- Prepared the project configuration that assists in developing the scope of the project package and supports developing the content of the Request for Qualifications (RFQ's) and Request for Proposals (RFP's) used to select Design-Builder(s) for project packages designated for D-B delivery.

  The project configuration will include the necessary base data (survey, geotechnical borings, etc.) to appropriately allocate risk between the CRC Program and the Design-Builder, define the critical elements or limitations of the project package so that they can be incorporated into the RFP, and identify and resolve, early in the process, any "fatal flaws" that may require design exceptions, additional Right-of-Way, or other considerations.
- Identification of and mitigation strategies for environmentally sensitive areas;
- Updated the cost estimate for each Highway project package to carry forward for the remainder of the Program;
- Updated the CRC Design Criteria and standard drawing and specification templates;
- Identified design deviations from the WSDOT or ODOT Highway (or Bridge) Design Manuals and/or AASHTO's A Policy on Geometric Design of Highways and Street. And,
  - For Washington-based project packages, prepared deviation requests and obtained approvals following the procedures in Exhibits 300-7 and 300-2, respectively, Chapter 300 – Design Documentation, Approval, and Process Review – of the WSDOT Design Manual (..\..\..\Background Materials - WSDOT General\design Manual.pdf).

  - For Oregon-based project packages, prepared design exception requests to the requirements in ODOT Design Exception Request Form (H:\Background Materials_ODOT\design_exception_request_form.doc) and obtained approvals following the procedures in Chapter 13 – Design Exception Process – of the ODOT Highway Design Manual (..\..\Background Materials_ODOT\ODOT-2003HDM.pdf).

- Evaluated obtaining Design Approval before entering into Final Design phase to secure early, approved documentation that locks in design policy for Washington-based project packages designated for D-B-B delivery in Washington. And, if seeking Design Approval prior to Final Design phase,

  - Completed the documentation of the Design Approval Package to the requirements in Exhibit 300-5, Chapter 300 of the WSDOT Design Manual (..\..\..\Background Materials - WSDOT General\design Manual.pdf); and,

  - Coordinated with WSDOT SW Region and WSDOT Headquarters Design Office the review of the Design Approval Package and obtained the necessary approvals (including FHWA's), for the levels described in Exhibits 300-2, 3 and 4, Chapter 300 of the WSDOT Design Manual (..\..\..\Background Materials - WSDOT General\design Manual.pdf).

  - Incorporated the Design Approval Package documentation into the Design Documentation Package.

- Completed the Design Acceptance Package (DAP) for each Oregon-based project package designated for D-B-B delivery to the requirements in the ODOT Design Acceptance Check List (..\..\..\Background Materials_ODOT\2003E-AppE.pdf), and completed respective Design Acceptance Checklists (..\..\..\Background Materials_ODOT\DesignAcceptanceChecklist.dot).

- Coordinated with ODOT Technical Services DAP reviews and obtained Certification of Design Acceptance from the ODOT Technical Center Manager for project packages designated for D-B-B delivery in Oregon.

- Addressed Highway-related Program risks discussed in the Risk and Contingency Management Plan (RCMP).

13.4.2 Highway Final Design

The goal of the Final Design phase is to elevate the preliminary plans to 100% level of design, refine project quantities, identify bid items for all work activities reflected in the 100% plans, prepare special contract provisions, and assemble biddable documents to advertize project packages for the purpose of selecting contractors to implement Highway construction under the D-B-B delivery. The Highway and Structures Engineering Managers assisted by their respective Assistant Managers and supported by the discipline-specific task managers will oversee preparation of contract bid documents including plans and specifications, and estimates to procure construction services for each highway and bridge project package identified in the Project Implementation Plan for D-B-B delivery. They will:

- Prepare 60%, 90%, and 100% design submittals;
- Manage formal roadway and structures design reviews at 60%, 90%, and 100% design submittal milestones;
- Control the scope, schedule, cost and quality of the roadway and structures work;
- Manage the deviation from approved roadway and structures design criteria and standards and ensure the traceability of scope, schedule and budget against the project definition;
- Develop a Traffic Management Plan (TMP), as discussed in below to minimize traffic impacts on freight and commuter traffic during the construction of the CRC Program;
- Implement procedures related to quality assurance and quality control, design reviews, constructability reviews, VE studies, and changes to in-progress designs;
- Manage, review and approve the packaging of roadway and structures procurement contracts, their scopes, sequencing, schedules and interfaces;
- For ODOT let project packages, complete PS&E bid documents for each set of roadway and structures contract bid documents including plans and specifications to the following requirements:
    - PS&E Delivery Manual (..\Procedures -ODOT\PSE_Delivery_Manual.pdf), and
    - Final PS&E Check List (..\Procedures -ODOT\Final_PSE_submittal_checklist.doc)
- For WSDOT let project packages, complete PS&E bid documents for each set of roadway and structures contract bid documents including plans and specifications to the following requirements:
    - WSDOT Plans Preparation Manual, M 22-31.02, December 2009 (..\..\..\Background Materials - WSDOT General\PlansPreparation.pdf)
    - Design Documentation Checklist (..\..\..\Background Materials - WSDOT General\DDPChecklist.xlsx).
- For WSDOT let project packages,
    - Prepare and submit the Project Development Approval Package to the requirements in WSDOT Design Manual, Division 3, Chapter 300, Exhibits 300-4 and 300-5 (..\..\..\Background Materials - WSDOT General\design Manual.pdf).
    - Obtain Project Development Approval when PS&E bid documents are completed for the approval levels described in Division 3, Chapter 300, Exhibits 300-2, 3 and 4 of the WSDOT Design Manual (..\..\..\Background Materials - WSDOT General\design Manual.pdf).

  - Enter the Project Development Approval documentation into the Design Documentation Package, as discussed in Section 13.4.4 - Design Documentation Management below.

- For ODOT let project packages, coordinate the review and acceptance of completed PS&E bid documents by ODOT's Technical Services - Office of Project Letting. Additionally, coordinate through ODOT's Program and Funding Services Unit for final processing and submittal of PS&E bid documents to FHWA for authorization to advertise for bids.

- Assist CRC's Project Controls Manager in developing third-party agreements and related relocation designs for impacted facilities and systems.

Traffic Management

During the Final Design phase a detailed Traffic Management Plan will be developed to minimize traffic impacts on freight and commuter traffic during the construction of the CRC. This plan will address, at a minimum, the following:

- Roles and responsibilities of the CRC's Traffic Management Team.

- Review of Maintenance of Traffic (MOT) plans at various design stages, for conformance with approved standards and the ability of proposed construction staging schemes and associated traffic shifts to maintain minimum required corridor mobility thresholds during construction.

- Coordination with local agencies regarding placements of temporary signing and traffic control devices within their jurisdictions during construction.

- Coordination with local agencies regarding restrictions and management of special events.

- Coordination with all local emergency providers, to ensure adequate passage of emergency vehicles through the construction zones.

The following strategies will be considered for implementation to assist in monitoring, responding and/or adjusting, as needed, the traffic management strategies in effect during construction:

- Coordination of traffic maintenance among multiple contractors, in order to integrate temporary signing and traffic control devices among various contracts.

- Conducting periodic MOT reviews during construction (including nighttime inspections), for conformance with plans, specifications, and approved standards; and to ensure that all traffic control devices are functioning properly.

- Incident management within the CRC limits, including accident prevention strategies, emergency procedures, reporting requirements, and mitigation strategies.

- Coordinating with the CRC's Communications Outreach Team concerning traffic switch, lane closures, traffic delays, alternate routes available, work zone accidents, etc.

- Traffic management monthly reporting.

13.4.3 Highway Drawing Management

The CADD Manager will oversee the drawing management system for the project's roadway and structures drawings. Detailed procedures for accessing and managing the development of Architectural and Engineering drawings that are controlled documents are described in CRC Procedure 12.4.3 - ProjectWise Architectural and Engineering Drawing Management. The CRC designers and technicians will comply with established ProjectWise procedures for preparing and delivering electronic engineering data for Highway project packages. The discipline-specific engineering managers are expected to manage CRC's structures, geotechnical, roadway, stormwater, traffic, landscaping, erosion and sediment control, right-of way, illumination, intelligent transportation system, survey and utilities designers and technicians to conform to the established protocols and procedures.

The QA/QC Manager will perform periodic audits of the drawing management process and the as-built drawing process.

13.4.4 Highway Design Documentation Management

The Highway and Structures Engineering Managers are responsible to ensure that their respective discipline-specific managers follow the general retention schedule or special records retention schedule and records laws that govern the retention and disposition of records in Washington and Oregon, and provide DOT staff with guidance and tools to assist with project close-out records management requirements. General records retention procedures are described in detail in the following controlled documents:

- For WSDOT let project packages, use the WSDOT Project Design Documentation Check List (..\..\..\Background Materials - WSDOT General\DDPChecklist.xlsx) which identifies all the documents necessary for records retention requirements. The Project Design Documentation Checklist categorizes documentation into two categories Project File (PF) and Design Documentation Package (DDP). PF documents are retained by the CRC for at least three years after construction is completed. DDP documents are retained at the WSDOT Headquarters Office for at least 75 years after construction is completed. The discipline-specific managers are responsible for properly categorizing documents as PF or DDP prior to transmitting to Document Control.

- For ODOT let project packages, use the ODOT Highway Division Records Retention Matrix and the ODOT Records Manual (..\Procedures -ODOT\Records_Manual.pdf and ..\Procedures -ODOT\m_HWY.PDF). The records retention schedule in these documents identifies the minimum and maximum length of time the Department records have to be kept in accordance with legal regulations.

13.5 Highway Design Control

The CRC Team shall give important management considerations to the following design control activities: design coordination, design reviews, value engineering, constructability reviews, operations and maintenance reviews, peer reviews, and reliability and safety.

13.5.1 Design Coordination

The Highway and Structures Teams will institute regular internal design coordination meetings and coordinate with partnering local jurisdictions, advisory groups (as needed), and third party stakeholders to communicate project information and work through final design issues.

Internal Coordination

The Highway and Structures Teams each holds regular internal design coordination meetings to discuss project issues, review design production progress, project schedule and upcoming delivery milestones. These meetings are the responsibility of the Highway and Structures Engineering Managers.

The Highway and Structures Engineering Managers attend weekly Task Managers meetings to discuss interface design issues between transit, highway and structures design functions, to coordinate with the Project Controls Manager on schedule, budget and scope interface issues, and to coordinate with the Communications Outreach Manager on upcoming public meetings.

Local Jurisdictions Coordination

Local jurisdictions (cities of Portland and Vancouver) will be invited to participate in external coordination meetings attended by the CRC's Highway and Structures staff to discuss and seek consensus on important project design issues. The meetings will be the primary forum for local jurisdictions coordination, communicating project information, exchange of views and working through final design issues, and providing informal guidance to project staff. Local jurisdictions design coordination meetings are the responsibility of the Highway and Structures Engineering Managers.

State and Federal Coordination

The CRC Program will interface with state and federal agencies as required by law and administration procedures. The Highway and Structures Engineering Managers are responsible for regular coordination with FHWA's designated CRC representative that is co-located with Project staff on highway and structures-related design, and environmental issues. The Environmental Manager is responsible for regular coordination with the Department of the Interior for 4(f) and 106 considerations, the U.S. Army Corps of Engineers for water permit concerns (such as 404 permits), the State Department of Environmental Quality (DEQ) for various environmental matters, and various other regulatory agencies.

Advisory Groups Coordination

The Highway and Structures Engineering Managers, assisted by the Communications Outreach Manager are responsible for coordination with the appropriate external interface groups during

Final Design phase to communicate project information and seek informal guidance to project staff on design issues.

