# APPENDIX D. TISSUE COMPOSITING PLAN AND TISSUE PREPARATION NOTES

# Clam Tissue Compositing Plan

Lower Duwamish Waterway Group
Port of Seattle / City of Seattle / King County / The Boeing Company

# MEMORANDUM

| | |
|---|---|
| To: | Elly Hale, EPA |
| From: | Windward on behalf of LDWG |
| Subject: | LDW pre-design studies: clam tissue compositing plan |
| Date: | June 8, 2018 |

Clams were collected throughout the Lower Duwamish Waterway (LDW) from May 15 to 19, 2018, as described in the US Environmental Protection Agency (EPA)-approved quality assurance project plan (QAPP) (Windward 2018). This memorandum presents the compositing plan for the collected clams for approval by EPA. The field data for each of the individual clams are provided in Attachment A.

## SUMMARY OF CLAM TISSUE COLLECTION

As described in the QAPP, clam tissues were collected to fulfill three different data quality objectives (DQOs):

- Clam tissue DQO 1 – Establish baseline site-wide 95% upper confidence limit (on the mean) (95UCL) concentrations of human health risk drivers for comparison to target tissue levels (TTLs) for remedial action objective (RAO) 1.
- Clam tissue DQO 2 – Calculate baseline site-wide mean clam tissue concentrations to assess trends following sediment remediation for contaminants with TTLs. For the LDW non-risk driver chemicals, calculate the site-wide average concentrations in three segment-wide intertidal composite samples to assess trends for these chemicals.
- Porewater DQO 1 – Assess the relationship among concentrations of carcinogenic polycyclic aromatic hydrocarbons (cPAHs) in clam tissue, porewater, and sediment to help evaluate whether achieving sediment cleanup levels for cPAHs will reduce concentrations in clam tissue to TTLs.

For clam tissue DQOs 1 and 2, 13 clams were needed from each of the 11 clam tissue collection areas (3 clams for the arsenic composite and 10 clams for the other risk driver

composite[1]). For porewater DQO 1, 3 clams (along with co-located sediment) were needed from each of the 20 cPAH porewater investigation areas. The target numbers of clams were collected from the majority of areas (Table 1). The sediment and tissue samples will be analyzed for cPAHs within three weeks of sample collection. The cPAH sediment and tissue data will be used to select a minimum of 10 locations, where freely dissolved concentrations of individual cPAHs in porewater will be determined using passive samplers exposed to the sediment *ex situ*.

**Table 1. Target and actual numbers of clams by collection area**

| Clam Tissue Collection | cPAH Porewater Investigation Areas | Target No. of Clams | Actual No. of Clams Collected[a] | Sufficient Clams Collected? | | | Notes |
|---|---|---|---|---|---|---|---|
| | | | | Clam Tissue DQOs 1 and 2 | | | |
| | | | | Inorganic Arsenic Composite | Other Risk Driver Composite | Porewater DQO 1 | |
| 1 | 1, 2 | 19 | 19 | ü | ü | ü | none |
| 2 | 4, 6 | 19 | 19 | ü | ü | ü | none |
| 3 | 3, 5 | 19 | 19 | ü | ü | ü | none |
| 4 | 7, 8 | 19 | 19 | ü | ü | ü | location of cPAH area 8 moved in the field to a comparable area where clams were present (see Maps 1–3) |
| 5 | 9, 10 | 19 | 19 | ü | ü | ü | none |
| 6 | 11 | 16 | 16 | ü | ü | ü | none |
| 7 | none | 13 | 4 | ü | no (insufficient clams) | na | fewer than the target number of clams collected; maximum level of effort of 9 person-hours reached |
| 8 | 12 | 16 | 16 | ü | ü | ü | none |
| 9 | 13, 14, 15, 16 | 25 | 7 | ü | no (insufficient clams) | investigation area13 only | fewer than the target number of clams collected; maximum level of effort of 12 person-hours reached |
| 10 | 19, 20 | 19 | 16 | ü | ü | investigation area 19 only | clams/sediment not collected from cPAH area 20 due to insufficient clams in both this area and a potential alternate area |
| 11 | 17, 18 | 19 | 19 | ü | ü | ü | none |

[a] An extra five clams were collected from each of the clam tissue collection areas 1, 2, 3, 4, 5, 6, 8, 10, and 11 to provide additional compositing options. Extra clams were not available from areas 7 and 9.

cPAH – carcinogenic polycyclic aromatic hydrocarbon na – not applicable
DQO – data quality objective

Sufficient clams could not be collected from the following areas:

- **cPAH porewater investigation area 8** – No clams could be collected from cPAH porewater investigation area 8 (no habitat in this area). The field crew was able to identify a different area with anticipated similar cPAH toxic equivalents (TEQs),

[1] The other risk driver composite samples will be analyzed for polychlorinated biphenyls (PCBs), dioxins/furans, and cPAHs. Inorganic arsenic will be analyzed in separate composite samples, because siphon skin will be analyzed separately from the remainder of the clam (Windward 2018).

so cPAH porewater investigation area 8 was relocated to the northern end of clam tissue collection area 4.

- **Clam tissue collection area 7** – As anticipated, the target numbers of clams were not collected from this area (Slip 4), which was remediated in 2012. A total of four clams were collected from this area. Per discussion with EPA, three of these clams (excluding the one undersized clam) will be used for the inorganic arsenic composite; insufficient mass is available to analyze for other risk drivers.
- **Clam tissue collection area 9 and cPAH porewater investigation areas 14 to 16** – A total of seven clams were collected from clam tissue collection area 9, including five clams from the vicinity of cPAH porewater investigation area 13, one clam from cPAH porewater investigation area 14, and one clam at approximately river mile (RM) 3.2. Clams were not abundant in this clam tissue collection area, and suitable habitat was patchy.

  As discussed with EPA, the three clams for which co-located sediment was collected in cPAH porewater investigation area 13 will be used for the cPAH porewater evaluation, and three of the remaining four clams from clam tissue collection area 9 will be included in the inorganic arsenic composite. With the exception of the single clam from cPAH porewater investigation area 14, clam or sediment samples were not collected from the other three cPAH porewater investigation areas (14, 15, and 16), because sufficient clams were not present in these areas.
- **cPAH porewater investigation area 20** – Insufficient clams were available in cPAH porewater investigation area 20, so no tissue or sediment samples were collected for this area.

## CLAM TISSUE COMPOSITES

As detailed in Attachment A, clams were distributed among composite samples to fulfill the three DQOs outlined in the QAPP (Windward 2018). Composites for clam tissue DQOs 1 and 2 were derived using the following criteria:

- **Spatial coverage** – Clams included in composites were, to the extent possible, selected to provide good spatial coverage of the clam collection area.
- **Clam size** – Only clams > 2 cm in width were included in composites; a range of clam sizes was included in the composites to the extent possible. Note that clam size varied among the tissue collection areas.

Based on these criteria, Table 2 presents information regarding the inorganic arsenic composites and other risk driver composites for clam tissue DQOs 1 and 2. For the third DQO (i.e., porewater DQO 1), clams included in the composites for the cPAH porewater investigation were determined in the field, because of the need to collect co-located sediment. Thus, the clams selected were collected within a cPAH porewater investigation area and were located as close to one another as possible. Table 3 presents clam composite information for porewater DQO 1.

