Sediment Characterization Report

Old Douglas Harbor Replacement

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Prepared for:

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Introduction

This document is specific to Old Douglas Harbor owned by the City and Borough of Juneau and located in Juneau, Alaska. The pre-dredge sampling program is part of the harbor renovation project. The preferred disposal location of the dredge material is a previously used ocean disposal site in Gastineau Channel near Douglas Harbor. This site was used for the previous dredging conducted in the western portion of Old Douglas Harbor. The northerly corner of the disposal location is latitude 58° 16' 45" N and longitude 134° 22' 54" W.

The sampling was conducted using the approved Sampling and Analysis Plan dated January 2007 and the Nationwide Permit POA 2007-289-D. This plan is in accordance with and meets the requirements of the Dredge Material Evaluation Framework for the Lower Columbia River Management Area Manual (LCRMA), November 1998. It also incorporates the information to meet state and local requirements.

Project Description

The purpose of this project is to renovate the existing Douglas Harbor in order to meet changing moorage demand in Juneau. The project consists of the removal of approximately 18,000 square feet of existing moorage at the A, B and C floats including all associated approach docks and finger floats. The project also includes the removal of existing east gangway, timber piles, and miscellaneous float mounted appurtenances. 55 creosote treated timber piles will be removed in their entirety with a vibratory extractor. The City Dock, consisting of 225 creosote treated timber piles and 16,200 square feet of dock will also be removed.

The project will replace the existing floats with approximately 21,000 square feet of timber moorage floats with galvanized steel piles. Maintenance dredging will occur to the original design depth, which is–12 feet MLLW (See Permit No. 2-2000-0495 Douglas Harbor 1). This occurs within the existing harbor basin area and along the Juneau Island Causeway. The slope along the causeway will be graded to 2:1 and will require some riprap slope protection.

The proposed dredging method is via clamshell or conventional excavator. Dredge quantity is estimated to be 32,500 cubic yards over 3.1 acres and is proposed for unconfined ocean disposal.

Site History

The existing Douglas Harbor facility is shown on the site plan of Appendix 1. The approximate 5.2 acre dredged basin is protected from Gastineau Channel by the Juneau Island Causeway, Juneau Island itself, a rock breakwater on the southeast side of the harbor entrance and the Dock Street fill. Existing improvements include moorage spaces for approximately 150 vessels, a boat grid, a two-lane boat launch ramp and parking for harbor users.

Douglas Harbor was created in a number of phases as summarized below:

- In the 1940's rock fill material were placed from the existing Douglas Island shoreline towards the city dock to create the existing Dock Street alignment.
- 1948: The Juneau Island Causeway was constructed to provide vehicle access between the Bureau of Mines facility on the island and nearby Douglas.
- ±1960±: A containment dike was extended perpendicular to the Juneau Island causeway along the existing alignment of Savikko Road. The containment dike was constructed with a sand core and rock facing for the purpose of containing harbor dredge spoils for the then proposed harbor dredging.
- 1961: The U.S. Army Corps of Engineers (COE) completed site investigations, plans and specifications for dredging of the harbor basin and wave protection at the harbor entrance.

- 1962: the existing harbor basin was dredged to elevation -12 MLLW and construction of the existing entrance breakwater was completed as a COE construction project. The dredge materials were placed on the Douglas Island side of the Savikko Road berm and provided foundation for the various roadways, parking areas, park and recreational facilities which now constitute Savikko Park.
- 1962: The state of Alaska developed plans for Phase 1 of the inner harbor facilities in late 1962 which provided the primary float system, access dock, gangway, and boat ramp.
- 1965: Phase 2 of the Douglas Harbor Development results in the construction of additional stall floats and the boat grid.
- 1997: The COE dredged 25,000 cubic yards to straighten the entrance channel and to lower the northern areas of the basin by two feet. The dredged spoils were placed in an unconfined ocean disposal site within Gastineau Channel.
- 1998: The CBJ constructed seven stall floats along the north side of C Float.
- 2003: The harbor basin was expanded by dredging, boat launch installed, fill, and new floats installed to bring Douglas Harbor to its current configuration. The dredged spoils were placed in an unconfined ocean disposal site within Gastineau Channel.

