

---

**APPENDIX C**

Construction Quality Assurance Project Plan

# Lower Duwamish Waterway Group

*Port of Seattle / City of Seattle / King County / The Boeing Company*

## **CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN**

Enhanced Natural Recovery/Activated Carbon Pilot Study  
Lower Duwamish Waterway

## **FINAL**

*Prepared for:*

**The US Environmental Protection Agency  
Region 10  
Seattle, Washington**

**The Washington State Department of Ecology  
Northwest Regional Office  
Bellevue, Washington**

*Prepared by:*

**Amec Foster Wheeler Environment & Infrastructure, Inc.  
Dalton, Olmsted & Fuglevand, Inc.  
ENVIRON International Corporation  
Floyd|Snider  
Geosyntec Consultants**

December 07, 2015

Project No. LY15160310

## TABLE OF CONTENTS

	Page
ABBREVIATIONS AND ACRONYMS .....	iii
1.0 INTRODUCTION .....	1
1.1 PROJECT SCOPE .....	1
1.2 CONSTRUCTION QUALITY MANAGEMENT OVERVIEW .....	2
1.3 CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN OBJECTIVES.....	3
1.4 DOCUMENT ORGANIZATION.....	3
1.5 DISTRIBUTION AND DOCUMENT CONTROL.....	3
2.0 PROJECT ORGANIZATION .....	4
2.1 ORGANIZATIONAL ROLES AND RESPONSIBILITIES.....	4
2.1.1 EPA and Ecology .....	4
2.1.2 King County .....	6
2.1.3 Lower Duwamish Waterway Group.....	7
2.1.4 Engineering Consulting Team.....	7
2.1.5 Construction Contractor .....	9
3.0 QUALITY CONTROL AND QUALITY ASSURANCE ACTIVITIES.....	12
3.1 PROJECT BEST MANAGEMENT PRACTICES .....	12
3.2 GENERAL QA ACTIVITIES .....	14
3.2.1 Verification of Contractor's QC Program.....	14
3.2.2 Independent Testing and Inspections .....	15
3.2.3 Project Closeout.....	15
3.3 QA AND QC OF PRODUCTS.....	15
3.3.1 Verification of AC Material .....	15
3.3.2 Verification of Sand and Gravelly Sand Products .....	16
3.3.3 Verification of AC-amended Sand and Gravelly Sand .....	16
3.4 QA AND QC PROCEDURES FOR ENR & ENR+AC PLACEMENT .....	17
3.4.1 Prior to Construction .....	17
3.4.2 ENR/AC Test Placement Demonstration .....	19
3.4.3 During Construction .....	21
3.4.4 Post Construction.....	25
4.0 CONSTRUCTION DEFICIENCIES .....	25
4.1 CONTRACTOR QC DEFICIENCY .....	25
4.2 CONSTRUCTION QUALITY DEFICIENCY.....	25
5.0 MEETINGS AND DOCUMENTATION .....	26
5.1 WORK MEETINGS .....	26
5.1.1 Preconstruction Meeting .....	26
5.1.2 Daily Briefings and Planning Meetings .....	27
5.1.3 Project Meetings (Progress Meetings).....	28
5.2 WORK DOCUMENTATION.....	29
5.2.1 Contractor Submittals Prior to Construction.....	29
5.2.2 Contractor Submittals During Construction.....	29
5.2.3 Contractor Quality Control Reporting.....	30
5.2.4 Change Orders .....	31

## TABLE OF CONTENTS (Continued)

	<b>Page</b>
5.2.5 Construction Report .....	32
5.3 CONTROL OF QA/QC DOCUMENTATION .....	32
6.0 CHANGES TO QA/QC REQUIREMENTS .....	33
6.1 CHANGES TO CQCP .....	33
6.2 CHANGES TO CQAPP .....	33

### TABLES

Table 1	Project Contact Information
Table 2	Quality Assurance Monitoring Elements and Frequency

### FIGURES

Figure 1	CQAPP Project Organizational Chart
Figure 2	Conceptual Grade Stake

### ATTACHMENTS

Attachment A	Sample Forms for Contractor Daily Report
Attachment B	Sample Forms for Contractor Weekly Report

## ACRONYMS AND ABBREVIATIONS

AC	Activated Carbon
AFE	Assistant Field Engineer
AMEC	Amec Foster Wheeler
BMP	Best Management Practice
County	King County Project Team
CQA	Construction Quality Assurance
CQAPP	Construction Quality Assurance Project Plan
CQCP	Contractor Quality Control Plan
DOF	Dalton, Olmsted, & Fuglevand, Inc.
Ecology	Washington State Department of Ecology
ENR	Enhanced Natural Recovery
ENR+AC	Enhanced Natural Recovery with Activated Carbon
EPA	U.S. Environmental Protection Agency
FE	Field Engineer
GPS	global positioning system
HASP	Health and Safety Plan
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
Order	Administrative Order
PCB	Polychlorinated biphenyl
PE	Project Engineer
Project Representative	King County Project Representative
QA	Quality Assurance
QC	Quality Control
QCO	Quality Control Officer
USACE	U.S. Army Corps of Engineers
WQMP	Water Quality Monitoring Plan

# CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN

## Enhanced Natural Recovery/Activated Carbon Pilot Study

### Lower Duwamish Waterway

## 1.0 INTRODUCTION

This Construction Quality Assurance Project Plan (CQAPP) has been developed for use during implementation of the Enhanced Natural Recovery/Activated Carbon Pilot Study Project (Project) on the Duwamish Waterway. This CQAPP describes the personnel, procedures, and activities required to assure that the construction work satisfies the engineering design and regulatory requirements, and that reliable, accurate, and verifiable construction data are recorded during construction.

## 1.1 PROJECT SCOPE

The Lower Duwamish Waterway Group (LDWG) will conduct a pilot study of an innovative sediment remediation technology in the field to evaluate the potential effectiveness of the technology in the Lower Duwamish Waterway (LDW). The study will determine whether Enhanced Natural Recovery (ENR) amended with granular activated carbon (AC) can be successfully applied to reduce the bioavailability of polychlorinated biphenyls (PCBs) in remediated contaminated sediment in the LDW. The study will compare the effectiveness of ENR with added AC (ENR+AC) with that of ENR without added AC in three areas (referred to as “plots”) in the LDW, which are referred to as the intertidal plot, subtidal plot, and potential scour plot. For the purposes of this project, ENR involves the placement of a thin layer of clean material (sand or gravelly sand) over subtidal or intertidal sediments. ENR+AC involves the placement of a thin layer of clean material augmented with AC over subtidal or intertidal sediments. The purpose of the ENR and ENR+AC treatments is to reduce the exposure of aquatic organisms to contaminants of concern.

A pilot study was specified under the Second Amendment (July 2014) to the Administrative Order on Consent (Order) for Remedial Investigation/Feasibility Study for the Lower Duwamish Waterway (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Docket No. 10-2001-0055, issued on December 20, 2000).

The goals of the pilot study, as stated in the Order, are the following:

- Verify that ENR+AC can be successfully applied in the LDW by monitoring physical placement success (uniformity of coverage and percent of carbon in a placed layer).

- Evaluate performance of ENR+AC compared to ENR alone in locations with a range of PCB concentrations.
- Assess potential impacts to the benthic community in ENR+AC compared to ENR alone.
- Assess changes in bioavailability of PCBs in ENR+AC compared to ENR alone.
- Assess the stability of ENR+AC in scour areas (such as berthing areas).

## 1.2 CONSTRUCTION QUALITY MANAGEMENT OVERVIEW

Construction quality management consists of quality control (QC) by the contractor and quality assurance (QA) by the King County Project Team (County) which includes work by Amec Foster Wheeler (AMEC), Dalton, Olmsted & Fuglevand (DOF), and subcontracted divers. The contractor is responsible for performing the work in accordance with the project plans and specifications, and the Contractor Work Plan. They are also responsible for the quality of work by their subcontractors. The contractor will establish an independent QC program, and prepare and implement a Contractor Quality Control Plan (CQCP). The CQCP may be part of the Contractors Work Plan or a stand-alone document.

The CQCP must specify:

- Testing and inspections to be done as directed in the project specifications,
- Any other testing and inspections required to verify that the work meets the project specifications,
- Procedures for controlling the quality of construction work,
- Procedures to document construction activities that affect the quality of work performed,
- QA/QC procedures for all construction project monitoring, and
- Specify corrective actions to be performed in the event of over-placement, under-placement, or placement outside of the specified area for the ENR and ENR+AC material.

The contractor shall have a copy of all its documents, including the CQCP, on site and available to its personnel, construction quality assurance (CQA) personnel, and agency personnel throughout the duration of the Project.

