QUALITY ASSURANCE MANUAL

Technical Manual

Rev. 0

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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.

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Appendices

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ACRONYMS

ADA	Americans with Disabilities Act
AFR	Audit Finding Report
CRC	Columbia River Crossing
DB	Design-Build
DBB	Design-Bid-Build
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GC/CM	General Construction/Construction Manager
NCR	Nonconformance Report
ODOT	Oregon Department of Transportation
PMP	Project Management Plan
QA	Quality Assurance
QAM	Quality Assurance Manual
QC	Quality Control
QCP	Quality Control Plan
QMP	Quality Management Plan
RFC	Released for Construction
RFP	Request for Proposal
RFQ	Request for Qualifications
WSDOT	Washington State Department of Transportation

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1. Management Commitment Statement

The quality of the Columbia River Crossing (CRC) project is the ultimate measure by which taxpayers of Oregon and Washington, and all people who will ultimately use this new facility, will judge the success of the project. The responsibility and commitment to quality belong to the highest level of management.

> ***Quality Policy:*** *It is the policy of the project team that the project will be planned and constructed with the highest regard for quality in all areas such as environmental, scheduling, design (both preliminary and final), geotechnical investigations, surveys, bidding, construction, and ongoing serviceability and usability for years to come.*

Quality assurance practices provide one of the most effective means of controlling, guiding, and improving planning, environmental concerns, scheduling, design, safety, costs, reliability, construction quality, and longevity of the project. As such, the CRC project team considers the use and implementation of sound quality assurance practices to be of the utmost importance and a critical element in the delivery of the CRC project.

The Project Management team will identify quality objectives, specify quality-related activities, and oversee solutions to any and all issues to achieve these objectives, and will assign responsibilities for implementation and successful completion of the project.

It is the intent of the CRC project that quality assurance be a team effort encompassing all persons and organizations participating in the development of the project from initiation to completion. The entire project team, including those providing management, planning, scheduling, design, construction, consulting, or other services, is responsible for producing quality results, and is committed to the full and faithful execution of the CRC Quality Assurance Program.

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Nancy Boyd, P.E.
Project Director
Columbia River Crossing

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Date

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2. Introduction

As an obligation to the people of Oregon and Washington, the Federal Highway Administration (FHWA), and the Federal Transit Administration (FTA), as well as funding requirements relating to grantees undertaking capital programs, the CRC quality management team is required to prepare a Project Management Plan (PMP) that includes a quality program composed of written quality policies and procedures, as well as identification of a management team that supports and takes responsibility for quality and personnel who undertake quality assurance (QA) and quality control (QC) activities. The overall requirements of the project's QA program are outlined in the PMP.

This Quality Assurance Manual (QAM) provides requirements, responsibilities, and definitions for the implementation of the project's quality assurance program, whereas the Quality Control Plan (QCP) defines the techniques and procedures that the design team will use to implement an effective, documented control of the design process for the CRC project. Both of these documents are included within the PMP.

In addition, for each contract, the construction contractors for the various construction delivery methods (Design-Build (DB), Design-Bid-Build (DBB), and General Construction/Construction Manager (GC/CM) methods), all of which are referred to in this document as the "Construction Contractor," are required to have an established Quality Management Plan (QMP) that provides detailed policies and procedures for quality control of construction-related activities. All of these documents combined make up the written quality program for the project.

The CRC quality program, including this QAM, is designed in response to the FTA's *Quality Assurance and Quality Control Guidelines* that are fully described at www.fta.dot.gov. The FTA guidelines specify 15 quality elements. These elements are used as the basis for Section 3 of this document.

QA and QC are related activities, but are different. The definitions are:

> 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 CRC QA program provides for the implementation of administrative and quality control measures from design through construction. The controls established within the QAM will facilitate early identification of conditions that might, if not identified, adversely affect

satisfactory completion of the project or a phase of the project. The administrative and control measures adopted by the CRC project team will be prepared and implemented in such a manner as to contribute to and document the successful completion of a safe, reliable, economical, and convenient public transit/transportation system.

Throughout the CRC project, all proposal documents and contracts for engineering or other required services will be reviewed to determine the level of quality-related activities required to be implemented by the QAM. The quality program for each phase or contract is to be based on its size, complexity, uniqueness, and impact on the safe and efficient design of the CRC project.

It is important to note that the QA and QC procedures and protocols that are appropriate for the construction phase are not necessarily appropriate for the engineering phase and, as such, will be referenced separately where applicable. QA and QC procedures and protocols for construction activities will be provided by the Construction Contractor in their QMP and will be compliant with the requirements of the FTA's 15 elements when transit is included in the contract, as well as the requirements of the states of Oregon and Washington.

2.1 Quality Policy

It is the policy of the project team that the project will be planned and constructed with the highest regard for quality in all areas such as environmental, scheduling, design (both preliminary and final), geotechnical investigations, surveys, bidding, construction, maintenance, and ongoing serviceability and usability for years to come.

2.2 Purpose/Objective

The CRC's quality objective is to reduce the occurrence of deficiencies and nonconforming work and services during the life of the project. As such, the CRC project team considers the use and implementation of sound quality assurance practices to be of the utmost importance and a critical element in the delivery of the CRC project.

The purpose of the QAM is to provide sound quality assurance practices and requirements, responsibilities, and definitions for implementation of the project's QA program. The objective is to attain the required level of quality from the planning phase to the end of construction.

2.3 Scope

The QA program encompasses all activities related to the design of the project. Staff (including subconsultants and off-site consultants) will conform to the applicable QA program requirements.

It is the intent of the CRC project team to ensure that the agency has an effective and complete QA program throughout the entire course of the project. As such, each consultant/subconsultant will be required to abide by the QAM. However, for construction-related activities, quality procedures and policies shall be provided by the Construction Contractor in its CRC project QMP, which will be approved by the QA/QC Manager and/or the Director.

2.4 Responsibilities for Design

The CRC QA/QC Manager is responsible for the administration of the project QAM. The CRC QA/QC Manager has been delegated the authority and organizational freedom to:

- Identify and evaluate any and all quality problems; and
- Initiate, recommend, or provide solutions and to control nonconforming or deficient items or services related to design until proper disposition is obtained.

The CRC QA/QC Manager will ensure that schedule and cost considerations do not compromise quality and will have complete, unhindered, and ready access to the Director to report on quality concerns.

The CRC QA/QC Manager also has specific authorization and authority to bring any and all quality issues directly to the attention of the Director or the Deputy Director.

The initial responsibility for compliance with the QA program falls to the Consultant Design Task Leads and the Consultant Design Quality Managers. Their submittals will be reviewed by the agency Task Leads/Managers on behalf of their respective agencies (ODOT, WSDOT, TriMet, and C-TRAN) for comment, approval, and acceptance prior to implementation. The basis for the review, approval, and acceptance may include this document, States of Oregon and Washington guidelines and requirements, FTA quality guidelines for the quality-related specification sections in the contract documents, and other documents and requirements as deemed necessary. The CRC Project Services Manager will review, approve, and coordinate all PMOC interactions with the consultant team members and all PMOC review documents.

The organizational charts for the CRC project can be found at the end of this manual in Appendix A. The organizational charts identify those with responsibility for QA (managers and leads for each specific CRC organizational element), the CRC QA/QC Manager, and project team members.

For activity descriptions and responsibility of tasks found within the QAM, a Consolidated QA/QC Responsibility Matrix (Appendix B) describes the task and responsibility thereof.

2.5 Responsibilities for Construction

The Construction Contractor will assume the primary responsibility for the overall quality of its construction work under the oversight of the CRC QA/QC Manager. The Construction Contractor will develop and submit a Quality Management Plan (QMP) that will describe how it will provide QA/QC procedures and policies for construction activities, materials, and documentation of the project. The Construction Contractor will have a designated qualified quality person (Construction Quality Manager) and designate a quality team to perform the QA/QC functions for the construction activities of the project. The QA/QC Manager will perform the verification of compliance of the quality procedures as defined in the QAM and the Construction Contractor's QMP. The QA/QC Manager's oversight role ensures that the work, materials, and progress comply with the contract requirements.

2.6 Implementation

The CRC QAM will be implemented in accordance with the project's needs and the policies and procedures contained in this document. The CRC QA/QC Manager has the responsibility to review project proposal documents to identify which sections of this QAM are applicable. For construction-related activities, this QAM indicates for each element of the QA program where the Construction Contractor must implement policies and procedures as described in its QMP. Implementation of this QAM therefore requires implementation by the Construction Contractor's QMP in relation to construction of the project.

2.7 Revisions

Revisions to and maintenance of the QAM are the responsibility of the CRC QA/QC Manager in collaboration with the Director. Revisions will be made as they become necessary. An overall review of the program will be made annually, or more often if necessary, to determine whether any revisions are warranted. The CRC QA/QC Manager will implement changes to the QAM. The QAM is a CRC controlled document, and revisions to the QAM are also controlled documentation. Therefore, the document control process detailed in section 3.4 should be followed. Whenever revisions to the QAM occur, the task leaders will be informed through the monthly Prolog report provided by Document Control that lists updated documents affecting their discipline. The task managers should then notify their staff that a revised manual has been produced and that all QA/QC policies and procedures shall be in compliance with the most recent QAM.

2.8 Precedence

In the event that there is any discrepancy between the PMP, this QAM, the QCP, or the QMP of the Construction Contractor, the PMP will take precedence. The documents will be subsequently revised for consistency.

3. Quality Assurance Program Implementation (FTA's Fifteen Elements)

3.1 Management Responsibility

3.1.1 Purpose

This section describes the management responsibility, organizational structure, and chain of command for QA/QC activities to be implemented during the course of the CRC project by the consultants, subconsultants, Construction Contractor, and others involved in the successful completion of the CRC project. The Quality Policy and stated management commitment to it is provided in section 1 of the QAM.

3.1.2 Scope

These QA requirements apply to CRC management and its consultants, subconsultants, the Construction Contractor, and all others who will perform activities that affect the overall quality of the project.

3.1.3 Policy

Authority, accountability, and responsibility of the CRC QA team must be identified for each organization, consultant, subconsultant, and Construction Contractor. The management structure, function, and chain of command of each contributing organization should be clearly established.

3.1.4 Quality Program Procedures

Organization

The CRC organizational charts are included as Appendix A of this document.

The structure for any organization assigned to perform work affecting quality will be that organization's responsibility, subject to approval by the CRC QA/QC Manager or those delegated by the CRC project team. Each QC program and staff organization will be structured in such a manner that:

1. Quality is achieved and maintained by those who have been assigned responsibility for performing the work. This is accomplished by utilization of QC plans and procedures already in place or by use of those embodied in the overall CRC QA program.

2. The staff organization responsible for quality will have sufficient authority, access to work areas, and organizational independence to identify quality problems, verify implementation of solutions, and ensure that further processing or delivery is controlled

until proper disposition of a deficiency, nonconformance, or unsatisfactory condition has been completed.

3. Qualified personnel will verify compliance with all aspects of the QA/QC program. To determine its effectiveness, they will perform planned and scheduled audits. Personnel who do not have direct responsibility for performing the activities being audited will perform these audits in accordance with the CRC project's written procedures and/or checklists. Audit results will be documented, reported, and reviewed by the CRC QA/QC Manager and responsible management. Follow-up responses and corrective actions will be implemented where appropriate.

4. Quality achievement is verified via quality audits, quality surveillance, and first-level QC reviews of work products performed by persons or organizations not directly responsible for performing the work.

5. Quality verification persons or organizations will report to a level of management that provides sufficient authority and organizational freedom to ensure that appropriate action is taken to resolve conditions adverse to quality.

Program Assessment

The adequacy and effectiveness of the project quality program will be regularly and formally assessed by the management of organizations implementing the programs and by the CRC QA/QC Manager.

3.1.5 Responsibilities

The CRC Director is ultimately responsible for the overall quality of the CRC project.

The Director has assigned the responsibility of ensuring the development, establishment, implementation, and evaluation of the project's QA program to the CRC QA/QC Manager.

The CRC QA/QC Manager is responsible for:

- Ensuring that the project's QA program is established and maintained.
- Providing consultation and direction regarding quality issues to design and other project tasks.
- Monitoring the quality program implementation and evaluating adequacy and effectiveness.
- Coordinating the project's QA program with the consultants' QA/QC plans to ensure that CRC project quality policies are not compromised.
- Resolving conflicts regarding the intent of the QA program.
- Reviewing and approving consultants' and subconsultants' QA programs for compliance.
- Reviewing and approving the Construction Contractor's QMP and their adherence to the QAM, QCP, and their QMP.

The CRC QA/QC Manager is provided with the complete organizational freedom to investigate quality-related activities in all areas of the project and to identify any quality problems. The CRC QA/QC Manager retains authority to control further design, investigations, and/or public input for nonconforming or deficient items or service until proper disposition has been obtained; to initiate, recommend, or provide solutions; and to verify implementation of solutions. In matters of quality, the CRC QA/QC Manager will have complete and ready access to the Task Leads, Consultant Project Manager, Senior Managers, and the Director.

Any decision made by the CRC QA/QC Manager regarding the applicability or interpretation of the QA program to consultants, subconsultants, or others who may work on the project is subject to review only by the Director or a satisfactory representative appointed by him or her.

3.2 Documented Quality Management System

3.2.1 Purpose

This section describes a documented quality management system that will ensure that project quality objectives are satisfied.

3.2.2 Scope

The quality management system described here applies to all project quality-dependent activities and participants.

3.2.3 Policy

The Quality Policy Statement requires a QA program to ensure that the expected level of quality is achieved. Implementation and documentation of the CRC QA program is described throughout this QAM, and is described in greater detail within the QCP for control of quality. This QAM describes in writing the policies, procedures, and instructions for the elements of the QA program as required for a documented quality management system and indicates areas where consultants, subconsultants, and the Construction Contractor are responsible for meeting requirements of the program.

