CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN (CQAPP) ADDENDUM 1

Enhanced Natural Recovery/Activated Carbon Pilot Study
Lower Duwamish Waterway
ENR Layer Thickness Measurement during Construction at the Subtidal Plot and Grade Stakes at Test, Intertidal, and Scour Plots

Lower Duwamish Waterway Group

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

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FINAL

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1.0 INTRODUCTION

This CQAPP Addendum serves as an addendum to the Construction Quality Assurance Project Plan, Enhanced Natural Recovery/Activated Carbon Pilot Study, Lower Duwamish Waterway (Pilot Study CQAPP, AMEC et al., 2015). This Addendum details the following:

1. Modified construction monitoring method for the subtidal plot described in CQAPP Sections 3.4.1 and 3.4.3 and Table 2.
2. Modified grade stakes to be used at test, intertidal, and scour plots as described in CQAPP Section 3.4.1.3.

2.0 SUBTIDAL PLOT

The following sections described observed conditions at the subtidal plot and proposed modifications to construction monitoring.

2.1 OBSERVED CONDITIONS

During solid-phase microextraction (SPME) deployment and attempted retrieval at the subtidal plot, divers reported that the waterway bottom appeared very disturbed, with furrows and ridges on the order of 1- to 1.5-feet oriented parallel to the river flow. They appeared to be mechanically created as typical sand waves are oriented perpendicular to the flow. Additional investigation by the field crew led to the hypothesis that when large, ocean going barges enter the Duwamish Waterway, they lower and drag their bow mounted tow bridles as they are pushed by tugs up the waterway.

These tow bridles, consisting of very large chains and cables, span the width of the barge and are thought to be lying flat on the waterway bottom across all or a portion of the barge width. During SPME retrieval, the vast majority of the diver's location stakes, ground lines, and the majority of

SPMEs were not recovered or found in a different location than originally placed. Due to the channel's parallel orientation of the subtidal plot, it is possible for a single barge to drag across a large portion of the plot in a single passage.

For thickness monitoring during construction, the CQAPP requires that divers place grade stakes prior to ENR material placement, then return to read the stakes after initial placement to determine thickness. If the placement does not meet acceptance criteria, additional placement and measurements may be needed. This will require stakes to remain in place for approximately 3 weeks, if installed just prior to subtidal plot placement, and longer if all stakes are placed concurrently in all plots prior to any construction. Any barge traffic during this time has the potential to damage or remove installed stakes, making this method as currently included in the CQAPP not practicable for the subtidal plot.

2.2 PLOT LOCATION

The alternate construction monitoring method described below will be implemented at the subtidal plot.

2.3 MODIFIED ENR THICKNESS MEASUREMENT PROTOCOLS AT SUBTIDAL PLOT

Based on conditions observed by the divers during SPME installation and retrieval as previously described, the use of grade stakes at the subtidal plot as described in CQAPP Sections 3.4.1.3 and 3.4.3.4 is not practicable. Therefore, as discussed with EPA and USACE during a conference call on October 27, 2016, the alternate method described below will be implemented.

2.3.1 Multiple Lines of Evidence for ENR Placed Thickness

As discussed during the call, in additional to the multiple lines of evidence, monitoring will be performed continuously during placement. The subtidal plot, the subject of this Addendum, is planned to be the last plot constructed, so experience gained from placement at the test plot and the other two plots will be incorporated into placement at the subtidal plot. Other lines of evidence include full-time observation of placement by project quality control and oversight staff, electronic tracking in real time of each bucket placed, observations of bucket loading during placement, and known total quantity to be placed over the plot and corresponding volume per unit area.

2.3.2 Initial Inspection

Prior to placement, divers will perform qualitative, visual observations of the subtidal plot and record their observations regarding current condition of plot, roughness, signs of recent

disturbance, and other physical characteristics that could affect placement. Observations made by the diver will be recorded by the diver support crew on a field form. Features that will be noted on the field form include but are not limited to presence of biota, presence of debris and type, major and minor substrate constituents, and bathymetric features. In addition, photographs of unique features (e.g., large debris) will be taken as visibility allows to supplement the data recorded on the field form.

2.3.3 ENR Placement

ENR materials will then be placed per the approved project plans incorporating any adaptive management or other modifications made during placement at test plot and other plots, as approved by EPA during implementation.