QA performed by the County and the Amec Foster Wheeler consulting team (consulting team) will consist of monitoring and audits to verify that the Contractor follows applicable QC programs, verify

effectiveness of the QC programs, and provide assurance and documentation that the completed construction work satisfies quality requirements specified in the construction contracts. Construction oversight will be provided by the King County Project Representative (Project Representative), the CQA field staff, and support staff.

### **1.3 CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN OBJECTIVES**

The purpose of the CQAPP is to provide assurance that the completed construction work meets the quality requirements in the project plans and specifications. The objectives of this CQAPP are to:

- Define project management organization and roles.
- Define the responsibilities and authorities of project QA/QC team members.
- Define procedures and methods to check the contractor's performance and work quality.
- Define procedures to implement corrective actions if performance standards or design criteria are not met.
- Define documentation procedures and requirements.

### **1.4 DOCUMENT ORGANIZATION**

This CQAPP is organized into the following sections.

- Section 1.0 presents an overview of the Pilot Study, the components of the construction quality management, and objectives of the CQAPP.
- Section 2.0 describes the organizations and key personnel involved in construction quality management as well as their responsibilities authorities.
- Section 3.0 describes the QA activities for different elements of construction work.
- Section 4.0 describes the procedure for tracking construction deficiencies from the identification through the accepted corrective action.
- Section 5.0 presents the procedures for managing, meeting, and construction documentation and reporting.
- Section 6.0 describes the procedures for revising the CQCPs and CQAPP.

### **1.5 DISTRIBUTION AND DOCUMENT CONTROL**

Copies of this CQAPP will be distributed to all supervisory personnel involved in Project implementation. All supervisory personnel working on the Project are required to read and familiarize themselves with this CQAPP prior to work at the Site. A current version of this CQAPP

should be in the possession of all supervisory field personnel. If this CQAPP is updated, each distributed copy of the CQAPP will be replaced by the revised version.

Other documents describe the procedures, guidelines, and requirements for other aspects of the work that the CQA field staff will use in conjunction with this CQAPP. Those documents are:

- *Health and Safety Plan (HASP)*: Describes procedures, equipment, and monitoring requirements to protect the health and safety of the King County project personnel, including the CQA field staff.
- *Project Permits and Approvals*: Project permit and approval requirements include but are not limited to the Water Quality Memo and the U.S. Environmental Protection Agency (EPA) Approved Contractor Work Plan.

## **2.0 PROJECT ORGANIZATION**

This section presents the structure of the project construction management and CQA team, the construction team including construction quality control, the roles of involved organizations, and the responsibilities and authorities of key personnel involved in QA/QC of the construction work (collectively referred to as the project team). Figure 1 shows the organization of the project team. The specific companies and responsible individuals in charge of CQA will be finalized prior to the start of construction, and the CQAPP will be updated as needed to reflect any changes in organization of the project team.

### **2.1 ORGANIZATIONAL ROLES AND RESPONSIBILITIES**

This section presents the organization, roles, and responsibilities of the construction management and CQA team (CQA team) during construction. Full contact information can be found in Table 1.

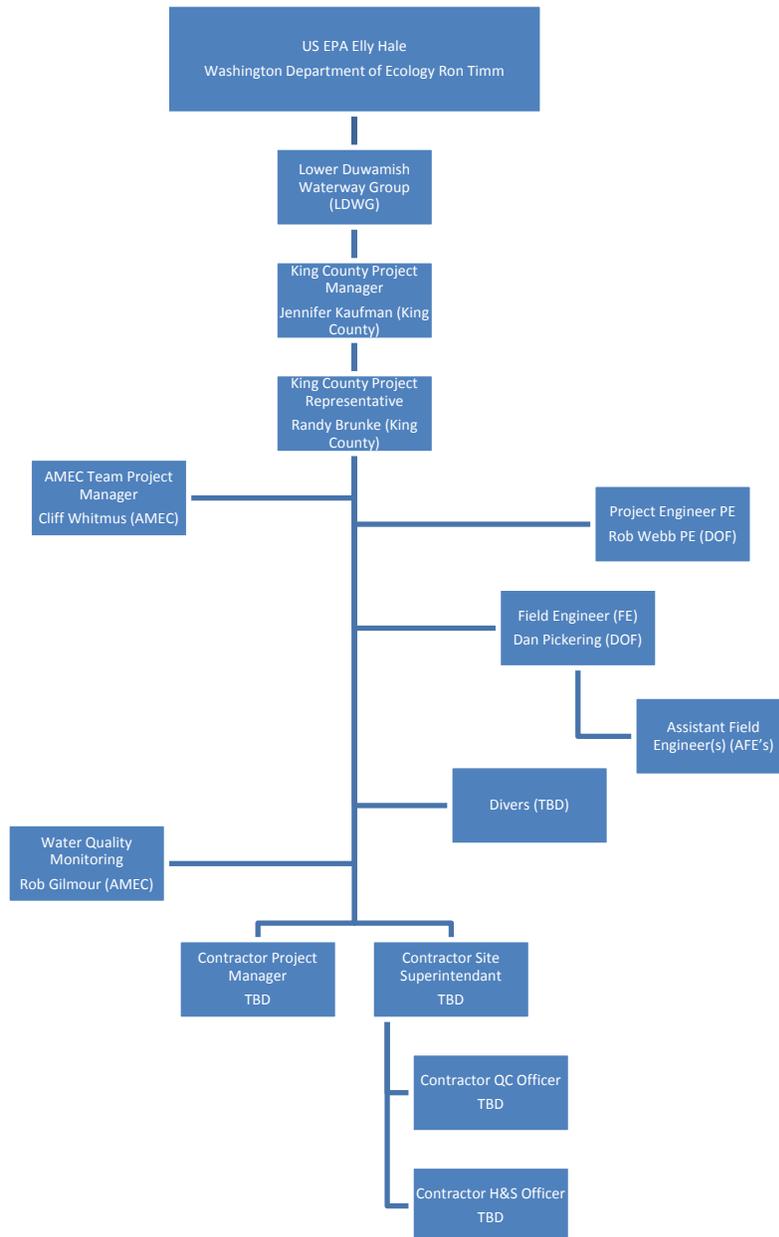
The LDWG is the lead for conducting this work for EPA and the Washington State Department of Ecology (Ecology) and as such will be involved in all aspects of this project.

#### **2.1.1 EPA and Ecology**

EPA and Ecology as oversight agencies will review and approve of the CQAPP as well as perform oversight on any field activities, as needed. EPA and Ecology will be represented by their project managers (PMs) for this project, Elly Hale and Ron Timm, respectively. EPA and Ecology responsibilities and authorities include but are not limited to:

- Overall Project oversight and approval;
- Programmatic oversight of project quality assurance;

- Final approval of changes to CQAPP in coordination with LDWG/King County;
- Final decision making on compliance with water quality standards and BMPs; and
- Authority for stopping work for any reason deemed appropriate by EPA/Ecology.



**Figure 1 – CQAPP Project Organizational Chart**

## **2.1.2 King County**

King County is the owner of the Project, and the Project Representative will be responsible for overall construction management and coordination of the work. The Project Representative will coordinate administrative aspects of the activities between King County, LDWG, the consulting team, and the Construction Contractor, monitor the project schedule, maintain communications within King County and the other interested parties, and be responsible for all verbal or written direction to the contractor. Project Representative will report to King County Project Manager and will be supported by the CQA team.

### **2.1.2.1 King County Project Manager**

The responsibilities and authorities of King County's Project Manager (King County PM) include, but are not limited to:

- Overall Project responsibility;
- Programmatic oversight of project quality assurance;
- Approval of changes to CQAPP in coordination with EPA
- Coordinate with LDWG on any major project deviations in accordance with LDWG agreements

The King County PM is Jennifer Kauffman.

### **2.1.2.2 King County Project Representative**

The responsibilities and authorities of the King County, Project Representative, include, but are not limited to:

- Final approval of all submittals;
- Tracking schedules;
- Conducting progress meetings;
- Conducting all administrative activities during construction among the LDWG, the Project Engineer, Field Engineer and the Contractor;
- Performing all field inspections;
- Approving all import materials and equipment;
- Accepting or rejecting key personnel on the project;
- Provide all verbal or written direction to the contractor;

- Stopping work for any reason deemed appropriate;
- Auditing the project QA; and
- Approving in conjunction with the King County PM deviations from the requirements in the project plans and specifications.

The Project Representative is Randy Brunke.

