Golder Associates Inc.

1750 Abbott Road, Suite 200
Anchorage, AK USA 99507-3443
Telephone (907) 344-6001
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725-883-0777

June 3, 2002 023-5524

Alaska Department of Transportation & Public Facilities
6860 Glacier Highway
Juneau, AK 99801

Attention: Mr. Jim Heumann

RE: RESULTS OF INTERTIDAL CLAM TISSUE CHEMICAL ANALYSIS SITKA, ALASKA

Dear Jim:

This letter presents results of preliminary sampling and analysis of clams from the intertidal zone of the Sitka Sportsmen Association shooting range in Starrigavan Bay. Accompanying this letter are a CAD drawing (Figure 1) and photos illustrating the location from which the samples were obtained. The drawing and photos also illustrate the relation of the clam tissue sample locations and adjacent features. Michael Kyte, Senior Marine Biologist, took the photos during sampling.

1. INTRODUCTION

The Alaska Department of Transportation and Public Facilities (ADOT&PF) requested that Golder Associates Inc. (Golder) conduct a preliminary study on levels of metal contamination in intertidal clams adjacent to the Sitka Sportsmen Association (SSA) trap and skeet shooting range in Starrigavan Bay. This work was performed at the request of the Alaska Department of Fish and Game (ADF&G) concurrent with another study by ADOT&PF of intertidal sediment, eelgrass distribution, and upland soil in and near the Allen Marine Shipyard north of the shooting range and across No Name Creek. The results of the studies at the Allen Marine Shipyard are presented separately as they were discrete tasks.

2. METHODS

Clams were sampled by digging by hand during a low tide in the intertidal zone on March 30, 2002. Locations for sampling were initially specified by ADOT&PF, but some of these

locations were unsuitable because of the lack of harvestable clams. Thus, clam samples were obtained from only two locations ("Clam 1" and "Clam 2," Figure 1), and a sample of mussels was taken at "Clam 3" (Figure 1). The clam locations were at an approximate elevation of 1 foot below mean lower low water (MLLW). The mussels were taken from near the high tide line.

Geographic coordinates for each sampling location were determined using a handheld global positioning system receiver (GPS) (Table 1). The GPS instrument featured a position averaging capability enhancing the resolution of each position to approximately 10 feet.

TABLE 1
Clam sample locations (Alaska Zone 1, NAD83)

Sample Number	Latitude	Longitude	Northing (ft)	Easting (ft)
Clam 1	57°07'40.8"	135°23'06.8"	1937866	2344531
Clam 2	57°07'40.9"	135°23'06.3"	1937875	2344559
Clam 3 (mussels)	57°07'40.9"	135°23'00.5"	1937867	2344879

Shellfish samples were sent to Columbia Analytical Services in Kelso, Washington for analysis of metal concentrations only. Analysis methods are indicated in the attached laboratory report.

3. RESULTS AND DISCUSSION

As stated previously, despite a thorough search, clam species that are harvested in the recreational fishery and that were suitable for tissue analysis were found at only two locations, 'Clam 1' and 'Clam 2.' These were on an intertidal spit seaward of the south side of the shooting range (Figure 1). At each of these locations, a 1-gallon plastic freezer bag was filled with clams. The predominant species at both locations were "Pacific littleneck" (*Protothaca staminea*) and "Washington butterclam" (*Saxidomus gigantea*). Littleneck clams were preferentially selected as the species that is usually the preferred target for recreational and subsistence harvesters.

The spit on which the two clam samples were taken is also the site of active clam harvesting. This is evidenced by both the presence of harvesters (see photo) and the presence of shell debris and disturbed ground and holes caused by digging activities (see photos).

At a third location ('Clam 3,' Figure 1), blue mussels (*Mytilus trossulus*) were taken for a third sample and for the same analysis as the clam samples. While mussels probably are

not routinely harvested for recreational or subsistence purposes, they are important indicators for environmental contamination. For example, a national "Mussel Watch" program conducted by the National Status and Trends Program (NSTP) regularly samples blue mussels nationwide to monitor marine water contamination trends[1]. Data for 1997 from a NTSP Mussel Watch station near Ketchikan are in Table 2 for comparison.

The results of laboratory analyses are presented in Table 2, along with NTSP Mussel Watch data.

