APPENDIX B: MEMO: RESULTS OF SECOND CLAM RECONNAISSANCE SURVEY AND PROPOSED CLAM SAMPLING LOCATIONS IN LDW, AUGUST 1, 2003

Lower Duwamish Waterway Group

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

MEMORANDUM

To:	Allison Hiltner, Rick Huey
From:	Maryann Welsch and Tad Deshler
Subject:	Results of second clam reconnaissance survey and proposed clam sampling locations in LDW
Date:	August 1, 2003

The Lower Duwamish Waterway Group (LDWG) is conducting a Remedial Investigation (RI) for the Lower Duwamish Waterway (LDW). The Phase 1 RI, which was based on existing information and data, is nearing completion. The draft Phase 2 RI work plan, which is the final Phase 1 RI deliverable, was submitted to EPA and Ecology on July 3, 2003. The majority of the field work described in the Phase 2 RI work plan will occur in 2004 after the work plan is approved by EPA and Ecology. Some field work, however, will occur in 2003 prior to work plan approval. The three studies planned for 2003 include bathymetry, juvenile salmon chemistry, and invertebrate surveys.

A draft Quality Assurance Project Plan (QAPP) for the invertebrate surveys was submitted to EPA and Ecology on May 16, 2003. LDWG received comments from EPA on this QAPP on June 13, 2003, and subsequently submitted a draft final QAPP to EPA and Ecology on July 30, 2003. The clam sampling portion of the invertebrate surveys included a reconnaissance survey designed to qualitatively assess the LDW clam habitat and to select sampling locations for the quantitative portion of the survey to be conducted from August 8 to August 13, 2003. This memorandum summarizes the results of the reconnaissance sampling and proposes sampling locations. The preliminary results presented in this memorandum will also be included in the data report to be prepared after the clam survey is completed.

Windward conducted the initial reconnaissance survey on July 16, 2003 to identify the potential sampling areas in the LDW. Twenty-three beaches were identified in the first reconnaissance survey. Windward conducted a second reconnaissance survey in the LDW on July 29 and 30, 2003 during negative low tides. Each beach identified by visual inspection during the July 16 reconnaissance survey was re-visited to assess relative clam presence and habitat. Some of these beaches were combined during the second survey, resulting in 20 beaches to be potentially surveyed. Each beach was ranked according to the number of clams, shows (i.e., siphon holes), and shells observed and the condition of the substrate. Beaches were given a high ranking if clams were found in

the majority of both random and targeted holes (targeted based on presence of shows) and if the clam habitat was good relative to other areas in the LDW. Beaches were given a low ranking if few clams, shells, or shows were observed and if the substrate was so soft that clam harvesters would sink deeper than approximately six inches while standing on the beach. Medium-ranked beaches were those with clam density and habitat type intermediate between the high and low-ranked beaches.

Each beach was assigned to one of three LDW regions: Harbor Island to the 1st Avenue South bridge, the 1st Avenue South bridge to the 16th Avenue South bridge, and the 16th Avenue bridge to the Boeing pedestrian bridge at RM 4.9. Each beach visited within each region was ranked relative to the rest of the beaches in that region. Several larger beaches were divided into smaller sections based on changes in substrate and clam presence and were subsequently ranked separately. Overall, there were eight high, five medium, and thirteen low-ranked beaches (Table 1, Figures 1a-d). The majority of the high-ranked beaches occurred in the first region from Harbor Island to the 1st Avenue bridge and most of the low-ranked beaches occurred upstream closer to Turning Basin #3.

Table 1. LDW beach descriptions and rankings

Beach	Location (RM)	Approximate area (ft^2)	Ranking	Clam presence and Site Description	Approximate number of samples[a]
Region 1 – Harbor Island to 1st Ave S bridge					
1a	0.1	57,000	High	The majority of the beach, starting at T105, is moderately sloped with silty sand substrate. Many shows, shells, and clams (*Mya arenaria*).	57
1b		10,000	Medium	Steeper and rockier section	10
2a	0.5	206,000	High	West bank of mainland opposite Kellogg Island and east bank of Kellogg Island. Both areas had many clams.	206
2b		253,000	Medium	The potential clam band was much narrower in these areas.	253
2c		178,000	Low	Rocky steep areas with few clams present	178
3a	0.5 – 0.6	30,000	Low	Small, narrow area with steeper banks bordered by riprap	30
3b		83,000	Medium	Moderate number of clams found, but not as many as Kellogg Island. Moderate habitat quality.	83
4	0.8	41,000	Low	Adjacent to GSA restoration site, sandy substrate, very few clams	41
5	1.5	71,000	Low	Adjacent to cement plant; small, mucky area with large algae mats; difficult to access	71
6	1.5	42,000	Low	Few clams, shows or shells	42
7	1.8	48,000	High	Many clams and shows, particularly under pier in shade.	48
8	2.1	54,000	High	Many clams and shows, particularly in shade under bridge.	54
Region 2 – 1st Ave S bridge to 16th Ave S bridge					
9	2.3	52,000	Low	Small, rocky substrate, some shows	52
10	2.6	98,000	Medium	Silty substrate, moderate number of clams	98
11	2.6	32,000	High	Beach with kayak and beach chair on abandoned pier; many clams and shows	32
12	2.8	21,000	High	Many clams and shows	21
13a	2.9	30,000	High	From riprap section to middle of exposed intertidal on the east bank of slip 4; many clams, shows, shells	30
13b		28,000	Low	From middle section to end of slip; very mucky with lower number of clams	28
14	2.9	406,000	Low	Sandy at higher elevation and soft mucky areas closer to waterline; few clams, shows or shells present	406