Third Party Coordination

The Utilities Lead is responsible for ensuring utilities within the Program area are properly located, impacts identified, and relocation (or protection) designs developed and implemented to ensure timely relocation to the Program schedule. This work effort requires close coordination between the Utilities Lead, other discipline-specific managers, and all known utility companies and agencies within the Program area. Policies and procedures specific to utility relocation in Washington and Oregon are described in detail in the following controlled documents:

- For project packages in Washington, the CRC Program shall follow the procedures in WSDOT's Utilities Manual (March 2010) (..\Procedures - WSDOT\Utilities Manual.pdf)
- For project packages in Oregon, the CRC Program shall follow ODOT's accommodation policy OAR 734-055 (http://arcweb.sos.state.or.us/rules/OARS_700/OAR_734/734_tofc.html), and:
  - ODOT's Utility Relocation Guide (July 2011) (http://www.oregon.gov/ODOT/HWY/ROW/utility_resource.shtml), and
  - ODOT's Utility Manual, (Chapter 10, Right of Way Manual), December 2010 (http://www.oregon.gov/ODOT/HWY/ROW/docs/row_manual_chapter_10.pdf)

The CRC Program will build on the extensive mapping of utility networks in the project area prepared during the PE phase and continue coordination with jurisdictional utility districts and utility companies during the Final Design phase to produce the necessary relocation plans. The Utilities Lead will coordinate closely with:

- AT&T
- Chevron
- Clark Public Utilities
- Comcast
- Electric Lightwave
- Level 3 Communications
- MCI
- NW Natural
- Pacific Power & Light
- Portland General Electric
- Qwest
- Sawtooth Technologies
- Sprint
- Time Warner Telecom
- Verizon

The CRC Program will also interface with the BNSF to address and reach agreement on operations and maintenance (O&M) of a new I-5 crossing in Vancouver, WA. The Structures Engineering Manager will hold regular coordination meetings with BNSF to ensure timely design input and reviews, resolution of any issues, and execution of the O&M agreement to project schedule.

13.5.2 Design Review Process

The Highway and Structures Teams will conduct, and document, quality control (QC) design reviews at major milestones during PE and Final Design phases in accordance with written

procedures in the QCP. The CRC Program will coordinate formal design reviews by internal and external stakeholders following the completion of a QC review.

Quality Control Design Review Process

A critical element to successful delivery of PE and Final Design phases is ensuring that the design criteria and other specified requirements including requirements of the relevant regulatory agencies are met by instituting thorough QC design reviews. Milestones for QC design reviews of roadway and structures work elements will be included in the project schedule. QC design reviews will begin no later than five business days before the submittal date. The following defines the major milestone submittals for the PE phase: 30% Design. Major milestone submittals for the Final Design phase include: 60%, 90%, and 100%.

The Highway and Structures Teams will perform QC design reviews to the approved engineering criteria, applicable codes and standards, and regulatory requirements. Quality-related activities will be documented and records maintained as discussed in Chapter 15 - Design Quality Control and in accordance with CRC's quality control procedures described in the QCP.

Stakeholders Design Review Process

The Highway and Structures Engineering Managers will distribute the 30%, 60% and 90% roadway and structures design documents (following completion of QC design reviews) to internal and external stakeholders along with comments sheets on which reviewers may record their comments on the documents. Reviewers will consist of internal WSDOT and ODOT representatives, FHWA, and representatives from the cities of Portland and Vancouver.

The design review process allows internal WSDOT, ODOT and FHWA reviewers to evaluate the roadway and structures design products (i.e., plans, specifications, and estimates) as they progress for project packages designated for D-B-B delivery. The Highway and Structures Engineering Managers will conduct plans-in-hand review sessions with internal reviewers following each distribution of the design documents. Their respective Assistant Manager will compile and maintain a list of all comments received and will distribute written responses to those comments in a timely manner. All comments will be tracked through resolution. The discipline-specific task managers will be responsible for the resolution of those comments in their respective areas.

The cities of Portland and Vancouver will review the design from the perspective of local code and ordinance compliance and compatibility with existing facilities or planned development. The CRC's Highway and Structures Managers will pay special attention to design comments that may impact the project schedule or budget. The Highway and Structures Engineering Managers or designated representatives will meet with the cities representatives to resolve any issues identified. All design service agreements will specify the participation of the cities of Portland and Vancouver in the design review process and the required time frames for submitting comments to the Highway and Structures Engineering Managers.

The Highway and Structures Assistant Managers review any internal or external comments that their discipline-specific task managers believe would be a change to the scope of work. They may determine that the change is minor and necessary, and direct that the design documents be revised. Comments that the Highway and Structures Assistant Managers believe could pose a

threat to the Project's budget or schedule are discussed with the Highway and Structures Engineering Managers, in their respective areas and with the CRC Director. The CRC Director determines if an external comment needs to be brought before the Integrated Project Sponsors Staff for discussion as described in Section 2.3 of this PMP if it is a potential change to the project definition.

13.5.3 Value Engineering

The CRC Program places a high degree of importance on VE studies. VE is a systematic process of review and analysis by a multi-disciplined team of persons not involved in the project. VE studies ensure that essential functions are procured at the lowest capital and life cycle cost, and that costs are consistent with needed performance, quality, reliability, aesthetics, safety, and operation. The CRC Program will coordinate VE studies through WSDOT's Value Engineering Program and comply with federal requirements.

WSDOT's program emphasizes participation from interdisciplinary industry experts and construction contractors independent of the CRC Team to ensure an unbiased interest in the project design. VE Team make-up may vary depending on the scope of the study. VE of roadway and structures design work elements may be done by independent teams of qualified professionals.

The VE Facilitator (a Certified Value Specialist through the Society for American Value Engineering (SAVE) International) submits a plan outlining the VE study phases and time allotment following WSDOT's VE policy and SAVE International best practices, for approval by CRC's Highway, Structures and Transit Managers. Each VE study will include investigation, speculation (brainstorm), evaluation, development, and presentation phases. The presentation phase results in a report and presentation from the VE Study Team.

The CRC completed several VE studies to date, and several more are planned. Below is a list of studies conducted and planned:

- Study No. 1 – Transit Options – May 21-25, 2007
- Study No. 2 – River Crossing Options – May 21-25, 2007
- Study No. 3 – Washington Approach – June 4-8, 2007
- Study No. 4 – Oregon Approach – June 4-8, 2007
- Study No. 5 – 30% Design Evaluation – *Date and Content To be Determined*
- Study No. 6 – 60% Design Evaluation – *Date and Content To be Determined*
- Studies No. 7 and 8 – Design/Construction Specific – *Date and Content To be Determined*

The Highway and Structures Managers are responsible for reviewing and preparing a formal response to VE recommendations in their respective disciplines indicating adoption or an explanation why the CRC disagrees with any particular recommendations. Adoption of

recommendations will only occur with appropriate notification to WSDOT and ODOT Executives and the CRC Director on scope and budget revisions.

During final design, the Highway and Structures Managers are responsible for ensuring that all agreed upon VE proposals, in their respective areas, are tracked and incorporated into the design documents.

13.5.4 Constructability Reviews

Given the complexity of the multimodal CRC Program, constructability reviews will occur at key process steps during PE and Final Design phases. Additionally, the reviews will focus on maintainability to assure that quality CRC facilities are provided continuously throughout the operational phase. Specifically, maintainability will assess ease of maintenance, workability, accessibility, and minimizing, wherever possible, operational conflicts and the exposure of maintenance staff and equipment to moving traffic.

Constructability reviews will occur during the phases of work described below and will focus on raising issues, resolve problems, recommend modifications, suggest actions and provide guidance that is endorsed by the CRC Team before moving further with the PS&E development.

- ***Conceptual/Schematic*** – A conceptual constructability review was held from June 16, 2008 to June 20, 2008. The constructability review panel provided feedback on several areas including staging, schedule durations, cost, risk identification, and ideas for improvement. A final report was prepared detailing findings of the study.

- ***30% Design Review*** – The 30% constructability review would mainly focus on a constructability assessment of the project's primary geometric features. Geometric details would be reviewed, and guidelines/directions would be given to Structures, Highway, and other disciplines so that they could develop the required/ultimate design details for the PS&E during Final Design phase.

- ***60% Design Review*** – The 60% constructability review would focus on several features and details and would address all items that would be critical to the completion of a constructible maintainable project. Reviews include structures and roadway plans, costs and structural requirements including special foundation considerations or materials involved, construction staging and traffic control requirements, details of hydraulics requirements and special drainage structures.

- ***90% Design Review*** – The 90% constructability review would be the review of the contract plans and the special provisions as the project design is being completed and advertisement for construction being readied. Complete plans for review would include traffic plans, structures, and roadway plans including stormwater, signals, illumination, signage and other miscellaneous plans. The review also would include any design modifications or variations from the agreements reached at the 60% constructability review.

- ***PS&E Review*** – Near the completion of the final design phase, a biddability review will be conducted for major civil, structures and systems contract(s). This review of the plans, specifications and estimates will focus on the following elements:
    - Completeness of scope
    - Correctness of cross-references from drawing to drawing and detail clarity
    - Agreement of intent between general conditions, special provisions, and technical sections of the specifications
    - Compatibility between drawings and schedule of bid items
    - Compatibility of civil, structures and systems construction
    - Expectations for construction schedule

The Highway Engineering Manager coordinates the scheduling of constructability reviews for the CRC Program. The reviews for Transit and Highway elements will be held concurrently since both are constructed within the same area, therefore, aiding in identifying potential issues and overlapping construction problems. The Highway Engineering Manager, with input from the Transit and Structures Engineering Managers, is responsible for developing the agenda, times for each segment of the review meeting, and background information to provide to reviewers prior to any meeting. He will also ensure that all disciplines involved have checked the applicable documents and plans, and completed the applicable checklists.

At each constructability review meeting, the CRC Team will distribute the design documents along with constructability review checklists for various project features. Reviewers may include outside professional consultants, construction trade experts, or any other agency discipline as necessary, depending on the expertise required. The review should be recorded by a designated note keeper. At a minimum, all decisions and agreements and all directions should be documented. A brief report should be developed outlining the results of the review (issues raised, decisions or solutions) and documenting the direction discussed and agreed to for the next phase of project development. The Highway Engineering Manager is responsible for coordinating with the Structures Engineering Manager to address any resolved issues in their respective area that remain at the conclusion of the review meeting and ensuring expedited resolution of any outstanding problems that affect PS&E progress. The noted action or response will be audited by the QA/QC Manager to ensure compliance with the final set of contract documents.

13.5.5 Operations Reviews

The CRC Program will coordinate with WSDOT's and ODOT's operations and maintenance staff to:

- Review and provide input to the preliminary and final design documents as described below to ensure that new CRC roadway and structures facilities mesh seamlessly with those already in place.
- Participate in constructability reviews to ensure operability, maintainability and safety.

13.6 Reliability and Dependability

Quality and other review processes are described below.

13.6.1 Quality Assurance Reviews

The QA/QC Manager will conduct formal quality assurance audits after major design submittals. These audits will assess compliance with the CRC's quality control program requirements described in detail in Appendix E, *Quality Assurance Manual*, and Appendix H, *Quality Control Plan*.

13.6.2 ADA Reviews

The CRC Program will conduct design reviews to ensure compliance with the requirements of the Americans with Disabilities Act (ADA). ADA compliance specialists may also be brought in for design reviews.

13.6.3 Peer Reviews

A peer review involves the focused review of selected project elements by a group of specialists (professionals and/or construction experts) experienced in the affected type of work, as recently done by the Bridge Expert Review Panel convened by CRC Management to evaluate Columbia River Bridge types and configurations.

The CRC Program will use peer reviews to provide technical and constructability guidance to staff where appropriate. Some elements that are potential candidates for peer review include:

- Main River Crossing type
- Major land structures
- New technologies being considered for use

Peer review panels will be composed of experienced design team personnel, experienced managers from other DOT's, and independent professionals and/or construction experts. Peer reviewers will be selected based upon several general guidelines:

- Experience in the specific areas under review
- Experience in the design and construction of major river crossing and land structures, and urban highway interchanges

The Highway and Structures Engineering Managers jointly coordinate with the Transit Manager the staffing and scheduling of peer reviews. They each are responsible for developing their portion of daily agendas for the meetings and the background information to provide to peer review members prior to any meetings so they can develop a familiarity with the purpose of the meetings, the subject matter, and the project. A brief report should be developed outlining the results of the review (issues raised, solutions, and recommendations). The Highway and

Structures Engineering Managers jointly coordinate with the Transit Manager to address recommendations in the report and ensure expedited response to avoid affecting PS&E progress.

This page left blank intentionally.

14. Design Oversight For Design-Build Delivery

14.1 Overview

This section summarizes the design oversight requirements post-selection of design-build entities ("Design-Builder") to ensure satisfactory development and management of work plans, products conform to the "Design Work" portion of executed Design-Build (D-B) contracts, satisfactory compliance with the design deviation process, and verify Design-Builder compliance with its design QC and QA Plan requirements.

Chapter 8 discusses the project packaging and delivery strategy that includes using the D-B delivery model to implement the Columbia River Bridge and its touchdowns (which are yet to be defined). The D-B delivery model allows the CRC Program to execute a single contract with one Design-Builder for the design, construction, and quality management necessary to deliver a completed project package.

The definition of "Design" function will normally vary by delivery method used to execute a project package. The "Design" oversight function discussed in this chapter is defined as follows:

- Design quality verification that consists of a combination of audits, reviews and checks performed by the CRC staff on a random basis of the Design-Builder's production plans including representatives of applicable CRC mandatory design standards and technical requirements for conformity with the terms of the executed contract, and compliance with the approved Design-Builder's Quality Management Plan requirements.

