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Memorandum

To: Sean Sheldrake, US EPA

From: Carl Stivers and Ryan Barth, Anchor Environmental, L.L.C.

CC: Rick Wadsworth, Parametrix
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Date: April 13, 2006

Re: Long Term Monitoring Year 0 Event 1 – Summary of Field Results and Proposed Alternative Field Methods

Anchor Environmental, L.L.C. (Anchor) performed the Year 0 Event 1 long-term monitoring of the engineered pilot cap placed at the NW Natural "Gasco" site (Site) from March 20 to March 23, 2005. Sampling was conducted to satisfy the objectives defined in the EPA-approved Monitoring and Reporting Plan (MARP, Anchor 2006). The purpose of this memorandum is to summarize the results of the monitoring activities and the issues encountered, and to describe alternative proposed sampling procedures to achieve the pilot cap monitoring objectives.

Summary of Field Activities and Issues Encountered

The following field activities were conducted in accordance with the protocols described in the EPA-approved MARP: video reconnaissance of the pilot cap area and perimeter fringe cover, topside visual survey, near-bottom surface water sampling, through-cap sediment coring, and pilot cap porewater collection. Due to the issues described below, no sampling was conducted at the upstream and downstream ambient stations and no semi-permeable membrane devices (SPMDs) were deployed. Each of the field activities and the issues encountered are described in further detail below.

Bathymetry Survey

To assess changes in cap thickness and stability since placement of the pilot cap material in late October 2005, Blue Water Engineering (BWE) conducted a bathymetry survey. The survey was conducted on March 17, 2006 using 15-foot line spacing throughout the entire

area previously bounded by the outer containment area. The staff gage installed at the Site prior to the removal action construction was missing (likely damaged during the winter high flow events) so BWE established a benchmark on the nearest cluster of pilings located just upstream of the removal action area. A marine surveyor has been contacted to install a new tide staff gage and provide the elevation of the bathymetry benchmark. Following receipt of the benchmark elevation, the bathymetry data will be translated into a bathymetric surface. This surface will be compared to the post-cap bathymetry surface and, to the extent and accuracy possible, elevation changes will be assessed. These results will be submitted to EPA in the Year 0 Event 1 data summary monitoring report (to be submitted following completion of the proposed alternative sampling activities discussed below).

Diver Video Reconnaissance

Research Support Services (RSS) performed a diver video reconnaissance survey within the removal action area to visibly evaluate the nature and extent of any potential seepage of non-aqueous phase liquid (e.g., tar oil and tar), and the integrity of the engineered pilot cap and immediately surrounding fringe cover areas. The diver survey was conducted on March 20, 2006 along four transects oriented perpendicular to the shoreline. In accordance with the MARP, each transect was extended 50 feet beyond the channelward extents of the pilot cap area to monitor for the presence of non-aqueous phase liquids in the hydraulic low spot created by the dredging. The diver could not continue the survey 50 feet beyond the shoreward side of the pilot cap area due to limitations in water depth. Note, the survey conducted along the upstream-most transect line was conducted along the upstream boundary of the pilot cap area to monitor for physical changes at the interface between the pilot cap and fringe cover materials.

Due to elevated turbidity levels in the river during the survey, the two high powered diver reconnaissance lights used to illuminate the river bottom were of limited use. The video only documented the physical characteristics directly in front of the camera. Along each transect, the diver followed a pre-placed measuring tape and examined the substrate at approximately 20-foot intervals. Throughout the entire pilot cap area, the pilot cap armor layer was overlain by a variable depth of recently deposited slightly sandy silt. At the 20-foot intervals, the diver extended his glove into the silt layer to determine the approximate depth to the underlying armor layer (ranged from 2 to 8 inches). Following completion of

the four transects (completed in one day), the Anchor Field Coordinator (Ryan Barth) contacted Parametrix (Rick Wadsworth) to discuss the reconnaissance findings and assess whether additional surveys were warranted. Parametrix and Anchor agreed that the survey density was sufficient due to the lack of identified variability in the mudline conditions and the limited visibility. A copy of the video reconnaissance will be submitted to EPA in the Year 0 Event 1 data summary report following completion of the proposed field activities (see below).