### **2.1.3 Lower Duwamish Waterway Group**

The LDWG consists of the City of Seattle, the Port of Seattle, King County and The Boeing Company. King County will regularly update the LDWG partners on the progress of this project, and LDWG will provide direction to King County on any major project deviations in accordance with LDWG agreements.

### **2.1.4 Engineering Consulting Team**

King County has retained an engineering consulting team (consulting team) to provide field engineering and construction QA during the project.

The consulting team will be referred to as the CQA team in this document. Dalton, Olmsted & Fuglevand, Inc. (DOF) is the Engineer of Record and is a sub-consultant to AMEC Foster Wheeler who is the prime consultant to King County for this project (collectively referred to as the CQA team in this document). The CQA team reports to King County.

#### **2.1.4.1 Consulting Team Project Manager**

Cliff Whitmus of AMEC Foster Wheeler will serve as the consulting team Project Manager. The responsibilities of the consulting team Project Manager include, but are not limited to, the following:

- Overall project coordination;
- Providing oversight on planning and coordination, work plans, project deliverables, and performance of the administrative tasks needed to ensure timely and successful completion of the project;
- Coordinating with LDWG, EPA, and Ecology on schedule, deliverable, and other administrative details.

#### **2.1.4.2 Project Engineer**

Rob Webb of DOF will serve as the Project Engineer (PE) and the CQA team leader under direction from the Project Representative. Mr. Webb will provide technical assistance and perform

limited field oversight during construction as necessary to support activities by the Field Engineer (FE). The PE's roles and responsibilities include, but are not limited to, the following:

- Overall responsibility of construction QA;
- Overall responsibility for CQA field staff;
- Resolve design issues during construction coordinating with the Project Representative;
- Coordinate technical aspects of the project with the Contractor, and
- Inform King County PM and Project Representative of issues encountered during construction.

#### **2.1.4.3 Field Engineer**

The FE reports to the Project Representative, works with the CQA field engineering staff, and monitors daily construction, inspections and monitoring activities to assure compliance with the CQAPP.

The Field Engineer will be Dan Pickering of DOF.

Responsibilities of the FE include, but are not limited to, the following:

- Coordinate activities with the Project Representative;
- Resolve any design and construction issues or conflicts with the Project Representative and the Contractor;
- Identify and resolve construction deficiency issues;
- Notify the Contractor's Site Safety Officer of any emergent safety issues;
- Notify the Project Representative of any needed direction to the Contractor; and
- Maintain project documentation.

#### **2.1.4.4 Assistant Field Engineers/Inspectors**

The FE may be assisted by Assistant Field Engineer(s) (AFE), who will assist in the inspection and documentation of daily activities. AFEs may include subcontractors such as divers for inspections.

Responsibilities and authorities of the Assistant Field Engineers and Inspectors include, but are not limited to:

- Review the Contractor's QC testing and inspection results of behalf of the FE and Project Representative;
- Document details of the work progress on the daily and weekly status reports;
- Inspect and document all construction activities;
- Document equipment and personnel on site daily;
- Conduct any QA testing;
- Perform water quality monitoring and documentation;
- Install grade stakes;
- Inspect plots using divers, and
- Coordinate and manage data from dive inspections of plots.

### **2.1.5 Construction Contractor**

King County will retain a contractor to implement the pilot study. The Contractor's Project Manager (PM) will report to the Project Representative. The Contractor's Site Superintendent shall be onsite whenever work is being performed and will report to the Project Representative.

The Contractor is responsible for completing the construction in accordance with the design drawings and specifications, the approved Work Plan, CQCP, approved permits and substantive compliance conditions, and all approved changes to these documents, as well as conducting Quality Control including appropriate tests and inspections to verify that the work meets all of the design requirements.

The Contractor will furnish a Work Plan that includes a CQCP for review and approval by King County, LDWG, the CQA team and EPA/Ecology. The CQCP will identify the inspections, monitoring, surveys, and other actions to be taken by the Contractor as required by the plans and specifications to ensure that the work complies with all contract requirements. The CQCP needs to be approved by LDWG and EPA/Ecology before construction Notice to Proceed (NTP).

The Contractor will use methods described within their CQCP to ensure project performance and compliance with the approved design drawings and specifications. The Contractor will have a dedicated Quality Control Officer (QCO) on site throughout the duration of the Project. The QCO will have the ability and authority to ensure that the work is performed in accordance with the approved plans.

In addition, the Contractor will submit a site-specific Health and Safety Plan (HASP) that will cover the controls, work practices, personal protective equipment, 40-hour HAZWOPER (& 8 hour annual refresher as appropriate) certifications for all onsite Contractor personnel, and other health and safety requirements that will be implemented in connection with the construction work. A similar site-specific HASP will be required for all subcontractors. The Contractor will ensure that all their staff and subcontractors' staff follow the approved quality control, documentation, and health and safety procedures, and document as-built conditions.

### **2.1.5.1 Contractor's Project Manager**

Contractor will employ a Project Manager (PM) with at least 8 years of remedial construction supervisory experience on sediment remediation projects including a minimum of one marine remediation project in the Puget Sound and one project using precision instrumented excavator for in water material placement.

The Contractor's Project Manager reports to the Project Representative, and is responsible for overseeing completion of the construction work in accordance with the project plans and specifications, design drawings, and the approved CQCP, or approved changes of the same. The Contractor's Project Manager is supported by the Contractors Site Superintendent, QC Manager, and Health and Safety Officer. The responsibilities and authorities of the Contractor's Project Manager include, but are not limited to:

- Ensure construction is conducted and completed in accordance with the plans and specifications;
- Ensure that the Contractor's staff follow the approved quality control and health and safety procedures;
- Ensure that required tests and inspections are conducted;
- Ensure that the Contractor's staff performing the tests and inspection are properly trained;
- Ensure that testing and inspection results meet QC requirements;
- Inform the FE and Project Representative of any new finds or changed conditions;
- Provide QC documentation to the FE and Project Representative; and
- Submit as-built conditions to the Project Representative.

The Contractor's Project Manager has the full authority to execute any and all actions necessary to ensure that the construction work complies with the project plans and specifications, and HASP.

### **2.1.5.2 Contractor's Site Superintendent**

Contractor shall designate a Site Superintendent. The Site Superintendent should have at least 8 years of sediment remediation construction supervisory experience including a minimum of one marine remediation project in the Puget Sound and one project using precision instrumented excavator for material placement. The Site Superintendent will be on site full time whenever work is being performed and supports Contractor's PM. The responsibilities and authorities of the Site Superintendent include, but are not limited to:

- Ensure construction is conducted and completed in accordance with the plans and specifications;
- Ensure that the Contractor's staff follow the approved quality control and health and safety procedures;
- Ensure that required tests and inspections are conducted;
- Ensure that the Contractor's staff performing the tests and inspection are properly trained;
- Ensure that testing and inspection results meet QC requirements;
- Provide QC documentation to the Contractors Project Manager, for submittal to the FE and Project Representative, and
- Document as-built conditions.

### **2.1.5.3 Contractor's Quality Control Officer**

Contractor will designate a full time Quality Control Officer (QCO) for the Project. The QCO will be an engineer or technician knowledgeable of standard QA/QC procedures for construction activities on aquatic environmental remediation projects with at least 2 years' experience including a minimum of one marine remediation project in the Puget Sound and one project using precision instrumented excavator for material placement. The Contractor's QCO is responsible for ensuring that the construction work meets the requirements in the project plans and specifications, communicates directly with the Project Representative or designee (specifically the FE and AFE), and reports to the Contractor's PM. The QCO's responsibilities include but are not limited to:

The QCO's responsibilities include:

- Implementing the approved CQCP;
- Adhering to project specifications, drawings, and field changes approved by the Project Representative;
- Performing required inspections specified in the CQCP;

- Ensuring that testing and inspection results meet QC requirements;
- Revising the CQCP as required and approved by the Project Representative;
- Maintaining QC documentation, and
- Providing QC documentation to the Contractor's Project Manager.

The QCO has the full authority to execute any and all actions necessary for implementing the QC program to ensure compliance with the project plans and specifications.

#### **2.1.5.4 Health and Safety Officers**

Each consultant and contractor will designate a Health and Safety Officer (HSO), who will be primarily responsible for implementing and overseeing that firm's HASP. Specific responsibilities of each HSO will include providing that firm's staff with the HASP that deals with project-specific hazards, ensuring that all employees are trained in appropriate safety techniques relevant to the project, ensuring that safe work procedures are followed at the job site, ensuring that proper safety equipment is available at the job site, and maintaining Health and Safety documentation and providing such documentation to the Project Representative.