Potential chain drag disturbance of ENR material during the construction period will be assessed prior to final inspection. Any potential transit of the construction plot by barges during the construction period will be noted by the Field Engineer (FE) if visually observed, and the U.S. Coast Guard Navigation Center Automatic Identification System (AIS) database will also be reviewed for information on vessel transits within the subtidal plot area. This information will provide context for interpreting the final inspection.

2.3.4 Final Inspection and Corrective Measures

Once ENR material placement at the subtidal plot has been completed, divers will revisit the subtidal plot and perform a second qualitative, visual inspection and record their observations on the field form. In addition to types of observations performed pre-placement, post-placement observations shall also include notes on and locations of any areas that do not visually appear to have been covered by the ENR material. In addition, photographs of unique post-placement features will be taken as visibility allows to supplement the data recorded on the field form.

Additionally, divers shall use a steel ruler (or similar) to probe the placed ENR material and attempt to measure placed thickness based on material type differences as detectable by the diver. This probing shall be performed at the 10 randomly-selected stake locations within each sub plot at the subtidal plot (20 locations total), as shown in the Project Plans.

Post-placement diver observations and probing results will be communicated to the project representative for review with EPA and USACE oversight personnel immediately following completion of the dive. Areas within the plot where no coverage was observed may receive a corrective measure of additional material placement as needed to achieve project objectives, based on discussions with EPA and USACE staff following review of diver observations and other

placement records. (For example, if it appears that a tow bridle was drug across the plot during placement [actual material placement but before diver inspection], disturbing the ENR material and creating areas less than minimum thickness, additional placement would not occur. Whereas if it appeared that otherwise undisturbed areas do not meet thickness acceptance criteria, then additional material placement may be performed.)

3.0 GRADE STAKE MODIFICATION FOR TEST, INTERTIDAL, AND SCOUR PLOTS

The EPA-approved CQAPP includes use of PVC grades stakes for use during construction to measure placed ENR material thickness. During subsequent discussions with the Muckleshoot Tribe, the need for a stake that was more flexible than the PVC grade was preferred in order to reduce potential for interference to Tribal fishing.

In response to requirement for a stake constructed of material more flexible than PVC pipe, numerous other materials were considered and evaluated. Materials need to be rigid enough to meet project objectives and be installable by divers but flexible enough to prevent net interference.

In order to meet these requirements, the proposed alternate stake is made of two materials. The upper section is cross-linked polyethylene (PEX) pipe, which is flexible. The lower portion consists of a small steel plate and rod. The PEX pipe is attached to the steel rod above the steel plate. The steel rod then passes through the small steel plate, which is held in place with two nuts, and then extends below the plate, providing an anchoring stake when driven into the sediment. The small steel plate provides a driving surface for divers to use during installation and a fixed point which is set flush with the pre-construction mudline. (See photographs below showing constructed stake and flexibility of PEX pipe in constructed stake.) The length of the stake protruding below the steel plate will be adjusted based on the firmness of the substrate (i.e., the stakes may be shorter in firmer substrates as compared to softer substrates). Each of the stakes will be labeled at the top of the PEX pipe with a location number using an indelible marker in such a way that if the top of the stake was cut off or otherwise to be removed the diver would notice.

The stakes will all be made to a fixed length of 18 inches above the steel plate. Divers will then be able to measure from top of stake down to the top of the ENR material to determine placed thickness of ENR material (18 inches minus the measurement from top of stake equals the placed thickness of ENR material). In addition, at several locations adjacent to a stake location, divers will attempt to measure the thickness of the placed material using a probe to detect the textural change in the material as a probe is inserted into the substrate. If the diver can detect a change in the

substrate texture, a measurement of the depth to the textural change will be made. The probing will also be conducted at locations where a stake was deployed but was missing when material thickness is being assessed.

These type of stakes will be used at the test plot, intertidal plot, and scour plot.

4.0 REFERENCE

AMEC et al. (Amec Foster Wheeler; Dalton, Olmsted & Fuglevand, Inc.; ENVIRON International Corporation; Floyd|Snider; and Geosyntec Consultants). 2015. Construction Quality Assurance Project Plan, Enhanced Natural Recovery/Activated Carbon Pilot Study, Lower Duwamish Waterway. Lower Duwamish Waterway Group, Seattle, WA. December 22.