- Periodic visits by the CRC staff to the Design-Builder offices to discuss with the designers and verify design progress and the designers' QC/QA Plan, and assist the Design-Builder and its designers in resolving design questions and issues.

Chapters 12 – LRT Design and 13 - Highway Design discuss in details the requirements, design management, and design activities for project packages (Transit and Highway) implemented using the traditional D-B-B and the GC/CM delivery methods to ensure minimum feasible costs for design, construction, capital facilities, operating expense, minimum energy consumption, and minimum disruption of local facilities and communities.

The design oversight responsibilities discussed in this chapter are managed by the Project Delivery Director assisted by the Project Delivery Engineering Manager. They will be supported by CRC staff (agency and consultant) that will perform formal reviews to assure that the Design-Builder design work products conform to the executed contract.

14.2 Design Requirements and Standards

The CRC Team has developed design standards and technical requirements ("design criteria") documentation for the Transit and Highway elements of the CRC Program. The Design-Builder must prepare all engineering documents including technical specifications necessary to complete

the design of the project package in accordance with the design criteria described in the executed contract.

Deviations and exceptions from the design criteria and not included in pre-approved design deviations described in the executed contract may be requested by the Design-Builder in particular situations. The Design-Builder must explain and justify any deviation from the established criteria. The Design-Builder must also identify scope, schedule and budget impacts of deviations or exception from the design criteria.

CRC Procedure 12.2 Design Criteria Approval and Modifications describes in details the process to modify and receive approval for design deviations or exceptions from established CRC Design Criteria. This includes approval by the Highway, Structures and Transit Managers in their respective areas of the Program, and approval by WSDOT or ODOT HQ's, as applicable. The Project Delivery Director (or representatives) shall communicate in writing the approval of any deviation before it can be included by the Design-Builder in the design.

14.3 Design Oversight Execution

The CRC staff will review all engineering documents prepared by the Design-Builder including representatives of the design criteria for conformity with the mandatory design standards and technical requirements in the executed contract and according to the approved Design-Builder's QC/QA Plan requirements. The CRC staff will also make periodic visits to the offices of the Design-Builder's designers to discuss and verify design progress.

The QA/QC Manager will perform design audit on Design-Builder's implementation of the design aspects of the Design-Builder's approved Quality Management Plan during the design phase. The frequency and timing of the quality audits will depend on the duration of the design activities, number of design units under design, and level of problems being encountered during the technical assurance reviews. Audits by the QA/QC Manager will be accomplished in accordance with Chapter 15 - Quality Assurance and Quality Control. Results of the audit will be issued to the Project Delivery Director for distribution by the Project Engineer (Resident Engineer) to the Design-Builder.

14.3.1 Design Oversight Philosophy

It is important for the CRC staff (agency and consultants) performing design oversight activities to understand that design review for a D-B contract is different than design review for a traditional D-B-B contract. It is not the purpose of the design oversight review to provide a technical competency review of the Design-Builder's engineering documents. For example, design review by the CRC Team does not include detailed review or checking of design of major components and related details, except in unusual cases, or the accuracy with which such designs are depicted on the plans. Plans accuracy, conformance with the design guidelines described in the executed contract, and constructability of the project rests with the Design-Builder.

The CRC Program developed the following key guiding principles for design oversight activities on D-B projects. These guiding principles state the intent and purpose of the design review and provide parameters for the expected scope of review of Design-Builder's engineering documents:

- Using standards and design criteria identified in the executed contract
- Referencing standards when providing technical comments
- Identifying requirements in the executed contract rather than preferences

The Quality Control Plan describes in detail the scope of design oversight reviews of products (e.g., Released for Construction plans and technical reports) prepared by the Design-Builder.

14.3.2 Design Management Oversight

The Project Engineers (Resident Engineers) under the direction of the Project Delivery Director are responsible for maintaining the guiding principles described above throughout the life of each project package implemented by the D-B delivery model. They will work throughout project execution to continually reinforce these principles with staff assigned to perform design oversight activities. They will perform the following key responsibilities:

- Overseeing the Design-Builder satisfactory development and management of work plans.
- Managing CRC staff (agency and consultant) conducting over the shoulder design reviews of the Design-Builder engineering documents and participation in the interpretive engineering decision process.
- Developing timely responses to formal submittal reviews from the Design-Builder.
- Responding to the Design-Builder's requests, such as Cost Reduction Proposals, RFIs, and so on, in accordance with executed contract requirements.
- Verifying the Design-Builder's compliance with approved design Quality Management Plan requirements, including performance of independent design checks and verifying that the design complies with the requirements of the executed contract prior to formal submittal reviews by CRC staff.
- Verifying all design services furnished by the Design-Builder are performed under the direction of a Professional Engineer licensed in the State of Washington (or in the State of Oregon on packages procured by ODOT).
- Overseeing the Design-Builder satisfactory compliance with the design deviation process.
- Verifying design progress for payment purposes.
- Providing correspondence indicating whether the design deliverables meet the contract requirements at successful completion of design reviews at various stages.

14.3.3 Pre-Contract Meeting

The Project Engineer (Resident Engineer) will coordinate with the Design-Builder scheduling a "Pre-Contract Meeting" as soon as practicable after the award of a contract. The purpose of the meeting is to acquaint key personnel with the details and features of the project to facilitate the

design process, exchange information, and address any questions pertaining to the scope or level of effort of the project.

14.3.4 Design Meetings and Over-The-Shoulder Reviews

The CRC Team shall give important management considerations to holding weekly design coordination meetings with the Design-Builder and performing over-the-shoulder design reviews to support project quality goals. These meetings, combined with over-the-shoulder reviews, shall be an integral part of the design oversight process to discuss and resolve design issues outside of the formal review process. Weekly design coordination meeting agenda and preparation of minutes are the responsibility of the Design-Builder. Attendance at coordination meetings by CRC staff will be determined by the Project Engineer (Resident Engineer) with input from the Highway, Structures and Transit Managers.

The over-the-shoulder reviews should not be considered "Hold Points" that restrict the progress of design. They are reviews of the design as it progresses, and opportunities for CRC staff to provide comments and feedback to the Design-Builder on the design.

14.3.5 Released For Construction (RFC) Document Review

The CRC Team shall perform at least one preliminary design review (near the mid-point of design) before completion of 100 percent design.

The CRC Team shall perform design reviews on formal preliminary and final design submittals, prepared by the Design-Builder, of all plans and technical specifications and resolve all review comments prior to the Design-Builder issuing Released for Construction documents. Any deviation by the Design-Builder from the mandatory design criteria requirements must be reviewed by the Highway, Structures and Transit Managers, in their respective areas, and recommended for approval to the Project Engineer (Resident Engineer) prior to a submittal being Released for Construction.

Preliminary Design Submittal Review

The intent of the Preliminary Design Submittal Review is to provide a formal opportunity for the CRC Team and participating jurisdictions to review the construction documents in order to ensure that the design is progressing appropriately and proceeding in the right direction; the plans reflect the executed contract requirements for construction; design features are coordinated; and there are no fatal flaws within a given discipline or between disciplines. At the conclusion of the Preliminary Design Submittal Review, the Project Engineer (Resident Engineer) shall ensure the following has been completed:

- Obtained certification from the Design-Builder's Design QA Manager (prior to distributing the design submittal for review) that the item or segment of work: 1) has been designed in accordance with executed contract requirements, and 2) has been checked in accordance with the Design-Builder's approved QC/QA Plan.

- Distributed the design documents with comments sheets on which reviewers may record their comments on the documents. Reviewers may include representatives from the cities

of Portland and Vancouver, FTA and its PMOC representative, FHWA, TriMet, C-TRAN, WSDOT and ODOT representatives.

- Collected and consolidated the review comments and provided them to the Design-Builder.
- Worked with the Highway, Structures and Transit Managers to ensure that the contents of the Preliminary Design Submittal in their respective area are as specified in the executed contract technical requirements.
- Deviations requests from the design criteria not included in pre-approved design deviations described in the executed contract have been documented by the Design-Builder, and approvals obtained as described in CRC Procedure 12.2 Design Criteria Approval and Modifications. Communicated in writing the approval of any deviation to the Design-Builder.

Final Design Submittal Review

The Final Design Submittal shall be prepared when the design for a given element or area is 100 percent complete. The Final Design Submittal shall include plan sheets, technical memos, reports, calculations, and other pertinent data, as applicable. It shall also include all specifications, all approved amendments to the Standard Specifications, Special Provisions, Technical Requirements, and Technical Specifications in the executed contract, necessary to construct the work elements represented in the submittal. At the conclusion of the Final Design Submittal Review, the Project Engineer (Resident Engineer) shall ensure the following has been completed:

- Obtained certification from the Design-Builder's Design QA Manager (prior to distributing the design submittal for review) that the work: (1) has been designed in accordance with executed contract requirements, (2) has been checked in accordance with the Design-Builder's approved QC/QA Plan, (3) assurance that the design fully provide for constructability, compatibility of materials and conformity to acceptance criteria for inspections and tests as provided in the executed contract, and (4) is ready for construction to 100 percent completion.
- Obtained review comments resolution and disposition documentation showing that all comments made by the CRC Team on the Preliminary Design Submittal has been addressed and incorporated by the Design-Builder into the Final Design Submittal.
- Worked with the Highway, Structures and Transit Managers to confirm that the contents of the Final Design Submittal in their respective areas are as specified in the executed contract, includes all amendments to the standard specifications, special provisions, technical requirements, and technical specifications, necessary to construct the work elements represented in the submittal.
- Obtained written approval for deviations from the mandatory design criteria and technical standards.

- Resolved all review comments on the Final Design Submittal so it may proceed through the written certification process described below in preparation for being Released for Construction.

Released for Construction (RFC) Documents

Released for Construction (RFC) Documents are prepared after the Design-Builder has incorporated the 100 percent design review comments. At the conclusion of the Released For Construction (RFC) Document Review, the Project Engineer (Resident Engineer) shall ensure the following had been completed:

- Obtained written certification from the Design-Builder's Design QA Manager that all plans, reports, specifications and quantity estimates submittals and design reviews were completed in accordance with the QC/QA Plan Requirements and the executed contract, and that the documents are ready to be Released for Construction.

- All plans, reports, and specifications are sealed and signed by the professional engineer in responsible charge and are stamped "Released For Construction" by the Design-Builder's Design QA Manager.

- Obtained review comments resolution and disposition documentation showing that all comments made on the Final Design Submittal have been addressed and incorporated by the Design-Builder into the RFC documents. If necessary, the Design-Builder shall resubmit revised RFC documents.

- Received from the Design-Builder six hard copies and electronic files (in both MicroStation and PDF formats) on CDROM of all RFC documents. The electronic drawing files shall include copies of all sheet and reference files used in the RFC documents.

Design Revisions Following Issuance of Released for Construction (RFC) Documents

Either the Design-Builder or the CRC Team may initiate design changes. Design changes may occur on items or segments undergoing early construction, before final designs are complete, or after completion of final design and issuance of Released for Construction (RFC) Documents. The Project Engineer (Resident Engineer) shall ensure:

- The Design-Builder prepares Preliminary and Final (100 percent) Design submittals for design review(s) by the CRC Team for all design changes.

- All design changes including revisions to the RFC Documents are prepared by, or under the direct supervision of, the Engineer of Record (EOR) for the documents.

- Obtain written certification from the Design-Builder's Design QA Manager that all revised plans, reports, specifications and quantity estimates submittals and design reviews were completed as the original documents, in accordance with the QC/QA Plan Requirements and the executed contract, and revised documents are ready to be re-Released for Construction.

- Calculations for design revisions made during construction are made available for CRC review and comments incorporated into the revised documents prior to implementation of the revisions during construction.

14.3.6 Drawing Management

The CADD Manager oversees the drawing management system for the CRC's Transit and Highway drawings. The CADD Manager shall ensure:

- The Design-Builder prepares Computer Aided Drafting (CAD) files in conformance with executed contract requirements using applicable ODOT or WSDOT methodologies and standards as defined in:
  - ODOT's PS&E Delivery Manual (..\..\..\Background Materials - ODOT General\PSE_Delivery_Manual.pdf), or
  - WSDOT's Plans Preparation Manual, M22-31.02, December 2009 (..\..\..\Background Materials - WSDOT General\PlansPreparation.pdf)
- The Design-Builder submits the CAD files, including end area cross-sections, to the CRC office in CAiCE format. All CAD data shall be provided in a format that can be used directly by MicroStation with no translation and that when accessed within MicroStation is organized on the applicable ODOT or WSDOT standard levels, symbologies, colors, weights and basemap/sheet file organization.