### **3.0 QUALITY CONTROL AND QUALITY ASSURANCE ACTIVITIES**

This section describes the QC and QA activities to be performed for different elements of the Project.

#### **3.1 PROJECT BEST MANAGEMENT PRACTICES**

The following best management practices (BMPs) have been developed for the Project and will be used for ENR material preparation and placement. These BMPs have been developed to improve material placement or meet other objectives such as water quality during placement. These BMPs are summarized in this document to provide quick reference, but are explained further in associated documents:

- Precision rigid arm excavator – Use precision, rigid arm excavator with real-time navigation and positioning system for material placement.
- Water-Tight Barges for ENR+AC Material – Verify barges are watertight to extent necessary prior to use. Perform hydrostatic test to verify and inspect for leaks as possible sources of turbidity during construction.
- Test Placement – Perform test placement, in location shown on plans, prior to actual plot placement to determine optimal bucket fill factor and bucket grid pattern to achieve thickness of placed material with thickness value of 6-9 inches at 80% of

locations with no single location less than 4 inches in the area where two lifts were placed.

- Bucket Fill Factor – Achieve uniform bucket fill factor, based on test placement, as practicable during in water material placement over Plot areas.
- Saturate AC – Monitor and adjust water level within ENR+AC material barge as needed to maintain flooded condition during and for a minimum of 12 hours prior to and during in water placement of ENR+AC Material.
- Clamshell Bucket Vertical Control – Place bucket approximately 2 to 2.5 feet above existing bottom grade as practicable during bucket opening without getting closer than 2 feet to bed at any time during placement operations.
- Clamshell Bucket Horizontal Position – Based on Test Placement, use bucket grid pattern developed to optimize material placement at target thickness. Pre-program pattern into navigation system prior to placement.
- Use of Spuds – Limit disturbance of Plot areas before and during construction due to spud operations, anchors, cables, and excessive tug maneuvering. Verify equipment is properly sized such that excavator can place a minimum of two bucket rows, as measured from front of barge outward, from each spud set location throughout full project depths. Do not place spuds in areas where ENR or ENR+AC material has already been placed. Other disturbances to plot areas by anchors, cables, prop wash, vessel grounding or similar shall be avoided.

Consistent with the Biological Evaluation the following BMPs will also be used:

- All mechanized equipment will be maintained in proper operating condition, with equipment inspections occurring prior to each workday. Equipment found to be leaking petroleum products or hydraulic fluid will be removed from the site for maintenance.
- Drip pads or pans will be placed under mechanized equipment to contain any potential leaks of petroleum products or hydraulic fluids.
- To the extent possible, vegetable-based hydraulic fluids will be used.
- A spill kit will be kept on work vessels to contain any potential petroleum spills that might occur.
- Ecology and the U.S. Coast Guard will be contacted immediately in the event of a spill.
- Any project-related debris or wastes will be placed in appropriate containers for off-site disposal. No project-related debris or wastes will be allowed to enter the water.
- Barges and work vessels will not be allowed to run aground on the substrate. Work barges will be held on station with spuds or anchors.

If there is a confirmed exceedance of the turbidity compliance criterion during construction monitoring, the Project Representative may direct the contractor to institute the following or other BMPs consistent with the Water Quality Monitoring Plan (WQMP; Appendix F of the Narrative Design Report):

- Review the documented operations at the time of the exceedance; specifically determine whether the in-water placement of ENR or ENR+AC or a non-project-related activity was occurring at the time of the exceedance.
- Once the activity resulting in the exceedance has been identified, determine the likely cause of the excess turbidity by reviewing the log of operations.
- The contractor may modify operations per direction from the Project Representative or designee (the FE). Potential modifications may include an adjustment to the placement process, including the following:
  - Decreasing the velocity of the bucket through the water column.
  - Pausing the bucket above the sediment surface before opening it.
  - Stopping work temporarily or increasing cycle time.
  - Modifying the position of barges to reduce potential grounding or scour from the tugs.
  - Modifying the ENR or ENR+AC material barge loading to reduce material spillage.

## **3.2 GENERAL QA ACTIVITIES**

General QA activities include, reviewing the Contractor's construction and QC records, observing the Contractor's QC tests and inspections, and conducting independent testing and inspections.

### **3.2.1 Verification of Contractor's QC Program**

The CQA team that includes the Project Representative, FE, and AFE will review the Contractor's construction and QC records on a daily basis and obtain QC documentation from the Contractor and provide the information to the Project Representative. The CQA team directed by the Project Representative will observe and provide oversight of the Contractor's QC testing and inspections to verify that:

- The frequency of testing and inspection meets CQCP requirements.
- Testing equipment is calibrated.
- Testing is performed properly.
- QC results meet CQCP requirements.

- Compliance with project BMPs.

### **3.2.2 Independent Testing and Inspections**

As described in later subsections, the CQA team will perform independent testing and inspections as required by this CQAPP to verify:

- Equipment meets the project plans and specifications.
- Products (ENR and AC materials) meets the project plans and specifications.
- Placement including locations, dimensions, elevations, and tolerances indicated in the project plans and specifications.
- Water Quality Compliance.
- The CQA team will verify that all testing equipment and apparatus are in working order and properly calibrated.

### **3.2.3 Project Closeout**

Prior to demobilization, the Project Representative and FE will verify that:

- Accurate as-built drawings are prepared.
- Corrective actions for construction deficiencies are completed and recorded.
- All QA/QC documents are complete and properly filed.

## **3.3 QA AND QC OF PRODUCTS**

### **3.3.1 Verification of AC Material**

AC gradation requirements can be found in Specification Section 02221 Part 2. A minimum of 15 days prior to ordering AC material, the Contractor will submit the following information to the Project Representative for approval:

- AC Supplier's name and material type;
- A sample of the AC, as described in the Specifications, so the CQA team can submit for chemical analysis for PCB content;
- Results of gradation tests for the AC materials to be imported.

Upon delivery of AC material to the ENR material loading facility, the CQA team will inspect the material to verify that the materials are the same as what is proposed by the Contractor and a sample of which was previously submitted, analyzed and approved. When required by the CQAPP, the FE will obtain the manufacturer's certificate for each lot of material delivered, which

will be signed by a responsible person employed by the manufacturer. The FE will verify that certificates are provided for all received material and that the certified properties meet design specifications.

The FE, in conjunction with the Project Representative, will reject incorrect material and verify that the rejected materials are either removed from the site or stored at a location separate from accepted material. Material that does not have the manufacturer's certificate will also be stored separately from accepted material until the certificates are received and approved by the FE. The FE will verify that all materials are stored with adequate safeguards to protect against damage.

### **3.3.2 Verification of Sand and Gravelly Sand Products**

#### **3.3.2.1 Contractor Verification of Sand and Gravelly Sand Products**

The Contractor shall perform the following verification of sand and gravelly sand products:

- Provide source of products to the CQA team;
- Inspect source of products;
- Verify sieve analysis matches the criteria designated in the Specifications; and
- Provide sample(s) of the products, as described in the QAPP, to the CQA team at least 4 weeks prior to anticipated mobilization.

#### **3.3.2.2 QA Verification of Sand and Gravelly Sand Products**

The consultant CQA team including the FE, AFE, and the Project Representative shall perform the following verification of sand and gravelly sand products:

- Inspect source of products;
- Submit sample(s) for chemical analysis per QAPP; and
- Verify sieve analysis and chemical analysis matches the criteria designated in the Specifications.

### **3.3.3 Verification of AC-amended Sand and Gravelly Sand**

#### **3.3.3.1 Contractor Verification of AC-Amended Sand and Gravelly Sand**

The Contractor shall perform the following verification of AC-amended sand and gravelly sand:

- Provide blend method in the Contractor Work Plan submittal;
- Provide weigh tickets of AC and sand or gravelly sand ENR Material (separate ticket for AC and for sand or gravelly sand; shall confirm specified% by weight AC) from the loading of each barge (or truck as appropriate);

- Provide sample(s) of blended material to the CQA team 1 week prior to expected mobilization; and
- Provide sample(s) to the CQA team periodically, as described in Specifications.

### **3.3.3.2 CQA Verification of AC-Amended Sand and Gravelly Sand**

The CQA team shall perform the following verification of AC-amended sand and gravelly sand:

- Observe the blending/loading of the AC-amended sand and gravelly sand in real-time;
- Visually verify the consistency of the blended material;
- Verify that the blended material meets the acceptance criteria designated in the Specifications (target percent by weight) based on visual observations and scale tickets from barge loading operations; and
- Collect random samples of the AC amended ENR materials from barge prior to placement for information only to determine the detected range of AC in the blend.