3.2.4 CRC Quality Assurance Program

The QA program for the CRC project consists of three elements, as follows:

1. The governing policies and general requirements specified in the PMP's Quality Assurance and Quality Control Section.

2. This Quality Assurance Manual, which addresses the 15 Elements identified in FTA's QA/QC Guidelines.

3. A Quality Control Plan that provides specific tools, policy, and procedures for consultant and agency staff.

In general, all QA program policies will comply with FTA quality assurance guidelines, quality-related requirements of the contract documents, and other documents or requirements as deemed necessary.

Consultants and the Construction Contractor will each be required to adhere to the requirements and standards set forth in this QAM and their own internal QC plans and QMP, respectively, which will be reviewed and approved by the CRC QA/QC Manager, whether they work in the CRC project office or off-site.

The CRC QA program will be subject to an annual review, and this QAM will be evaluated by CRC upper management (Consultant Project Manager, Senior Managers, and Director) to ensure adequacy and effectiveness of policies and personnel.

3.2.5 Responsibilities

The CRC QA/QC Manager's responsibilities are outlined in Section 3.1.5.

CRC personnel performing quality functions will be qualified by training and/or experience and be subject to the approval of the CRC QA/QC Manager.

Consultants are responsible for developing, implementing, and maintaining a QC plan that satisfies the requirements of their current contract documents. If a consultant subcontracts a portion of the work, the accountability for the QC plan remains with the primary consultant. The primary consultant may, however, delegate responsibility for portions of the plan to the performing subconsultant, subject to approval by the CRC QA/QC Manager.

The Construction Contractor is responsible for the development, implementation, and maintenance of a QMP for construction-related components and activities and must be in compliance with the FTA's 15 elements and state requirements. It is the responsibility of the Construction Contractor to ensure that only trained and experienced personnel perform the quality functions of the construction activities.

The CRC QA/QC Manager is responsible for verification of all review procedures and disposition of quality issues.

3.3 Design Control

3.3.1 Purpose

This section describes the requirements for the establishment and maintenance of procedures to control and verify design and design changes, and to ensure that design criteria and requirements of the relevant regulatory agencies are met. Design control activities more specific to control of quality are detailed in the QCP.

3.3.2 Scope

The CRC project has developed the QCP to identify who has design and quality responsibilities and identifies the design criteria to be used, and the verification of its use.

These requirements apply to all transportation activities conducted within the CRC office and the off-site offices of any consultant or subconsultant.

The Design Control element applies to all major categories of work including:

- Street and highway activities
- River crossing
- Transit activities
- Structures
- All other transportation activities

3.3.3 Policy

All design consultants and subconsultants are required to conform to this QAM and the QCP and to govern their work in accordance with this QAM.

3.3.4 Procedure

Design Control quality procedures are located in the QCP Chapter 4 – Design Review. Procedures for Design Control activities involving light rail transit (LRT) can be found in the PMP, Chapter 12 – LRT Design. Design Control for Highway Design is located in Chapter 13 – Highway Design.

Design changes that occur after Released for Construction (RFC) acceptance shall have a notification of impending design change and should be distributed in accordance to Section 14.3.5.4, Design Revisions Following Issuance of RFC Documents, of the PMP. Any design change must have a formal quality review in accordance with this QAM and the QCP. The Construction Contractor will not construct any items affected by the identified changes until after the updated plans have been through the RFC process. All plans, calculations, and special provisions with design changes must be in compliance with the quality review procedures found in Chapter 4 of the QCP.

For each release of a plan or special provision, the sequential number of the release and the date it is released shall be provided by Document Control and tracked accordingly. Procedures for the controlling of design changes can be found in Chapter 3 – Management Control, Section 3.6.4.1, Design Change Control, of the PMP.

3.3.5 CRC Quality Assurance

The CRC QA/QC Manager will perform audits and/or surveillance of the design QC process to verify that the QCP has been implemented. QA activities will include sampling design documents for adequacy, completeness, and compliance with relevant agency standards. QA staff will also examine the consultants' QC documentation to verify that the QC records are complete and that design criteria and requirements of relevant regulatory agencies have been verified.

3.3.6 Responsibility

The CRC Design Managers are responsible to communicate with staff regarding design requirements and to develop, implement, and maintain procedures to control and verify the design in order to ensure that the design criteria, other specific requirements, and requirements of the relevant regulatory agencies are met. This includes internal QC review of deliverables according to the requirements of the QCP and this QAM. The CRC Design Managers will designate staff responsible for review of designated deliverables.

In addition, Design Managers will participate to the extent necessary in reviews by CRC project team members exterior to the task groups (departments of transportation, etc.) and in reviews performed by outside entities, such as those required by the InterCEP Agreement.

The CRC QA/QC Manager is responsible for verification of all review procedures and disposition of quality issues.

3.4 Document Control

3.4.1 Purpose

Procedures for control of project documents and data are established and maintained. The document control measures for controlled documents ensure that all relevant documents are current and available to all users who require them.

Controlled documents are key documents that are either developed internally or acquired from external sources and used as authoritative references during the development of design and construction of the CRC project.

3.4.2 Scope

The procedures for control apply to all third-party reference and project documents prepared by agency staff, by consultants or off-site subconsultants, or the Construction Contractor that are subject to a quality review. Document control for reference manuals, project work papers, and official project files are addressed in the PMP in Section 3.7.3, Records Management; 3.7.3.1(a), Reference Material; 3.7.3.1(b), Project Work Papers; and 3.7.3.1(c), Official Project Files.

3.4.3 Policy

Controlled documents are subject to controlled distribution to see that changes and updates are made in a systematic manner, and that all parties are working from the latest version of the documents. Individual discipline-specific managers are responsible for identifying project-specific documents that require controlled distribution. Each discipline is responsible for following the established document control procedures as defined in the PMP, Section 3.7.2, Controlled Documents, and this QAM.

All quality-reviewed project documents, including third-party reference documents, will be controlled in accordance with established document control procedures defined in the CRC PMP and the QCP. Quality assurance measures will be used to verify conformance as outlined in Section 3.2 above.

3.4.4 **Procedure**

Each discipline is responsible for following established document control procedures as defined in the PMP. The discipline managers will each identify a discipline administrative assistant (discipline admin) to assist with the administration of key documents and records within his or her respective discipline.

Within each discipline, the discipline-specific task managers are responsible for developing and issuing documents that are either developed internally or acquired from external sources, and that require controlled distribution for their respective discipline and related sub-disciplines. In accordance with the established document control procedures within the PMP, the author of each CRC-issued controlled document, under the direction of the discipline-specific task manager, defines the appropriate distribution and revision for that document or record. The discipline-specific task managers are each responsible for defining the distribution list, including a list of official electronic copies and printed copies, if applicable.

The discipline-specific task manager overseeing the distribution of a controlled document (whether prepared on-site or by off-site consultants) is responsible for any necessary updates, approvals, and subsequent redistribution of that controlled document, and for transmitting updates to Document Control (with the exception of engineering design drawings). All updates must be approved according to the QC requirements for that particular document.

Controlled documents prepared by consultants, subconsultants, and/or the Construction Contractor shall be prepared in accordance with CRC requirements and procedures, which can be found in PMP Section 3.7.2, Controlled Documents, and approved or accepted by the responsible discipline-specific task manager. The discipline-specific task manager is responsible for distribution of these controlled documents, and for transmitting them, including any updates, to Document Control (with the exception of engineering design drawings).

Design drawings designated as controlled documents will be maintained by the CRC CAD Manager in ProjectWise.

Creation of controlled documents should follow procedures found in the Controlled Documents section of the PMP. To initiate an update to an existing controlled document and to distribute the updated document, the following procedures should be followed:

1. The discipline manager shall confirm with Document Control that the current version of the document that is intended to be updated and distributed is, in fact, the most recent version.

2. Once the updates have been completed and the document has undergone the required quality review process, the discipline admin shall then distribute the updates to the discipline and provide them to Document Control.

3. Document Control will file the controlled documents and their updates (with the exception of engineering design drawings) in the Controlled Documents folder under CRC on the G drive. Obsolete documents are placed in the obsolete folder and the pdf is stamped “VOID” in Adobe.

4. Document Control is responsible for the coding of controlled documents and their updates into the document control electronic system, Prolog. In the deliverable packages section, the following information is included:
    a. Document title and number
    b. Revision number and date
    c. Responsible document author
    d. Distribution list (electronic and physical)
5. Document Control will produce a report that lists updated documents from Prolog and distribute the report monthly to discipline-specific task managers and discipline admins. Discipline-specific task managers will be responsible for verifying the accuracy of these reports.

The same controlled updating and distribution procedures apply to externally issued reference documents that are used in the development of the CRC design and during construction, and that are designated as controlled documents.

Project quality reviews are also considered part of the project record, and therefore a series of document control measures shall be followed to ensure the integrity and accessibility of hard copy and electronic document reviews. For procedures regarding Document Control of quality-reviewed documents, see the QCP, Section 5.

All quality-reviewed documents, drawings, specifications, reports, cost estimates, and calculations must incorporate appropriate file codes in accordance with the project's standard file code system. Completed quality documents shall be filed electronically in the "QC Documents" folder of the "Work paper" CRC electronic file directory or a hard copy shall be placed in the project office as a record of the QC review process. The documents shall be clearly labeled as to milestone submittal and dated. No other notations or markings shall be placed on these documents. These documents may not be purged until approved by the Business Manager or Director.

The project document control system and consultants' document and drawing control systems (including the project document control system of the Construction Contractor) will be subject to review by the CRC QA/QC Manager at any time.

3.4.5 **Responsibility**

Within each discipline, the discipline-specific task managers are responsible for developing and issuing documents in accordance with established document control procedures found in the Controlled Documents section of the PMP. Once an original document or an updated document is provided to Document Control, it is the responsibility of Document Control to file and record the document into Prolog.

It is the responsibility of the Design Quality Manager to ensure that the established quality review process was completed and to confirm that the quality review document was filed in the proper location.

The Construction Contractor's are responsible for developing and conforming to a document control system for documents produced during construction activities. Policy and procedure for the control of documents during construction are located in each of their QMPs.

3.5 Purchasing (Construction Only)

3.5.1 **Purpose**

The purpose of this element is to ensure that during construction, purchasing requirements are clear and complete, that the suppliers of the Construction Contractor understand them, and that appropriate quality elements are made part of the purchasing contract. Additional requirements, such as on-site inspection and handling and receiving procedures, may be required.

3.5.2 **Scope**

A documented list of acceptable suppliers and contractors will be established for the desired service or product, consistent with applicable purchasing requirements. Suppliers or contractors will be selected on the basis of their being able to meet contract requirements, including quality requirements. The quality requirements will depend upon the nature of the service or product provided by the supplier or contractor in which the minimum requirements are initially provided in the Request for Proposal (RFP) package and must be met before a contract or purchase order can be issued.

3.5.3 **Policy**

The Construction Contractor will establish the contract with the supplier based on purchasing requirements as defined in its QMP and the CRC construction contract, including relevant standards, drawings, specials, specifications, process requirements, inspection instructions, and approval criteria for materials, processes, and products. The purchasing documents should be reviewed and approved by the Construction Quality Manager or the Construction Project Manager for adequacy of specified requirements prior to release. The Construction Contractor should ensure that the supplier fully understands the contract, agrees with the contract, and has the capacity to perform as required.

The contract between the Construction Contractor and the supplier should specify the right of the purchaser or other authorized representatives to carry out inspection and testing at the source and upon receipt to verify that the work or product meets specifications. Such provision should not absolve the supplier of the responsibility to provide acceptable work or product, nor should it preclude subsequent rejection.

Where equipment procurement is involved, the Construction Contractor will define, as appropriate, the means and methods for handling, storage, packaging, and delivery of product.

3.5.4 **Procedure**

All materials delivered to the job site shall be documented and inspected within 24 hours of delivery. The Construction Quality Manager shall maintain the records for each delivery,

material bill of lading, certificate of compliance, and test results. The Construction Quality Manager shall develop a materials tracking system to track the quantities and acceptance status of the materials. Any equipment that is damaged or is otherwise unsuited for use should be documented and reported to the supplier.

The Construction Quality Manager or designated representative shall identify and log the material. There should be means of identification to indicate where the material should be used. All material, each piece of equipment, or each element of work will be tagged, labeled, or stamped to indicate the acceptance of the material. To eliminate duplicate testing or inadvertent by-passing, items need to have an identification either when they pass required inspections and tests or upon acceptance when the materials are delivered to the job site. Refer to the Construction Contractor's QMP for further policies and procedures regarding Purchasing requirements.

3.5.5 Responsibility

It is the responsibility of the Construction Contractor to ensure that the materials and equipment used during the construction of the project meet the product specifications, and the Construction Contractor should have sufficient evidence that the product (materials or equipment) has been inspected and tested and is suitable for use.

3.6 Product Identification and Traceability

3.6.1 Purpose

This section describes the policy and procedures for the identification and traceability for documents, drawings, specifications, reports, cost estimates, and calculations that are created during the design process for the CRC project. Detailed standard document control procedures are established within the PMP.

Product identification and traceability in regards to construction materials and documents will be established and maintained by the Construction Contractor for identifying and controlling items of production (batch, materials, parts, and components) to prevent the use of incorrect or defective items and to ensure that only correct and acceptable items are used or installed. These measures should be included in the Construction Contractor's QMP and should meet the requirements of the FTA's 15 Elements.

3.6.2 Scope

These requirements apply to all documents, drawings, specifications, reports, cost estimates, calculations, equipment, and materials, either created or used, for the CRC project.

3.6.3 Policy

Procedures for product identification and traceability for the engineering design phases are established within the CRC PMP in Section 3.7.2, Controlled Documents, and shall be followed during all stages of design to ensure that project documents, drawings, specifications, reports, cost estimates, and calculations are correct and easily traced by leaving an auditable trail.