The QA/QC Manager will perform audits of the Design-Builder's drawing management aspects of the approved Quality Management Plan during the design phase. Audits will be accomplished in accordance with Chapter 15 - Quality Assurance and Quality Control. Results of the audit will be issued to the Delivery Manager for distribution to the Design-Builder.

14.3.7 Design Documentation Management

The Project Engineer (Resident Engineer) is responsible to ensure that the Design-Builder completes and submit the following documentation before Final Acceptance:

- Updated the Design Approval Package for WSDOT let project packages for any revisions and additional information prepared following execution of the contract including Channelization Plan and Supplemental Conceptual and Geometric Design, if applicable.
- Completed the Design Acceptance Package (DAP) for an ODOT let project package and/or for work elements in Oregon.
- Completed the Project Development Approval Package when PS&E bid documents are completed for a WSDOT let project package and/or for work elements in Washington.
- Completed the Design Documentation Package (DDP) and the Project File (PF) documents for WSDOT let project packages to include all of the elements identified in the WSDOT Design-Build Project Design Documentation Checklist ..\..\..\Background Materials - WSDOT Design-Build\DesignBuildDesignDocChecklistAugust2006.xls) to

have components of work started by the CRC, and that the Design-Builder is required to complete or update. The Design-Builder shall provide the CRC with updates and access to the DDP and PF items as changes are made.

- Completed the PS&E documents for ODOT let project packages including plans and specifications to the following requirements: Final PS&E Check List (..\Procedures - ODOT\Final_PSE_submittal_checklist.doc)

- Reports and technical memoranda that document decisions made during completion of the design regarding components not included in the design criteria.

- Approved deviations.

- Design calculations and documentation.

- Electronic MicroStation and InRoads files, including all Released for Construction (RFC) sheets, reference files and base mapping (topography).

- Two hard copies of the As-Built Plans that meet the requirements of the executed contract and accurately represent the as-constructed conditions in the field. The As-Built Plans shall include the following:

    - A written certification by the EOR that the As-Built Plans accurately and completely reflect all changes and corrections made during construction.

    - The EOR's stamp on each re-issued sheet of the revised RFC Documents, and the cover of each of the re-issued revised RFC Technical Specifications.

    - Each sheet of the As-Built Plans stamped or clearly marked "AS-BUILT."

    - An accompanying index and instructions.

- Updated electronic MicroStation and InRoads files that show the as-constructed conditions, incorporating all revisions made during construction, and are consistent with the software and drawing conformance requirements in the technical requirements of the executed contract,

- Reproducible originals of the shop drawings for pre-stressed structural elements and all structural steel components.

- Calculations for design revisions made during construction were incorporated into the design calculation file when construction is completed in accordance with the executed contract.

14.3.8 **Change Proposal**

The CRC Program places a high degree of importance on value engineering to optimize the value of each dollar spent. Design-Build contracting allows for innovation and a value engineering approach to design optimization by the design-Builder through Value Engineering Change Proposal (VECP) or a Category B Change Proposal (CBCP).

The Design-Builder may submit a VECP to change Category A contract requirements that include changes to: (a) any requirement in the General Provisions, (b) any of the standards identified as "Mandatory Standards" in any Section of the Technical Requirements (but not including the WSDOT Standard Specifications), (c) any change to a commitment made in the Design-Builder's Proposal Documents, and (d) a change to the Basic Configuration. The Project Engineer (Resident Engineer) will evaluate any cost savings per General Provision 1-04.4(4).

The Design-Builder may also submit changes to Category B contract requirements that include changes to: (a) any requirement found in the contract Technical Requirements, but not including changes to standards identified as "Mandatory Standards," (b) any change to a requirement of the WSDOT Standard Specifications, or to the Amendments to the Standard Specifications which are included in the Contract, and (c) any change to a requirement identified in the Contract as a Special Provision. It is up to the Design-Builder to propose a change to a Category B requirement as either a VECP or a Category B Change Proposal (CBCP). The Project Engineer (Resident Engineer) will evaluate a CBCP per General Provision 1-04.4(3) to determine whether or not a Design-Builder's proposed change is "equal or better" than the underlying Contract Requirements.

This page left blank intentionally.

15. Quality Assurance and Quality Control

15.1 Overview

The goal of the CRC Program quality program is to ensure conformance to specified quality requirements by the CRC Team (agency and Consultant staff) and construction contractors. The quality program accomplishes this objective by providing documented evidence that all facilities (transit, bridge, highway, and related components) are designed, procured, and constructed in accordance with established engineering criteria and applicable state and federal requirements.

The CRC Program's quality objective is to reduce the occurrence of deficiencies and nonconforming work and services during the life of the Program. The CRC Team accomplishes this quality objective by implementing specific quality control activities and confirming, through quality assurance (QA) audits, compliance of the work activities performed by CRC Team members and construction contractors.

The following are the definitions of quality assurance and quality control:

- **Quality Assurance (QA)** – All those planned and systematic actions necessary to provide adequate confidence that an item is in conformance with established requirements and will satisfy given needs. The activity of providing the evidence needed to establish confidence that quality functions are being performed adequately. QA is a management tool.

- **Quality Control (QC)** – Those functions that provide a means to control and measure characteristics as related to established design requirements. The techniques and activities that sustain quality of an item to satisfy given needs; also the use of such techniques and activities. QC is a production tool.

The *Quality Assurance Manual (QAM)* in Appendix E, and the *Quality Control Plan (QCP)* in Appendix H, comprise the overall quality program for the CRC Program. The QAM and QCP describe the necessary quality assurance (QA) and quality control (QC) activities to ensure conformance to specified quality requirements. They are "living documents" that may be modified throughout the duration of the Program to reflect changes in quality requirements.

A summary of the overall requirements of the QAM and QCP follows.

15.1.1 Management Commitment to Quality

The CRC Executive Management Team is committed to planning and constructing the Program with the highest regard for quality in all areas. The CRC Team is responsible for ensuring that design and construction is in conformance to specified quality requirements. The quality of the transit and highway systems is the ultimate measure by which public users of both systems make their judgment. The CRC Executive Management Team has identified Program quality objectives and has designated a QA/QC Manager to verify that quality-related activities are being implemented during design and construction activities to achieve those objectives. Every

CRC Team member is expected to follow the QA program and QC procedures detailed in the QAM and QCP, respectively.

15.1.2 Quality Assurance Program

The objective of the QA program is to provide a planned and systematic approach to ensure that contracted products and services are produced and delivered as specified, and the expected level of quality is achieved. The QA program provides for the implementation of activities during design and construction that facilitate early identification of conditions that might, if not identified, adversely affect satisfactory completion of the Program. The administrative and control measures will be implemented by the CRC Team members in such a manner as to verify the successful completion of a safe, reliable, economical, and convenient transit and highway infrastructure.

15.1.3 Program Implementation

The QAM and QCP provide the necessary policies and processes for implementation of the CRC quality program through written procedures and audits, including the documentation of such activities. The objective is to ensure that the required quality is attained through developing final designs to required engineering criteria, effective procurement and contracting procedures, and proper manufacturing, construction, installation, and testing and start-up activities.

Controls necessary for implementing quality-related activities, and the documentation of such activities, are categorized into the following general areas:

- Review of design, contract, and procurement documents, as well as inspection, testing, and start-up procedures, to verify that quality aspects have been considered.
- Review and approval of the Consultant's quality control program to verify acknowledgement of and adherence to the design, procurement, and contract requirements.
- Surveillance and monitoring of manufacturing, installation, construction, inspection, and testing and start-up activities to verify adherence to design, contract, and procurement requirements.
- Audits of the Consultants and Construction Contractor's quality control activities, and quality assurance of their subcontractors' quality control activities, to ensure compliance with procedures and documentation of the activities.

15.2 FTA Requirements (15 Elements)

The QA/QC program complies with the FTA's Quality Assurance and Quality Control Guidelines and includes the 15 elements of a quality program suggested by the FTA Guidelines. The QAM and QCP include detailed requirements and guidelines for implementation of the quality policies.

15.2.1 Management Responsibility

The commitment to and responsibility for quality for the CRC Program belong ultimately to the highest level of management. Management should formally declare and communicate its quality policy and is responsible for making sure that the quality program is implemented and maintained. A person within the project organization should be designated who represents management in the quality efforts. This person and all personnel who have responsibility for quality activities should be included on an organizational chart that shows their interrelationships with other project personnel.

The CRC Management Team is ultimately responsible for the Program's quality program. The CRC quality policy and the organizational chart showing the roles and responsibilities of personnel with quality-related responsibilities appear in the QAM. As detailed in the QAM and the QCP, the QA/QC Manager will have responsibility for monitoring and auditing the QA/QC activities.

15.2.2 Documented Quality Management System

The QA program will be implemented and maintained through a documented quality management system to ensure that the Program's quality assurance goals and objectives are met. This quality management system extends to all aspects of design, procurement, manufacturing, and construction. Written procedures and instructions should address processes including inspection, testing, nonconforming product and work, corrective action, maintenance of quality records, quality audits, and training.

The QAM and the QCP for the Program include written policies and procedures that document the quality management system, including provisions for design control, inspection, testing, construction activities, nonconforming product and work, corrective action, maintenance of records, quality audits, and training.

15.2.3 Design Control

Procedures that control and verify the design should be established and maintained by the Program. These procedures must identify the roles responsible for QA for design and specify what design information should be documented, transmitted, and reviewed. Design inputs and design outputs should be documented, and design reviews should address constructability, operability, and maintainability. The procedures must also clearly indicate how design changes and modifications will be identified, documented, reviewed, and approved. QA activities will be conducted to verify that QC procedures related to design are being carried out according to their requirements.

The QAM and the QCP include references and/or procedures to control and verify that the design criteria, other specific requirements, and requirements of regulatory agencies and industry standards are met.

15.2.4 Document Control

Procedures for control of project documents and data are established and maintained. Document control measures ensure that all relevant documents are current and available to all users who require them.

Document control procedures are discussed in the QAM and presented in more detail in the QCP. Document control procedures of construction activities will be established and located in the Construction Contractor's Quality Management Plan (QMP).

15.2.5 Purchasing

All suppliers, installers, manufacturers, and contractors should be selected based on their ability to meet the contract requirements, including quality requirements. Contract documents or purchasing specifications will contain relevant criteria, standards, drawings, process requirements, and inspection and testing procedures. The level of quality requirements specified will depend upon the nature and complexity of the work or product.

The procedures for purchasing during construction are provided in further detail in the QAM.

15.2.6 Product Identification and Traceability

Procedures for the control and identification of the items of production in order to ensure that incorrect or defective items are not used should be established and maintained. Physical identification and control will be used to the most reasonable extent possible, but if physical identification is impractical, then other appropriate means, such as physical separation of products or procedural control, will be used.

The QAM outlines procedures for identifying and tracking items of design production. Additional procedures for product identification and traceability specific to the Construction phase of the Program will be established by the Construction Contractor within its QMP.

15.2.7 Process Control

Special processes required in fabrication, production, or installation that cannot be verified by subsequent inspection and testing will be performed under controlled conditions and continuously monitored. Special processes include, but are not limited to, welding, soldering, heat treatment, and nondestructive examination. Documented work instructions, qualified personnel, and conformance with applicable codes, standards, and the Construction Contractor's QMP should be used to ensure quality for these processes. Work instructions should assist in making sure that work is completed in the proper sequence and that interfaces between disciplines are addressed.

15.2.8 Inspection and Testing

Performance of inspection and testing will be according to the established QCP or documented procedures, and will verify the quality of work and products throughout the duration of the work (in-process work). Final inspection and testing should be conducted to ensure that the final

product conforms to the specifications, and records should be maintained to document the final inspection and testing.

All equipment, materials, and products delivered to the project site shall be inspected, marked, and tracked in accordance with the QAM and the Construction Contractor's QMP to ensure that only acceptable materials are used and that any rejected materials are removed from the project site.

Inspection and testing are addressed in the QAM. Further detailed inspection and testing procedures and requirements for construction activities will be addressed in the Construction Contractor's QMP.

15.2.9 Inspection, Measuring, and Test Equipment

Inspection, measuring, and test equipment used in the work will be identified, controlled, calibrated, and maintained in proper working order to ensure conformance to requirements. Such equipment must meet the standards of accuracy for the measurements required. Equipment will be calibrated according to national standards when applicable or to documented standards when national standards do not exist. Equipment will also be regularly recalibrated. If inspection, measuring, and test equipment is found to be out of calibration, the validity of previous inspection and testing results will be re-evaluated for acceptability. A record of the equipment calibration status should be maintained.