## Table 2. Clams included in inorganic arsenic and other risk driver composites for clam tissue DQOs 1 and 2

| Clam Tissue Collection Area | Inorganic Arsenic Composite | | | Other Risk Driver Composite | | | Segment-wide Composite[b] | | |
|---|---|---|---|---|---|---|---|---|---|
| | Composite ID[a] | Clam Width (mm) | | Composite ID | Clam Width (mm) | | Composite ID | Clam Width (mm) | |
| | | Average | Range | | Average | Range | | Average | Range |
| **Intertidal segment 1:** | | | | | | | | | |
| 1 | LDW18-C01-CLSP-Comp1; LDW18-C01-CLRM-Comp1 | 32 | 24 - 42 | LDW18-C01-CLWB-Comp2 | 33 | 24 - 42 | LDW18-S1-CLWB-Comp1 | 29 | 22 - 42 |
| 2 | LDW18-C02-CLSP-Comp1; LDW18-C02-CLRM-Comp1 | 32 | 26 - 37 | LDW18-C02-CLWB-Comp2 | 30 | 23 - 38 | | | |
| 3 | LDW18-C03-CLSP-Comp1; LDW18-C03-CLRM-Comp1 | 26 | 23 - 28 | LDW18-C03-CLWB-Comp2 | 25 | 22 - 32 | | | |
| **Intertidal segment 2:** | | | | | | | | | |
| 4 | LDW18-C04-CLSP-Comp1; LDW18-C04-CLRM-Comp1 | 24 | 21 - 28 | LDW18-C04-CLWB-Comp2 | 24 | 21 - 29 | LDW18-S2-CLWB-Comp1 | 26 | 21 - 40 |
| 5 | LDW18-C05-CLSP-Comp1; LDW18-C05-CLRM-Comp1 | 27 | 24 - 32 | LDW18-C05-CLWB-Comp2 | 28 | 23 - 40 | | | |
| 6 | LDW18-C06-CLSP-Comp1; LDW18-C06-CLRM-Comp1 | 27 | 22 - 34 | LDW18-C06-CLWB-Comp2 | 27 | 22 - 39 | | | |
| **Intertidal segment 3:** | | | | | | | | | |
| 7 | LDW18-C07-CLSP-Comp1; LDW18-C07-CLRM-Comp1 | 23 | 20 - 25 | na | insufficient clams collected | | LDW18-S2-CLWB-Comp1 | 29 | 22 - 37 |
| 8 | LDW18-C08-CLSP-Comp1; LDW18-C08-CLRM-Comp1 | 28 | 22 - 33 | LDW18-C08-CLWB-Comp2 | 28 | 22 - 34 | | | |
| 9 | LDW18-C09-CLSP-Comp1; LDW18-C09-CLRM-Comp1 | 26 | 22 - 33 | na | insufficient clams collected | | | | |
| 10 | LDW18-C10-CLSP-Comp1; LDW18-C10-CLRM-Comp1 | 29 | 23 - 35 | LDW18-C10-CLWB-Comp2 | 30 | 23 - 37 | | | |
| 11 | LDW18-C11-CLSP-Comp1; LDW18-C11-CLRM-Comp1 | 30 | 24 - 35 | LDW18-C11-CLWB-Comp2 | 29 | 22 - 36 | | | |

Note: As described in the QAPP, 3 clams were included in each inorganic arsenic composite, and 10 clams were included in each composite for the other risk drivers (i.e., PCBs, dioxins/furans, and cPAHs).

[a] Each tissue collection area had a composite sample of siphon skin (SP) and remainder (RM) clam tissue.

[b] Segment-wide composites included equal amounts of homogenized tissue from each of the clam tissue collection area composite samples from that segment. These samples will be analyzed for non-risk driver chemicals per the QAPP.

cPAH – carcinogenic polycyclic aromatic hydrocarbon
DQO – data quality objective
ID – identification
na – not applicable
PCB – polychlorinated biphenyl
QAPP – quality assurance project plan

## Table 3. Clams included in cPAH composites for porewater DQO 1

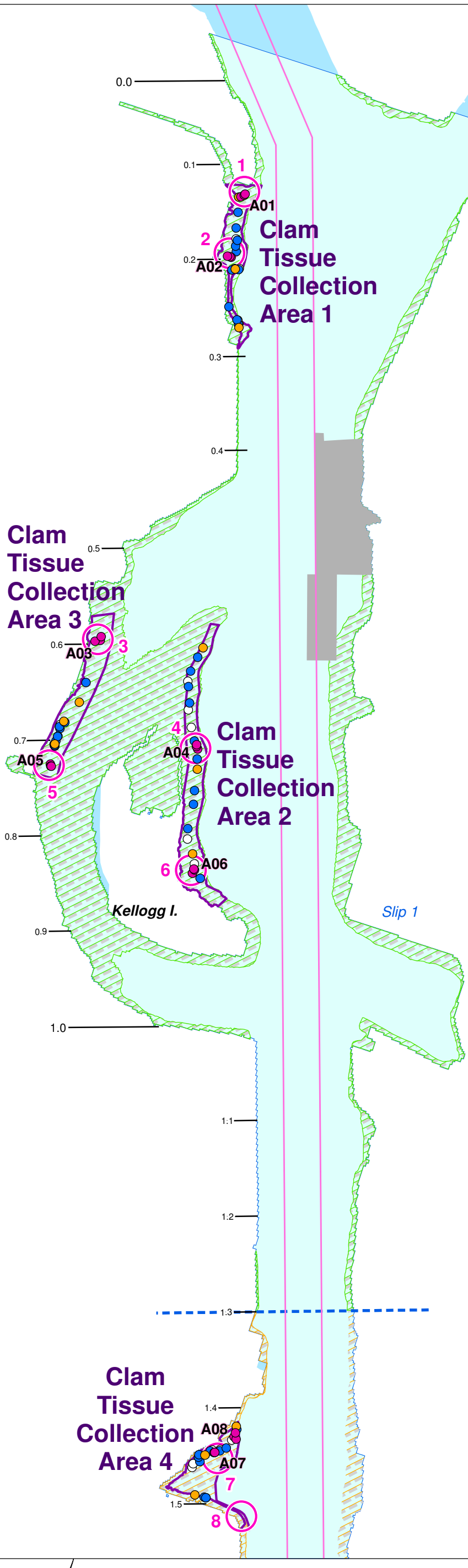
| cPAH Porewater Investigation Area | Composite ID | Clams per Composite | Clam Width (mm) | |
|---|---|---|---|---|
| | | | Average | Range |
| 1 | LDW18-A01-CLWB-Comp1 | 3 | 24 | 22–26 |
| 2 | LDW18-A02-CLWB-Comp1 | 3 | 24 | 20–29 |
| 3 | LDW18-A03-CLWB-Comp1 | 3 | 27 | 25–28 |
| 4 | LDW18-A04-CLWB-Comp1 | 3 | 34 | 32–36 |
| 5 | LDW18-A05-CLWB-Comp1 | 3 | 26 | 22–32 |
| 6 | LDW18-A06-CLWB-Comp1 | 3 | 33 | 32–33 |
| 7 | LDW18-A07-CLWB-Comp1 | 3 | 25 | 22–28 |
| 8 | LDW18-A08-CLWB-Comp1 | 3 | 25 | 23–26 |
| 9 | LDW18-A09-CLWB-Comp1 | 3 | 27 | 22–35 |
| 10 | LDW18-A10-CLWB-Comp1 | 3 | 29 | 23–39 |
| 11 | LDW18-A11-CLWB-Comp1 | 3 | 26 | 26–27 |
| 12 | LDW18-A12-CLWB-Comp1 | 3 | 27 | 24–31 |
| 13 | LDW18-A13-CLWB-Comp1 | 3 | 29 | 26–34 |
| 14 | na | na | insufficient clams collected | |
| 15 | na | na | insufficient clams collected | |
| 16 | na | na | insufficient clams collected | |
| 17 | LDW18-A17-CLWB-Comp1 | 3 | 32 | 29–35 |
| 18 | LDW18-A18-CLWB-Comp1 | 3 | 30 | 27–36 |
| 19 | LDW18-A19-CLWB-Comp1 | 3 | 35 | 30–43 |
| 20 | na | na | insufficient clams collected | |