The policy for product identification and traceability for construction activities, materials, equipment, and construction documentation shall be found in the Construction Contractor's QMP.

3.6.4 Procedures

Physical identification and traceability shall be incorporated into submittal documents, reports, cost estimates, and calculations through one or more of such means including: job number, deliverable identification number, identification markings (submittal name, date, etc.), and/or serial number. The Finance Manager shall provide the required identification numbers to the Design Manager to reference on all submittal documents. Refer to the Controlled Documents and Design Criteria sections within the PMP for how to acquire an identification number (i.e., deliverable identifier) and requirements for the submittal format.

Equipment that is used to collect data for the design process shall have an identification number or serial number that shall be referenced in all reports and documents relating to that equipment. Physical identification and control will be used to the most reasonable extent possible. Where physical identification is impractical, other appropriate means, such as physical separation of products, will be used. Surveillance of the process may be completed to verify conformance of this procedure.

All materials and equipment being used for construction of the CRC project shall reference some form of identification through means of a job number, identification markings, and/or serial number that can be referred to through an auditable trail. Further procedures can be found in the Construction Contractor's QMP.

3.6.5 Responsibility

It is the responsibility of the Design Manager to ensure that all submittal documents include a deliverable identification number provided by the Finance Manager and that the format conforms to the procedures established within the PMP to allow for easy tracking and provide an auditable trail. It is the Design Manager's responsibility to verify with lower-tier consultants that they have an established QA/QC plan and that equipment used to collect data during the design process correlates to the equipment identifier provided on the test, report, or document.

It is the responsibility of the Construction Contractor to ensure that all equipment and components used for construction of the project meet the requirements of this element and its QMP.

3.7 Process Control (Construction Only)

3.7.1 Purpose

This section briefly describes the policy in place to identify and plan the production and installation processes during construction. Further policy and procedures for this section can be found in the Construction Contractor's QMP.

3.7.2 Scope

The process control requirements apply to all production and installation processes during construction.

Continuous monitoring and/or conformance with documented procedures is required during special processes, such as welding, non-destructive testing, and heat treatment, where the results will impact quality of the final product, but where inspection after the fact will not reveal the deficiencies.

3.7.3 Policy

An established plan is required for production and installation processes during construction that directly affect quality to ensure these processes are performed under controlled conditions. Special processes, the results of which cannot be verified by subsequent inspection and testing of the product, shall be continuously monitored.

Further policies regarding process control during construction shall be found in the Construction Contractor's QMP.

3.7.4 Procedure

Procedures regarding process control during construction shall be found in the Construction Contractor's QMP and must meet the requirement of the FTA guidelines for this element.

3.7.5 Responsibility

It is the responsibility of the Construction Contractor to ensure that the procedures and policies for Process Control meet the intent of this element and that they are adhered to.

3.8 Inspection and Testing

3.8.1 Purpose

Procedures and policies are required during design and construction for implementing and controlling inspection and testing activities to verify conformance to contract requirements and adherence to this QAM. Detailed procedures and policy for inspection and testing for construction activities shall be found in the Construction Contractor's QMP.

3.8.2 Scope

Inspections (i.e., quality control reviews with respect to design documents) and testing requirements apply to all project documents, drawings, specifications, reports, cost estimates, and calculations. Further details regarding inspection and testing of documents can be found in the CRC QCP.

All equipment, materials and products delivered to the project site shall be inspected, marked, and tracked in accordance with this 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.

3.8.3 **Policy**

All submittal documents shall have a formal quality control review and provide evidence of such according to the procedures found in the CRC QCP. Quality control reviews are monitored and audited routinely to ensure that the quality review has been performed correctly and is in conformance with the CRC QCP.

All equipment used to collect data during the design phase must have records of all inspections and tests which must be in compliance with the requirements of AASHTO R-18.

Policies for Inspection and Testing for construction-related activities are provided in the Construction Contractor's QMP.

3.8.4 **Procedures**

Procedures for quality control reviews and audits are established and are covered in-depth in the CRC QCP. All consultants are required to include procedures for quality control reviews and audits thereof in their QC plans.

Audits are documented, and the documentation is stored electronically in the CRC project files for project record as a test of the quality review (inspection) process.

Any consultant that provides services using equipment is required to have a QC plan that includes thorough inspection and testing procedures for that equipment and provides assurance that the inspections and tests will be performed according to contract requirements and standard industry practice.

For activities regarding construction components, daily inspection reports should be completed to document that construction practice, finished work, and sampling and testing meet the requirements of the QAM, the Construction Contractor's QMP, and project documents.

Quality sampling and testing will be performed at random in accordance with the testing plan for each material. The plan will be developed using a random numbers table generated in a spreadsheet format, and it will reflect the total estimated plan quantity. The plan shall be submitted to the CRC QA/QC Manager and posted in the Construction Contractor's tracking software before placement of the material on the project.

Daily inspection reports shall be created and maintained by the Construction Quality Manager. Each inspection report should contain each work activity that has been inspected. These reports are a part of the project file and should be available for verification.

Further procedures for Inspection and Testing related to construction materials and equipment shall be provided in the Construction Contractor's QMP.

3.8.5 Responsibility

It is the responsibility of the QA/QC Manager to monitor the project's adherence to the QCP and to provide oversight of the quality activities during construction. It is the Design Quality Manager's responsibility to assist the Design Manager in coordinating the quality control of the design and drafted products prepared by the Designers and Technicians.

The consultant and/or Task Lead is responsible to determine the required inspections and tests for equipment that is used during the design phase.

The Construction Contractor is responsible to provide a testing plan and maintain the inspection reports in conformance to the policy and procedures for Inspection and Testing as provided in its QMP.

3.9 Inspection, Measuring, and Test Equipment

3.9.1 Purpose

Inspection, measuring, and test equipment required to carry out inspection and testing should be identified, controlled, calibrated, and maintained in order to demonstrate the conformance of work to the specified requirements. Provisions should be made for recalibration of such equipment in a timely manner.

This section describes the requirements for controlling the performance of inspection, measuring, and testing equipment, such as instruments used for collection and testing of survey, geotechnical, and air quality data, as well as equipment used during construction.

3.9.2 Scope

These requirements apply to all inspection, measuring, and testing equipment used for determining the quality of materials, equipment, parts, components, and services for the project. This includes, but is not limited to, equipment for survey, geotechnical sampling, air quality measuring, and equipment used during construction on this project, all of which must be in compliance with industry guidelines.

3.9.3 Policy

Off-site subconsultants and the Construction Contractor are subject to the FTA requirement to include an inspection, measuring, and testing equipment policy, for all equipment maintained by them, in their QC plans or QMP, respectively, which must be approved by the CRC QA/QC Manager.

All survey equipment used on this project will be properly maintained and shall meet or exceed industry inspection and testing standards. A record of calibrations, previous inspections, and test results shall be maintained and filed according to project standards and should be readily available for a surveillance audit. Any equipment without such records or that does not meet the manufacturer's specifications will not be accepted for use on this project.

For further policy regarding inspection, measuring, and test equipment for construction, refer to the Construction Contractor's QMP.

3.9.4 **Procedures**

All consultant equipment used to obtain CRC design data must be maintained and have inspection, measuring, and test equipment procedures defined in their QC plans, which must be approved by the QA/QC Manager.

Survey equipment shall be calibrated every two weeks, or before any control traverse, and the calibration test shall be documented in a report. A total station calibration consists of a horizontal columniation, vertical index, tilt axis, and level compensator. Each total station setup will include a backsight check. If the backsight check distance and elevation do not match, within an expected tolerance, a timely investigation will be made to verify the control and/or the equipment performance.

Field survey crews are to provide the collected electronic field data and copies of the field notes to the office survey technicians, together with any photographs and other supporting information. The survey technicians will process the field data into lines, points, blocks, and terrain model information.

The survey technicians will fill out a processing log with the following information:

- The field file name.
- A description of the work.
- The field book number and page number.
- The technician's initials and date that the survey data was processed.
- Point numbers generated.
- Any additional comments or field notes addressing or clarifying unusual or unexpected conditions or areas of conflicts or concern.

The processing log and backup information for each field file (field notes, photographs, etc.) will be filed with the project records.

The Construction Quality Manager is responsible for the inspection, testing and measuring of all equipment, field samples, and equipment used on the job site. The Construction Contractor shall establish procedures for the inspection and testing for all work requiring acceptance tests in accordance to AASHTO, ASTM, and/or local jurisdiction requirements.

The Construction Quality Manager will check all measuring and testing devices to evaluate the working order, condition, calibration and certification of the equipment. The calibration verification of all testing equipment will meet the requirements of AASHTO R-18. The calibration records shall be maintained in an organized manner and be made available upon request by the CRC QA/QC Manager. Further Procedures with regard to inspection, measuring, and test equipment for construction activities are provided in the Construction Contractor's QMP.

3.9.5 Responsibility

It is the responsibility of the Task Lead to ensure that inspection, measuring, and testing equipment is properly maintained and that evidence of testing and maintenance is readily available.

It is the responsibility of the Construction Contractor to ensure that all equipment used during construction is properly maintained and inspected in accordance with the equipment specifications and industry standards.

3.10 Inspection and Test Status

3.10.1 Purpose

This section briefly describes the policy and procedures for identifying the inspection and test status of work during production and installation.

3.10.2 Scope

The requirements below include planning and design documents, as well as construction components.

3.10.3 Policy

Suitable work products, including materials used for installation during construction, should show evidence of successful test and inspection and should be identified by means of markings, stamps, tags, labels, routing cards, inspections records, test software, physical location, or other suitable means. The status identification indicates the conformance or nonconformance with regard to inspections and tests performed.

Further policies for inspection and test status of construction materials are located in the Construction Contractor's QMP and must be in compliance with the FTA's requirements for this element.

3.10.4 Procedure

All work products and construction components should follow the requirements of Section 3.6, Product Identification and Traceability, and have evidence of inspection with a successful result. Design documents shall use the stamp process as provided in the QCP, Section 4.2, as evidence of acceptable review.

The status of completed, tested, and inspected construction components should be kept as an ongoing record in the daily inspection reports. Nonconforming materials or construction components should be recorded, with the location noted on inspection reports or nonconformance reports as applicable. Any product or equipment that is not in conformance should not be used.

Further procedures for inspection and test status for construction can be found in the Construction Contractor's QMP.

3.10.5 **Responsibility**

It is the Design Manager's responsibility to make sure the quality process has been completed in conformance with the QAM and QCP.

The QA/QC Manager is responsible for ensuring that design documents have evidence of a formal quality review.

The Construction Contractor is responsible for all construction components and evidence of quality inspections and related reports. The CRC QA/QC Manager is responsible to audit the Construction Contractor's records for inspections and reporting.

3.11 Nonconformance

3.11.1 **Purpose**

This section describes the procedures and requirements for identifying and tracking nonconforming work items and products to their resolution.

3.11.2 **Scope**

Nonconforming work or products shall be identified, documented, and evaluated to determine appropriate disposition. Activities affected by the nonconforming work or product shall be identified. Disposition of nonconforming work or product can include rework, acceptance, use for alternative applications, removal, or use of a different product.

Disposition of nonconforming work or product should be documented. Reworked or repaired work should be re-inspected in accordance with documented procedures as described in the Procedures section 3.11.4.

These requirements apply to all contracts, consultants, and the Construction Contractor, all of whom are a part of the CRC project.

3.11.3 **Policy**

Procedures should be followed to discover and maintain control of nonconforming work to ensure that such work is not used or installed and that any possible adverse effects are controlled. The final disposition of nonconforming work may include rework, acceptance for an alternative application, or rejection.

3.11.4 **Procedures**

A nonconformance report (NCR) will be submitted for any instance of a nonconforming item, as identified by either the Design Manager, Construction Quality Manager, or by the CRC QA/QC Manager, deriving from an inspection or quality audit.

NCRs are controlled documents that give the Design Manager or Construction Project Manager notice of a nonconforming item. The NCR is used to track the actions taken to address the nonconformance. Once a nonconforming item is identified and an NCR form, located in the QCP as Appendix E, is initiated, the person responsible for managing the remediation of the nonconformance investigates the cause of the nonconformance and tracks its disposition. The Design Manager shall inform the QA/QC Manager upon initiation of an NCR. The QA/QC Manager will provide oversight during the entire NCR process. When the issue is resolved, the completed form shall be included in the project record.

Any reworked or repaired work will be re-inspected, retested, or re-reviewed.

3.11.5 **Responsibility**

The Design Manager or the CRC QA/QC Manager is responsible for initiation and documentation of an NCR related to design.

It is the responsibility of the Construction Contractor's Quality Manager or the CRC QA/QC Manager to initiate and maintain the documentation of an NCR for any nonconformance that is related to a construction activity. The CRC QA/QC Manager will be responsible for oversight during the investigation of the cause and shall monitor the status until it is resolved. The Construction Quality Manager is responsible for maintaining communication with the CRC QA/QC Manager regarding the NCR and shall provide a completed copy upon its resolution to the QA/QC Manager for distribution to the Director. A copy of the NCR will be provided to the Director for any additional comment or action. If the Director requests further action, the NCR will remain in open standing until the Director is satisfied with the result and requests the NCR to be closed.

3.12 Corrective Action

3.12.1 **Purpose**

This section describes the procedure for implementing corrective actions when repetitive nonconforming work and product exists.

3.12.2 **Scope**

These requirements apply to all project team members on the CRC project.

3.12.3 **Policy**

Corrective action procedures are established to investigate causes of nonconforming work or product, analyze processes to detect and eliminate causes of nonconforming work or product, initiate preventive measures to correct problems, ensure that corrective actions are effective, and implement and record changes in procedures resulting from corrective actions.