The QAM details the policies and procedures for inspection, measuring, and test equipment. Additional requirements and procedures related to inspection, measuring, and test equipment specific to the Construction phase of the Program will be addressed in the Construction Contractor's QMP.

15.2.10 Inspection and Test Status

Procedures for identifying the inspection and test status of work during production and installation will ensure that only work that has passed inspections and tests is incorporated into the Program. The status will indicate conformance or nonconformance with regard to reviews, inspections, and tests. Test and inspection status will be identified by means of markings (stamp), tags, labels, routing cards, inspection and test records, physical location, or other suitable means.

Inspection and test status detailed procedures for the design phase are located in the QCP. Further policies and procedures for inspection and test status for construction activities will be located in the Construction Contractor's QMP.

15.2.11 Nonconformance

Procedures for controlling nonconforming work will ensure that such work is not used or installed on the Program. Nonconforming work will be identified, controlled, documented, and evaluated for determining the proper disposition of the nonconforming work. Documented procedures will define the responsibility and authority for the review and disposition of nonconforming work. The final disposition of nonconforming work will require the approval of

the Project Engineer (Resident Engineer), dependent upon the nature of the work, and may include rework, acceptance for an alternative application, or rejection. Reworked or repaired work will be re-inspected and/or retested in accordance with contract requirements. All nonconformances will be resolved with the involvement of quality personnel.

The QAM details the policies and procedures for nonconforming work related to design and construction.

15.2.12 Corrective Action

Corrective action required as a result of nonconforming work or product will be identified and controlled to eliminate potential problems. Procedures for corrective action should be established, documented, and maintained. Corrective action procedures will be used that will:

- Investigate the cause of nonconforming work or product
- Analyze processes to detect and eliminate potential causes of nonconforming work or product
- Initiate preventative measures to correct problems appropriate to the level of risk
- Ensure that corrective actions are implemented and effective
- Implement and record changes in procedures resulting from corrective actions

The corrective action process will be documented and controlled to final acceptance and closeout of the issue.

The QAM and QCP documents outline procedures for corrective action related to design. Procedures regarding corrective action of construction activities can be found in the Construction Contractor's QMP.

15.2.13 Quality Records

Procedures for maintaining quality records will be established and maintained that will show the proper functioning of the quality management system. These records will be prepared, compiled, and stored so that they can be easily retrieved. Attention will be given to accuracy, completeness, legibility, retention time, final disposition, and security of the quality records. Records will be kept in an environment that will help prevent their deterioration or damage. Typical quality records may include:

- Design reviews
- Inspection reports
- Test data
- Qualification records
- Calibration records

- Nonconformance reports
- Corrective actions
- Audit reports

The QAM and the QCP documents address quality records in more detail.

15.2.14 Quality Audits

The QA/QC Manager and other QA staff, as assigned, will perform periodic scheduled audits, as detailed in the QAM, to verify that each aspect of the QCP is being followed and that the elements of the quality management system are functioning as intended. Auditors will be qualified to perform the audit by meeting requirements of quality auditors as defined in the policies and procedures. Quality audits will be fully documented, and findings will be tracked to their final disposition. The QA/QC Manager will review audit findings with the personnel who have responsibility in the area being audited.

The QAM and the QCP address in detail the procedures and requirements related to quality audits.

15.2.15 Training

Procedures for identifying training needs and for providing training to project staff performing activities that affect quality will be established and maintained. All Program staff members will be technically qualified for their tasks and trained in the QA program and QC procedures pertaining to their work responsibilities. The QA/QC Manager will establish a training program and maintain records of the participation of key project staff in training related to the QA program and QC procedures.

Training is addressed in more detail in the QAM and the QCP.

15.3 Quality Assurance and Quality Control Responsibilities

The responsibilities of the QA/QC Manager related to the fifteen elements of a quality program are described in the QAM. In-depth details of the Construction Contractor's responsibilities will be included in its approved QMP.

15.4 Design Quality Control

Quality control of design activities applies to the activities of defining, performing, and controlling designs, including but not limited to, design of facilities, structures, systems, and equipment. CRC Team members (agency and Consultant staff) will perform their design activities to the approved engineering criteria, applicable codes and standards, and regulatory requirements. QC reviews, including Interdisciplinary Reviews, will be performed by qualified individuals (other than those who originated the design) within the reviewer's area of professional expertise. Design changes or revisions will be subjected to the same level of checking, review, and approval as the original design. Design documents will be uniquely

identified and controlled to ensure the use of approved documents. Quality-related design activities will be documented and records will be maintained as detailed in the QCP.

Design activities performed through the Design-Build delivery model should follow the Construction Contractor's QMP and should be in compliance to the CRC QAM and the QCP.

15.5 Construction Quality Control

The Program will establish minimum requirements for quality control of construction activities that the Construction Contractor must follow. The Construction Contractor will submit to the Project Engineer (Resident Engineer) a QMP that will control the quality of its work according to contract requirements. CRC's Project Delivery Director will assign a Project Engineer (Resident Engineer) and inspection staff to each construction contract to provide on-site quality inspections and oversight of the Construction Contractor's QMP. CRC's Project Delivery Director, with input from the QA/QC Manager, will provide the Project Engineer (Resident Engineer) with review comments regarding the Construction Contractor's proposed QMP and personnel. The Project Engineer (Resident Engineer) is responsible for final disposition of the Construction Contractor's QMP.

15.6 Inspection and Test Plans

The Construction Contractor will be responsible for the quality of all work performed by its own employees, as well as by any manufacturers, subcontractors, or suppliers, to meet contract requirements and as detailed in its approved QMP. The Construction Contractor will develop and submit to the Project Engineer (Resident Engineer) for approval a QC Plan that addresses all testing requirements, including the type of tests, frequency of tests, minimum qualifications of those performing the tests, and required quality documentation.

15.7 In-Process Inspections

The Project Engineer (Resident Engineer) and inspectors will be deployed to ensure that construction QC procedures are in place and effective, ensuring that quality standards are acceptable. The Project Engineer (Resident Engineer) and inspector activities will include:

- Verifying the Construction Contractor's material certifications and samples.
- Inspecting materials and equipment delivered to the job site(s).
- Performing inspections of specialty equipment and fabricated construction materials.
- Participating in First Article Inspections (FAIs), or witness and hold point activities, as delineated in the contract specifications and established in the Construction Contractor's approved QMP.
- Inspecting construction and installation work in progress.
- Documenting the results of inspections and tests, and specifically noting any failed tests, retesting, or re-certification required.

- Monitoring construction operations and field-testing of construction material.
- Reviewing the Construction Contractor's QC documentation.

The Project Delivery Director may assign a full-time on-site inspector to the vehicle manufacturing facility to ensure ongoing compliance with the Construction Contractor's QMP. The TriMet QA Manager will also perform audits and surveillances of the manufacturer's facilities on an as-needed basis.

15.8 Materials Testing Program

Contract specifications will include standards for materials and corresponding tests to ensure compliance with contract requirements. Qualified personnel will accomplish materials testing during construction in accordance with approved testing practices and procedures, as outlined in Chapter 9 of the WSDOT *Construction Manual* (Publication M 41-01, July 2011) on contracts procured by WSDOT, in TriMet *Design Criteria* (Revision 10.2, January 2010) on contracts procured by TriMet, and in the ODOT *Construction Manual* (October 2010) and *Manual of Field Test Procedures* (2010 Update) on contracts procured by ODOT. Requirements for materials are described in Section 1-06 and Division 9 of the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction (M 41-10).

The Construction Contractor will have primary responsibility for testing of materials to WSDOT, ODOT or TriMet. The Construction Contractor is to prepare and submit a QMP that includes a testing plan, containing a list of tests that references each Specification Section required by the contract. It is anticipated that the Construction Contractor will obtain the services of an independent materials testing laboratory to actually perform the materials quality control tests. Laboratory qualifications shall also be submitted as part of the QMP. The Construction Contractor will submit the results of quality control tests to the Project Engineer (Resident Engineer). The Project Engineer's (Resident Engineer's) office will review and maintain test reports and direct any actions to be taken for nonconforming items.

CRC's agency staff (WSDOT, ODOT, and TriMet) is responsible for verification testing and inspection of prefabricated materials on construction contracts procured by their respective agency. They will perform quality assurance confidence tests to verify that the Construction Contractor's QC testing is satisfactory. The Project Engineer (Resident Engineer), the Inspector, or the QA/QC Manager will coordinate quality assurance confidence testing by CRC's agency staff.

This page left blank intentionally.

16. Construction Administration

16.1 Overview

[Under Development]

This page left blank intentionally.

17. **Public Art Program**

17.1 Overview

The CRC Program will include public art with the transit construction for the benefit of the general public. The goal of the public art program is to encourage increased transit usage and community pride by integrating art works into the transportation system, thereby celebrating the contributions of public transportation and recognizing the cultural richness in the region. The art program is administered in accordance with the public art policy in the WSDOT Design Manual M 22-01.05 (2009), Chapter 950, and the requirements of FTA Circular 9400.1A, "Federal Transit Administration Design and Art in Transit Projects" and FTA Best Practices, Chapter 6.7.

The art program will be modeled after the successful examples and processes used on previous LRT projects in the Portland metropolitan region. Artists will be hired early in final design phase to collaborate with the architects, planners, project managers, and engineers. Selected art projects or themes will be integrated into each transit facility itself and not simply added into the facility as stand-alone pieces. Art will serve to create an identity for each station or facility based on the history, culture, and character of the surrounding area.

17.2 Organization

TriMet's Public Art Manager of the Capital Projects and Facilities Division will coordinate the public art program under the direction of the Transit Manager and Transit Deputy Manager. Specific duties include:

- Implementing the art program with input from the Public Art Advisory Committee.
- Assisting in outreach efforts to gather program input and support from the community.
- Retaining, administering, and managing artists for the art project(s).
- Coordinating between design and construction work and art project(s).

17.3 Budget and Funding

The public art budget will be established during PE. The art program budget includes cost of the art as well as the design and construction costs to incorporate the art into the facilities.

17.4 Art Development and Integration

The CRC Program may establish a Public Art Advisory Committee to provide oversight of public art in light rail projects. The committee would be comprised of community representatives, artists, city leaders, and staff.

The Public Art Advisory Committee's roles could include:

- Selection of artists to develop plans, articulate themes, and identify potential art projects

- Approval of identified art projects
- Oversight and advice on art program implementation

Should special issues regarding the art program arise, The CRC Program will obtain assistance through the services of the Regional Arts and Cultural Council (RACC) and/or the SW Washington Center for the Arts. Experienced experts in the field of public art are available for consultation in the areas of programming, community involvement, artist selection, and design integration.

The CRC Team will be responsible for incorporating the art into the final design. Manufacture and installation of the art may be incorporated into the construction contract(s) or may be the responsibility of the artist. Any art requirements incorporated into the construction contracts will be the joint responsibility of the Public Art Manager and the Project Engineer (Resident Engineer) responsible for construction administration.

17.5 Maintenance of Art Elements

Delineation of the roles and responsibilities for the ongoing care and maintenance of the art will be determined during the Final Design phase.

18. LRT System Testing and Start-Up

18.1 Overview

The primary goal of the CRC system testing and start-up program is a revenue service opening that incorporates the lessons learned and builds upon the successes achieved on previous LRT extension start-ups in the Portland metropolitan area. The CRC Program will leverage TriMet's successful integration of new and existing service on the Metropolitan Area Express (MAX) light rail system on prior extension start-ups including:

- Westside/Hillsboro Light Rail (Blue Line) Extension, September 1998
- Airport Light Rail Extension (Red Line), September 2001
- Interstate MAX Light Rail Extension (Yellow Line), May 2004
- South Corridor Extension (Green Line), September 2009

In each case, start up culminated over a year of ever-intensifying pre-revenue testing, training, and other preparatory activities.

18.2 System Testing Procedures, Analysis, and Results

This section describes the objectives, methodology, management controls, and major milestones in the conduct of a test program intended to verify LRT's readiness for revenue operations.

18.2.1 Objectives

Listed below are the objectives of the system testing and start-up program:

- Develop and execute a comprehensive testing program
- Verification of contract compliance
- Validation and demonstration of system performance
- Demonstration of safety, security, and service characteristics
- Training of TriMet and/or C-TRAN personnel, and integration of personnel, equipment, and procedures into TriMet's overall operations
- Full collaboration with TriMet and C-TRAN operations

18.2.2 Types of Tests

Five types of tests will be required under the CRC system testing and start-up program. The following definitions include examples to distinguish the general uses of each of these tests.