Note: As discussed in the QAPP, clams included in the cPAH porewater investigation composites were determined in the field, because of the need to collect co-located sediment.

cPAH – carcinogenic polycyclic aromatic hydrocarbon
DQO – data quality objective
ID – identification
na – not applicable
QAPP – quality assurance project plan

## REFERENCES

Windward. 2018. Lower Duwamish Waterway clam collection and chemical analyses - quality assurance project plan. Final. Windward Environmental LLC, Seattle, WA.




- Clams included in cPAH porewater investigation composites
- Clams included in inorganic arsenic composites
- Clams included in other risk driver composites
- Clams not proposed for inclusion in composites
- cPAH porewater investigation area[a]
- Clam tissue sampling area

**Clam tissue intertidal segments**

- Segment 1
- Segment 2
- Segment 3
- Intertidal segment boundary
- Early Action Area
- LDW Superfund Boundary
- Navigation Channel
- River mile

[a] Circle sizes in map are exaggerated to 4x actual size for visibility.

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N

0 200 400 Yards

0 200 400 Meters

**Map 1. Assignment of clams to composite samples, RM 0.0 to 1.5**

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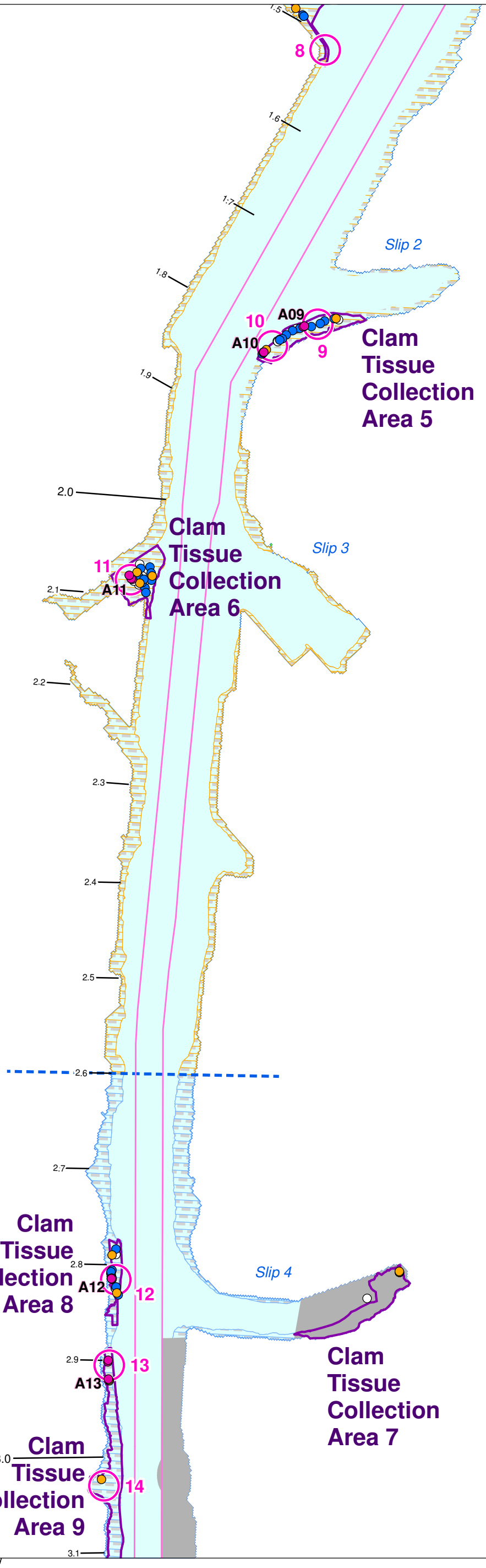


Clams included in cPAH porewater investigation composites

Clams included in inorganic arsenic composites

Clams included in other risk driver composites

Clams not proposed for inclusion in composites

cPAH porewater investigation area[a]

Clam tissue sampling area

**Clam tissue intertidal segments**

Segment 1

Segment 2

Segment 3

Intertidal segment boundary

Early Action Area

LDW Superfund Boundary

Navigation Channel

River mile

[a] Circle sizes in map are exaggerated to 4x actual size for visibility.

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0 200 400 Yards

0 200 400 Meters

**Map 2. Assignment of clams to composite samples, RM 1.5 to 3.1**

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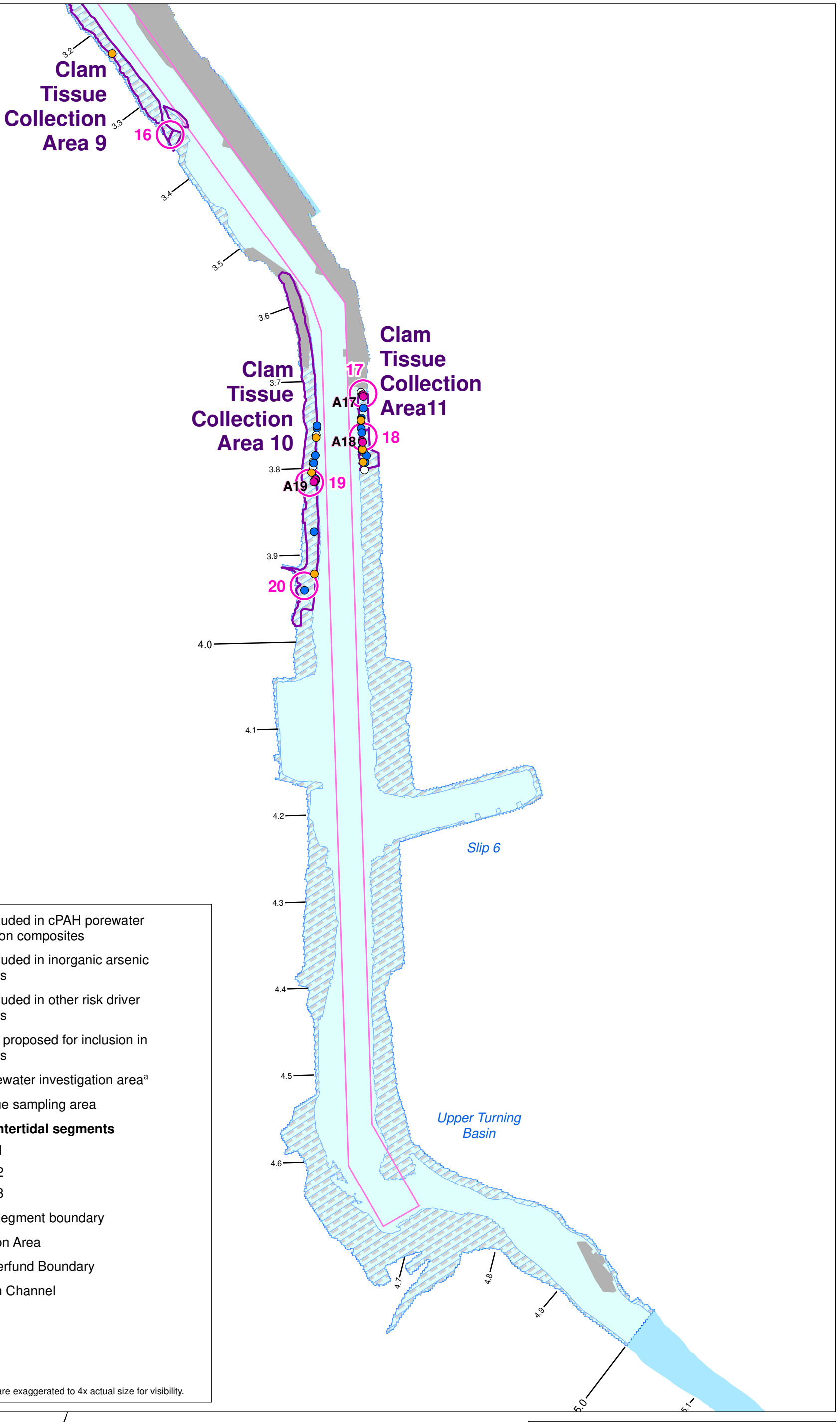