Topside Visual Inspection

Visual monitoring was conducted to identify any areas of sheen/product release in the removal action area that were visual from the topside. Monitoring was conducted from the shoreline and the adjacent oil pipeline continuously from March 20 through March 22, 2006 during the field monitoring activities. In contrast to the visual observations conducted on January 3, 2005, the river elevations were much lower facilitating observations of the shoreward extents of the removal action area. No sheen or odors were observed. A small portion (i.e., 2 feet by 20 feet long) of the organo-clay mat that resided above the shoreline dredge cut was partially exposed. It is likely that wave action during the high winter flow events displaced the quarry spall in this small area. Anchor proposes to cover this area with larger riprap obtained from the adjacent shoreline area during the proposed field monitoring events (see discussion below).

Co-Located Near-Bottom Surface Water, Coring, and Porewater Sampling

Near-bottom surface water, coring, and porewater collection was attempted at stations PCM-06, PCM-08, and PCM-09 (approximately co-located with post-dredge confirmation samples RAA-PD10, RAA-PD11 and RAA-PD7, respectively). In accordance with the MARP, the near-bottom surface water sample was collected at each station by the diver prior to disturbance of the surface sediments. Due to the issues encountered during the coring activities (discussed below), the surface water samples collected from these stations were not submitted to the laboratory for chemical analysis.

Following collection of the near-bottom surface water sample, the diver removed the overlying silt deposit and pilot cap armor layer to facilitate core collection through the pilot cap. Due to zero visibility and the interlocking nature of the armor layer, displacement of

the armor and silt layer proved very difficult and time consuming (approximately 45 minutes per station) for the diver. In addition, each station was located on a slope and the upslope material continued to collapse into the cleared area. Following clearing of the area, the diver attempted without success at both stations to collect a core through the use of a diver impact corer. This method of coring minimizes mixing of cap and underlying sediments and mobilization of porewater. The diver used a heavy duty fence post driver attached to a topside line to impact the core head. The topside crew assisted the diver by lifting the driver after each drive.

Coring was initially attempted at station PCM-09. Penetration was assessed by the diver at this station (the topside line was not marked for this initial station) and estimated to be approximately 18 inches. Given the design thickness of the cap was 12 inches and the contractor placed some additional pilot cap material to ensure the design thickness was achieved, it was thought the core may have penetrated through the pilot cap layer. However, upon retrieval of the core to the topside crew, no material remained within the core tube. Inspection of the core tube indicated etching along the core tube to approximately 14 inches confirming the penetration depth and particles of pilot cap sand were intermixed in the core catcher "fingers." No evidence of penetration through the underlying silty material (e.g., smearing along the core sidewalls and/or silt within the core catcher "fingers") was present.

Coring was subsequently attempted at station PCM-08 with similar results. The estimated penetration depth (measured using marks on the topside line) was approximately 9 inches. Upon retrieval of the core to the topside crew, no material remained within the core tube except some sand and one rock (approximately 2-inch diameter indicating that the pilot cap armor collapsed into the cleared area prior to sampling) within the core catcher "fingers." The third and final coring attempt was at station PCM-06. At this station, the diver placed a core cap over the end of the core barrel just as the core was pulled above the mudline. The estimated penetration at this station was 8 inches, but upon retrieval only 2 inches of pilot cap material (medium coarse sand) was present within the core cap. This material contained no odor or sheen, and insufficient volume was present for potential chemical analysis. No evidence of penetration through the underlying silty material was present at either station.