Qualification or Proof of Design Testing

Proof of design tests are designed to verify that a proposed design can meet the specification requirements. They are usually performed on pre-production units or the first unit of a production run; for example, substation load test or LRV crash worthiness test.

Manufacturing Tests

Manufacturing tests are a general category of tests that are performed by the contractor and suppliers on a sampling basis or routine basis to verify the quality control and manufacturing process. They usually represent milestones for further assembly or construction activity.

Acceptance Tests

Acceptance tests are performed by the contractors on each individual item, thereby verifying performance at the equipment/subsystem/system level, after installation or assembly. These tests are normally used as advanced milestones for contract progress payment on equipment type contracts. At the system level, these tests require interface with other system elements; for example, vehicle acceptance, or ticket vending machine acceptance.

System Tests or Integrated Tests

Systems, or integrated tests, are any test or series of tests that require the interface of more than one system or civil element and are designed to verify the integration and compatibility among individual elements. These tests are usually beyond the contractual responsibility of any single contractor. They are planned, performed, witnessed, reported, and documented by TriMet and C-TRAN. These tests are generally required as a validation of total system performance. A detailed test plan for each test and the required sequence will be included in the Integrated Test Plan.

Pre-Revenue Testing

Pre-revenue tests utilize the complete functional capabilities of all system elements. Such tests are beyond the contractually required tests of individual contractors, are required to be performed prior to the introduction of revenue service and will utilize and evaluate representative system schedules, personnel, procedures, and equipment. These tests will begin after system elements relating to systems operations are complete and accepted. A detailed test plan for each test and the required sequence will be included in the Integrated Test Plan.

18.2.3 Test Management Approach

The management of the test program has been adapted to the organization of the CRC Program and is divided into two categories.

The first category includes proof of design, manufacturing, and acceptance tests. These tests are managed by the Resident Engineer responsible for the contract to which they relate.

The second category of tests-- systems integration and pre-revenue-- are the responsibility of the CRC Test Program Coordinator. Typically, prior to testing activities, the Test Program Coordinator is selected from within CRC’s systems engineering team.

The Test Program Coordinator reports to the Systems Manager, who has the duty to implement the overall test plan. During the latter phases of the project, the tasks of schedule coordination and organization of other facilities or support elements will be the responsibility of the Test Program Coordinator.

There are three major activities in performing both categories of tests:

1. Establish requirements;
2. Perform tests; and
3. Report test status, document and analyze results.

The general approach to the utilization of TriMet personnel will be to encourage maximum test witnessing as a means of training opportunities while at the same time avoiding the imposition of contractual obligations and costs. These objectives must be consistent with the assumption of responsibilities relating to various stages of contract acceptance, and within the limits of TriMet personnel resources.

18.2.4 Establish Requirements

The requirements for testing system elements are established based several factors:

- Functional criticality;
- Developmental nature;
- Procurement/installation relative to construction sequences; and
- Historical experience.

Each element of the system must be examined in terms of these factors and test requirements established. Where the requirements relate directly to contract performance specifications, the tests shall be contractor tests and will be included as part of the contract requirements.

Where test requirements are established that are beyond the contractual responsibility of any system or civil element contractor, the tests shall be termed District tests and shall be managed by the Test Program Coordinator.

The process of establishing test requirements differs between contractor and District tests. The definition of contractor tests, since they will become contractual requirements in specifications, is the responsibility of the Resident Engineer for the contract. The designer, Systems Manager, and TriMet and C-TRAN Operations staff provide technical support. Coordination of support requirements (system facilities and interfaces with other system elements) is also the responsibility of the Resident Engineer; the CRC Test Program Coordinator will provide coordination assistance. The Coordinator will assure that all contractor tests are compatible with TriMet and C-TRAN policy, system wide schedules, and the requirements of other contracts.

The definition of District tests, and the specific objectives and method of accomplishing them, will be developed by the CRC Test Program Coordinator based on input from Resident Engineers, TriMet and C-TRAN Operations, Safety and others.

18.2.5 Perform Tests

Tests will be executed in one of three ways:

1. Contractor off-site tests;
2. Contractor on-site tests; or
3. TriMet and C-TRAN Tests

Contractor off-site tests

Tests assigned to the contractors that are not performed at the point of final installation are termed off-site testing. Examples include most qualification and manufacturing tests. There are four basic activities involved in off-site testing:

1. Review of test plans, procedures, and reports;
2. Execution monitoring of the tests;
3. Verification of test performance and results; and
4. Status reporting of submittals and tests, and test completion reporting

Review of test plans, procedures, and reports is the responsibility of the Resident Engineer. The Test Program Coordinator may provide technical support. Test plans and procedures must be reviewed by the Resident Engineer to ensure that the specification requirements are met including all technical and District requirements.

The contractor will perform execution of the tests. Execution will be in accordance with the contract specifications and the test plan and/or procedures, as approved. The contractor shall provide test specimen(s), equipment, and operating personnel.

Monitoring of the tests will be the responsibility of the Resident Engineer. Members of the design team, and TriMet and C-TRAN Operations may be requested to support or witness these tests. Auditing or witnessing of tests by quality assurance staff will be performed on a spot check or random sample basis. Status reporting of all significant contractor off-site tests shall be the responsibility of the Resident Engineer.

Contractor On-Site Tests

Tests assigned to the contractors that are performed at the point of final installation are termed on-site testing. Examples include acceptance tests and contractor system tests. Basic activities involved in contractor on-site testing include:

- Review of test plans, procedures, and reports;

- Scheduling of tests;
- Equipment operation or use of other system elements;
- Execution monitoring of tests; and
- Verification of test performance and results.

Review activities are the responsibility of the Resident Engineer, supported by the Test Program Coordinator.

Scheduling of on-site tests begins during the review process, and continues through test execution and completion of test result documentation. In all phases those tests, which require interfaces with other system elements, must be identified for individual attention and additional resource support.

The Test Program Coordinator, in conjunction with TriMet's and C-TRAN's Operations, and designated CRC staff, will meet on a regular basis to coordinate the schedules and resolve potential problems associated with the on-site testing. As test plans and procedures are reviewed, the need for other system elements to be functioning will be identified and resources coordinated.

Actual test execution will be the responsibility of the contractor who must provide the necessary test equipment, test operators, and data recording. Where operation and/or maintenance of other system elements (equipment outside the contractor's responsibility) are required, such operation shall be provided by TriMet and C-TRAN personnel or by other contractors through coordination by the Test Program Coordinator.

Monitoring, execution, verification, status, and completion reporting are performed with similar responsibilities as described in off-site testing.

District Tests

The major activities in District tests (system and pre-revenue) are as follows:

- Identification of requirements;
- Preparation and review of procedures;
- Test supervision and execution; and
- Status and rest completion reporting.

Responsibility for these activities rests with the CRC Test Program Coordinator. Responsibility for certain aspects of these tests is also vested in the Light Rail Vehicles (LRVs) Resident Engineer, and TriMet and C-TRAN Operations personnel. In general, the role of the CRC Test Program Coordinator will vary with increasing responsibilities, particularly during the pre-revenue test phase.

Three types of District tests are required and occur in sequential order:

1. Light rail vehicle acceptance testing and burn-in;
2. Systems testing (integration of equipment, facilities, personnel and procedures); and
3. Pre-revenue testing (operations of total system, simulating normal, abnormal, and emergency conditions.)

Preparation of test procedures for LRVs acceptance testing will be the responsibility of the LRVs Resident Engineer. The Test Program Coordinator, and TriMet and C-TRAN Operations will review the procedures.

Preparation of procedures for systems tests will be the responsibility of the Test Program Coordinator. TriMet and C-TRAN Operations, and other TriMet ad C-TRAN staff, as required, will review procedures.

TriMet and C-TRAN Operations and the Test Program Coordinator will coordinate preparation of test procedures for the pre-revenue tests. Test supervision and execution responsibilities will vary according to the type of test. The Test Program Coordinator will be responsible for system verification tests. Pre-revenue tests will be planned, managed, and executed by TriMet and C-TRAN Operations personnel with the CRC Test Program Coordinator acting in an advisory and coordination role.

Test result reports of all District tests shall be the responsibility of the person conducting the test. The Test Program Coordinator will keep documentation of all tests performed.

18.2.6 Report Test Status, Document Results

Effective test reporting has two objectives. First, an overall knowledge of test progress is vital for an understanding of the status of individual contracts and the system as a whole. Second, the status of tests that have relationships with other contracts or tests must be closely monitored to ensure coordination and prevent delays.

The primary responsibility for providing the input on test documentation submittals (test procedures and test results) and status of individual contractor tests will be with the Resident Engineer who will submit such data to the CRC Test Program Coordinator for compilation.

The CRC Test Program Coordinator, in turn, has the responsibility to closely monitor testing and notify the Resident Engineers when late or unsuccessful tests may interfere with other project activities. The reporting of test status, test results, and test completion of systems tests will be done by the CRC Test Program Coordinator or designee. Reporting of test status, test results, and completion of pre-revenue tests will be done by the TriMet and C-TRAN Operations.

Test Documentation

The Resident Engineers and CRC Test Program Coordinator are responsible for assuring that all their test documentation is prepared and available for review. Documentation shall include a description of each test required in the contract documents, the results of each test including fail and pass dates, names of test witnesses, test reports or dates, and the acceptance of the test by the

Resident Engineer or CRC Test Program Coordinator. The CRC Test Program Coordinator will be responsible to maintain a master log of all tests required and their status. This log will become part of the back-up documentation necessary for safety certification.

Test Completion Reports

At the completion of each test, the individual responsible for approval of the test results will complete a test summary report and submit it to the CRC Test Program Coordinator. Approval of, and exceptions to, the test results will be reported on this form and any need for additional retests will be identified. The CRC Test Program Coordinator will compile test completion reports.

18.3 Modifications or Retrofits

During system or pre-revenue testing necessary changes to various project elements may be identified. Any such change will take the form of a modification or retrofit. Determination of the need for any modifications or retrofits will be based on the results of the system testing and startup program, incorporate engineering input and judgment, and must be carefully coordinated with the management of change orders and warranties.

Agreement on the scope of and assignment of financial responsibility for modifications and/or retrofits will be negotiated and administered by the Resident Engineer.

18.4 Start-Up Planning

Start-up of the light rail line is an inherently complex process requiring exceptional intra-agency coordination and planning. Anticipated challenges are:

- The construction and integrated testing phases will be nearing completion, a point in the overall process that is often exceptionally time sensitive and for which few “work-arounds” are available to deal with unresolved issues.
- Additional operations personnel are needed to operate the new line as an extension of the existing light rail line.
- General growth in other transit service areas is needed to support growth in rail, fixed-route bus, and paratransit operations well in advance of the commencement of new light rail operations.

Approximately two years in advance of revenue operations, TriMet and C-TRAN will each designate a Start-up Coordinator who will report to the Systems Manager. They will be responsible for managing the identification, critical path scheduling, coordination, and progress reporting of all activities directly supporting the commencement of revenue operations. Key coordination is required with the Transit Design Manager and Project Delivery Director to manage interfaces. An initial task will involve assuring that a coordinated training program is implemented.

TriMet and C-TRAN divisions will be involved with CRC transit staff during start-up. This includes staff from: Rail Transportation, Bus Transportation, Transportation Planning, Safety and Security, and Marketing and Customer Service.

18.4.1 Start-up Plan

The Start-up Coordinator will convene a Start-up Steering Team to oversee the start-up effort. The first priority of the Steering Team will be to guide the development of a comprehensive Start-up Plan. The plan will outline the procedures and policies necessary to activate and operate the light rail line and the key steps (testing, staffing, training, etc.) and timetable required.

Preparation of the plan will be the responsibility of the CRC Start-up Coordinator. It will be based on the successful plan and implementation process used on TriMet's previous start-ups. The plan will be used as a guide during the activation of the rail line and as a reference manual in future operation of the entire route.

The start-up activities program will continue past the date of commencement of revenue operations until all identified open items in the program have been closed.

Information under the following headings will be developed during the preliminary engineering and final design phases and included in later versions of this plan.

18.4.2 Start-up Schedule

The schedule for implementation of the plan will be prepared as a separate document, referred to as the "Start-up Schedule." Functional groupings of start-up activities will be represented. Activity groups will include:

- Completion of construction
- Bus/rail service planning
- Operating budgets programming
- Personnel hiring and training
- Maintenance of facilities/equipment
- System safety and security certification
- Systems activation
- Marketing/customer services/community relations' activities

CRC transit staff will closely coordinate with TriMet and C-TRAN divisions to prepare the sequence and timing of activities in this schedule. The stated sequence and timing of events will be followed closely to meet the established date for the start of revenue service.