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**Map 3. Assignment of clams to composite samples, RM 3.1 to 5.0**

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## Attachment A. Clam tissue collection data

| Collection date | Clam Tissue Collection Area ID | Clam ID | Collection Time | Width (mm) | Included in Other Risk Driver Composite? | Included in Inorganic Arsenic Composite? | Included in cPAH Porewater Investigation Area Composite? | Composite ID(s), if applicable | Extra Clam (Not Included in Composite) |
|---|---|---|---|---|---|---|---|---|---|
| 5/16/2018 | 1 | LDW18-C01-CL03 | 13:17 | 24 | yes | | | LDW18-C01-CLWB-Comp2 | |
| 5/16/2018 | 1 | LDW18-C01-CL14 | 13:48 | 24 | | yes | | LDW18-C01-CLSP-Comp1 and LDW18-C01-CLRM-Comp1 | |
| 5/16/2018 | 1 | LDW18-C01-CL07 | 13:10 | 26 | yes | | | LDW18-C01-CLWB-Comp2 | |
| 5/16/2018 | 1 | LDW18-C01-CL06 | 13:27 | 27 | yes | | | LDW18-C01-CLWB-Comp2 | |
| 5/16/2018 | 1 | LDW18-C01-CL10 | 13:13 | 27 | | | | | x |
| 5/16/2018 | 1 | LDW18-C01-CL15 | 13:23 | 29 | yes | | | LDW18-C01-CLWB-Comp2 | |
| 5/16/2018 | 1 | LDW18-C01-CL11 | 13:50 | 30 | | yes | | LDW18-C01-CLSP-Comp1 and LDW18-C01-CLRM-Comp1 | |
| 5/16/2018 | 1 | LDW18-C01-CL02 | 13:41 | 31 | | | | | x |
| 5/16/2018 | 1 | LDW18-C01-CL24 | 13:23 | 32 | yes | | | LDW18-C01-CLWB-Comp2 | |
| 5/16/2018 | 1 | LDW18-C01-CL17 | 13:21 | 33 | yes | | | LDW18-C01-CLWB-Comp2 | |
| 5/16/2018 | 1 | LDW18-C01-CL18 | 13:20 | 34 | | | | | x |
| 5/16/2018 | 1 | LDW18-C01-CL19 | 13:27 | 35 | yes | | | LDW18-C01-CLWB-Comp2 | |
| 5/16/2018 | 1 | LDW18-C01-CL20 | 13:12 | 38 | yes | | | LDW18-C01-CLWB-Comp2 | |
| 5/16/2018 | 1 | LDW18-C01-CL01 | 13:12 | 40 | | | | | x |
| 5/16/2018 | 1 | LDW18-C01-CL16 | 13:25 | 41 | yes | | | LDW18-C01-CLWB-Comp2 | |
| 5/16/2018 | 1 | LDW18-C01-CL04 | 13:32 | 42 | | yes | | LDW18-C01-CLSP-Comp1 and LDW18-C01-CLRM-Comp1 | |
| 5/16/2018 | 1 | LDW18-C01-CL21 | 13:33 | 42 | yes | | | LDW18-C01-CLWB-Comp2 | |
| 5/16/2018 | 1 | LDW18-C01-CL23 | 13:21 | 49 | | | | | x |
| 5/16/2018 | 2 | LDW18-C02-CL14 | 11:03 | 23 | yes | | | LDW18-C02-CLWB-Comp2 | |
| 5/16/2018 | 2 | LDW18-C02-CL06 | 11:56 | 25 | yes | | | LDW18-C02-CLWB-Comp2 | |
| 5/16/2018 | 2 | LDW18-C02-CL18 | 11:10 | 25 | | | | | x |
| 5/16/2018 | 2 | LDW18-C02-CL11 | 11:09 | 26 | | | | | x |
| 5/16/2018 | 2 | LDW18-C02-CL16 | 11:24 | 26 | yes | | | LDW18-C02-CLWB-Comp2 | |
| 5/16/2018 | 2 | LDW18-C02-CL22 | 11:53 | 26 | | yes | | LDW18-C02-CLSP-Comp1 and LDW18-C02-CLRM-Comp1 | |
| 5/16/2018 | 2 | LDW18-C02-CL01 | 11:01 | 28 | yes | | | LDW18-C02-CLWB-Comp2 | |
| 5/16/2018 | 2 | LDW18-C02-CL04 | 11:02 | 30 | | | | | x |
| 5/16/2018 | 2 | LDW18-C02-CL10 | 10:57 | 30 | yes | | | LDW18-C02-CLWB-Comp2 | |
| 5/16/2018 | 2 | LDW18-C02-CL02 | 11:47 | 32 | | | | | x |
| 5/16/2018 | 2 | LDW18-C02-CL07 | 11:42 | 32 | | yes | | LDW18-C02-CLSP-Comp1 and LDW18-C02-CLRM-Comp1 | |
| 5/16/2018 | 2 | LDW18-C02-CL17 | 11:46 | 32 | yes | | | LDW18-C02-CLWB-Comp2 | |
| 5/16/2018 | 2 | LDW18-C02-CL20 | 11:31 | 32 | yes | | | LDW18-C02-CLWB-Comp2 | |
| 5/16/2018 | 2 | LDW18-C02-CL05 | 10:59 | 34 | yes | | | LDW18-C02-CLWB-Comp2 | |
| 5/16/2018 | 2 | LDW18-C02-CL09 | 11:34 | 35 | | | | | x |
| 5/16/2018 | 2 | LDW18-C02-CL15 | 11:57 | 36 | yes | | | LDW18-C02-CLWB-Comp2 | |
| 5/16/2018 | 2 | LDW18-C02-CL12 | 12:02 | 37 | | yes | | LDW18-C02-CLSP-Comp1 and LDW18-C02-CLRM-Comp1 | |
| 5/16/2018 | 2 | LDW18-C02-CL08 | 11:30 | 38 | yes | | | LDW18-C02-CLWB-Comp2 | |