Description of Sampling Procedures

The initial sampling effort was started on March 1, 2007 but was quickly aborted due to extremely poor weather conditions. Sampling was successfully attempted again on March 21, 2007 and continued through to March 24, 2007. Jennifer Lundberg, PND Engineers, was the primary sampler and had several assistants through out the sampling event (see attached typed field notes). Sampling followed the SAP submitted to the Corps with the deviations and reasons for deviations noted in the deviations section below.

Clean techniques were used during the sampling with Ms. Lundberg as the environmental sampler. There were three methods of collecting samples; small test pit, diver collected, and split spoon. Ms. Lundberg, with assistance, collected the small test pit samples in the boat grid area on March 21st. The diver collected samples on March 22nd and 23rd for Ms. Lundberg. Ms. Lundberg collected samples from a split spoon on March 24th. All samples were processed by Ms. Lundberg and remained in her direct control at all times.

For each sample, the volatile sample was taken immediately and placed into a pre-tared sample jar provided by the laboratory. Methanol preservative was pored onto the sample and the jar sealed. After the sample was characterized, the non-volatile samples were taken and the portion for composting placed into stainless steel bowls and covered with saran wrap. Once all the material was collected for a composite sample, the material was thoroughly mixed and placed in jars. The remainder was placed in Ziploc bags for grain size analysis.

Sampling procedure

Sampling was originally scheduled for March 1, 2007. However, due to sever weather conditions including difficulty getting the drill rig to Juneau, the team decided to postpone the sampling until March 21, 2007. Sampling on March 21, 2007 consisted of sampling the boat grid area. Sampling on March 22 and 23, 2007 consisted of sampling in the dredge basin for the samples obtained by the diver. Sampling was completed on March 24, 2007 with the samples taken using the drill rig. See the attached field notes for the samples taken. See the sampling deviations section below for changes to the sampling plan.

For this project, there was a combination of sample types taken including grab samples and composite samples. Grab samples were taken at all sampling locations for all material types. In addition, composite samples were taken of the non-volatile and semi-volatile compounds. The composite samples were placed into stainless steel bowls and covered with saran wrap until the entire DMMU being composited was completed.

The chemistry samples were shipped via GoldStreak to STL-Seattle in the afternoon of the day they were taken. The physical samples were delivered to Anchorage the Anchorage R&M Engineering laboratory as checked baggage by Ms. Lundberg due to the inability of the Juneau R&M Engineering laboratory to complete the work on the requested timeline.

Sampling Summary

Ms. Lundberg collected samples from the boat grid area (DMMU 3) using a shovel. No composite samples were taken in the boat grid. Only one sample representing the upper 2 feet was taken at each of the four sampling locations as this area will actually be buried and no dredging will occur. That means that DMMU 4 was eliminated from the project as well. A DMMU was added based on a recent bathymetric survey that was not available during the development of the SAP and identified as Harbor Dredge for the dredge prism and New Surface Dredge for the newly exposed surface. This area is under and around Floats A, B, and C. All these samples were taken using the same method as the diver samples original proposed for DMMU 1.

The general sampling procedure that was followed on all samples included Ms. Lundberg collecting the individual GRO/BTEX/8260B sample for each core and immediately field preserving the sample with 25 ml of methanol. The dry weight sample was then taken as well. The sediment was characterized then the 8 oz individual jar filled for the remaining parameters. A portion of the remainder was then collected in a stainless steel bowl for compositing. The remaining sediment was collected in a 1 gallon Ziploc bag for grain size analysis. Once all the samples were collected for a composite sample, the sediment was mixed and placed in a jar.

Table 1 provides a description of the sampling locations and their identification numbers.

Table 1 Sample ID by sampling location including QC analysis.