## **3.4 QA AND QC PROCEDURES FOR ENR & ENR+AC PLACEMENT**

This section presents QA/QC requirements for in-water placement of ENR material and ENR+AC material. Table 2 summarizes the anticipated QA/QC monitoring requirement for in-water work, including frequency and personnel responsible for performing monitoring. The results of these inspections and monitoring activities will be documented as specified in Section 5.0 of this document.

### **3.4.1 Prior to Construction**

Prior to construction, the Contractor will do the following:

- Establish survey and positioning controls; and
- Ensure all equipment is functional and ready for mobilization.

The necessary inspections by CQA staff will be performed prior to the start of construction activities, including inspecting all equipment to be used by the Contractor that could affect the quality of the project and to verify compliance with the project specifications. Items to be specifically included during preconstruction inspections include ENR material plant and equipment, navigation and positioning equipment and display, tidal gauges, telemetry, and other individual or integrated systems on ENR material plant or survey vessel.

### **3.4.1.1 ENR/AC Material Inspection, Sampling, Analysis**

As described in the QAPP, baseline sampling will be conducted to establish the conditions within each subplot prior to placement. During this timeframe, the Contractor will provide samples to the Project Representative who will have the QCA staff test the samples of the ENR and AC substrates. Those tests will follow the requirements described in the QAPP. ENR material will be tested for SMS compounds, TOC, and grain size and the AC material will be tested for PCB congeners, as described in the QAPP.

### **3.4.1.2 Equipment Inspection**

Prior to the start of any construction, periodically throughout the project and after any change of equipment, the FE will inspect all equipment to be used. These inspections will include but not be limited to:

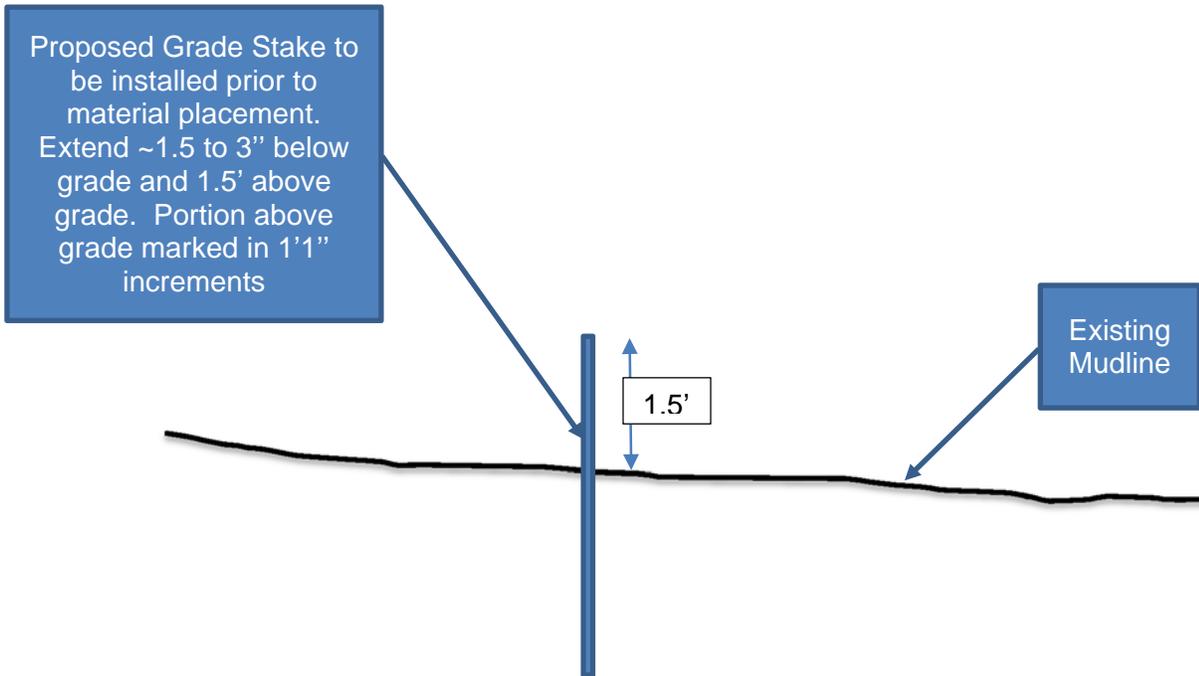
- Prior to loading any ENR material, Material barge bins will be tested by pumping water from the Duwamish Waterway into the bin up to a level of approximately 2 feet deep. Material bins on barges will be inspected for water tightness with minor weeping, as determined by the CQA team, being acceptable; any visible leak determined to be of unacceptable magnitude by the Project Representative, including any causing turbidity impacts, shall be repaired by Contractor and then re-inspected until no visible leaks of unacceptable magnitude occur;
- Verification and inspection of positioning/navigation equipment; and
- Verification that navigation and offsetting bucket files have been assembled.

### **3.4.1.3 Grade Stake Placement**

Prior to ENR material placement within any subplot or test placement area, King County will install breakaway grade stakes within the subplot or test placement area. Within the Test Placement (Demonstration) areas, stakes will be installed at a rate of 1 per 100 square feet. In subplots, 15 stakes will be installed per subplot at approximate locations shown on the Project Plans. Stakes shall be placed within one week of planned material placement within a sub plot. Stakes will be placed by diver or possibly by foot access at low tide at the intertidal plot at location shown on plans. The location of the stakes will be surveyed in using either a global positioning system (GPS) rod placed directly on or adjacent to the stake or by diver using small buoy to display location on water surface where GPS can be used to survey.

It is anticipated that stakes will be made from 1-inch diameter PVC pipe or similar, as approved by the Project Representative prior to installation, driven approximately 1.5 feet (18 inches) to 3 feet (36 inches) into the existing waterway bed as practicable to prevent over turning based on sediment characteristics and extending 1.5 feet (18 inches) above the existing waterway bed.

Stakes shall be clearly marked in 1-inch increments from 0.0 feet (set at existing mudline) up to 1.5 feet (18 inches) at top of stake.



**Figure 2 – Conceptual Grade Stake**

### 3.4.2 ENR/AC Test Placement Demonstration

Prior to waterway placement, Contractor will perform test placement demonstrations in designated demonstration areas (as shown on Plans) within the intertidal zone of the Duwamish Waterway for both the AC amended sand ENR material and the gravelly sand ENR material. The test Placement Demonstration areas are located near and within the intertidal plot. Timing of the test placement will occur during one of the two timeframes: 1) November 29th, 2016 through December 1st, 2016; or 2) December 12th, 2016 through December 16th, 2016, where daytime high tides will allow access to the demonstration areas for floating equipment and evening low tides will allow access for visual inspection of material placement within the demonstration area. The purpose of the test placement is to evaluate material spread characteristics and behavior when placed underwater and then use that information to develop actual bucket placement pattern and bucket fill factor to be used for in water plot placement.

The Test Placement will occur in the following manner:

1. Using a water-tight material barge that has been inspected for leaks by the Project Representative, have material loading facility convey blended ENR+AC material into barge

(perform separately for sand ENR material and gravelly sand ENR material). Barge loading to be observed by Project Representative.

2. When at site, flood the material barge using saline water pumped from the Duwamish until the water level is approximately 1-2 inches above the ENR material; maintain flooded condition for the specified minimum time prior to placement.
3. Test placement to be performed during second high tide of day that precedes lower low tide of the day, which occurs later that evening.
4. Within each test placement area, Contractor shall place 2 lifts over approximately 75% of the test placement area and only one lift over approximately 25% of the test placement area such that the results of single lift placement and double lift placement can be evaluated and information used to adjust placement as necessary to meet project objectives. Within the test placement area located within the intertidal plot, the area where only one lift is placed during the Test Placement shall have a second lift placed as part of the placement within that sub plot.

The first lift shall be intended to place approximately 4.5 inches of material over the placement area. The Second lift is intended to place an additional approximately 4.5 inches of material. The second lift shall be placed by offsetting bucket grid pattern by ½ bucket dimension in X & Y directions with target to achieve total target thickness of 6 to 9 inches over a minimum of 80% of the area and 100% of area is 4 inches or more in thickness.

5. As material is removed from the barge, pump water into or from the barge as necessary to maintain water level approximately a 1-2 inches water depth above the material. When discharging water to the Duwamish use a bag filter 1 micron opening size to remove turbidity and comply with Water Quality Memo. Alternately material in barge may be adjusted provided it does not create additional winnowing or segregation of material as determined by Project Representative.