| Collection date | Clam Tissue Collection Area ID | Clam ID | Collection Time | Width (mm) | Included in Other Risk Driver Composite? | Included in Inorganic Arsenic Composite? | Included in cPAH Porewater Investigation Area Composite? | Composite ID(s), if applicable | Extra Clam (Not Included in Composite) |
|---|---|---|---|---|---|---|---|---|---|
| 5/16/2018 | 3 | LDW18-C03-CL09 | 11:46 | 20 | | | | | x |
| 5/16/2018 | 3 | LDW18-C03-CL13 | 12:00 | 20 | | | | | x |
| 5/16/2018 | 3 | LDW18-C03-CL04 | 12:20 | 22 | yes | | | LDW18-C03-CLWB-Comp2 | |
| 5/16/2018 | 3 | LDW18-C03-CL16 | 12:28 | 22 | | | | | x |
| 5/16/2018 | 3 | LDW18-C03-CL05 | 12:28 | 23 | | yes | | LDW18-C03-CLSP-Comp1 and LDW18-C03-CLRM-Comp1 | |
| 5/16/2018 | 3 | LDW18-C03-CL06 | 11:41 | 23 | yes | | | LDW18-C03-CLWB-Comp2 | |
| 5/16/2018 | 3 | LDW18-C03-CL12 | 11:55 | 23 | yes | | | LDW18-C03-CLWB-Comp2 | |
| 5/16/2018 | 3 | LDW18-C03-CL07 | 11:43 | 24 | | | | | x |
| 5/16/2018 | 3 | LDW18-C03-CL14 | 12:20 | 24 | yes | | | LDW18-C03-CLWB-Comp2 | |
| 5/16/2018 | 3 | LDW18-C03-CL24 | 12:40 | 24 | yes | | | LDW18-C03-CLWB-Comp2 | |
| 5/16/2018 | 3 | LDW18-C03-CL17 | 12:32 | 25 | yes | | | LDW18-C03-CLWB-Comp2 | |
| 5/16/2018 | 3 | LDW18-C03-CL19 | 12:54 | 25 | | | | | x |
| 5/16/2018 | 3 | LDW18-C03-CL18 | 12:40 | 26 | | yes | | LDW18-C03-CLSP-Comp1 and LDW18-C03-CLRM-Comp1 | |
| 5/16/2018 | 3 | LDW18-C03-CL08 | 11:45 | 27 | yes | | | LDW18-C03-CLWB-Comp2 | |
| 5/16/2018 | 3 | LDW18-C03-CL11 | 11:49 | 27 | yes | | | LDW18-C03-CLWB-Comp2 | |
| 5/16/2018 | 3 | LDW18-C03-CL20 | 11:58 | 27 | yes | | | LDW18-C03-CLWB-Comp2 | |
| 5/16/2018 | 3 | LDW18-C03-CL10 | 11:50 | 28 | | yes | | LDW18-C03-CLSP-Comp1 and LDW18-C03-CLRM-Comp1 | |
| 5/16/2018 | 3 | LDW18-C03-CL15 | 12:25 | 32 | yes | | | LDW18-C03-CLWB-Comp2 | |
| 5/19/2018 | 4 | LDW18-C04-CL03 | 14:00 | 20 | | | | | x |
| 5/19/2018 | 4 | LDW18-C04-CL23 | 13:05 | 20 | | | | | x |
| 5/19/2018 | 4 | LDW18-C04-CL06 | 14:35 | 21 | | | | | x |
| 5/19/2018 | 4 | LDW18-C04-CL08 | 14:43 | 21 | | | | | x |
| 5/19/2018 | 4 | LDW18-C04-CL10 | 14:00 | 21 | yes | | | LDW18-C04-CLWB-Comp2 | |
| 5/19/2018 | 4 | LDW18-C04-CL20 | 13:21 | 21 | yes | | | LDW18-C04-CLWB-Comp2 | |
| 5/19/2018 | 4 | LDW18-C04-CL24 | 12:59 | 21 | | yes | | LDW18-C04-CLSP-Comp1 and LDW18-C04-CLRM-Comp1 | |
| 5/19/2018 | 4 | LDW18-C04-CL01 | 13:45 | 23 | yes | | | LDW18-C04-CLWB-Comp2 | |
| 5/19/2018 | 4 | LDW18-C04-CL04 | 14:16 | 23 | yes | | | LDW18-C04-CLWB-Comp2 | |
| 5/19/2018 | 4 | LDW18-C04-CL07 | 14:24 | 24 | yes | | | LDW18-C04-CLWB-Comp2 | |
| 5/19/2018 | 4 | LDW18-C04-CL16 | 12:50 | 24 | yes | | | LDW18-C04-CLWB-Comp2 | |
| 5/19/2018 | 4 | LDW18-C04-CL17 | 13:16 | 24 | | yes | | LDW18-C04-CLSP-Comp1 and LDW18-C04-CLRM-Comp1 | |
| 5/19/2018 | 4 | LDW18-C04-CL15 | 13:00 | 25 | | | | | x |
| 5/19/2018 | 4 | LDW18-C04-CL18 | 13:47 | 25 | yes | | | LDW18-C04-CLWB-Comp2 | |
| 5/19/2018 | 4 | LDW18-C04-CL02 | 14:45 | 26 | yes | | | LDW18-C04-CLWB-Comp2 | |
| 5/19/2018 | 4 | LDW18-C04-CL11 | 13:20 | 27 | yes | | | LDW18-C04-CLWB-Comp2 | |
| 5/19/2018 | 4 | LDW18-C04-CL09 | 14:15 | 28 | | yes | | LDW18-C04-CLSP-Comp1 and LDW18-C04-CLRM-Comp1 | |
| 5/19/2018 | 4 | LDW18-C04-CL21 | 13:54 | 29 | yes | | | LDW18-C04-CLWB-Comp2 | |
| 5/18/2018 | 5 | LDW18-C05-CL15 | 15:05 | 23 | | | | | x |
| 5/18/2018 | 5 | LDW18-C05-CL24 | 15:30 | 23 | yes | | | LDW18-C05-CLWB-Comp2 | |