The lack of recovery in each of the cores prohibited determination of the appropriate sampling interval for the porewater measurements. Therefore, the diver attempted to assess the pilot cap thickness through an alternate method. The diver inserted a thin, metal rod through the pilot cap to attempt to assess the cap thickness through variations in the penetration resistance. Unfortunately, the variations in resistance were minor and irregular diminishing the accuracy of this indirect measurement. Since the pilot cap thickness could not be accurately determined and no bulk sediment samples were collected, no porewater samples were collected for chemical analysis. However, the field crew deployed the piezometer (in accordance with the procedures defined in the MARP) at stations PCM-08 and PCM-06 to test the equipment and ensure it was functioning as designed. The piezometer was slightly offset from the core collection location (additional overlying silt and pilot cap armor was cleared by the diver) to avoid sampling artifacts potentially created by the coring activities. At both piezometer locations, the sloping mudline and granular nature of the cap, combined with the lack of visibility, prevented the diver from installing the fabricated base plate attachment at the mudline elevation. As described in the MARP, this base plate was designed to minimize short-circuiting from the overlying water column during sample collection. Future sampling within the pilot cap area will need to account for this potential sampling artifact. At each station the piezometer was installed with the piezometer screened interval (2 inches in length) from approximately 8 inches to 10 inches below the mudline. This depth was assumed to be within the pilot cap layer for testing purposes.

At both sampling stations, two general issues arose that called into question the accuracy of porewater collected by the piezometer: discrepancies in calculated purge volume and highly turbid sample volume. At both stations the piezometer and Teflon™ lined tubing were filled with deionized water prior to installation to minimize the infiltration of river water into the sampling device during deployment. The volume of deionized water within the piezometer and tubing was calculated and it was anticipated that this volume would need to be removed prior to sampling of porewater. However, sample water (distinct muddy brown color) was encountered prior to purging of the calculated purge volume. Subsequent testing of the piezometer assembly following the Gasco sampling identified the purge volume discrepancy was due to use of the incorrect diameter for the Teflon tubing. The

collected water also had a mud-like consistency indicating the sample volume was likely not being pulled from the sandy pilot cap layer, which was placed with less than 3 percent fines. Potential sources of the muddy water include penetration of the screened interval into the pilot cap/underlying sediments mixing zone and/or sloughing of recently deposited silt into the cleared sampling area prior to piezometer penetration. The brown water contained a mothball-type odor and contained no visible sheen. Following approximately 200 mL of the brown water, the fluid began to run clear. This clear fluid also exhibited the same odor and contained no visible sheen. Neither the muddy nor clear fluids were submitted for analysis due to the above identified issues.

Proposed Alternative Pilot Cap Monitoring Methods

Core Collection

Due to the inability of the diver-assisted coring method to successfully penetrate the pilot cap layer, a more robust coring technology is required. Other commercially available coring methods that have commonly been used include vibracore and dynamic impact coring technologies. Based on Anchor's experience with these technologies and discussions with contractors who offer these coring technologies, Anchor proposes to use a specialized dynamic impact core sampler termed the MudMole™. The MudMole™ was developed by MCS Environmental, Inc., and has successfully been used at numerous remediation sites around the country in a variety of sediment conditions. It consists of an air-powered hammer that delivers a linear, dynamic force to the core barrel. A linear force is preferred over the vibrating force imparted by a vibracore because it reduces the potential for sediment liquefaction resulting in cap material/underlying sediment mixing and porewater mobilization. The MudMole™ allows for continuous monitoring of core penetration versus recovery, which enables identification of the specific depth(s) where recovery is poor. The MudMole™ is also equipped for diver assisted placement of the core barrel (following diver removal of the overlying pilot cap armor layer) and is much safer for diver deployment compared to typical vibracore assemblies. This technology uses a square (4 inch) core barrel, which increases the available sample volume and increases penetration through sandy substrates. A flap at the end of the barrel serves to cap the sediments following penetration and minimize the potential loss of sample during core retrieval.