The Project Representative will verify test placement thickness on low tide following placement by reading grade stakes within demonstration area and approving thickness of placed material within tolerance of 6 to 9 inches at 80%<sup>1</sup> of locations with no single location less than 4 inches in areas where two lifts were placed. The FE or AFE, on behalf of the Project Representative, will also monitor pumping during return of water used to saturate material in barge to the LDW following the test.

---

<sup>1</sup> Excluding areas where existing bathymetric features or relief dictate potentially thicker localized resulting placement thickness.

This test is to be conducted once for AC amended sand and once for AC amended gravelly sand by the excavator operator assigned to perform placement at the sub plots. When method of placement of material is acceptable to the Project Representative, placement within subplots may begin.

### **3.4.3 During Construction**

During construction, the AFE, at the direction of the Project Representative, will conduct regular monitoring and observations as needed to verify the quality of the work. Examples of these verifications and monitoring are described below. Table 2 has a complete list of QA monitoring activities to take place during construction.

- Verification of correct material type for placement area;
- Verify daily clamshell bucket positioning calibration tests;
- Daily bucket inspections;
- Bucket placement is within approved pattern and in correct order;
- Monitor lift thickness being placed through diver surveys (divers will place grade stakes prior to placement of material and read grade stakes upon completion of placement in each area);
- Verification that material placed within sub-plot is weight equivalent for area based on scale tickets and/or barge draft during placement as appropriate;
- Document placed layer characteristics through coring;
- Verify full coverage and uniform placement through continuous observation during placement;
- Verify that spuds are not used in areas where material has already been placed within the plots by making sure Contractor's grid pattern is properly executed.

#### **3.4.3.1 Positioning/Navigation System**

The excavator operated by the Contractor will be instrumented with DGPS and inclinometers so as to accurately determine the location of the bucket within +/- 4 inches in the X, Y, and Z axis (i.e., horizontally and vertically) including bucket rotation.

Positioning system will be inspected by the FE or AFE to confirm that system is consistent with Contractor's previous submittals describing system and that system meets required accuracy

### **3.4.3.2 Bucket Grid Pattern and Fill Factor**

The following bucket grid pattern and fill factor will be performed by the Contractor:

1. Use bucket grid pattern and fill factor developed during test placement for in-water placement.
2. Spuds shall not be set within area where material has already been placed. This requires the placement of both lifts while stepping barge through the placement area once. In order to ensure that no spuds are used over an area where material has already been placed within each subplot, the Contractor shall use the grid pattern and stepping presented here (or similar as approved by Project Representative to prevent use of spuds within already placed plot areas): start placement at the end of placement lane within the subplot; start placement with farthest rows out from the excavator; complete two adjacent rows, then perform the second pass on the first row (consistent with the grid pattern deemed acceptable during the test placement); continue pattern until the closest row attainable by the excavator is reached; step or move backfill barge backwards (away from area just placed); repeat pattern.

The Project Representative designee (FE or AFE) will be on backfill barge at all times during material placement and will verify that the correct bucket grid pattern and approximate fill factor developed during test placement are being used and that buckets are being placed in the correct sequence.

### **3.4.3.3 Diver Inspection of Plots**

To verify full coverage of each plot and qualitatively document placement results, CQA divers will swim at least 4 transects across each subplot, visually assessing placement results including coverage (percent of area based on visual observation) and relative surface uniformity or roughness. Additionally divers will report any observed abnormalities including presence of large debris that may be impacting placement or other features that may impact monitoring.

### **3.4.3.4 Thickness Verification of Placed ENR and ENR+AC Materials**

Two methods will be used by the CQA team on behalf of the Project Representative to assess Contractor's successful placement of thickness within tolerances. These methods will be used for test placement areas and all subplots.

First, FE or AFE will calculate placement on a volumetric basis. FE will verify for each sub-plot that material placed in two 4.5 inch lifts within each sub-plot is weight equivalent to a 9-inch nominal layer for the area, based on scale tickets and/or barge draft during placement as appropriate. FE

or AFE will also be continuously observing placement to confirm bucket patterns and locations are as defined in the Contractor's placement plan.

Second, CQA staff divers (or foot access in intertidal areas) will take direct measurements of thickness. Thickness grade stakes will be used determine placed thicknesses at specific points. To verify placement thickness within each subplot, suitable grade stakes will be placed by divers in the subplot prior to placement of ENR or ENR/AC Material within that subplot. Stakes will be placed at a density of 15 stakes per subplot (~1 stake per 0.03 acre). The grade stakes will be marked prior to deployment with an incremental mark every 1 inch with up to 1.5 feet above existing mudline prior to material placement. After ENR or ENR/AC Material placement, divers will be used to read off placement thickness. Stakes will be left in place for future monitoring.

The thickness acceptance criteria are:

- Placement thickness of 6-9 inches in 80%<sup>2</sup> of stake locations per subplot;
- Placement minimum thickness of 4 inches at approximately 100% of stake locations per subplot, and
- No placement that impedes navigation.

The visual diver observations described above may also be considered in determining compliance with the target thickness criteria. Should the thicknesses be determined out of compliance, the Project Representative will notify the Contractor of the need for corrective action, which may include placement or relocation of additional material, as directed by the Project Representative. These CQA tasks and any corrective actions must be complete before the Contractor is permitted to move to the next set of subplots. Material from areas where the placement is too thick will only be relocated if it shall encroach upon the existing Federal authorized navigation depth and thereby poses a hazard to navigation as determined in consultation with the U.S. Army Corps of Engineers (USACE).

Any extra ENR or ENR+AC material left over after acceptance of layer thicknesses for plots may be placed immediately adjacent to any of the plots within the areas specified on the Plans. All procedures for placement of material within the plots should be used for placement outside of the plots. ENR or ENR+AC materials would be placed adjacent to subplots of similar material.

---

<sup>2</sup> Excluding areas where existing bathymetric features or relief dictate potentially thicker localized resulting placement thickness.

#### **3.4.3.5 Documentation of Layer Characteristics**

The CQA divers will collect push cores for visual observation of layering, carbon segregation, thickness, intermixing of native materials, etc. These would be performed for documentation only.

#### **3.4.3.6 Hydrographic Surveys**

Multibeam surveys are to be performed by the hydrographic surveyor retained by the Contractor both before and after placement of material. These surveys are for documentation only and will be used to create as-built surfaces for each plot. For intertidal plots, surveys will need to be performed during higher tides to allow full coverage up to the higher elevations within the plots.

The FE will review the surveys for major anomalies and potential interference with navigation requirements.

#### **3.4.3.7 Water Quality Monitoring Compliance**

Water quality monitoring is to be performed by the CQA team during in-water work to verify compliance with the Section 401 Water Quality Memo. Details of water quality monitoring are presented in the Water Quality Monitoring Plan (WQMP).

Water quality monitoring will be performed by sampling water upstream and downstream of the ENR or ENR/AC Material placement according to the requirements of EPA's Section 401 Water Quality Memo. Data will be routinely monitored to verify compliance. If water quality parameters are identified that do not meet the criteria listed in the Section 401 Water Quality Memo, and if these effects cannot be shown to be unrelated to the construction activities, the Contractor will be required to modify or suspend operations until water quality improves.

The CQA team will verify compliance with manufacturers' recommendations for equipment calibration. Calibration logs will be maintained for all instruments.

Water quality data will be reported to EPA on a weekly basis unless an exceedance event is recorded, as described in the WQMP.

#### **3.4.3.8 Notification of Water Quality Exceedances**

The communications and decision making roles for water quality exceedances are described in detail in the WQMP. In the event that any water quality criteria specified in the Section 401 Water Quality Memo are not met, EPA will be notified on the same day by the Project Representative via the point of contact designated in the Water Quality Memo.

### **3.4.4 Post Construction**

The CQA team will verify that final ENR or ENR+AC Material placements have been completed and that final as-built conditions and other reporting requirements are properly documented.

## **4.0 CONSTRUCTION DEFICIENCIES**

This section describes the procedures for identifying and correcting construction deficiencies, which consists of Contractor QC deficiency and construction quality deficiency. The Project Representative has the authority to approve corrective actions for construction deficiencies, subject to EPA approval.

### **4.1 CONTRACTOR QC DEFICIENCY**

Contractor QC deficiency occurs when the Contractor fails to comply with their CQCP. When a Contractor QC deficiency is identified by the CQA team on any segment of the work, the CQA team may immediately stop the construction work on the affected segment, depending on the deficiency. Such deficiency will be immediately brought to the attention of the Project Representative and the Contractor's Project Manager for correction. Construction work may resume after the CQA team determines that the Contractor has met the QC requirements on the affected segment. The CQA team will document such deficiencies and Contractor's corrections in the daily/weekly reports, together with the corrective action taken or planned.