3.12.4 **Procedures**

Deficiencies discovered during surveillance will require corrective actions and acceptance by the QA/QC Manager or designated staff.

Corrective action procedures will be invoked when conditions indicate that an error in the work or product has occurred. The need for a corrective action may be identified based on observations of work in progress.

When the need for a corrective action is identified, a Corrective Action Request (Appendix C) shall be developed, implemented, and tracked to reduce the possibility of another occurrence. Corrective actions will be noted and conveyed to the Design Manager who is responsible.

Corrective action procedures for construction activities shall be described in the Construction Contractor's QMP.

3.12.5 **Responsibility**

The QA/QC Manager and/or Design Manager are responsible for initiation and documentation of a corrective action request resulting from the occurrence of nonconforming work.

It is the responsibility of the Construction Contractor to initiate and document a Corrective Action Request when repetitive nonconforming work or product that is related to a construction activity occurs. The QA/QC Manager is responsible for oversight of the Construction Contractor's corrective action procedure.

3.13 Quality Records

3.13.1 **Purpose**

This section describes the requirements for production, collection, filing, and maintenance of quality records.

3.13.2 **Scope**

These requirements apply to all quality records for the project, including nonconformances, corrective actions, and audit reports.

3.13.3 **Policy**

Written records of QA/QC activities will be prepared, compiled, and stored in a retrievable manner, as indicated in the PMP and according to the procedures described in this QAM and the QCP.

3.13.4 **Procedures**

Quality records will be collected, stored, and preserved in a manner that precludes damage, loss, or deterioration. Quality records may be in either hard copy or electronic form.

Quality records will be maintained to demonstrate conformance to quality-related requirements and the effectiveness of the quality system. They will be available to authorized persons at any time when requested within a reasonable timeframe.

Quality records will be assigned a unique number, and a database will be maintained that includes the item description, unique number, location, and responsible authority.

Quality records will be categorized as: (1) permanent quality records, or (2) nonpermanent quality records. Retention time will be as required by applicable law and in accordance with contract requirements.

Permanent quality records, as well as records that may be determined to be permanent at a later date, are those that involve the following:

- Final design development.
- Demonstrated capability for proper function and safe operation of critical items.
- Required baseline data.
- NCRs and the resolution of NCRs.

Nonpermanent quality records are those that do not meet any of the above criteria for permanent records.

Quality records are subject to QA audits and or surveillance.

Consultants/subconsultants and the Construction Contractor are also responsible for retention of their own quality records throughout the period of preliminary investigations, design, etc., in accordance with these requirements.

Storage facilities for quality records should consist of steel file cabinets or other storage containers located within an area having features that minimize damage from fire, condensation, and extreme temperature variation, whenever possible. Alternatively, a second (backup) copy of each quality record should be maintained in an area remote from the primary storage area described above.

CRC project staff performing QC or QA activities are responsible for maintaining quality records in accordance with this section.

All materials generated for the CRC project will be filed in the CRC office at 700 Washington Street, Vancouver, Washington, or its successor location. Unless otherwise stated in the contract, the consultants'/subconsultants' and the Construction Contractor's permanent quality records will be turned over to the Design Quality Manager or CRC QA/QC Manager as they are generated throughout the contract to be placed in the project files.

Quality Records

Examples of quality records include:

- Quality control plans.
- Quality assurance system audit and surveillance reports.

- Quality reviews of deliverables.
- CRC quality management training records (such as training attendance sheets).
- Audit plans.
- Audit reports.
- Nonconformance reports.
- Corrective action requests.
- Quality management meeting minutes.
- Inspections of construction equipment, supplies, and materials.
- Quality documentation of construction activities.

Quality record examples for construction activities are located in the Construction Contractor's QMP. Construction quality documents and reports of construction activities must be maintained until approval from the QA/QC Manager. The Construction Contractor is responsible for maintenance of its quality reviews and audits for its construction activities. All records must be kept in an organized manner on file, either electronically or by hard copy, and must be made available upon request. Further procedures and policies regarding quality audits for construction activities can be found in the Construction Contractor's QMP.

3.13.5 **Responsibility**

Consultants/subconsultants and the Construction Contractor are responsible for establishing and maintaining a comprehensive set of quality records. This item is addressed in the QCP.

The Design Quality Manager is responsible for maintaining, assembling, and preparing all quality records for archiving. While the files are in the possession of the Design Quality Manager, accessibility and retrievability of the documents must also be controlled.

The Construction Contractor is responsible for establishing the policy and procedures for quality records of construction activities. The CRC QA/QC Manager will provide oversight of the Construction Contractor's quality process, and as such, the CRC QA/QC Manager is responsible for conducting verification audits, maintaining audit paperwork, and reporting to CRC management regarding quality audits of the Construction Contractor.

The CRC QA/QC Manager or delegated staff will perform audits or surveillance of quality records.

3.14 Quality Audits

3.14.1 **Purpose**

This section describes the requirements for performing audits of the quality management system.

3.14.2 Scope

These requirements apply primarily to QA audits of project QC activities performed principally by CRC project's QA staff, including consultants, subconsultants, and the Construction Contractor, related to overall project quality activities.

3.14.3 Policy

A program for planned, periodic audits and routine surveillance is established per the QCP to ensure full implementation of the project's QA program and the Construction Contractor's QMP. Formal audit findings will be prepared and reviewed with the affected project participants and maintained in quality records for review by the FTA and others.

Surveillance will be performed on a random basis to check and verify conformance to the QA program. Surveillance is not considered as a scheduled audit and is performed to review and assist the CRC project team in verifying conformance to the QA program. Deficiencies discovered during the surveillance activity will require corrective action and acceptance of such corrective action by the CRC QA/QC Manager or designated staff.

Auditors should be free from bias and influences that could affect objectivity and should act in an ethical manner at all times. At a minimum, auditors must possess the following traits and experience:

- Sound quality principles, and be motivated, hard working, and an example to others.
- Achiever and team player, and have good judgment of human nature.
- Ability to conduct audits in an objective manner that is professional and ethical.
- Firm and confident, able to stand their ground and resolve conflict when appropriate.
- Knowledge of key team members and team structure.
- Knowledge and ability to interpret applicable codes, standards, and project requirements.
- Awareness of potential safety, legal, and financial risk-related issues and the ability to recognize and communicate risk potential.
- Ability to effectively facilitate an audit as defined in the QCP. Ability to verify, document, and communicate audit results and provide corrective action follow-up.
- Eight years of project experience in the professional field(s) being audited. A minimum of three years of this experience must be in a decision making position where the authority to define, execute, or control a project's processes and outcome were the primary responsibility.

An auditor will be assigned for each audit performed and will be responsible for all elements of the audit. Audit personnel are to have no direct responsibility in the activities to be audited. Auditors will have experience or training commensurate with the scope, complexity, or special nature of the activities to be audited. It is preferred for the auditors to be ASQ certified, or have a nationally recognized quality auditing certification. Auditors will be given access to all records necessary to identify problems, recommend solutions, and evaluate corrective actions.

3.14.4 **Procedure**

A comprehensive program of planned, periodic audits is established to verify that applicable elements of the QA program and QC plans have been effectively implemented in accordance with specified requirements indicated in the QCP. The activities of consultants and subconsultants will be audited for compliance and implementation of contractually required quality activities, including evaluation of overall program effectiveness. The quality activities of the Construction Contractor will also be subject to review.

Audits will be performed in conjunction with known deliverables, for which each Design Manager will provide a schedule to the auditor (see Appendix D). The Construction Contractor will provide a construction schedule to the QA/QC Manager.

This section also includes information for QA assessments of daily activities performed by CRC project personnel.

The management of the audited organization will be required to respond to the audit report within 15 working days after receipt of the narrative and the Audit Finding Report (AFR). Circumstances may arise where responses require additional time or further clarification. Such instances will be resolved directly with the auditor and appropriately documented. The CRC QA/QC Manager will be advised of any extensions to the required response time. CRC's QA/QC Manager is responsible for accepting or rejecting corrective action responses to audits. The reason for rejection will be stated in writing.

The auditor is responsible for scheduling closeout audits as necessary to verify completion and effectiveness of corrective actions. Deficiencies that continue to exist after the closeout audit may be closed to an appropriate document, such as an NCR, or remain open on the AFR to be addressed during a follow-up audit activity. Every reasonable effort will be made to close out audit findings on the AFR on which they originated.

Audit records are to be maintained and included as project quality records and made available for review. Records include audit schedules, audit logs (Appendix E), audit reports, audit checklists, audit performance records, AFRs, and Corrective Action Requests, as applicable.

3.14.5 **Responsibility**

The CRC QA/QC Manager is responsible for performing or having performed QA audits and surveillance in accordance with these requirements.

The Construction Contractor is responsible for quality audits performed during construction and the surveillance thereof. Further procedures and policy regarding quality audits for construction can be found in the Construction Contractor's QMP.

3.15 Training

3.15.1 Purpose

This section describes the requirements for training personnel performing activities affecting quality.

3.15.2 Scope

These requirements apply to all project personnel involved in or responsible for activities affecting quality.

3.15.3 Policy

Personnel performing quality-related activities will be technically qualified for their task and familiar with the project QA program procedures.

3.15.4 Procedure

All personnel performing quality-related activities throughout the lifecycle of the project will be technically qualified for their task on the basis of appropriate education, training, and/or experience. Each person will also be familiar with the project QA program and approved QC plans and review procedures pertaining to their work responsibilities.

The consultant or subconsultant will attend trainings or briefings regarding the QA program and QC procedures. Records as to participation of key project staff in training or briefings will be maintained in the project file. See Appendices G and H.

Specific training requirements are identified in Section 8 of the QCP. See Appendix F.

3.15.5 Responsibility

CRC's QA/QC Manager is responsible for ensuring that quality training for CRC staff is adequate and complete. The consultant/subconsultant Project Managers are responsible for the training of their staff and QC Reviewers under their responsible charge.

The Construction Quality Manager is responsible for providing training for the quality procedures related to construction activities to its employees working on the CRC project, as well as to CRC staff involved with components and activities during construction. This training shall be based on the Construction Contractor's QMP, the QAM, and QCP documents.

4. Solicitation and Bidding Documents

4.1 Solicitation Documents (RFQ)

4.1.1 Purpose

The purpose of this section is to control the solicitation process to ensure quality is incorporated in the selection process.

4.1.2 Scope

The policy and procedures apply to the Request for Qualifications (RFQ) and reviews of the submittals for the Design-Build (DB), Design-Bid-Build (DBB) or General Construction/Construction Manager (GC/ CM) delivery methods.

4.1.3 Policy

The RFQ should be developed in accordance to the Controlled Documents section of the PMP and Document Control section of this QAM. A formal quality review should be performed and have evidence of such that can be easily retrieved upon request of the QA/QC Manager. See the QCP, section 8 for review procedures of the solicitation documents.

RFQ submittals that are received shall be evaluated and scored based on the RFQ requirements and criteria. A review and backcheck shall be performed by a person designated by the Program Manager or Delivery Manager.

4.1.4 Procedure

Upon development, the RFQ shall have a formal quality review performed by using the review procedures found in the QCP in section 8. The RFQ is subject to verification that the review procedures used are in compliance to this QAM and the QCP.

Incoming RFQ submittals shall be evaluated and graded based on the bidder's RFQ content against the RFQ criteria. To assist with the evaluation, a checklist should be created specifically for each RFQ and respective delivery method addressing each RFQ requirement. After the initial grading process has been completed of the submittal, a backcheck shall then be performed by a person designated by the Program Manager or Delivery Manager to ensure that the scoring is accurate. A review stamp (Figure 4-2 of the QCP) shall be used as evidence that a review and backcheck was performed and shall be displayed on the front cover. The quality review document is subject to review by the QA/QC Manager.

4.1.5 Responsibility

It is the responsibility of the Program Manager and/or the Delivery Manager to ensure a proper quality review of the RFQ has been performed before it is released for public viewing. The QA/QC Manager is responsible for providing oversight of the quality review process of the RFQ.

4.2 Contract Bidding Documents (RFP)

4.2.1 Purpose

The purpose of this section is to control the Request for Proposal (RFP) process to ensure quality is incorporated in the proposal process.

4.2.2 Scope

The policy and procedures apply to the RFP and evaluations of the proposals for the Construction Contractor's delivery methods.

4.2.3 Policy

The RFP should be created in compliance to the Controlled Documents section of the PMP and Document Control section of this QAM. A formal quality review of the RFP should be performed, and evidence of a proper review should be provided.

The proposals that are received shall be evaluated and scored based on the RFP requirements and criteria. A backcheck of the scoring process shall be performed by a person designated by the Program Manager or Delivery Manager.

4.2.4 Procedure

Upon creation of the RFP, a formal quality review should be performed by using the review procedures found in the QCP, section 8. The RFP is subject to verification that the review procedures used are in compliance to this QAM and the QCP. The documented review of the RFP shall be filed so that it can be easily retrieved upon request of the QA/QC Manager. See the QCP, section 8 for review procedures of the solicitation documents.

Once the proposals are received, each shall be evaluated and graded based on the proposal content against the criteria requirements provided in the RFP by use of an itemized checklist that shall be created specifically for each of the delivery methods. The checklist should incorporate each requirement by section. After the initial grading process has been completed of the proposal, a backcheck shall then be performed by a person designated by the Program Manager or Delivery Manager to ensure that the scoring is accurate.

Evidence that a review and backcheck was performed shall be displayed on the front cover by use of a stamp (see section 4.2 of the QCP). The checklist and document are subject to verification by the QA/QC Manager to ensure the process was followed according to the QCP.

4.2.5 Responsibility

It is the responsibility of the Program Manager and/or the Delivery Manager to ensure that a proper quality review of the RFP has been performed before it is released for public viewing. The QA/QC Manager is responsible for providing oversight of the quality review process of the RFP.