Sampling Station Number	DMMU	Sample Designation	Core Depth (ft)	Physical Testing	Composite Chemical testing	Individual Chemical Testing (Volatiles only)	Duplicate
~~PND07-01~~							
PND07-02	DMMU 1	A	2	PND1	PND-1 **Yes**	**Yes**	
	DMMU 1	B	2	PND1	PND-1 **Yes**	**Yes**	
	DMMU 4	C	2	PND1	PND-3 **Yes**	**Yes**	
PND07-03	DMMU 1	A	2	PND1	PND-1 **Yes**	**Yes**	
	DMMU 4	C	1	PND1	PND-3 **Yes**	**Yes**	

Sampling Station Number	DMMU	Sample Designation	Core Depth (ft)	Physical Testing	Composite Chemical testing	Individual Chemical Testing (Volatiles only)	Duplicate
PND07-04	DMMU 1	A	2	PND1	PND-1 **Yes**	**Yes**	
	DMMU 4	C	1	PND1	PND-3 **Yes**	**Yes**	
PND07-05	DMMU 2	A	1.5	5,6,7 combined	PND-2 **Yes**	**Yes**	
	DMMU 5	C	1	5,6,7 combined	PND-4 **Yes**	**Yes**	
PND07-06	DMMU 2	A	3	5,6,7 combined	PND-2 **Yes**	**Yes**	
	DMMU 5	C	1	5,6,7 combined	PND-4 **Yes**	**Yes**	
PND07-07	DMMU 2	A	2	5,6,7 combined	PND-2 **Yes**	**Yes**	
	DMMU 5	C	1	5,6,7 combined	PND-4 **Yes**	**Yes**	PND-8 (Vols only) **Yes**
PND07-08	DMMU 3	PND07-08	2	PND3			
PND07-09	DMMU 3	PND07-09	2	PND3 ~~PND-6 (duplicate)~~			PND-9 (vols only) **Yes**
PND07-10	DMMU 3	PND07-10	2	PND3			
PND07-11	DMMU 3	PND07-11	2	PND3		**Yes (full panel)**	

Sampling Station Number	DMMU	Sample Designation	Core Depth (ft)	Physical Testing	Composite Chemical testing	Individual Chemical Testing (Volatiles only)	Duplicate
PND07-12	Harbor Dredge	A	3	Harbor Dredge	Harbor Dredge Comp **Yes**	**Yes**	
	New Surface Dredge	C	1	New Surface Dredge	New Surface Dredge Comp **Yes**	**Yes**	
PND07-13	Harbor Dredge	A	2	Harbor Dredge	Harbor Dredge Comp **Yes**	**Yes**	
	New Surface Dredge	C	1	New Surface Dredge	New Surface Dredge Comp **Yes**	**Yes**	
PND07-14	Harbor Dredge	A	3	Harbor Dredge	Harbor Dredge Comp **Yes**	**Yes**	
	New Surface Dredge	C	1	New Surface Dredge	New Surface Dredge Comp **Yes**	**Yes**	

Sampling Station Number	DMMU	Sample Designation	Core Depth (ft)	Physical Testing	Composite Chemical testing	Individual Chemical Testing (Volatiles only)	Duplicate
PND07-15	Harbor Dredge	A	2	Harbor Dredge	Harbor Dredge Comp **Yes**	**Yes**	
	New Surface Dredge	C	1	New Surface Dredge	New Surface Dredge Comp **Yes**	**Yes**	
PND07-16	Harbor Dredge	A	3	Harbor Dredge	Harbor Dredge Comp **Yes**	**Yes**	
	New Surface Dredge	C	1	New Surface Dredge	New Surface Dredge Comp **Yes**	**Yes**	

Sampling Deviations

The two most significant field deviations were to change the boat grid area to a single DMMU and the addition of a new DMMU (Harbor Dredge and New Surface Dredge). Both changes were made due to more recent design and bathymetry information than was not available when the SAP was written and submitted to the USACE. The first change was made because the boat grid will be entirely buried in the new slope so the sampling was modified to only test the top 2 feet to determine if there was contamination that would be buried.