### **4.2 CONSTRUCTION QUALITY DEFICIENCY**

Construction quality deficiency occurs when any material, work performed, or installation does not meet project plans and specifications. When a construction quality deficiency is identified by the CQA team at any time, the CQA team will immediately stop the construction work, and notify the Project Representative and the Contractor's Project Manager of such deficiency. King County's Project Manager will notify EPA where necessary. The CQA team will document that non-conforming material or installations are clearly marked or segregated, to the extent practical, from conforming material or installations by the Contractor. The Contractor will describe proposed corrective actions to the Project Representative in writing for approval. The corrective actions could include, for example, placement of additional ENR material in thin spots or replacing defective equipment. Corrective actions will use methods that will not compromise conforming work. The proposed corrective action will be reviewed, review responses will be consolidated, and the Contractor be notified that one of the following actions need to be taken:

- Approve – Proposed corrective actions meet contract requirements. The Contractor will implement corrective actions as proposed, subject to the same QA/QC testing and inspections as the original work.

- Approve As Noted – Proposed corrective actions meet contract requirements with minor changes. Contractor does not need to resubmit corrective actions, but must incorporate the required changes during implementation of corrective actions.
- Reject – Proposed corrective actions do not meet contract requirements. Contractor must propose alternative corrective actions.

The implemented corrective actions will be subject to the same QA/QC procedures as original construction. The Project Representative will be the primary point of contact with the Contractor in regard to construction quality deficiencies. EPA will be notified by the King County Project Manager if corrective actions may result in changes to EPA approved documents. Any proposed change to EPA approved documents must be reviewed and approved in writing by the EPA Project Manager.

## **5.0 MEETINGS AND DOCUMENTATION**

This section describes the meetings and QA/QC documentation requirements:

- Pre-construction (Contractor Work Plans, Preconstruction meeting),
- During Construction (Daily operations meetings, weekly progress meetings),
- Post Construction.

### **5.1 WORK MEETINGS**

This section describes the format and content of meetings to be conducted as part of the in-water work.

#### **5.1.1 Preconstruction Meeting**

A preconstruction meeting will be conducted prior to the start of field activities.

##### **5.1.1.1 Attendance**

The preconstruction meeting will be attended by the following personnel:

- EPA Site Manager and/or designated representatives,
- Ecology Site Manager and/or designated representatives,
- LDWG and King County representatives, as determined by each group,
- King County Project Manager and Project Representative,
- CQA team,

- Contractor's Project Manager,
- Contractor's Site Superintendent,
- Contractor's QC Manager,
- Contractor's key subcontractor representatives.

EPA may also invite other participants, such as representatives from the USACE or other agencies.

### **5.1.1.2 Purpose**

The purposes of the preconstruction meeting are to:

- Establish lines of authority and communication within the Contract team;
- To discuss the administrative requirements of the Contract;
- Address project issues if needed;
- To define the duties and responsibilities of all parties;
- Review methods for documenting and reporting inspection data and compliance with construction documents, including methods for processing design changes and securing EPA review and approval of such changes as necessary;
- Review methods for distributing and storing documents and reports;
- Review work area security and safety protocols; and
- Demonstrate that construction management is in place, and discuss any appropriate modifications of the CQAPP to address site-specific considerations.

All meetings will be documented by the CQA team for the Project Representative and minutes will be transmitted to all parties within 7 working days of the meeting.

### **5.1.2 Daily Briefings and Planning Meetings**

The FE or Project Representative will attend the Contractor's daily tailgate Health and Safety meeting prior to the start of work each day.

The FE or AFE on behalf of the Project Representative will run a daily meeting with the Dredging Contractor's Project Manager and Site Superintendent to review:

- Work performed since previous day's meeting;
- Schedule for the next 3 days;

- Health and Safety;
- Weather forecast for the next week and how it may impact work; and
- Any issues encountered and progress towards resolution.

Contractor's operators and other staff will be made available to attend meetings as requested by the Project Representative. When possible, meetings will be scheduled to coordinate with Contractor's shift changes so required personnel can attend. Any issues and progress towards resolution will be provided to the Project Representative within one business day.

### 5.1.3 Project Meetings (Progress Meetings)

Progress meetings will be held on a weekly basis unless King County agrees to a different schedule. The progress meetings will address the following issues:

- General progress over the past week, including:
  - General progress of construction;
  - Health and Safety issues, if encountered;
  - Problems encountered and associated action items;
  - Planned work for the upcoming week;
  - Pending design, personnel, or schedule changes requiring EPA review and approval;
- Results of ongoing water quality monitoring over the past week, including:
  - Recorded water quality data;
  - Observed non-construction-related events affecting water quality;
  - Summary of any violation of water quality criteria and corrective actions taken;
- Quality Assurance Monitoring over the past week, including:
  - Results of the FE QA inspections, testing, surveying, and monitoring activities;
  - Out-of-spec conditions that may have been encountered and the actions taken to correct the situation;
- Change Orders, including:
  - Change order status since the last report;

- Change orders approved since last meeting.

Minutes of the weekly project meeting will be prepared by the FE or AFE for the Project Representative. The minutes and a cover memo, providing any required clarifications or background information for the record will constitute a Weekly Progress Report (see Section 5.2.3.2).

## **5.2 WORK DOCUMENTATION**

A variety of field recording mechanisms will be used during the project including electronic data files such as bucket placement files, and paper field notes and log books.

### **5.2.1 Contractor Submittals Prior to Construction**

Prior to initiating construction activities, the Contractor will prepare and submit documents listed in the Design Drawings and Specifications. These will include the following submittals:

- Contractor Work Plan(s),
- Construction Project Schedule,
- Contractor Quality Control Plan,
- Environmental Protection Plan,
- Site HASP, and
- Examples of all QC forms, including daily and weekly progress reports.

These Contractor submittals will meet the requirements specified in this CQAPP and the design drawings and specifications. All documents will be provided to the Project Representative in accordance with the schedule listed in the submittal register. All elements of the Contractor Work Plan are subject to EPA approval prior to start of construction.

### **5.2.2 Contractor Submittals During Construction**

#### **5.2.2.1 Contractor Daily Reports**

The Contractor will submit daily production and quality control reports to the Project Representative and FE. These reports will include details of the work performed that day (location, quantities, equipment, personnel), date, period covered by the report, downtime and delays to operation, safety, QC methods used, inspections and verifications performed, and field conditions encountered that could affect the quality of the completed project.

An example of this report is included in Attachment A. The actual format and content of the daily report will be developed by the Contractor and submitted as part of the required submittals prior to initiating the start of work.

The daily report will be submitted by the Contractor to the Project Representative and FE daily via e-mail (by 3 PM the day following the day covered by the report). Signed hard copies of each week's daily reports will be submitted at the end of each week.

### **5.2.2.2 Contractors Weekly Report**

The Contractor will submit a weekly report to the Project Representative and FE. The weekly reports will:

- Summarize actual ENR and ENR+AC production per week over the course of the project to date and projected material production per week through the completion of the Project.
- Summarize the number of barges and tons of ENR material delivered per week over the course of the project to date and the projected barges/tons for the next 2 weeks.
- Summarize work planned for the upcoming week.
- Identify anticipated delays in completing the work on schedule, and recommend modifications to the work plan to mitigate delays.

An example of this report is included in Attachment B. The actual format and content of the weekly report will be developed by the Contractor and submitted as part of the required submittals prior to initiating the start of work.

### **5.2.2.3 Contractors Closeout Submittals**

At conclusion of construction Contractor shall submit the following:

- As built surveys of plots; and
- Summary of construction including description of any difficulties encountered.

## **5.2.3 Contractor Quality Control Reporting**

### **5.2.3.1 Daily Report by FE**

The FE will prepare a daily Operations and QA report which will document site conditions, work done by the contractor, issues encountered and resolution for these issues, personnel on site and equipment used, and quantity of material placed during the shift. This report will also include photo documentation of activities performed and a progress map of work completed to date. Additional reports such as water quality and QA testing results will be documented but not included in the

daily report unless there is an issue with QA testing, which would be summarized under the issues encountered section of the Operations and QA report. These reports would not be distributed on a daily basis but made available on site if needed.