18.4.3 Start-Up Target Date

An initial target date for start-up of light rail service will be established early in the overall project scheduling. Progress toward this date will be continually evaluated during the testing and start-up phases. The ultimate decision on the start-up date will be made by the CRC Director in consultation with TriMet and C-TRAN only after assurance of the system's safety and reliability is assured. A fundamental requirement for determining the opening date will be the availability of the entire length of the line, including all line segments, operations facility, vehicles, and system elements for a period of approximately four months for purposes of testing, training, and simulated operation. Depending on the actual segment completion dates, the CRC Director in consultation with TriMet and C-TRAN will determine if certain segments can be operated for either special or demonstration services. Full-revenue rail start-up will be integrated with the existing light rail system and bus service.

18.5 Operations Planning

Rail operations and maintenance plans are described below.

18.5.1 Basic Operating Plan

The basic information as to through-line operations, the location of stations, headways required to carry the expected passengers and other similar information is determined during preliminary engineering and is set forth in the Final Environmental Impact Statement (FEIS).

Critical information on the means of achieving the service level stated in the FEIS will be contained in the next *Rail Operations Five-Year Plan*. This plan will define the work requirements and set forth the personnel and training needs required to accomplish the CRC line objectives while maintaining existing service. Changes in the basic operating plan are expected to be made as additional information becomes available regarding ridership levels, vehicle characteristics, legal and regulatory directions, and other factors that may affect the operation.

18.5.2 Rail Transportation Plan

The Rail Transportation Plan in the Rail Operations Five-Year Plan will define the work requirements and hiring needs by time periods, including consideration of training. This plan will take into account the continuation of existing service, as well as demands for CRC operation and other capital and operating charges.

18.5.3 Rail Maintenance Plan

The Rail Maintenance Plan within the Rail Operations Five-Year Plan determines the work requirements by years for continued operation of the existing line, for modification thereof, and for the addition of CRC operation. As a result of long lead-time in filling many of the jobs requiring apprenticeship training, hiring efforts for such positions begin as much as two years ahead of start-up. A complete discussion of the maintenance needs and the times at which the employees must be brought into the system will be contained in the Rail Operation Five-Year Plan. The maintenance items include LRV maintenance, maintenance of way and training. As in

the Transportation Plan, consideration is given to continuation of the present service, expected changes in that operation and to the requirements for CRC service.

18.6 Operations Staffing

Since the CRC light rail line will be physically and operationally an extension of the existing light rail system in Portland, staffing of functions for train operators, LRV's maintenance, and plant/right-of-way maintenance will be organized as additions to organizational units within existing TriMet and C-TRAN Operations. Personnel requirements for the start-up and operational phases will be developed as part of the Rail Operations Five-Year Plan. The CRC light rail line will combine with the existing light rail system and will function as a fully-integrated system. Operations personnel, particularly maintainers and train operators, required for the CRC line will be at least partly drawn from the existing personnel at the Ruby Junction and Elmonica facilities. New personnel--whether from outside the District or from TriMet's Bus Operations-- will augment existing personnel. Training programs will be developed which recognize the needs of both new and existing personnel for both the new and existing lines.

Generally, Ruby Junction will serve as headquarters for the CRC portion of the combined light rail operations with management positions residing at the facility for the vehicle maintenance, plant/right-of-way maintenance and rail transportation functions. The existing Ruby Junction rail operations facility will continue to serve as headquarters for TriMet rail operations with the various managers within Rail Operations and most support staff residing at that facility.

Actual hiring practices for the new positions and all training/retraining practices are subject to collective bargaining agreements. Staff hiring will follow standard procedures as identified in current TriMet personnel policies and procedures. Operations staffing must be available to respond to the start-up plan and schedule. Key activities include:

- Completion of facility modifications in time to accept delivery of the new LRVs;
- Acceptance of the new LRVs;
- System verification testing;
- Operational Safety and Security Certification components; and
- Simulated or pre-revenue service.

The entire operations staffing program will be described in detail in the Rail Operations Five-Year Plan, which will be updated annually to adjust to any operational changes. Increases in numbers of non-operational positions (e.g. accounting, revenue collection, community relations) will be considered early in the start-up period.

18.7 Operations Training

During the start-up phase, an outline of the education and training program for the TriMet and C-TRAN Operations staff will be developed through a combined effort of suppliers, vendors, consultants, and the TriMet/C-TRAN training staff. The training program will ensure all operations personnel are cross-trained for both existing service and new system components. The

training will also reinforce for trainees the importance of the safety of the system to TriMet and C-TRAN staff as well as the public.

TriMet has in place training programs for all rail operations, rail transportation and maintenance personnel. These training programs will be updated based on recent experience and modified to include any new or unique CRC features. Specific course requirements, lesson plans, and detailed training materials for the CRC line will be created by TriMet and C-TRAN training staff with support from the CRC engineering staff, equipment suppliers and contractors, and engineering consultants. The training program will be finalized and ready to support the testing and start-up efforts.

Most systems contracts will contain a "train the trainer" program to educate TriMet and C-TRAN supervisory personnel in all details related to the safe operations and maintenance of their respective equipment. Supervisory personnel, initially trained by the contractor, will train other TriMet and C-TRAN personnel operating and maintaining equipment related to their discipline.

Any training provided by contractors or suppliers as requirements of each contract will be the responsibility of each respective contractor, and coordinated and monitored by the Resident Engineer. The training program will include, at a minimum, training manuals and instructor workbooks, and will focus on equipment and components that are new to the TriMet system. TriMet and C-TRAN will be responsible for maintaining and updating the training programs following the completion of initial contractor training.

18.7.1 Contractor Provided Training and Manuals

The contractor will develop training courses and class schedules, as well as all other appropriate manuals and training materials for approval by TriMet and C-TRAN. Emphasis will be on components from the CRC project that are new to the TriMet system. Included in the plan will be sample lessons, proposed training aids, hours of instruction to be provided, and a preliminary training schedule. Sign-in sheets will document trainee attendance.

Training Manuals

For components that are new to the TriMet system, contractors and suppliers will provide training manuals that will present a step-by-step introduction to equipment functions and operation, including basic safety and other design principles on which the system is based. These manuals will be suitable for use in the contractor-run training program and for future staff training by the District.

Maintenance Manuals

Maintenance manuals will be provided for components that are new to the TriMet system which detail procedures for all aspects of servicing, adjusting, testing and repair. They will cover all levels of maintenance from field adjustment, test and component replacement to shop adjustment, overhaul and test of components or apparatus. The manuals will contain systematic failure isolation procedures.

Standard manufacturer maintenance instructions may be used for individual components or equipment, however specific instructions and additional details in an operations and maintenance manual form will be provided for the integration of overall system maintenance.

Light Rail Vehicle Training

The light rail vehicle supplier will be required to provide TriMet and C-TRAN with an educational program to ensure satisfactory use, service and maintenance of equipment furnished. The program will be designed for trainees having no prior knowledge of light rail vehicles or their features, and will bring trainees to a level of knowledge sufficient to ensure employee safety and knowledgeable performance of vehicle operations and maintenance. Training will be provided for three categories of personnel:

1. Engineering and Administrative personnel;
2. Maintenance personnel; and
3. Train operating personnel.

Contractor-provided instructions must include physical analysis and functioning of the equipment under discussion, but also the essentials of routine maintenance, including lubrication schedules, maintenance materials, and maintenance methods and procedures where applicable. The contractor's recommendations for test frequency, limits and methods, including instruments required, will be covered in detail where applicable. When methods of access, removal, dismantling, or application are not self evident, the instructions will cover these matters. Overhaul procedures are required, since they are to be supplied in detailed maintenance manuals.

Traction Electrification System (TES) Training

The contractor will provide a training program to ensure satisfactory inspection, use, servicing and maintenance. The program will include:

- Substation training demonstrating equipment operation, inspection, routine maintenance, TES test procedures, switching, emergency operations, and safety procedures;
- Overhead line training demonstrating handling and making safe downed wires, emergency and permanent repair for every type of overhead line construction used in the light rail system, routine and surprise inspection procedures, identification of overhead line materials and tools, and safety procedures; and
- Return circuit training demonstrating description of problems, inspection procedures, identification of return circuit materials and equipment, and safety procedures.

Signal System Training

The contractor will provide a training program to ensure satisfactory inspection, use, servicing and maintenance. The program will include:

- A thorough explanation of the function of the system and the basic safety principles involved, its various safety features, and the basic levels of required maintenance;

- Detailed instruction on all special maintenance functions required: relay test and adjustment, switch mechanism and adjustment, track circuit maintenance and adjustment, and highway crossing protection equipment maintenance and adjustment; and

- Hands-on experience with maintenance and adjustment of equipment: participation in simulated installation and preliminary testing and actual adjustment where possible.

Fare Equipment Training

The contractor will prepare instruction programs and materials and provide instruction in the operation and maintenance of the fare collection equipment. The training anticipated is:

- Revenue service personnel to collect monies, replenish ticket stock and change, and accumulate record data;

- Maintenance personnel to perform scheduled maintenance and equipment field repairs; and

- Shop personnel to perform detailed overhaul and repair of components.

Shop Equipment Training

Equipment manufacturer(s) or supplier(s) will provide initial operation and maintenance instruction to appropriate LRT maintenance personnel for equipment, such as car washer equipment, jacks, and turntables. Operating, maintenance and spare parts manuals must be provided for all equipment.

Non-Revenue Equipment Training

The supplier will provide a complete training program for appropriate maintenance personnel. The training program will include operation instructions of the equipment and all appurtenances specified. In addition, the supplier will be notified prior to the date training is to be performed. This general training requirement should apply to equipment, such as line trucks, car mover (e.g., Unimog or Trackmobile), forklifts, hi-rail vehicles, autos, vans, lawn mowers, snow blowers, etc. Contractors outside the District may maintain this equipment.

18.7.2 TriMet Provided Training

Rail Transportation Training

The training program for the CRC line operations will include both classroom and field work for all Controllers, Supervisors, and train operators. Principal reference documents that will be used for the Controller, Supervisor, and Operator Training courses are TriMet's *Rail Operations Rule Book, Standard and Emergency Operating Plans and Procedures,* and the *LRV Manual*. Additional training materials will be identified and obtained as necessary. Course descriptions, lesson plans and related detailed training materials will be developed and documented by TriMet and C-TRAN operations management.

Rail Vehicle Maintenance Training

Maintenance personnel will be trained to maintain and operate the vehicles and facilities during delivery, initial testing, and burn-in operations. The vehicle mechanic group will also perform vehicle inspections, operate test vehicles as required, set up and use shop equipment, and perform other related functions. These personnel will be involved in car maintenance, testing, and modification as much as possible while working side-by-side with the car supplier's personnel.

Maintenance training will be provided through specialized courses prepared and conducted by equipment manufacturers and suppliers in accordance with the contract provisions. This training will include both classroom instruction and on-the-job training. Additional training to supplement contract training, and for ongoing maintenance functions not covered by contractor training is TriMet's and C-TRAN's responsibility.

Track Maintenance Training

TriMet will update its training course for track maintenance personnel as necessary to incorporate the CRC system requirements. The courses must cover all aspects of track and special work, inspection requirements, and repair procedure for all the various rail and track components used in the rail system, with emphasis on components that may be new to the existing TriMet system.

The training course must include review of proper methods of track and switch inspection; Federal Railroad Administration (FRA), Association of American Railroads (AAR), and American Public Transit Association (APTA) standards; gauging; tie renewal; paving; and safety precautions. Discussions of the specialized requirements for rail construction and maintenance on an electrified transit system using running rails for return circuits and track circuit signal control must be included. Written and practical demonstration will be developed for certification.

18.7.3 Orientation for Employees

A CRC light rail line orientation program will be developed for all TriMet and C-TRAN Operations and selected other employees to enable them to function effectively and safely within the system. The program may include classroom and in-field activities.

Other agency employees and contractors who may need to work on or near the CRC facilities or right-of-way will be required to receive training in transit safety and procedures, with emphasis on the need to notify and obtain permission before entering upon TriMet and C-TRAN property or doing any work on the system.

18.8 Spare Parts and Inventory Control

TriMet has established strict procedures for the receipt and storage of all spare parts and material procured, and these procedures will be followed on the CRC Project. CRC's vehicle contract manager and Resident Engineer will coordinate timing and location for receiving inspections on all incoming material and supplies. Once spare parts are delivered and accepted, the material will be securely stored and issued in accordance with TriMet inventory procedures.