The second change was to add a new dredging area that encompasses Float A, B, & C. The proposed dredge prism was identified as Harbor Dredge and the newly exposed surface as New Surface Dredge. Newly available bathymetry indicates that the area below these floats has accumulated more sediment than the area between the floats though the area between floats also needs to be dredged. The new dredging area is approximately 2.8 acres (120,000 sq ft) and 15,000 cy. We followed the same sampling protocol as proposed for PND07-03 through PND07-07; diver obtained samples. This method was suitable because the deepest the diver had to collect samples was 4 feet, including the newly exposed surface sample.

PND07-01 was dropped from the drilling program. Due to equipment and tide timing issues, only one drilled hole could be taken so the team elected to take the PND07-02 as there was less geotechnical

information available in this part of the site. As there are still three sample locations within this DMMU, this change will not significantly impact the results.

Less significantly, PND07-06 and PND07-07 were both moved slightly due to access issues due to the docks. The change is reflected in the drawing.

PND07-04 was also moved slightly due to access issues.

Several field duplicates were not obtained. These include PND-5 and PND-7 (not collected due to dropping that sampling location and not picking it up on another) and PND-6 (not taken). The volatiles field duplicate for PND07-9A (PND-9) was not taken on the same day as the primary sample but taken on the following day when the error was identified.

Laboratory Deviations

Physical Testing

The only deviation noted for the physical samples was the change of laboratory. Due to a scheduling conflict, R&M Engineering in Juneau was unable to process the grain size analysis on the requested timeline. The first batch of samples was sent to R&M Engineering in Anchorage (an unaffiliated testing firm). For consistency, the remaining samples were also sent to R&M Engineering in Anchorage. No other deviations were noted.

Chemical Testing

All samples were shipped to STL-Seattle in the afternoon that they were taken via GoldStreak. They were retrieved the next day except for the last batch, which was sent on Saturday and thus not retrieved until Monday.

The temperature was within limits for job number 580-5372-1 and 580-5404-1, identified as within but not marked for 580-5407-1, and not marked or listed for 580-5385-1.

Quality Control (QC)

Physical Testing

R&M Engineering, Anchorage conducted sieve grain size analysis tests on the samples delivered. No issues were noted with the handling or testing of the materials.

Chemical Testing

This section is broken down into discussions on QC for the laboratory and for the field. Where applicable, there is discussion as to how one might affect the other.

Laboratory QC Discussion

There were consistent issues with laboratory QC for all the DMMUs unless noted for a specific sample and/or DMMU.

A consistent issue for all the samples except those taken on the final day (representing DMMU 1 and DMMU 4) was with volatile organic recovery (EPA 8260B), which also affected the GRO/BTEX results under AK 101. The field preserved sample for each sampling location was consistently over the method maximum weight of 50.0 grams and the sample was nearly dry when recovery attempted by the laboratory. This is likely due to the highly organic nature of the samples, which are believed to be primarily detritus and not sediment. The results were likely biased low for nearly all of the AK101/BTEX samples. The field surrogate was below control limits but all other laboratory controls were met. This would also indicate that the results are biased

low as the poor recovery of the field surrogate further indicates that the soil to methanol ratio and/or high organic levels in the sediment was not optimal. The results for AK 101/BTEX should only be considered estimates due to the field preservative issues.

Several issues were noted with the semivolatile samples (8270C). PND07-11 (boat grid DMMU 3), PND-2 (DMMU-2 dredge prism), New Surface Dredge Comp, and Harbor Dredge Comp required dilution prior to analysis due to high phthalates, which are not one of the chemicals of concern specifically listed for this project. While this testing program did not specifically evaluate phthalates, three phthalates were identified in the method blank. One of these phthalates also had a LCS recovery that exceeded limits. No corrective action was taken or required. In addition to the above listed issues for semivolatiles, PND -1 (DMMU 1) and PND-3 (DMMU 4) also had issues with the MS/MSD control limits for 1,2-dichlorobenzene, 1,3-dichlorobenze and hexachloroethane in the QC batch. The RPD for the MS/MSD also failed the control limits for 1,4-dichlorobenze and dibenze(a,h)anthracene. The failure was on a batch sample and there were no noted issues with other MS/MSD for these chemicals and the LCS/LCSD were acceptable for this batch so no action is taken. No affect on the results is anticipated because the LCS/LCSD was acceptable and according to the EPA Functional Guidelines no action is necessary for MS/MSD failures when all other controls are met. Most of the analytes in 8270C also had issues with the MDL being higher than goal per the SAP. These were not excessive so no action taken.