During the initial coring attempts, the diver commented that removal of the overlying armor layer material was very difficult given the lack of light, the interlocking nature of the coarse material, and the sloping mudline elevation. This difficulty quickly led to diver fatigue, which increased potential diver health and safety issues as the day progressed. The diver also noted that a large area needed to be cleared around each station in order to adequately remove the recently deposited silt material and pilot cap armor layer for both the coring and porewater measurements. During each monitoring event, the stations would need to be offset from previous sampling stations, further increasing the zone of disturbance. The sampling is currently proposed at nine stations within the pilot cap during each monitoring event, with monitoring conducted at least seven times at each station during the first three years. This will result in 63 holes that are each several feet in diameter in the armor layer over the course of the scheduled monitoring. (Note that this is potentially followed by semi-annual monitoring after the initial three years, until the site-wide remedy is implemented.) Consequently, a significant portion of the pilot cap armor layer will be disturbed during the course of the long-term monitoring. Due to this disturbance, as well as the diver health and safety issue noted above, Anchor proposes to reduce the number of sampling locations within the pilot cap area to four stations. In accordance with previous EPA comments, these stations would be distributed through the pilot cap area to provide adequate spatial coverage and be co-located with the post-dredge surface sediment sample locations that showed the highest elevated chemical concentrations. Final locations would be determined in consultation with EPA.

Porewater Collection

The test porewater collection confirmed that the piezometer base plate will not be able to be used at any of the sampling locations due to the coarse substrate and sloping mudline. Short circuiting of surface water and/or sampling of porewater from the contaminated sediments below the pilot cap could significantly alter the measured porewater chemical concentrations and decrease the accuracy of the porewater migration evaluation. To evaluate these potential sampling artifacts, Anchor proposes to conduct porewater measurements using both the piezometer and passive peeper sampling technologies during this next round of sampling. The piezometer sampling would occur directly following the near-bottom surface water sampling and subsequent coring activities, as described in the MARP. Following the piezometer porewater collection, low volume passive peepers similar

to those used during the Lower Willamette Group Round 2 groundwater pathway assessment transition zone water sampling would be deployed at locations approximately co-located with the piezometer sampling locations. Peeper set-up, installation, and processing would be similar to the methods summarized in the Portland Harbor RI/FS document: Draft Round 2 Groundwater Pathway Assessment – Transition Zone Water Sampling Field Sampling Report (Integral 2006).

Due to volume limitations and cost considerations, Anchor proposes limiting the peeper analysis to benzene, toluene, ethylbenzene and xylene (BTEX). Based on discussions with the manufacturer (Rickley Hydrological Company) and Integral field staff, approximately 10 inches of pilot cap is necessary to achieve the necessary volume for BTEX analysis. Peepers would not be installed if the pilot cap thickness is less than 10 inches. The BTEX analysis would be conducted by Columbia Analytical Services (same lab that performed the LWG peeper analysis and is performing the other Gasco long-term monitoring analyses) and would achieve method reporting limits identical to the porewater analysis collected from the piezometer apparatus. The peepers would be maintained in place for approximately 30 days and would be removed coincident with the co-located SPMDs. Anchor proposes to compare the BTEX concentrations obtained from the piezometer and peeper assemblies and evaluate whether sampling artifacts created during piezometer collection are potentially occurring. This evaluation will help guide which technology most accurately measures the pilot cap porewater concentrations and should be used for subsequent long-term monitoring events.

Conclusions

We are prepared to initiate mobilization for the above-proposed field monitoring activities without the need for a conference call with EPA. However, if EPA would like to have a call to discuss and/or clarify our proposed path forward, please let us know. Once the need for a call is determined, we will provide a timeline for completion of the proposed fieldwork. Preliminary discussions with the various contractors indicate the monitoring could be performed the week of April 24 to 28, 2005. We anticipate the fieldwork would take 3 days to complete. Following completion of the proposed field and laboratory work, a brief summary of the Year 0 Event 1 results will be compiled and provided to EPA in the data summary monitoring report in accordance with the MARP.