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5. Quality Assurance Program Definitions

The following definitions are provided to ensure a uniform understanding of terms as they apply to the project QA program.

Audit – A documented activity performed in accordance with written procedures or checklists to verify, by examination and evaluation of objective evidence, that applicable elements of the QA/QC program(s) have been developed, documented, and effectively implemented in accordance with specified requirements. An audit should not be confused with surveillance or inspection.

Certification – The action of determining, verifying, and attesting, in writing, to the qualifications of personnel in accordance with applicable requirements.

Certified (Personnel) – An individual certified by a recognized standard or approved as having successfully completed requirements of the standard or procedure.

Change Control – The systematic evaluation, coordination, and approval or disapproval of all changes to the established baseline configuration. It also includes the performance of those actions necessary to ensure that the actual configuration of a system completely matches its technical description in the approved engineering drawings, specifications, and related documents.

Characteristics – Any property or attribute of an item, process, or service that is distinct, describable, and measurable as conforming or nonconforming to specified quality requirements. Quality characteristics are generally identified in specifications and drawings, which describe the item, process, or service.

Configuration Management – A management method of producing an end result that comprises three elements: product identification, change control, and configuration accountability. Configuration management may be distributed throughout a number of organizational entities.

Conformance – An affirmative indication or judgment that an item has met the requirements of the relevant specifications or regulation.

Contractor – Any organization under contract for furnishing items or services. It includes the terms of but is not limited to architect, engineer, consultant, vendor, supplier, subconsultant, and sub-tier levels of these organizations where appropriate.

Controlled Document – A document that is intended for limited, specified, and tracked distribution and that must be periodically reviewed and updated as required. The use and distribution of controlled documents are tracked and monitored under configuration control procedures.

Corrective Action – Documented commitment of specific action planned or being implemented to resolve a known and identified condition, or conditions, adverse to quality. Typically used in reference to a non-conforming condition or item.

Corrective Action Request – A document issued to the Design Manager of a group whose activities are not meeting requirements. This is a significant document that, in effect, warns the consultant/subconsultants or others that continuing deficient activities will result in consideration of contract default.

Critical Preliminary Design Review – A design review that takes place prior to the issuance of the final preliminary design.

Deficiency – A minor deviation from the QAM and/or the QA/QC documents of the CRC project.

Design – Technical and management processes that create, fashion, execute, or construct documents according to a predetermined plan or requirement.

Design Defects – There are three classifications of design defects as follows:

> **Critical** – A defect of a specification, inspection, or test or a defect, which if not properly controlled, could result in a failure. Such a defect is one that judgment and experience indicates is likely to result in hazardous or unsafe conditions for individuals using or depending upon the product or is one that judgment and experience indicate is likely to prevent performance of the function of an end item.
>
> **Major** – A defect of a specification, inspection, or test or a defect, other than critical, which if not properly controlled, could result in excessive costs, defect rates, rework, or delays in scheduled shipping dates. Such a defect is likely to materially reduce the usability of the product or end item.
>
> **Minor** – A defect of a specification, inspection, or test or a defect, other than critical or major, which if not controlled, would not materially reduce the usability of the product or end item for its intended purpose, or is a departure from established standards having no significant bearing on the effective use or operation of the unit, or affects the appearance in a minor degree where appearance is a significant characteristic.

Design Input – Those criteria, parameters, basis or other design requirements upon which detailed final design is based.

Design Output – Documents such as drawings, specifications and other documents defining technical requirements of structures, systems and components.

Design Review – The formal review of an existing or proposed design for the purpose of detection and remedy of design deficiencies that would affect fitness-for-use and environmental aspects of the product, process or service, and/or identification of potential improvements of performance, safety, and economic aspects.

Designer – Design team member who is responsible for design of the particular element under consideration. The Designer is the originator of the document (calculation, drawing, specification, or report) and his/her initials will be on the final signed and sealed drawing.

Document – An original or official paper relied on as the basis, proof or support of something; a writing conveying information. Documents may include but are not limited to loose-leaf or bound books, drawings (tracings and/or reproductions), electronic mails, engineering calculations, procedures, specifications, standards, reports, manuals, and other material generated that affects quality.

Documentation – Any written or pictorial information describing, defining, specifying, reporting or certifying activities, requirements, procedures or results.

Examination – An element of inspection consisting of investigation of materials, components, supplies or services to determine conformance to those specified requirements, which can be determined by such investigation. Examination is usually nondestructive and includes simple physical manipulation, gauging, and measurement.

Final Design – Approved design output documents and approved changes therein.

Finding – (As it relates to a quality audit.) Issued at the completion of an audit to describe an item that is not in compliance with the approved procedure. Items assigned this status require that an Audit Finding Report be issued and formally responded to by the entity audited.

Guidelines – Particular provisions that are considered good practice, but which are not mandatory in programs intended to comply with the standard. The term “should” denotes a guideline; the term “shall” denotes a mandatory requirement.

Maintainability – Ability of an item stated conditions of use to be retained in, or restored to, within a given period of time, a specified state in which it can perform its required functions when maintenance is performed under stated conditions and while using prescribed procedures and resources.

Modification – A planned change in design or operation and accomplished in accordance with the requirements and limitations of applicable codes, standards, specifications, and predetermined safety restrictions.

Nonconformance – A major deficiency in characteristic, documentation or procedure that may affect form, fit or function and renders the quality of an item unacceptable or indeterminate. Nonconformance items shall not be addressed with a Request For Information.

Preliminary Design Review – A design review that takes place after conceptual design and prior to release for construction.

Procedure – A document that specifies or describes how an activity is to be performed. It may include methods to be employed, equipment or materials to be used, and sequence of operation.

Qualification (Personnel) – The abilities gained through training to recognized standards as well as practical experience that enable an individual to satisfactorily perform a required function.

Quality – The features and characteristics of an item that determine its ability to satisfy given needs.

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 Audit – A systematic independent examination that verifies or evaluates compliance to the operational requirements of the quality program specification, or contract requirements of the product or service.

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.

Recommendation – (As it relates to a quality audit.) Information provided as the result of an audit activity to inform the consultant, contractor, designer, etc. that while a reviewed item is not in violation of the approved procedure, it may be improved upon or brought closer in line to the procedure.

Specification – A detailed presentation of requirements that a product, material, service or process must meet.

Standard – Guidelines, benchmarks or examples established and approved by a recognized authority.

Storage – Holding items in an area other than their permanent location.

Technical Bases – Information that identifies the specific technology upon which the design criteria for materials, items processes, or calculation methods and analyses are based.

Appendices

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APPENDIX A
CRC Organizational Charts

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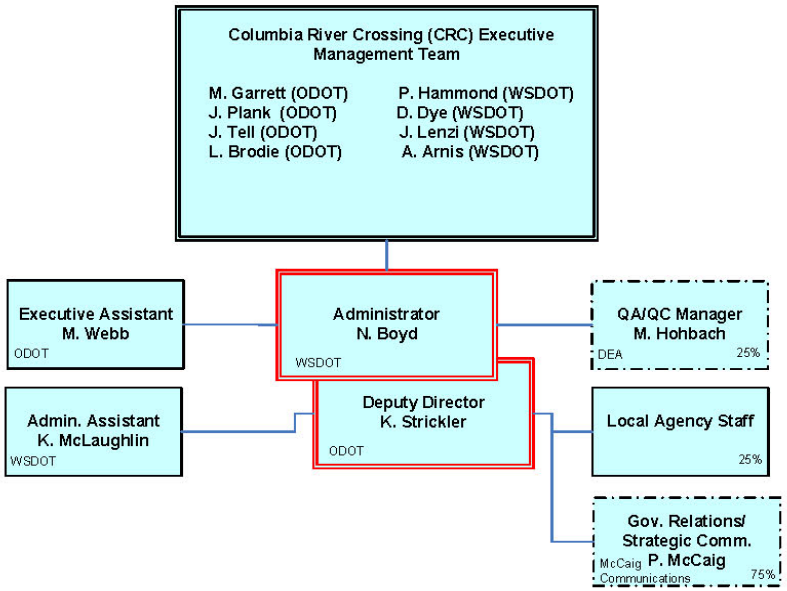
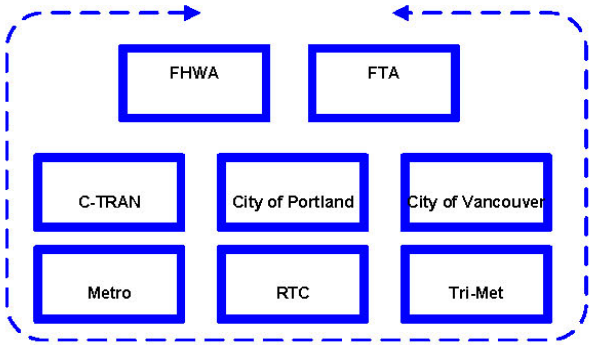
Columbia River CROSSING

Columbia River Crossing Executive Management





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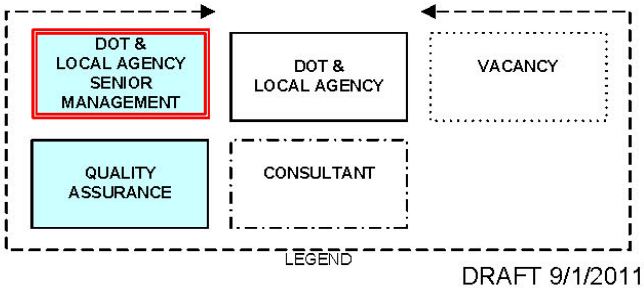
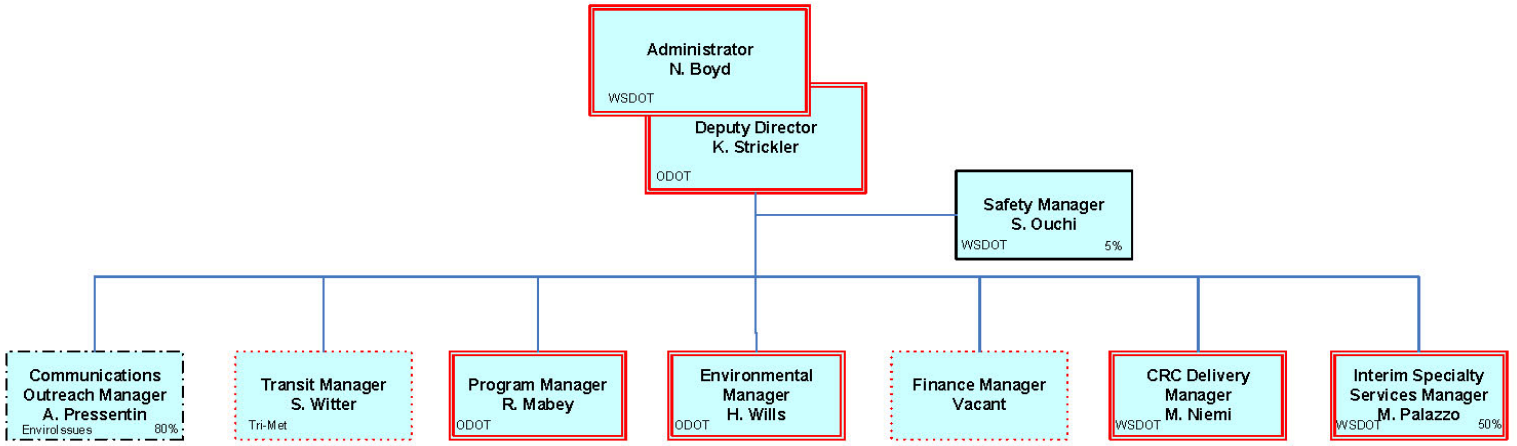
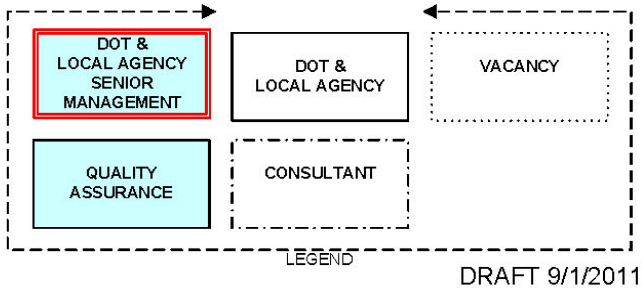


LEGEND

DRAFT 9/1/2011

Columbia River Crossing Project Management Team





Columbia River CROSSING

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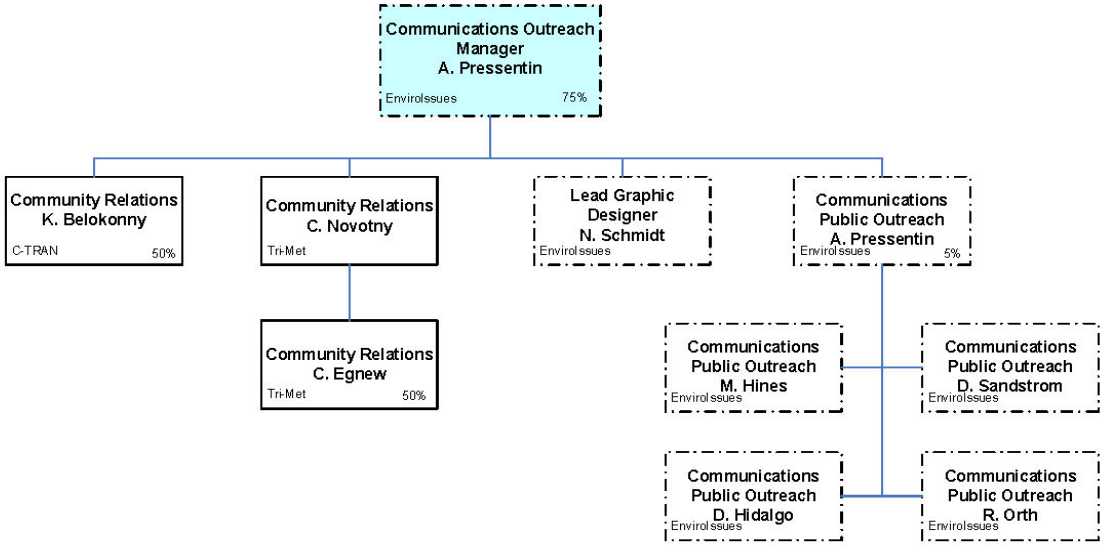
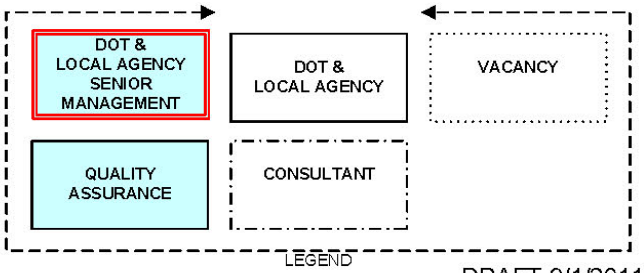
Columbia River Crossing Communications Team