| Collection date | Clam Tissue Collection Area ID | Clam ID | Collection Time | Width (mm) | Included in Other Risk Driver Composite? | Included in Inorganic Arsenic Composite? | Included in cPAH Porewater Investigation Area Composite? | Composite ID(s), if applicable | Extra Clam (Not Included in Composite) |
|---|---|---|---|---|---|---|---|---|---|
| 5/18/2018 | 5 | LDW18-C05-CL06 | 14:59 | 24 | yes | | | LDW18-C05-CLWB-Comp2 | |
| 5/18/2018 | 5 | LDW18-C05-CL19 | 14:50 | 24 | | yes | | LDW18-C05-CLSP-Comp1 and LDW18-C05-CLRM-Comp1 | |
| 5/18/2018 | 5 | LDW18-C05-CL03 | 15:05 | 25 | | | | | x |
| 5/18/2018 | 5 | LDW18-C05-CL05 | 15:30 | 25 | yes | | | LDW18-C05-CLWB-Comp2 | |
| 5/18/2018 | 5 | LDW18-C05-CL09 | 14:48 | 25 | | | | | x |
| 5/18/2018 | 5 | LDW18-C05-CL18 | 14:50 | 25 | yes | | | LDW18-C05-CLWB-Comp2 | |
| 5/18/2018 | 5 | LDW18-C05-CL23 | 15:30 | 25 | | yes | | LDW18-C05-CLSP-Comp1 and LDW18-C05-CLRM-Comp1 | |
| 5/18/2018 | 5 | LDW18-C05-CL01 | 15:20 | 26 | yes | | | LDW18-C05-CLWB-Comp2 | |
| 5/18/2018 | 5 | LDW18-C05-CL16 | 15:00 | 26 | yes | | | LDW18-C05-CLWB-Comp2 | |
| 5/18/2018 | 5 | LDW18-C05-CL07 | 15:07 | 27 | yes | | | LDW18-C05-CLWB-Comp2 | |
| 5/18/2018 | 5 | LDW18-C05-CL04 | 14:43 | 29 | | | | | x |
| 5/18/2018 | 5 | LDW18-C05-CL13 | 15:05 | 29 | yes | | | LDW18-C05-CLWB-Comp2 | |
| 5/18/2018 | 5 | LDW18-C05-CL17 | 15:20 | 32 | | yes | | LDW18-C05-CLSP-Comp1 and LDW18-C05-CLRM-Comp1 | |
| 5/18/2018 | 5 | LDW18-C05-CL10 | 15:32 | 33 | yes | | | LDW18-C05-CLWB-Comp2 | |
| 5/18/2018 | 5 | LDW18-C05-CL14 | 14:55 | 33 | | | | | x |
| 5/18/2018 | 5 | LDW18-C05-CL02 | 14:41 | 40 | yes | | | LDW18-C05-CLWB-Comp2 | |
| 5/15/2018 | 6 | LDW18-C06-CL03 | 11:00 | 20 | | | | | x |
| 5/15/2018 | 6 | LDW18-C06-CL01 | 10:45 | 22 | yes | | | LDW18-C06-CLWB-Comp2 | |
| 5/15/2018 | 6 | LDW18-C06-CL08 | 11:26 | 22 | | yes | | LDW18-C06-CLSP-Comp1 and LDW18-C06-CLRM-Comp1 | |
| 5/15/2018 | 6 | LDW18-C06-CL12 | 11:03 | 22 | | | | | x |
| 5/15/2018 | 6 | LDW18-C06-CL11 | 10:58 | 23 | yes | | | LDW18-C06-CLWB-Comp2 | |
| 5/15/2018 | 6 | LDW18-C06-CL16 | 11:55 | 23 | yes | | | LDW18-C06-CLWB-Comp2 | |
| 5/15/2018 | 6 | LDW18-C06-CL07 | 11:18 | 24 | | | | | x |
| 5/15/2018 | 6 | LDW18-C06-CL13 | 11:12 | 24 | yes | | | LDW18-C06-CLWB-Comp2 | |
| 5/15/2018 | 6 | LDW18-C06-CL21 | 11:48 | 24 | yes | | | LDW18-C06-CLWB-Comp2 | |
| 5/15/2018 | 6 | LDW18-C06-CL10 | 11:49 | 25 | | | | | x |
| 5/15/2018 | 6 | LDW18-C06-CL14 | 11:15 | 25 | | yes | | LDW18-C06-CLSP-Comp1 and LDW18-C06-CLRM-Comp1 | |
| 5/15/2018 | 6 | LDW18-C06-CL15 | 11:25 | 25 | | | | | x |
| 5/15/2018 | 6 | LDW18-C06-CL19 | 11:40 | 25 | yes | | | LDW18-C06-CLWB-Comp2 | |
| 5/15/2018 | 6 | LDW18-C06-CL02 | 10:48 | 27 | yes | | | LDW18-C06-CLWB-Comp2 | |
| 5/15/2018 | 6 | LDW18-C06-CL09 | 11:37 | 27 | yes | | | LDW18-C06-CLWB-Comp2 | |
| 5/15/2018 | 6 | LDW18-C06-CL06 | 11:05 | 33 | yes | | | LDW18-C06-CLWB-Comp2 | |
| 5/15/2018 | 6 | LDW18-C06-CL18 | 11:36 | 34 | | yes | | LDW18-C06-CLSP-Comp1 and LDW18-C06-CLRM-Comp1 | |
| 5/15/2018 | 6 | LDW18-C06-CL17 | 11:33 | 39 | yes | | | LDW18-C06-CLWB-Comp2 | |
| 5/15/2018 | 7 | LDW18-C07-CL04 | 11:28 | 16 | | | | | x |
| 5/15/2018 | 7 | LDW18-C07-CL02 | 10:50 | 20 | | yes | | LDW18-C07-CLSP-Comp1 and LDW18-C07-CLRM-Comp1 | |
| 5/15/2018 | 7 | LDW18-C07-CL01 | 10:45 | 24 | | yes | | LDW18-C07-CLSP-Comp1 and LDW18-C07-CLRM-Comp1 | |
| 5/15/2018 | 7 | LDW18-C07-CL03 | 10:49 | 25 | | yes | | LDW18-C07-CLSP-Comp1 and LDW18-C07-CLRM-Comp1 | |