### **5.2.3.2 Weekly Progress Reports**

The FE will prepare a Weekly Progress Report and submit the report via e-mail to the Project Representative, who will distribute to EPA/Ecology Site Manager and LDWG representatives and Project Manager. The weekly report will document the following items:

- Weekly progress meetings and subjects discussed at the weekly progress meetings;
- General progress of construction with respect to the schedule;
- Problems encountered and associated action items;
- Results of ongoing water quality monitoring, including:
  - Time series plots of water quality data,
  - Observed non-construction-related events affecting water quality,
  - Summary of any violation of water quality criteria and actions taken;
- Outcome from QA monitoring, including:
  - Results of QA inspections, surveying, and monitoring activities performed by the CQA field engineering staff,
  - Out-of-spec conditions that may have been encountered and the actions taken to correct the situation; and
- Photographs of:
  - Typical construction activities during the period covered by the Weekly Progress Report;
  - Problems encountered, if any.

### **5.2.4 Change Orders**

The Contractor will submit all change order requests to the Project Representative for review and approval. All submitted change order requests will include a description of the change, reason for the change, the schedule impacts of the change, and cost impacts of the change. Submitted change orders will be reviewed by the Project Representative. If the submitted change order request does not contain all information necessary for review, it will be returned to the Contractor for revision.

If the proposed change is acceptable to King County, King County will coordinate with LDWG on any major project deviations in accordance with LDWG agreements. Also, if the change requires a revision to the design drawings and/or specifications approved by EPA, King County will immediately or during the next weekly Progress Meeting, discuss with the EPA site representative. EPA will review and approve change orders as expeditiously as possible so to avoid delays in construction.

Change orders that do not materially change the scope of the remediation will not require formal EPA approval. The Contractor will then be notified of the acceptance of the change.

### **5.2.5 Construction Report**

Upon completion of the construction work, a draft and final Construction Report will be prepared and submitted to the EPA as part of the Draft Year 1 Monitoring Report.

After completion of Pilot construction, the consulting team will prepare a draft Construction Report within 30 days and submit it to the King County PM, Project Representative, and LDWG. Once King County and LDWG approve the draft, the draft report will be submitted to EPA and Ecology with the Draft Year 1 Monitoring Report. A courtesy copy of the construction sections of the Draft Year 1 Monitoring Report will be submitted to EPA and Ecology within 6 months of the completion of construction. The objective of the construction report is to document that the Pilot is constructed in accordance with the project plans and specifications.

At a minimum, the Construction Report will include a description of the construction process, a list of any design revisions and their justifications, a list of major construction problems and their resolutions, laboratory test results, testing data sheets, and as-built drawings stamped and a certification statement signed and sealed by a professional engineer licensed in the State of Washington.

The consulting team will prepare a Final Construction Report for submittal to EPA and Ecology based on EPA/Ecology comments on the draft report.

### **5.3 CONTROL OF QA/QC DOCUMENTATION**

King County's Project Representative is responsible for controlling all QA/QC documentation, including daily and weekly logs, photographs, revisions to the design and specifications, monthly status reports, and record drawings. The FE/AFE will maintain a working set of record drawings where all deviations and changes are noted. All original documents will be maintained in the project file located at the construction site. A duplicate set will be maintained in King County's Project Representative off-site office. Each document will also be saved electronically on a server

in the off-site office. The Project Representative will maintain a log of all QA/QC documents. The final storage of all project records will be performed in accordance with EPA requirements.

## **6.0 CHANGES TO QA/QC REQUIREMENTS**

This section describes the procedure for making changes to the QA/QC requirements in the CQCP and CQAPP. Changes to the CQCP or this CQAPP will be required if:

- Deficiencies in the CQCP or CQAPP are identified;
- The scope of work has changed; or
- The QA/QC procedures are deemed to be excessively hindering work productivity.

### **6.1 CHANGES TO CQCP**

The Project Representative or the Contractor may initiate changes to the CQCP. The Contractor is required to submit proposed changes in writing to the Project Representative for review and approval. The Project Representative has the authority to approve the Contractor's proposed changes or require the Contractor to make other changes to the CQCP. No changes will be made to the CQCP without the Project Representative's approval. The revised QC program is in effect immediately upon approval by the Project Representative. If the changes to the CQCP will result in changes to the CQAPP then the procedures in Section 6.2 will be followed to obtain agency approval.

### **6.2 CHANGES TO CQAPP**

The FE or Project Representative may initiate revisions to the CQAPP. The FE will submit a revised CQAPP to the Project Representative for review and approval.

No changes will be made to the CQAPP without the approval of the Project Representative. The Project Representative will then coordinate changes to the CQAPP with EPA for their formal written approval. Any proposed change to EPA approved documents must be reviewed and approved in writing by the EPA Project Manager.

## **TABLES**

---

**TABLE 1****PROJECT CONTACT INFORMATION**

	<b>Project Role</b>	<b>Name</b>	<b>Company</b>	<b>Phone</b>	<b>Email</b>
Agency	EPA Project Manager	Elly Hale	EPA	206.553.1215	hale.elly@epa.gov
Agency	Ecology Project Manager	Ron Timm	Ecology	425.649.7185	rtim461@ecy.wa.gov
Construction Management	King County Project Manager	Jennifer Kauffman	King County	206.477.5449	jennifer.kauffman@kingcounty.gov
Construction Management	King County Project Representative	Randy Brunke	King County	206.477.5654	randy.brunke@kingcounty.gov
CQA field staff	Project Engineer	Rob Webb	DOF	360.394.7917	rwebb@dofnw.com
CQA field staff	Field Engineer	Dan Pickering	DOF	360.394.7917	dpickering@dofnw.com
CQA field staff	Assistant Field Engineer	TBD			
Consulting Team	Consultant Team Project Manager	Cliff Whitmus	AMEC Foster Wheeler	425.921.4023	cliff.whitmus@amecfw.com
Construction Contractor	Contractor Project Manager	TBD			
Construction Contractor	Contractor Site Superintendent	TBD			
Construction Contractor	Contractor Quality Control Officer	TBD			
Construction Contractor	Contractor Site Safety Officer	TBD			

**TABLE 2**

**QUALITY ASSURANCE MONITORING ELEMENTS AND FREQUENCY**

<b>Construction Element</b>	<b>Monitoring Requirement</b>	<b>Monitoring Performed By</b>	<b>Monitoring Frequency</b>
Prior to Construction	Verification and inspection of all ENR material, surveying, positioning and navigation equipment. Material bins on barges will be inspected for appropriate water-tightness.	FE	Prior to start of construction
	ENR/AC material inspection, sampling, and analysis. Verification of initial blend ratios based on weight observations during barge loading.	FE or AFE	Prior to material placement or test placement
Prior to Material Placement	ENR/AC Test Placement. Verification that material can be placed in 4.5 inch lifts to achieve 6-9 inch target thickness at 80% of locations with no single location less than 4 inches in the area where two lifts were placed.	FE/Project Representative	Prior to in-water placement other than in test placement locations as shown on the plans
In-Water Placement	Visual observation of correct material type for placement area, verification of pre-soaking requirements, bucket fill factor, and bucket grid pattern.	FE	Continuous during in-water placement
	Verification of daily clamshell bucket positioning calibration tests.	FE	Daily during in-water placement
	Verification that material placed in subplot is weight equivalent for area based on scale tickets and/or barge draft during placement.	FE	Per each completed sub-plot
	Qualitative diver verification of placement results including coverage (%of area) and relative surface uniformity or roughness.	AFE	Per each completed sub-plot
	Quantitative verification of placement thickness by divers using grade stakes.	AFE	Grade stakes placed prior to material placement and read after completion of placement in each sub-plot
	Visual observation of layering, carbon segregation, and thickness of layer using push cores collected by divers.	AFE	For documentation only
	Water quality monitoring to ensure compliance with criteria listed in the Section 401 Water Quality Memo.	Design Team	Periodically as specified in the WQMP
	Review of hydrographic surveys.	FE or AFE	After completion of sub-plots; for documentation only

**ATTACHMENT A**

---

Sample Forms for Contractor Daily Report



**ATTACHMENT B**

---

Sample Forms for Contractor Weekly Report

<b>Week Ending:</b>	<b>Report Prepared By:</b>
<b>General Site Conditions:</b>	

SUMMARY OF WORK

DOWNTIME/DELAYS AND OTHER INFORMATION

SUMMARY OF WORK PLANNED FOR UPCOMING WEEK

PRODUCTION					
Location	Station Start	Station Stop	Est. Quantity this week	QTY to Date	Comments

GENERAL COMMENTS

MATERIALS IMPORTED				
Barge Loads	Material	Qty. to Date	Qty.	Qty. to Date

EQUIPMENT					
Date	Description	MOB Date	DEMOB Date	Down Time	Comments

Signatures acknowledging above:  
 Contractor: \_\_\_\_\_ Date: \_\_\_\_\_  
 FE: \_\_\_\_\_ Date: \_\_\_\_\_