Metals testing had two minor issues. Mercury testing required dilution for all samples tested. This was due to the high concentration of mercury in the samples. The laboratory reported results do not require correction. Copper, lead, and zinc were found in the method blank at levels above the MDL but below RL. There was an additional issue with PND07-11 for copper and mercury with the MS recovery being 4 times the amount added. Failure of the MS/MSD can indicate matrix interference but all other QC tests were within control limits so no action is necessary.

The RPD for MS/MSD for DRO/RRO (AK 102 and 103) batch QC sample for laboratory batch 580-5407 failed control limits. No other issues were noted so no corrective action taken or necessary.

While not a parameter specifically identified for reporting in this project, the RPD for MS/MSD and LCS/LCSD for PCB's exceeded limits for several chemicals. No action required.

No issues were encountered with the organotins (TBT) analyses.

All other tests performed were within control limits and are deemed acceptable for evaluation and use.

Field QC Discussion

The results for all the trip blanks came back as ND with all the laboratory controls within limits.

Only one field duplicate pair was completed due to only some of the samples being required for testing. The following table provides the results of the field duplicate, which are primary sample PND07-7C and field duplicate PND-8. It is important to note that the laboratory reported results, shown in parentheses, were all not detect. The RPD is not terribly helpful in determining field sampling technique because the results were essentially the same with the variability coming from minor differences coming from the differences in MDL.

Table 2 Field duplicates analysis. The reportable result is shown with the laboratory reported result in parathenses.

Analyte	Primary PND07-7C	Duplicate PND-8	RPD
GRO (AK101)	0.43 mg/kg (ND)	0.48 mg/Kg (ND)	10.9%

Analyte	Primary PND07-7C	Duplicate PND-8	RPD
Benzene	1.6 mg/kg (ND)	1.8 mg/kg (ND)	11.7%
Toluene	4.2 mg/kg (ND)	4.7 mg/kg (ND)	11.2%
Ethylbenzene	4.1 mg/kg (ND)	4.5 mg/kg (ND)	9.3%
Total Xylene	12.5 mg/kg (ND)	14 mg/kg (ND)	11.3%
TVS	3.9%	4.3 %	9.7%

Results

Physical

The grain size analysis laboratory reports are attached. Table 3 summarizes the results of the grain size analysis and cross references the sample with the DMMU. The results show that this portion of the harbor has a very high fine content. This is supported by the field observations and that the expected source of the sediment is from detritus. However, this assertion that much of the fine sediment is organic detritus is not supported by the TVS results, which is an estimation of organic content and was below the 5% screening level.

Table 3 Grain Size Analysis and Selected TVS Results

Sample ID	Representative DMMU(s)	Result (% passing the No. 230 sieve)	TVS
PND-1	DMMU 1 DMMU 4	91.0%	4.5%
PND-3	DMMU 3	80.0%	3.7%
PND 5,6,7	DMMU 2 DMMU 5	84.0%	-
New Surface	Newly exposed surface in the added dredging area	86.0%	4.5%
Harbor Dredge	Dredge prism in the added dredging area	82.0%	3.6%

Chemical

Test results are included in the attached table, which include the reportable results and the screening levels, as well as the full laboratory report.

The TVS screening level was exceeded for PND07-11 and PND07-6C. These represent one sample in DMMU 3 and DMMU 5, respectively.

The screening level was exceeded for mercury in all samples submitted. See Table 4 below for the results.