| Collection date | Clam Tissue Collection Area ID | Clam ID | Collection Time | Width (mm) | Included in Other Risk Driver Composite? | Included in Inorganic Arsenic Composite? | Included in cPAH Porewater Investigation Area Composite? | Composite ID(s), if applicable | Extra Clam (Not Included in Composite) |
|---|---|---|---|---|---|---|---|---|---|
| 5/18/2018 | 8 | LDW18-C08-CL04 | 13:20 | 22 | yes | | | LDW18-C08-CLWB-Comp2 | |
| 5/18/2018 | 8 | LDW18-C08-CL06 | 12:23 | 22 | | | | | x |
| 5/18/2018 | 8 | LDW18-C08-CL14 | 12:50 | 22 | | yes | | LDW18-C08-CLSP-Comp1 and LDW18-C08-CLRM-Comp1 | |
| 5/18/2018 | 8 | LDW18-C08-CL07 | 12:22 | 23 | yes | | | LDW18-C08-CLWB-Comp2 | |
| 5/18/2018 | 8 | LDW18-C08-CL08 | 12:25 | 25 | | | | | x |
| 5/18/2018 | 8 | LDW18-C08-CL12 | 12:54 | 25 | yes | | | LDW18-C08-CLWB-Comp2 | |
| 5/18/2018 | 8 | LDW18-C08-CL19 | 12:50 | 26 | | | | | x |
| 5/18/2018 | 8 | LDW18-C08-CL20 | 12:52 | 26 | yes | | | LDW18-C08-CLWB-Comp2 | |
| 5/18/2018 | 8 | LDW18-C08-CL13 | 12:53 | 28 | yes | | | LDW18-C08-CLWB-Comp2 | |
| 5/18/2018 | 8 | LDW18-C08-CL16 | 12:48 | 28 | | | | | x |
| 5/18/2018 | 8 | LDW18-C08-CL05 | 12:21 | 29 | yes | | | LDW18-C08-CLWB-Comp2 | |
| 5/18/2018 | 8 | LDW18-C08-CL09 | 12:29 | 29 | | yes | | LDW18-C08-CLSP-Comp1 and LDW18-C08-CLRM-Comp1 | |
| 5/18/2018 | 8 | LDW18-C08-CL15 | 12:52 | 29 | yes | | | LDW18-C08-CLWB-Comp2 | |
| 5/18/2018 | 8 | LDW18-C08-CL02 | 12:02 | 30 | | | | | x |
| 5/18/2018 | 8 | LDW18-C08-CL03 | 13:01 | 31 | yes | | | LDW18-C08-CLWB-Comp2 | |
| 5/18/2018 | 8 | LDW18-C08-CL01 | 11:55 | 32 | yes | | | LDW18-C08-CLWB-Comp2 | |
| 5/18/2018 | 8 | LDW18-C08-CL17 | 12:50 | 33 | | yes | | LDW18-C08-CLSP-Comp1 and LDW18-C08-CLRM-Comp1 | |
| 5/18/2018 | 8 | LDW18-C08-CL10 | 12:30 | 34 | yes | | | LDW18-C08-CLWB-Comp2 | |
| 5/17/2018 | 9 | LDW18-C09-CL01 | 12:30 | 22 | | yes | | LDW18-C09-CLSP-Comp1 and LDW18-C09-CLRM-Comp1 | |
| 5/17/2018 | 9 | LDW18-C09-CL05 | 13:35 | 22 | | yes | | LDW18-C09-CLSP-Comp1 and LDW18-C09-CLRM-Comp1 | |
| 5/17/2018 | 9 | LDW18-C09-CL07 | 13:05 | 25 | | | | | x |
| 5/17/2018 | 9 | LDW18-C09-CL06 | 12:00 | 33 | | yes | | LDW18-C09-CLSP-Comp1 and LDW18-C09-CLRM-Comp1 | |
| 5/17/2018 | 10 | LDW18-C10-CL02 | 13:31 | 19 | | | | | x |
| 5/17/2018 | 10 | LDW18-C10-CL01 | 12:13 | 23 | yes | | | LDW18-C10-CLWB-Comp2 | |
| 5/17/2018 | 10 | LDW18-C10-CL05 | 12:28 | 23 | | yes | | LDW18-C10-CLSP-Comp1 and LDW18-C10-CLRM-Comp1 | |
| 5/17/2018 | 10 | LDW18-C10-CL09 | 13:07 | 23 | yes | | | LDW18-C10-CLWB-Comp2 | |
| 5/17/2018 | 10 | LDW18-C10-CL14 | 13:22 | 23 | yes | | | LDW18-C10-CLWB-Comp2 | |
| 5/17/2018 | 10 | LDW18-C10-CL03 | 14:20 | 27 | | | | | x |
| 5/17/2018 | 10 | LDW18-C10-CL11 | 13:21 | 27 | yes | | | LDW18-C10-CLWB-Comp2 | |
| 5/17/2018 | 10 | LDW18-C10-CL10 | 13:46 | 30 | | yes | | LDW18-C10-CLSP-Comp1 and LDW18-C10-CLRM-Comp1 | |
| 5/17/2018 | 10 | LDW18-C10-CL12 | 13:35 | 31 | yes | | | LDW18-C10-CLWB-Comp2 | |
| 5/17/2018 | 10 | LDW18-C10-CL13 | 13:39 | 33 | yes | | | LDW18-C10-CLWB-Comp2 | |
| 5/17/2018 | 10 | LDW18-C10-CL19 | 13:43 | 34 | yes | | | LDW18-C10-CLWB-Comp2 | |
| 5/17/2018 | 10 | LDW18-C10-CL04 | 13:39 | 35 | | | | | x |
| 5/17/2018 | 10 | LDW18-C10-CL06 | 13:52 | 35 | yes | | | LDW18-C10-CLWB-Comp2 | |
| 5/17/2018 | 10 | LDW18-C10-CL08 | 13:42 | 35 | | yes | | LDW18-C10-CLSP-Comp1 and LDW18-C10-CLRM-Comp1 | |
| 5/17/2018 | 10 | LDW18-C10-CL07 | 12:59 | 36 | yes | | | LDW18-C10-CLWB-Comp2 | |
| 5/17/2018 | 10 | LDW18-C10-CL18 | 12:57 | 37 | yes | | | LDW18-C10-CLWB-Comp2 | |

| Collection date | Clam Tissue Collection Area ID | Clam ID | Collection Time | Width (mm) | Included in Other Risk Driver Composite? | Included in Inorganic Arsenic Composite? | Included in cPAH Porewater Investigation Area Composite? | Composite ID(s), if applicable | Extra Clam (Not Included in Composite) |
|---|---|---|---|---|---|---|---|---|---|
| 5/18/2018 | 11 | LDW18-C11-CL22 | 13:53 | 22 | | | | | x |
| 5/18/2018 | 11 | LDW18-C11-CL23 | 13:40 | 22 | yes | | | LDW18-C11-CLWB-Comp2 | |
| 5/18/2018 | 11 | LDW18-C11-CL14 | 13:23 | 23 | yes | | | LDW18-C11-CLWB-Comp2 | |
| 5/18/2018 | 11 | LDW18-C11-CL16 | 13:40 | 24 | | yes | | LDW18-C11-CLSP-Comp1 and LDW18-C11-CLRM-Comp1 | |
| 5/18/2018 | 11 | LDW18-C11-CL06 | 12:57 | 25 | | | | | x |
| 5/18/2018 | 11 | LDW18-C11-CL21 | 13:37 | 25 | yes | | | LDW18-C11-CLWB-Comp2 | |
| 5/18/2018 | 11 | LDW18-C11-CL01 | 13:10 | 26 | yes | | | LDW18-C11-CLWB-Comp2 | |
| 5/18/2018 | 11 | LDW18-C11-CL18 | 13:35 | 27 | yes | | | LDW18-C11-CLWB-Comp2 | |
| 5/18/2018 | 11 | LDW18-C11-CL13 | 13:02 | 30 | | | | | x |
| 5/18/2018 | 11 | LDW18-C11-CL02 | 12:33 | 32 | yes | | | LDW18-C11-CLWB-Comp2 | |
| 5/18/2018 | 11 | LDW18-C11-CL03 | 13:22 | 32 | yes | | | LDW18-C11-CLWB-Comp2 | |
| 5/18/2018 | 11 | LDW18-C11-CL04 | 13:27 | 32 | | yes | | LDW18-C11-CLSP-Comp1 and LDW18-C11-CLRM-Comp1 | |
| 5/18/2018 | 11 | LDW18-C11-CL19 | 12:47 | 32 | | | | | x |
| 5/18/2018 | 11 | LDW18-C11-CL24 | 13:53 | 34 | yes | | | LDW18-C11-CLWB-Comp2 | |
| 5/18/2018 | 11 | LDW18-C11-CL05 | 12:52 | 35 | yes | | | LDW18-C11-CLWB-Comp2 | |
| 5/18/2018 | 11 | LDW18-C11-CL07 | 13:05 | 35 | | yes | | LDW18-C11-CLSP-Comp1 and LDW18-C11-CLRM-Comp1 | |
| 5/18/2018 | 11 | LDW18-C11-CL20 | 13:32 | 35 | | | | | x |
| 5/18/2018 | 11 | LDW18-C11-CL17 | 13:28 | 36 | yes | | | LDW18-C11-CLWB-Comp2 | |