Beach	Location (RM)	Approximate area (ft^2)	Ranking	Clam presence and Site Description	Approximate number of samples[a]
15	2.9	182,000	Low	Sandy at higher elevation and soft mucky closer to waterline; few clams, shows or shells present with the exception of one small patch close to bridge where multiple clams were present	182
Region 3 – 16th Ave S bridge to Boeing pedestrian bridge					
16	3.5	163,000	High	Predominantly sandy, slope steeper than most beaches; many clams and shows	163
17a	3.7	130,000	Medium	Many shows, shells, clams; soft, mucky areas closer to waterline	130
17b		167,000	Low	Wider flat area, very soft substrate	167
18	4.3	152,000	Low	Few shows and clams	152
19	4.3	218,000	Low	Small, narrow area, appeared mucky	218
20	4.6	405,000	Low	Very soft substrate at Turning Basin #3	405

[a] Based on average sampling density of one sample per 1,000 ft^2 (94 m^2)

Using an average sample density of one sample per 1000 ft^2 (94 m^2), which is the approximate midpoint of the sample density range proposed in the QAPP (675 to 1,345 ft^2 or 63 to 125 m^2), sample density per beach ranges from 10 to 406 samples with a total of 3157 samples in the LDW (Table 1). However, the size of each beach was estimated by tracing the exposed intertidal area identified from aerial photographs taken during a -2 ft low tide, which may overestimate the size of the beach due to the inclusion of area above +6 ft MLLW. Reduction in sample area will reduce the number of samples per beach. Washington State Department of Fish and Wildlife suggests that one person can dig 30 holes per low tide. At this rate, 5 people (the proposed field crew size) would need 21 days to sample all of the beaches identified in the LDW. Although a reduced sample density at some of the larger beaches based on the absence of clams within a portion of the beach (see Section 3.2.2 of the QAPP) may be warranted, it will not be possible to sample all the beaches in the LDW in the upcoming five-day low tide period (August 8-12). According to the WDFW estimate, five people can theoretically dig 750 holes in a five-day sampling effort. Therefore, only a portion of the beaches identified on Table 1 can be sampled, as described below.

The majority of the sampling effort will focus on the high-ranked beaches, but medium- and low-ranked beaches will also be included such that 60% of the sampling will take place on the high-ranked beaches and 40% will take place on the medium- and low-ranked beaches (20% each). All 8 of the high-ranked beaches listed on Table 1 are proposed for sampling. Low- and medium-ranked beaches to be sampled were randomly chosen within each category regardless of the size of each beach. Based on the anticipated level of effort, 14 of 26 beaches identified can be sampled (Table 2). Eight are high-ranked beaches (~60%), 3 are medium-ranked beaches (~20%), and 3 are low-ranked beaches (~20%). Using the average sample density of one sample per 1,000 ft^2, total samples required for the chosen beaches is approximately 1,300 samples. However, the medium- and low-ranked beaches will likely require fewer samples because the clam abundance is likely to be low (Table 2). A block size of 1,000 ft^2 (94 m^2) is probably warranted for all high-ranked beaches, whereas block sizes for medium- and low-ranked beaches range from 1,000 ft^2 to 4,000 ft^2 for medium- and low-ranked beaches. The total number of samples indicated by this design is 847, which should be feasible within the 5-day sampling window. Additional diggers may be added, if needed to complete the sampling.

Table 2. Clam sample density for each beach in the LDW

BEACH	LOCATION (RM)	APPROXIMATE AREA (FT^2)	RANKING	NUMBER OF SAMPLES	BLOCK SIZE IN FT^2 (AND M^2)
1a	0.1	57,000	High	57	1,000 (94)
2a [a]	0.5	69,000	High	69	1,000 (94)
2a [a]	0.5	137,000	High	137	1,000 (94)
7	1.8	48,000	High	48	1,000 (94)
8	2.1	54,000	High	54	1,000 (94)
11	2.6	32,000	High	32	1,000 (94)
12	2.8	21,000	High	21	1,000 (94)
13a	2.9	30,000	High	30	1,000 (94)
16	3.5	163,000	High	163	1,000 (94)
1	0.1	10,000	Medium	10	1,000 (94)
2b [a]	0.5	118,000	Medium	59	2,000 (188)
3	0.6	83,000	Medium	42	2,000 (188)
2c [a]	0.5	63,000	Low	16	4,000 (370)
3	0.5	30,000	Low	8	4,000 (370)
14	2.9	406,000	Low	101	4,000 (370)
TOTAL		**1,322,000**		**847**	

[a] These areas are distinct beaches identified on Kellogg Island.

As discussed in the QAPP, results obtained from the first day of sampling (Friday August 8) may be used to alter the sampling design for the rest of the survey. Beaches 1a and 8 will be sampled on August 8. The results from these beaches will be quickly collated and analyzed. A conference call with EPA, Windward, LDWG, and Tribal representatives will be held late Friday afternoon (August 8) to discuss the results of the first day's sampling and discuss whether the proposed design should be altered. A decision will made during this conference call to either proceed with the design as described in this memo or to alter it.