Columbia River CROSSING

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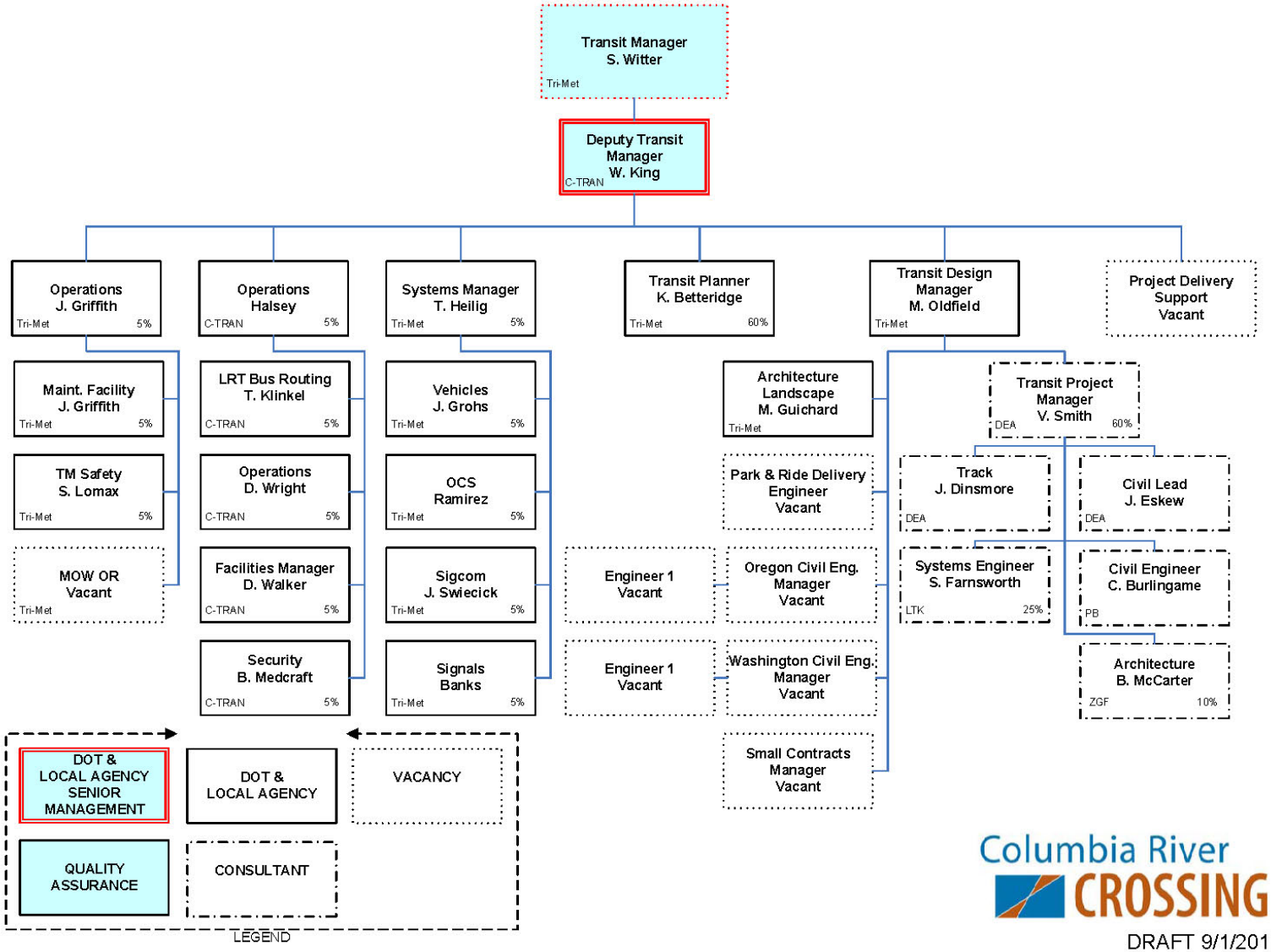
Columbia River Crossing Transit Engineering Team



Columbia River CROSSING

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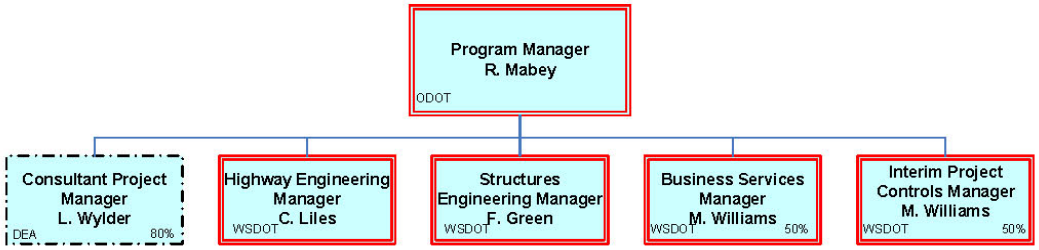

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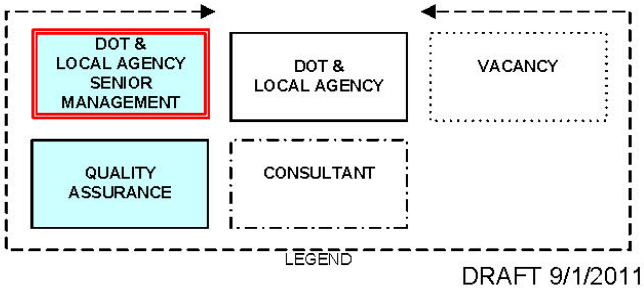

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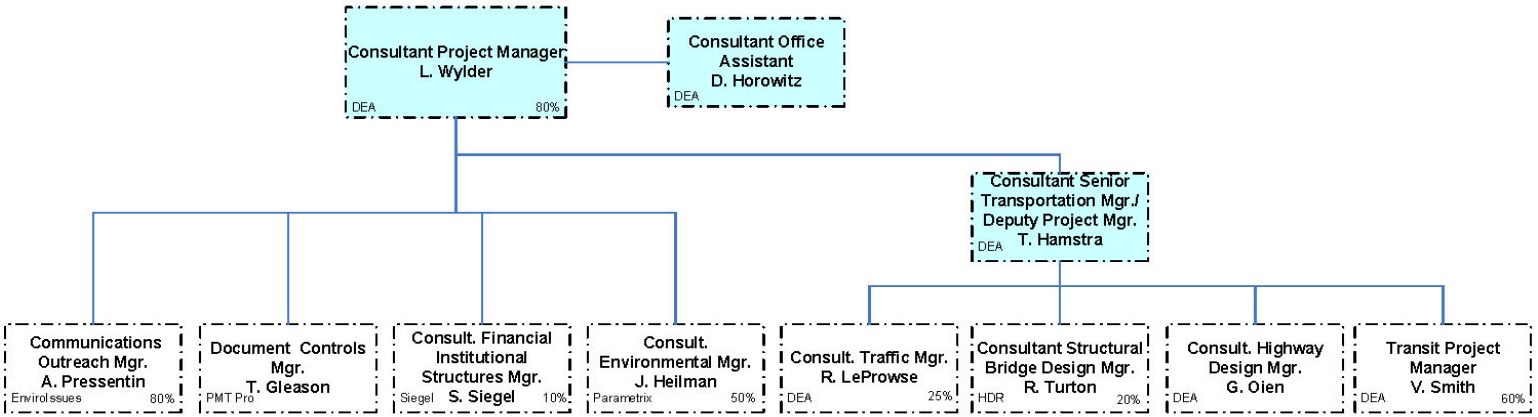
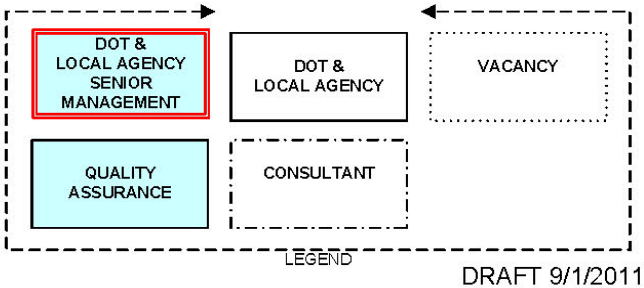
Columbia River Crossing Consultant Staff





Columbia River CROSSING

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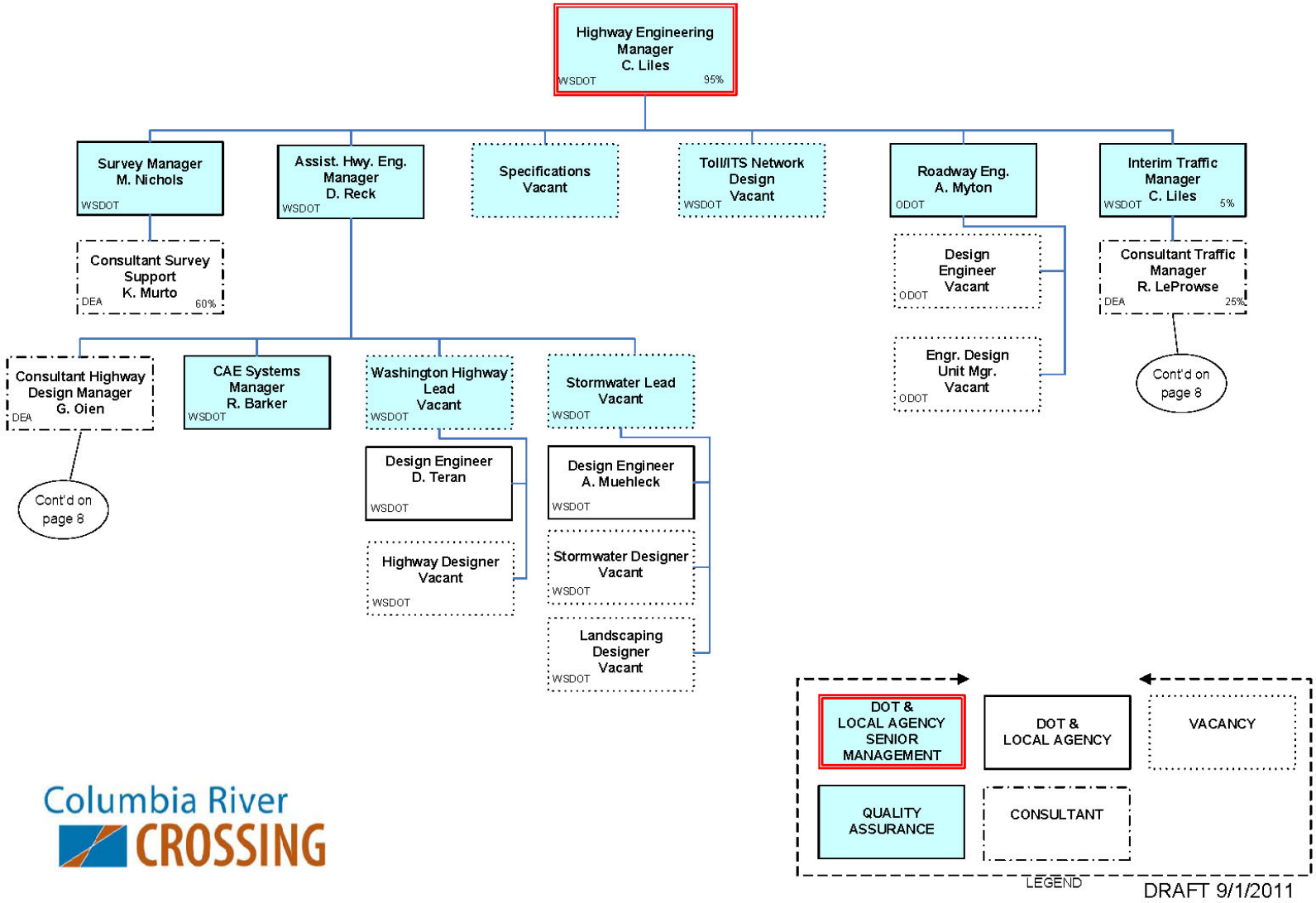
Columbia River Crossing Highway Engineering Team