# Tissue Preparation Notes

**Analytical Resources, Incorporated**
Analytical Chemists and Consultants

# Organic Extractions
# Prep Sheet Notes

Extraction Parameter: Tissue Prep

Element Batch: BGF0686 WorkOrder(s): 18F0364

Matrix: Tissue

1. Shuck, rinse, and weigh each individual clam.
2. Composite and homogenize each group of ten clams into Area composites (C01, C02, etc.) accordingly.
3. Take 25 g from each Area ID and composite into segment composite (composite of composites).
   Take 25g from C01, C02, and C03 composited to make 75g of S1.
   Take 25g from C04, C05, and C06 composited to make 75g of S2.
   Take 25g from C08, C10, and C11 composited to make 75g of S3.
4. Take 40g from each of the nine Area composites (C01, C02, etc.) and put in new jar and return to sample receiving.
5. Take 10g from each segment composite (S1, S2, and S3) and put in new jar and return to sample receiving.

Record weights on next page.

Prep Start Time: 9:30 Prep End Time: 17:15

Analyst/Date: YL/CT 06/28/18 Balance ID: B3347059341

**Special Instructions:**

6/22/18

Record weights of individual clams and area composites.

| Sample 18F0364-01 | 362.66g |
|---|---|
| Area: C01 | Weights |
| LDW18-C01-CL03 | 19.96 g |
| LDW18-C01-CL07 | 18.55 |
| LDW18-C01-CL06 | 22.82 |
| LDW18-C01-CL15 | 22.95 |
| LDW18-C01-CL24 | 28.33 |
| LDW18-C01-CL17 | 33.75 |
| LDW18-C01-CL19 | 45.66 |
| LDW18-C01-CL20 | 56.67 |
| LDW18-C01-CL16 | 61.26 |
| LDW18-C01-CL21 | 61.15 |

| Sample 18F0364-02 | 317.23g |
|---|---|
| Area: C02 | Weights |
| LDW18-C02-CL14 | 17.47 g |
| LDW18-C02-CL06 | 21.42 |
| LDW18-C02-CL16 | 12.17 |
| LDW18-C02-CL01 | 35.45 |
| LDW18-C02-CL10 | 35.57 |
| LDW18-C02-CL17 | 48.63 |
| LDW18-C02-CL20 | 28.71 |
| LDW18-C02-CL05 | 44.22 |
| LDW18-C02-CL15 | 28.68 |
| LDW18-C02-CL08 | 54.11 |

| Sample 18F0364-03 | 169.35 |
|---|---|
| Area: C03 | Weights |
| LDW18-C03-CL04 | 11.67 |
| LDW18-C03-CL06 | 19.67 |
| LDW18-C03-CL12 | 11.27 |
| LDW18-C03-CL14 | 8.96 |
| LDW18-C03-CL24 | 17.99 |
| LDW18-C03-CL17 | 15.55 |
| LDW18-C03-CL08 | 26.72 |
| LDW18-C03-CL11 | 22.27 |
| LDW18-C03-CL20 | 22.93 |
| LDW18-C03-CL15 | 24.86 |

| Sample 18F0364-04 | 150.21 |
|---|---|
| Area: C04 | Weights |
| LDW18-C04-CL10 | 9.56 g |
| LDW18-C04-CL20 | 6.83 |
| LDW18-C04-CL01 | 13.45 |
| LDW18-C04-CL04 | 11.40 |
| LDW18-C04-CL07 | 15.42 |
| LDW18-C04-CL16 | 15.75 |
| LDW18-C04-CL18 | 19.49 |
| LDW18-C04-CL02 | 21.90 |
| LDW18-C04-CL11 | 18.54 |
| LDW18-C04-CL21 | 27.16 |

| Sample 18F0364-05 | 236.04 |
|---|---|
| Area: C05 | Weights |
| LDW18-C05-CL24 | 9.41 |
| LDW18-C05-CL06 | 12.38 |
| LDW18-C05-CL05 | 13.76 |
| LDW18-C05-CL18 | 22.40 |
| LDW18-C05-CL01 | 15.81 |
| LDW18-C05-CL16 | 19.88 |
| LDW18-C05-CL07 | 20.92 |
| LDW18-C05-CL13 | 44.10 |
| LDW18-C05-CL10 | 36.32 |
| LDW18-C05-CL02 | 51.70 |

| Sample 18F0364-06 | 216.00g |
|---|---|
| Area: C06 | Weights |
| LDW18-C06-CL01 | 14.74 |
| LDW18-C06-CL11 | 12.17 |
| LDW18-C06-CL16 | 14.32 |
| LDW18-C06-CL13 | 14.36 |
| LDW18-C06-CL21 | 15.83 |
| LDW18-C06-CL19 | 11.61 |
| LDW18-C06-CL02 | 26.69 |
| LDW18-C06-CL09 | 31.17 |
| LDW18-C06-CL06 | 42.27 |
| LDW18-C06-CL17 | 48.68 |

Record weights of individual clams and area composites.

| Sample 18F0364-07 | 255.67 |
|---|---|
| Area: C08 | Weights |
| LDW18-C08-CL04 | 12.79 |
| LDW18-C08-CL07 | 13.49 |
| LDW18-C08-CL12 | 17.31 |
| LDW18-C08-CL20 | 15.56 |
| LDW18-C08-CL13 | 25.44 |
| LDW18-C08-CL05 | 21.28 |
| LDW18-C08-CL15 | 44.77 |
| LDW18-C08-CL03 | 39.05 |
| LDW18-C08-CL01 | 34.79 |
| LDW18-C08-CL10 | 40.69 |

| Sample 18F0364-08 | 254.52 |
|---|---|
| Area: C10 | Weights |
| LDW18-C10-CL01 | 11.83 |
| LDW18-C10-CL09 | 9.66 |
| LDW18-C10-CL14 | 9.45 |
| LDW18-C10-CL11 | 39.42 |
| LDW18-C10-CL12 | 19.25 |
| LDW18-C10-CL13 | 33.03 |
| LDW18-C10-CL19 | 48.38 |
| LDW18-C10-CL06 | 14.19 |
| LDW18-C10-CL07 | 36.68 |
| LDW18-C10-CL18 | 46.05 |

| Sample 18F0364-09 | 247.43 |
|---|---|
| Area: C11 | Weights |
| LDW18-C11-CL23 | 7.44 |
| LDW18-C11-CL14 | 19.72 |
| LDW18-C11-CL21 | 24.45 |
| LDW18-C11-CL01 | 15.12 |
| LDW18-C11-CL18 | 17.65 |
| LDW18-C11-CL02 | 31.37 |
| LDW18-C11-CL03 | 26.30 |
| LDW18-C11-CL24 | 19.95 |
| LDW18-C11-CL05 | 48.21 |
| LDW18-C11-CL17 | 43.22 |