Table 4 Mercury levels for samples submitted. Screening level per the SAP is 0.41 mg/kg. The PSSDA maximum level is 2.1 mg/kg.

Sample Location	DMMU Represented	Reportable Result
PND07-11	3	1.3 mg/kg
PND-2	2	2.4 mg/kg
PND-4	5	2.5 mg/kg
Harbor Dredge	Harbor Dredge	3.5 mg/kg
New Surface Dredge	New Surface Dredge	2.2 mg/kg
PND-1	1	1.8 mg/kg
PND-3	4	2.7 mg/kg

As all the composite samples exceeded the screening level for mercury, the laboratory ran the individual samples to determine if there is a pattern or some other issue with the composite samples. The results of the individual samples are in the table below.

Table 5 Individual Sample Mercury Results

Sample ID	DMMU Represented	Reportable Result	Unit
PND07-5A	2	**3.5**	mg/Kg
PND07-5C	5	**3.9**	mg/Kg
PND07-6A	2	**2.7**	mg/Kg
PND07-6C	5	**1.9**	mg/Kg
PND07-7A	2	**2.1**	mg/Kg
PND07-7C	5	**1.7**	mg/Kg
PND07-15A	Harbor Dredge	**5.4**	mg/Kg
PND07-15C	New Surface	**2.5**	mg/Kg
PND07-16A	Harbor Dredge	**1.9**	mg/Kg
PND07-16C	New Surface	**3**	mg/Kg
PND07-14A	Harbor Dredge	**2.1**	mg/Kg
PND07-14C	New Surface	**2.7**	mg/Kg
PND07-12A	Harbor Dredge	**4.9**	mg/Kg
PND07-12C	New Surface	**4.7**	mg/Kg
PND07-13A	Harbor Dredge	**4.4**	mg/Kg
PND07-13C	New Surface	**2.1**	mg/Kg
PND07-4A	1	**3.5**	mg/Kg
PND07-4C	4	**1.1**	mg/Kg
PND07-3A	1	**2.8**	mg/Kg
PND07-3C	4	**2.2**	mg/Kg
PND07-2A	1	**0.47**	mg/Kg
PND07-2B	1	**1**	mg/Kg
PND07-2C	4	**1.8**	mg/Kg

A visual inspection of the above results would indicate that the mercury level is remarkably consistent across the entire harbor. Statistical analysis of the results strongly suggests that there is not a significant difference between the proposed dredge prism and the newly exposed surface or between the different DMMU's.

All other Chemicals of Concern were below screening level.

Discussion

The mercury levels in the dredge prism is the only chemical of concern that exceeded the screening level for the preferred disposal method; unconfined open water disposal. Mercury is known to exist in higher levels in Juneau and Southeast Alaska than what is found in the Puget Sound or on the Columbia River where the screening levels were established.

The issues associated with the field preservation of the volatile compounds do not significantly impact the overall testing and the specific chemicals of concern for this project. While the results should be considered estimates they are well below the screening level for all chemicals of concern.

The lack of duplicate samples for most of the analytes and at the prescribed rate does pose an issue in reviewing the data for repeatability. However, for the only analyte above the screening level, mercury, the difference between the means of the composite samples and the individual samples is not significant using the Student T Test. Similar results were found for the other analytes though they are not shown here. As the procedure for taking the non-volatile composite samples with individual samples is similar to the duplicate process and the level of contamination is consistent over the entire area, this does show repeatability in this case. It is noted that this is not the case where there is not consistent levels of contamination across the entire sampling area.

Limitations

This report is only intended for use by the City and Borough of Juneau and their designees. Any other uses are prohibited without the written permission of the City and Borough of Juneau, their designees, and PND Engineers, Inc. This report has a specific purposes and use of the information contained herein may not be applicable to unintended uses. The signatories on the cover of this report are responsible for the content of this report and indicate that the information contained with the report is accurate and true to the best of their knowledge at the time the report was signed.

Attachments

SAP
NWP 6
Typed Field Notes
Log Book including Site Map
Laboratory Results
    R&M Engineering, Anchorage
    STL-Seattle