All capital assets procured by TriMet are controlled and managed in accordance with the Office of Management and Budget requirements. The TriMet parts database provides automated materials management with the capability for tracking receipt of goods, inventory accounting, and procurement forecasting.

18.9 Pre-Revenue Operations

The operational testing program-- including simulation of regular operations, emergency drills and other special situations-- will be scheduled well in advance of the start of revenue service.

All TriMet rail transportation and maintenance personnel will participate in the operational testing program. For many tests, TriMet and C-TRAN bus employees will be required. Some of the tests will call upon fire, police, and other emergency responders, as well as state highway and utility personnel. Various operating situations will be simulated, and the adequacy of response relative to system security, safety of people, protection of property, and maintenance of service will be measured.

Pre-revenue testing and simulated revenue operations will be performed in accordance with the requirements specified under Section 18.2, System Testing Procedures, of this PMP. The CRC Test Program Coordinator and the TriMet and C-TRAN Operations share responsibility for pre-revenue testing.

In analyzing pre-revenue performance and results, several items will be given consideration:

- Notification procedures
- Security coordination
- Central Control response
- Transportation supervisory response
- Maintenance response
- Police/fire/rescue performance
- Power sectionalization
- Performance of re-railing equipment
- Accident investigation procedures
- Simulated bus substitutions
- Assumption of authority
- Rescue train or Hi-Rail towing dispatch
- Continuation of service
- Simulated public notification
- Single-tracking performance
- State Safety Oversight (SSO) assessment
- Emergency drills
- Safety and security certification

A baseline start-up schedule will be established based on previous start-up experience and current operations.

18.10 Crossing Order Approvals

The Transit Manager will coordinate with state and city agencies, including ODOT’s Rail Division and the City of Vancouver, responsible for approving and certifying certain safety elements of the LRT system, namely, railroad-type (gates and flashers) grade crossing protection equipment.

18.11 System Opening and Revenue Service

The primary goal of the system testing and start-up program is a revenue service opening that incorporates the lessons learned and builds upon the successes achieved on previous extension start-ups.

The final decision to open the extension will be made by the CRC Director in consultation with TriMet and C-TRAN only after assurance of the system's safety and reliability is assured and all necessary testing and training has been completed. That assurance is made possible by the development, implementation and management of the system testing and start-up program and cooperation from the many departments within TriMet and C-TRAN, including but not limited to:

- Rail Transportation
- Rail Maintenance
- Capital Projects
- Safety and Security
- Treasury (fare collection)
- Human Resources (hiring & staffing)
- Information Technology
- Grants Administration
- Transportation Planning
- Marketing/Customer Services
- Elderly and Disabled Access
- Bus Operations
- Facilities
- Programs and Communications

In addition, other agencies and groups contribute as partners in completing related improvements and providing oversight throughout the projects progression to start-up. This ongoing collaboration ensures the safe and timely integration of new transit services.

18.12 Operations Description

The proposed 2.9-mile CRC extension will be constructed from the north terminus of the Yellow Line (Interstate MAX) at the Expo Center in North Portland to a terminus at Clark College in Vancouver. The extension is currently anticipated to open in 2019.

The CRC light rail system’s service design is based on the use of day-base trains to provide the base service, 15-minute headways throughout the system. These 15-minute policy headways are provided for most of the service day until about 10:30 PM when there is a transition to 30-minute headways. As a supplement to the day-base trains, peak tripper trains are added during peak periods where peak passenger demand is such that day-base trains alone cannot carry the loads. Trains are mostly 2-car consists, but can be single cars if passenger demand permits. The downtown block length and the station design criteria limit train length to a maximum of two cars.

18.12.1 Routing and Frequencies

Information under this heading will be developed during the Final Design phase and included in later versions of this plan.

18.12.2 Travel Time and Ridership

Information under this heading will be developed during the Final Design phase and included in later versions of this plan.

This page left blank intentionally.

Appendix A
Technical Capacity and Capability Plan

This page left blank intentionally.

[Insert Appendix A
Technical Capacity and Capability Plan]

Appendix A

will be sent under separate cover.

This page left blank intentionally.

Appendix B
Program Cost Breakdown

This page left blank intentionally.

ANNUALIZED COST-BUILD ALTERNATIVE

(Rev.14, August 5, 2011)

Washington State DOT — Today's Date 9/15/11

Columbia River Crossing — Yr of Base Year $ 2011

PE — Yr of Revenue Ops 2019

	Quantity	Total Base Year Dollars (X000)	Cat. 80 Prof. Svc. spread proportionally over Cats. 10 - 50 (X000)	Spread Cat. 90 Unalloc. Cont. according to perceived risks (X000)	Revised Total Base Year Dollars (X000)	Years of Useful Life	Annualization Factor (based on 7% rate) [.07/1 - (1.07)^-no. yrs]	Annualized Cost (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	2.90	1,158,987	249,378	220,000	1,628,343			115,251
10.01 Guideway: At-grade exclusive right-of-way	0.15	522	112		634	125	0.0700	44
10.02 Guideway: At-grade semi-exclusive (allows cross traffic)	0.00	0	0		0	30	0.0806	0
10.03 Guideway: At-grade in mixed traffic	1.80	12,021	2,587		14,607	30	0.0644	1,379
10.04 Guideway: Aerial structure	1.07	1,046,324	225,139	220,000	1,491,462	80	0.0700	104,870
10.05 Guideway: Built-up fill	0.00	0	0		0	80	0.0700	0
10.06 Guideway: Underground cut & cover	0.01	2,900	621		3,520	125	0.0700	246
10.07 Guideway: Underground tunnel	0.00	0	0		0	125	0.0700	0
10.08 Guideway: Retained cut or fill	0.07	73,960	15,916		89,885	125	0.0700	6,293
10.09 Track: Direct fixation		6,899	1,485		8,384	30	0.0806	676
10.10 Track: Embedded		8,096	1,742		9,838	20	0.0944	929
10.11 Track: Ballasted		3,304	711		4,014	35	0.0772	310
10.12 Track: Special (switches, turnouts)		4,858	1,002		5,861	30	0.0806	456
10.13 Track: Vibration and noise dampening		288	62		349	30	0.0806	28
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	5	115,026	24,750	0	139,776			10,091
20.01 At-grade station, stop, shelter, mall, terminal, platform	4	15,455	3,326		18,781	70	0.0706	1,328
20.02 Aerial station, stop, shelter, mall, terminal, platform	1	1,253	270		1,523	70	0.0706	108
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0		0	125	0.0700	0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0		0	70	0.0706	0
20.05 Joint development		0	0		0	70	0.0706	0
20.06 Automobile parking multi-story structure		98,317	21,155		119,472	50	0.0725	8,657
20.07 Elevators, escalators		0	0		0	30	0.0806	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS		44,640	9,605	0	54,245			3,931
30.01 Administration Building: Office, sales, storage, revenue counting		0	0		0	50	0.0725	0
30.02 Light Maintenance Facility		44,640	9,605		54,245	50	0.0725	3,931
30.03 Heavy Maintenance Facility		0	0		0	50	0.0725	0
30.04 Storage or Maintenance of Way Building		0	0		0	50	0.0725	0
30.05 Yard and Yard Track		0	0		0	80	0.0700	0
40 SITEWORK & SPECIAL CONDITIONS		625,075	134,498	0	759,573			58,749
40.01 Demolition, Clearing, Earthwork		66,220	14,251		80,569	125	0.0700	5,643
40.02 Site Utilities, Utility Relocation		44,488	9,572		54,059	125	0.0700	3,785
40.03 Haz. mat'l, contam'd soil removal/mitigation, groundwater treatments		11,991	2,579		14,570	125	0.0700	1,020
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		32,704	7,037		39,741	125	0.0700	2,782
40.05 Site structures including retaining walls, sound walls		0	0		0	80	0.0700	0
40.06 Pedestrian / bike access and accommodation, landscaping		12,064	2,596		14,659	20	0.0944	1,384
40.07 Automobile, bus, van accessways including roads, parking lots		175,122	37,681		212,805	20	0.0944	20,089
40.08 Temporary Facilities and other indirect costs during construction		282,485	60,782		343,267	100	0.0701	24,056
50 SYSTEMS		82,386	17,727	0	100,111			8,417
50.01 Train control and signals		11,544	2,484		14,028	30	0.0806	1,130
50.02 Traffic signals and crossing protection		16,437	3,537		19,974	30	0.0806	1,610
50.03 Traction power supply: substations		3,402	732		4,134	50	0.0725	300
50.04 Traction power distribution: catenary and third rail		15,240	3,279		18,519	30	0.0806	1,492
50.05 Communications		17,360	3,735		21,096	20	0.0944	1,991
50.06 Fare collection system and equipment		14,498	3,120		17,618	25	0.0858	1,512
50.07 Central Control		3,905	840		4,745	30	0.0806	382
Construction Subtotal (10 - 50)		2,026,093	435,958	220,000	2,682,049			196,419
60 ROW, LAND, EXISTING IMPROVEMENTS		202,868		0	202,868			14,190
60.01 Purchase or lease of real estate		202,868			202,868	125	0.0700	14,190
60.02 Relocation of existing households and businesses		0			0	125	0.0700	0
70 VEHICLES (number)	19	105,804		0	105,804			9,079
70.01 Light Rail	19	105,804			105,804	25	0.0858	9,079
70.02 Heavy Rail	0	0			0	25	0.0858	0
70.03 Commuter Rail	0	0			0	25	0.0858	0
70.04 Bus	0	0			0	12	0.1259	0
70.05 Other	0	0			0	12	0.1259	0
70.06 Non-revenue vehicles	0	0			0	12	0.1259	0
70.07 Spare parts	0	0			0	12	0.1259	0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)		435,958						
80.01 Preliminary Engineering		118,106						
80.02 Final Design		121,676						
80.03 Project Management for Design and Construction		139,008						
80.04 Construction Administration & Management		50,426						
80.05 Professional Liability and other Non-Construction Insurance		2,940						
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		0						
80.07 Surveys, Testing, Investigation, Inspection		0						
80.08 Start up		3,797						
Subtotal (10 - 80)		2,770,519						
90 UNALLOCATED CONTINGENCY		220,000						
Subtotal (10 - 90)		2,990,519	435,958	220,000	2,990,519			219,887
XX.XX Insert here other components req'd in Annualized Cost		0		0	0	125	0.0700	0
XX.XX Insert here other components req'd in Annualized Cost		0		0	0	125	0.0700	0
XX.XX Insert here other components req'd in Annualized Cost		0		0	0	125	0.0700	0
XX.XX Insert here other components req'd in Annualized Cost		2		0	2	125	0.0700	0
TOTAL		2,990,521		220,000	2,990,521			219,888

This page left blank intentionally.

Appendix C
Risk and Contingency Management Plan

This page left blank intentionally.

[Insert Appendix C
Risk and Contingency Management Plan]

Appendix C

will be sent under separate cover.

This page left blank intentionally.

Appendix D
Project Implementation Plan

This page left blank intentionally.

[Insert Appendix D
Project Implementation Plan]

Appendix D

will be sent under separate cover.

This page left blank intentionally.

Appendix E
Quality Assurance Manual

This page left blank intentionally.

[Insert Appendix E
Quality Assurance Manual]

Appendix E

will be sent under separate cover.

This page left blank intentionally.

Appendix F
Real Estate Acquisition Management Plan

This page left blank intentionally.

[Insert Appendix F

Real Estate Acquisition Management Plan]

Appendix F

will be sent under separate cover.

This page left blank intentionally.

Appendix G
Safety and Security Management Plan

This page left blank intentionally.

[Insert Appendix G
Safety and Security Management Plan]

Appendix G

will be sent under separate cover.

This page left blank intentionally.

Appendix H
Quality Control Plan

This page left blank intentionally.

[Insert Appendix H
Quality Control Plan]

Appendix H

will be sent under separate cover.

This page left blank intentionally.

Appendix I
TriMet Rail Fleet Management Plan

This page left blank intentionally.

[Insert Appendix I
TriMet Rail Fleet Management Plan]

Appendix I

will be sent under separate cover.

This page left blank intentionally.

Appendix J
TriMet Bus Fleet Management Plan

This page left blank intentionally.

[Insert Appendix J

TriMet Bus Fleet Management Plan]

Appendix J

will be sent under separate cover.

This page left blank intentionally.

Appendix K
C-TRAN Bus Fleet Management Plan

This page left blank intentionally.

[Insert Appendix K

C-TRAN Bus Fleet Management Plan]

Appendix K

will be sent under separate cover.

This page left blank intentionally.

Appendix L
Procedures Manual

This page left blank intentionally.

[Insert Appendix L

Procedures Manual]

Appendix L

will be sent under separate cover.

This page left blank intentionally.