Columbia River CROSSING

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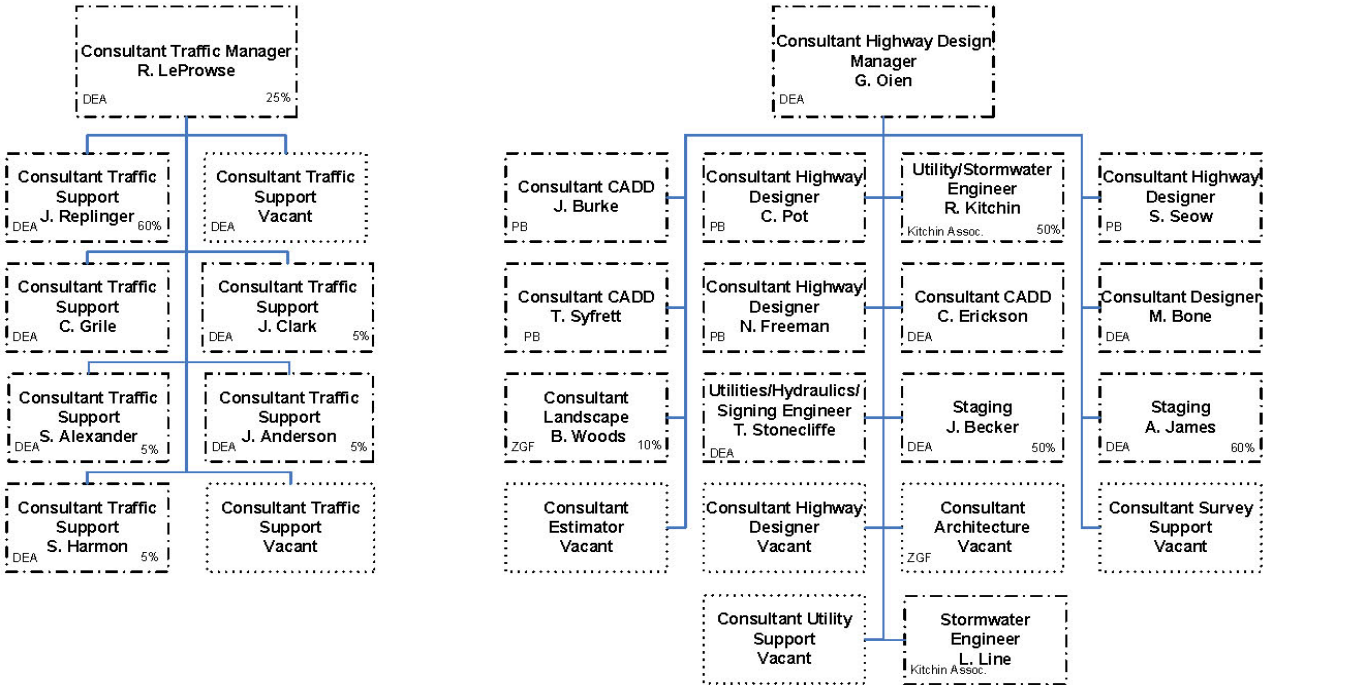
Columbia River Crossing Consultant Highway and Traffic Engineering Staff



Columbia River CROSSING

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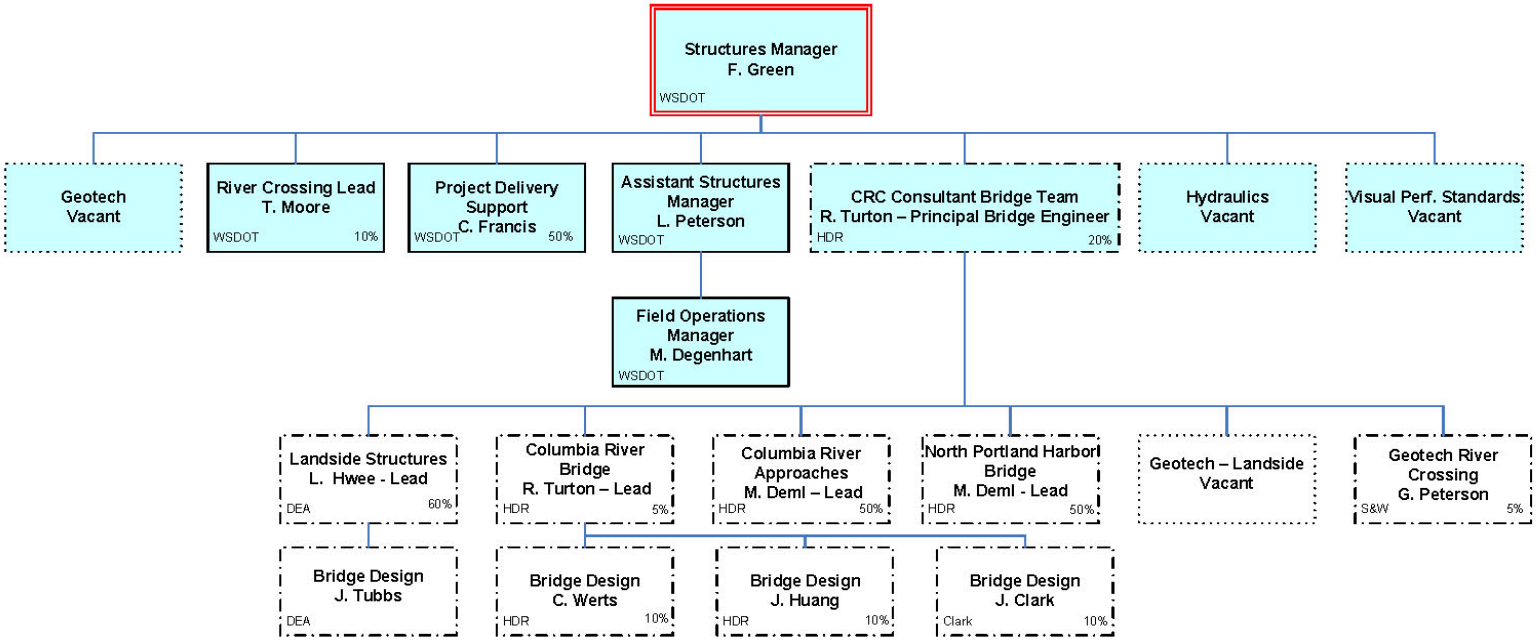
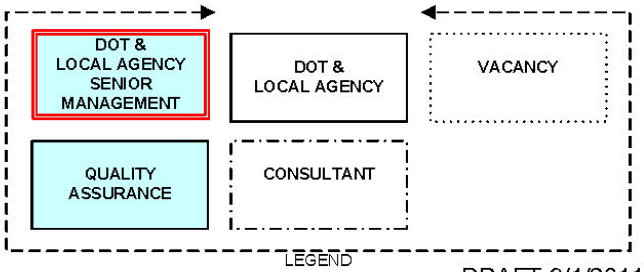
Columbia River Crossing Structures Engineering Team





Columbia River CROSSING

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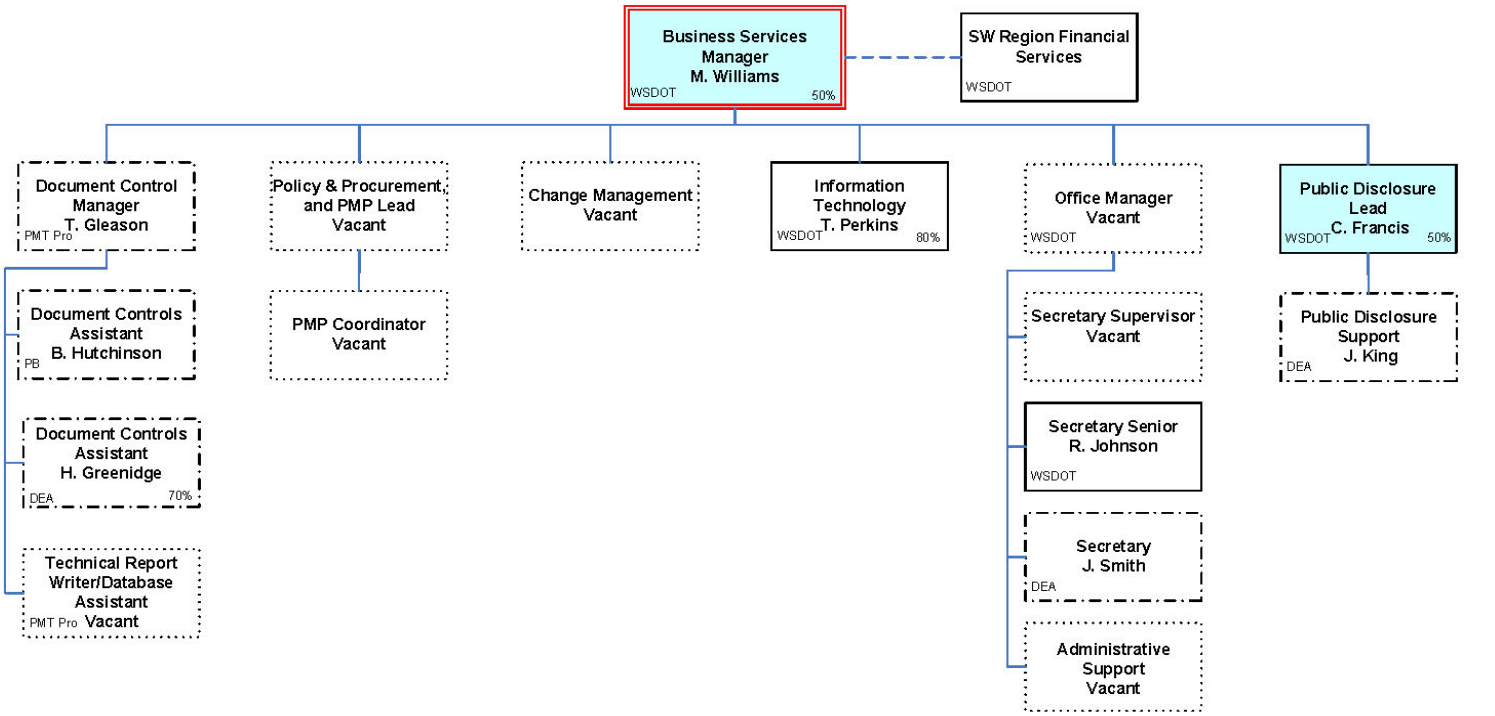
Columbia River Crossing Business Services Team



Columbia River CROSSING

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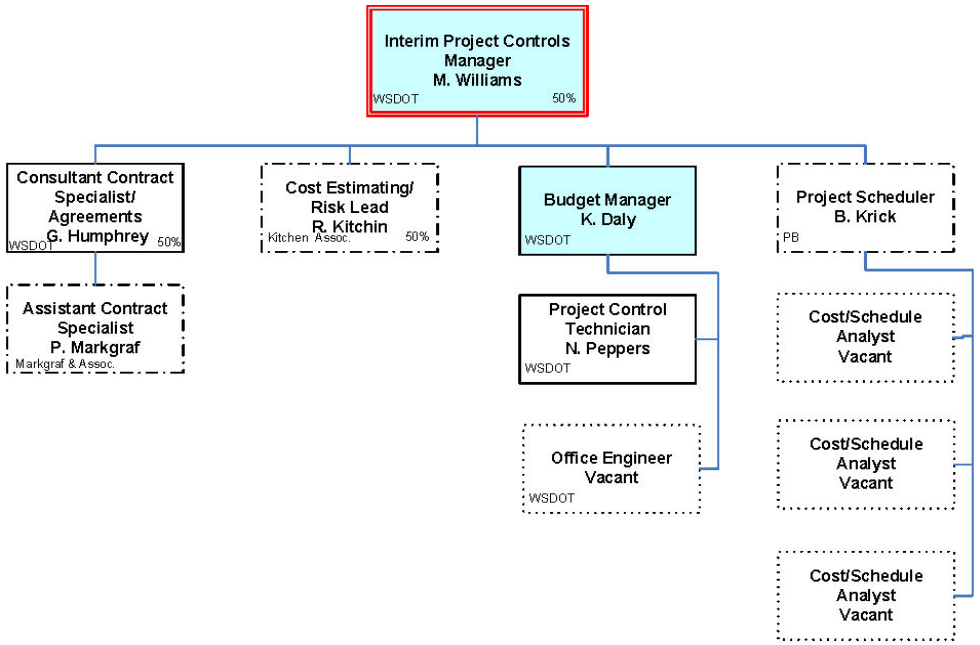
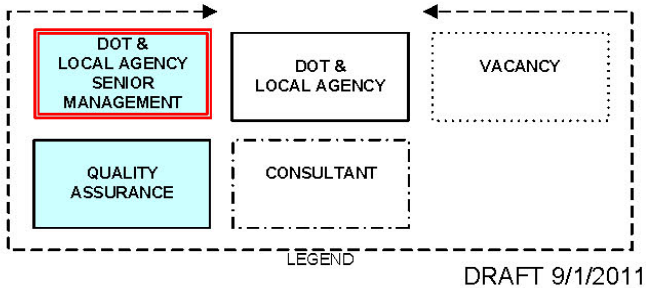
Columbia River Crossing Project Controls Team





Columbia River CROSSING

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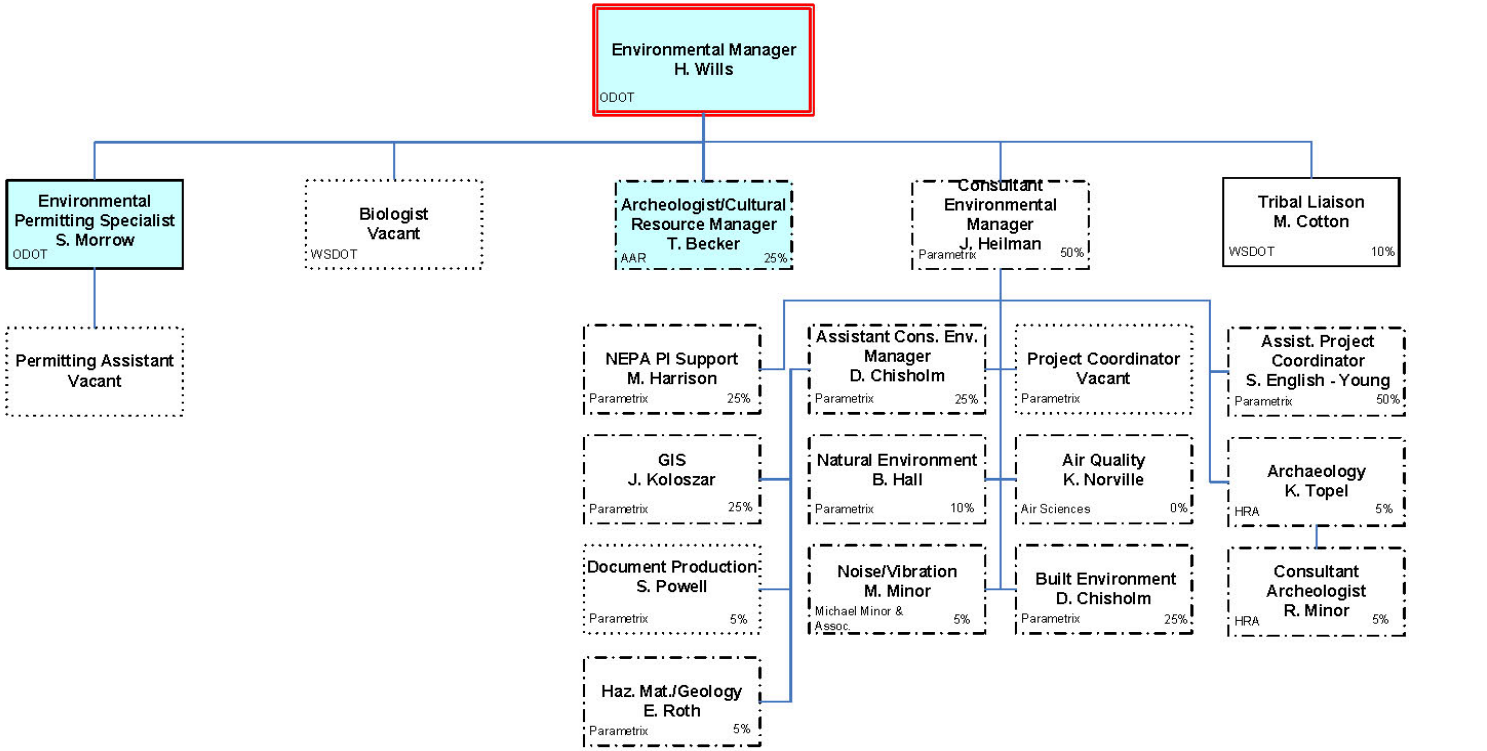

Columbia River CROSSING

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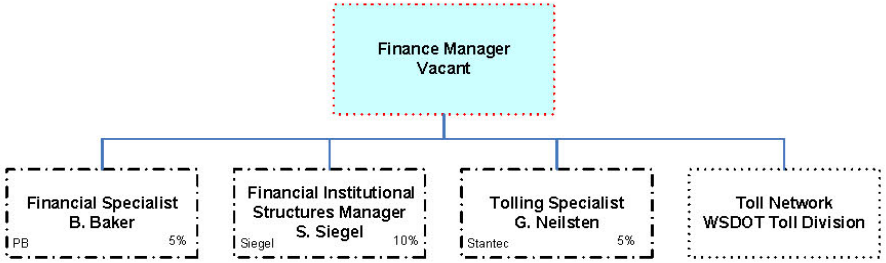

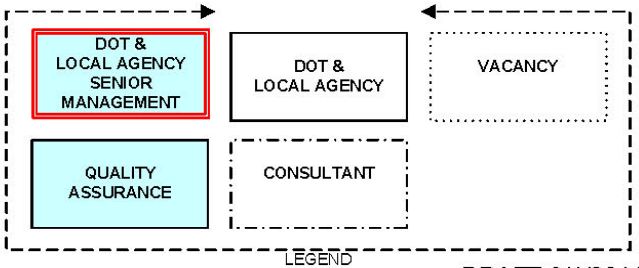

Columbia River CROSSING

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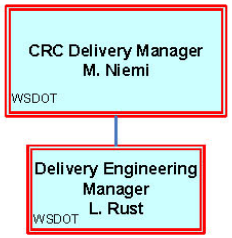
Columbia River Crossing Delivery Team



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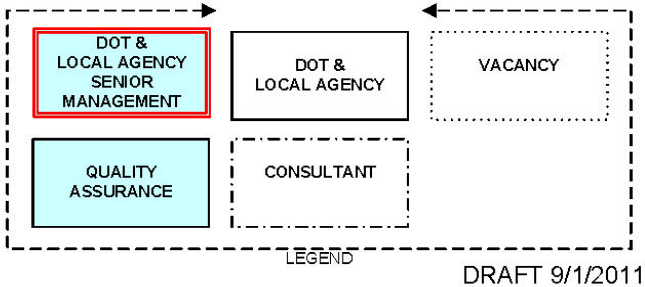

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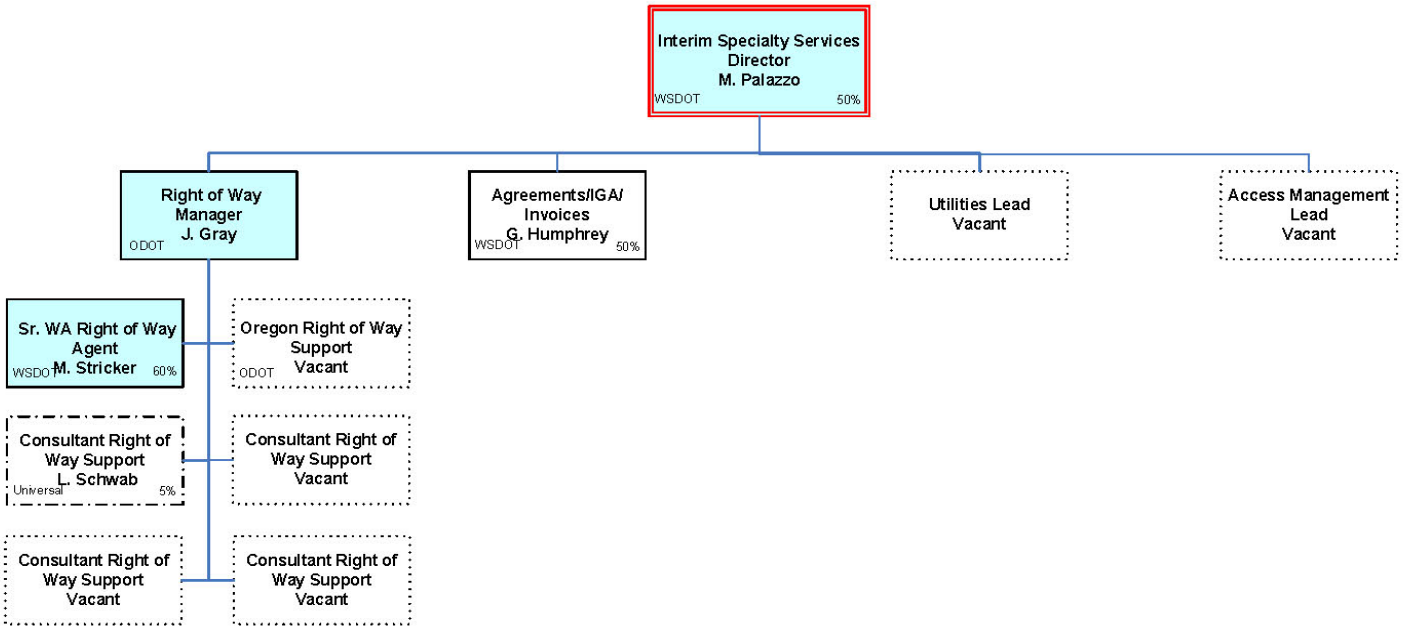
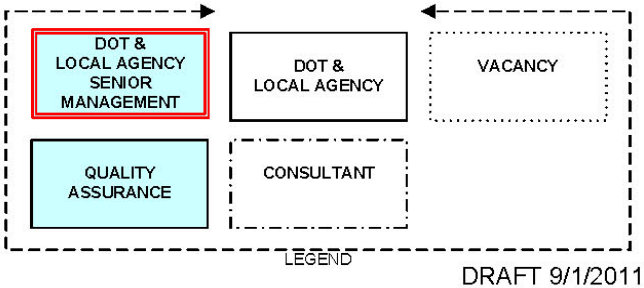
Columbia River Crossing Support Services Team





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APPENDIX B
Responsibility Matrix

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Consolidated QA/QC Responsibility Matrix

Activity Description	Responsibility				
	Designer/Analyst	CADD Manager	Task Manager	Project Director, Director of Project Delivery, Consultant Project Manager	QA/QC Manager
Development, establishment, implementation, and evaluation of the QAM.					X
Day-to-day management of QAM requirements.			X	X	
Administration and implementation of the QAM.					X
Review all proposals prior to issuance and determine quality program requirements.					X
Review and comment on the contractor's proposed QC plan.					X
Verify the effectiveness of the QA manual.					X
Develop, implement, document, and maintain a QC plan for their work.	X		X		
Overall coordination of design effort.				X	
Coordination with Design Lead for electronic document management effort.	X	X	X		
Coordination of all items related to their assigned specialty.			X		
Oversight of design as it relates to cost/schedule (coordinate with Project Director).			X		
Audit the design process to verify that the QC plan has been implemented.	X		X		X
Examine the consultant's QC documentation to verify that the QC record is complete.					X
Perform design reviews in accordance with the PMP.	X		X		
Completeness and accuracy of design reviews.			X	X	
QA activities and quality issue disposition for design activities.					X
Development and implementation of the document control system.			X		X
Organization and control of internal files and for providing required documents to CRC for inclusion in the document control system.	X		X		
Document/drawing management system.	X	X	X		
QA verification of the document and drawing control systems.					X
Establishing and maintaining quality records.	X	X	X	X	X
Assembling, preparing, and maintaining all quality records for archiving.					X
Performing audits of quality records.					X
Performing or having performed quality assurance audits.					X
Training of their staff.	X		X		
Ensuring that training for CRC staff is adequate and complete.					X

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APPENDIX C
Corrective Action Request

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Columbia River CROSSING

CORRECTIVE ACTION REQUEST

Page _____ of _____

1. Contract No.	2. Item Location	3. Issue Date	4. CAR No.

5. Responsible Organization	6. Specification/Drawing No.	7. Originator of CAR ☐ Contractor ☐ Owner

8. Previously Issued Deficiency Notices, NCRs or AFRs	9. Response Date	10. Reviewed By (Supervisor)

11. Description of Recurring Condition and Contract Requirement _____

12. Root Cause of Problem _____

13. Action Taken to Prevent Recurrence _____

14. Response Prepared By	15. Response Date	16. CAR Proposed Implementation Date

17. RE Disposition	18. Approval	Date

19. Verification of Corrective Action

20. QA Disposition ☐ Acceptable ☐ Unacceptable	21. Approval	Date

22. Verification of Corrective Action _____

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APPENDIX D
Quality Assurance Audit Schedule

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Columbia River CROSSING

Quality Assurance Audit Schedule

Page _____ of _____

	20____											
Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Prepared By: _____ Date: _____

Approved By: _____ Date: _____

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APPENDIX E
Quality Assurance Audit Log

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Columbia River CROSSING

QA/QC Manager:
Update:

Deliverable ID	Deliverable Name	Task QM	Audit Date	Findings	Corrective Action	Date Verified	Item Closed Y	Item Closed N

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APPENDIX F
Quality Assurance Manual Training Matrix

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Quality Assurance Manual Training Matrix

	QAM Procedure Number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Project Director, Director of Project Delivery, Consultant Project Manager	RA	RA	RA												RA
Design Managers, Task Leads (Transit, Environmental, Highway, Structures)	RA	RA	RA												RA
Specialty Leads (Survey, Structures, Highway, Stormwater, Utilities)	RA	RA	RA	RA									RA	RA	RA
Specialty Leads (CADD and Document Control) and Support (CADD and Document Control)	RA	RA	RA	RA									RA	RA	RA
Designers, Analysts, and Support	RA	RA	RA	RA									RA	RA	RA
Quality Assurance Staff	RA	RA	RA	RA									RA	RA	RA

RA = Read and Acknowledge training (See Note 1)

Procedure Number and Title

1. Management Responsibility
2. Document Quality Management System
3. Design Control
4. Document Control
5. Purchasing
6. Product Identification and Traceability
7. Process Control
8. Inspection and Testing
9. Inspection, Measuring, and Test Equipment
10. Inspection and Test Status
11. Nonconformance
12. Corrective Action
13. Quality Records
14. Quality Audits
15. Training

Note(s)

1. A 'Read and Acknowledge Form' (Appendix G) shall be filled out and signed by each individual participating in training on the CRC QAM.

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APPENDIX G

Read and Acknowledge Form for Quality Assurance Manual Training

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Read and Acknowledge Form
for
Quality Assurance Manual Training

The Quality Assurance Manual Training Matrix lists the positions within the Project that require training in quality procedures and documentation. The training is in the form of reading and becoming familiar with particular sections of the CRC Quality Assurance Manual.

Please note and perform the appropriate training for your position shown on the training matrix.

Please proceed with the "Read and Acknowledge" training at your earliest convenience.

You may contact the QA/QC Manager regarding any questions you have about the manual. When you have read and understand the assigned procedures in the Quality Assurance Manual **please circle the corresponding numbers listed below for the sections assigned to your position**, sign and complete the remainder of the form, and return it to the attention of the CRC QA/QC Manager.

Procedure Number

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

This is to acknowledge that I have read and understand the CRC Quality Assurance Manual procedure numbers identified above for my position as outlined in the QAM Training Matrix, Appendix F.

Name: _____

Signature: _____

Position: _____

Date: _____

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APPENDIX H
Read and Acknowledge Training Form Status

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Columbia River CROSSING

CRC Quality Assurance Manual
Read and Acknowledge Training Form Status

Forms Required			Completed Forms	
Name (Last, First)	Assigned To	Date	Name (Last, First)	Assigned To