TABLE 2
Clam Tissue Chemical Analysis Results
(concentrations in parts per million)

ANALYTES	CLAM SAMPLES			MUSSEL SAMPLES	
	Clam 1	Clam 2	Risk-Based Concentration	Clam 3 (mussels)	NSTP-Ketchikan
Antimony	0.008	0.008	0.054	0.003	NA
Arsenic	1.72	2.02	0.0021	1.57	8.3
Cadmium	0.153	0.161	0.14	0.518	3.61
Chromium	0.5	0.6	200	0.6	0
Copper	0.955	0.946	5.4	0.893	13.8
Lead	16.3	27.2	1.7[2]	0.846	0.22
Mercury	0.005	0.006	0.014	0.010	0.044
Nickel	0.69	0.75	2.7	0.44	0.7
Silver	0.022	0.014	0.68	0.003	0
Zinc	10.2	10.6	41	12.0	88

Notes: - NA: Antimony was not included in NSTP's analyte list.
- See Text for discussion of risk based concentrations.

[1] National Oceanic and Atmospheric Administration (NOAA). 1998 (on-line). "Chemical Contaminants in Oysters and Mussels" by Tom O'Connor. NOAA's State of the Coast Report. Silver Spring, MD: NOAA. http://state-of-coast.noaa.gov/bulletins/html/ccom_05/ccom.html

[2] EPA Region III does not establish a RBC for lead. The value of 1.7 ppm is the U.S. Food and Drug Administration's "level of concern" for lead in shellfish based on a lead consumption of 15 grams per day and a provisional tolerable total intake level of 25 micrograms per day by pregnant women.
U.S. Food and Drug Administration. 1993. Guidance Document for Lead in Shellfish. Center for Food Safety and Applied Nutrition. August 1993. http://www.cfsan.fda.gov/~frf/guid-pb.html

As seen from Table 2, the concentration of lead in clam tissue was substantially higher than the mussels. The levels of other contaminants (e.g., arsenic, chromium, copper, and zinc) were similar in the three samples. Clam and mussel exposure to contamination from lead present in the sediment would vary, with clams having greater exposure as they ingest sediment during feeding and respiration because their siphon tips are at the sediment surface. The mussels were located above the sediment on larger rocks in the upper intertidal zone. Thus, exposure of the mussels would be largely restricted to contaminants carried by water and for less time each day than the clams.

Abundant remains of clay pigeons and the orientation of the SSA facilities indicate that shooting is conducted away from shore and over the intertidal zone. Thus, the source of lead in the intertidal zone is likely the shooting range.

Sources of other metals including arsenic, chromium, copper, and zinc found in the clam and mussel samples could be one or more of the following:

- No Name Creek and upstream mineral (e.g., gold and arsenic) deposits
- Allen Marine Shipyard
- The Alaska Marine Ferry Terminal
- The tug and barge shipping facility on the north side of the Alaska Marine Ferry terminal
- Other natural and industrial sources in Starrigavan Bay and Sitka Sound

The relationship of the SSA results to these other potential sources was not evaluated as part of this study. However, elevated levels of metals could be the result of dust and other debris containing metals that may be transported to the clam sampling locations by wind, tidal currents, or both.

The NSTP information in Table 2 indicates that the metal concentrations found in the mussel sample are not unusual and could probably be viewed as "normal." The variations seen between the Ketchikan and Sitka mussel data could be due to natural variation, the influence of local sources, or both. The fact that the concentration of lead is slightly higher (0.846 ppm versus 0.22 ppm in NSTP data) could indicate that the mussels are ingesting some lead particles suspended by wave action.

Table 2 includes risk-based concentrations (RBCs) for shellfish tissue. These RBCs were used in a previous study on contaminated shellfish in Puget Sound[3] and are based on data issued by Region III of the U.S. Environmental Protection Agency (EPA)[4]. The RBCs were

[3] Kyte, Michael A. and Sharon Quiring. 1999. A Preliminary Investigation of Geoduck (*Panope abrupta*) Tissue Chemistry for the Kingston Wastewater Treatment Plant Outfall Project. Report prepared for CH2M HILL and Kitsap County.

[4] U.S.EPA. 2000. Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories. Volume 2. Risk Assessment and Fish Consumption Limits. Third Edition. EPA 823-B-00-008. http://www.epa.gov/waterscience/fishadvice/volume2/index.html#2

based on a consumption scenario that assumed a minimum shellfish consumption of 54 grams (1.9 ounces) per day.

It must be noted that the results presented in this letter and in Table 2 are preliminary and based only on two samples. A human health risk assessment cannot and should not be conducted using such a small data set and without data on concentrations of contaminants in the water and sediment within the study area. However, because the clams in the study area are regularly harvested[5], it is important to recognize that a potential health risk, especially to children and pregnant women, may exist from consumption of clams at the SSA site as indicated by concentrations of arsenic, a known carcinogen, and lead, a physiological toxin, that exceed the RBC values presented in Table 2.

4. CLOSURE

Thank you for this opportunity to assist ADOT&PF and ADF&G with this investigation. We hope the results presented in this letter are helpful. Please feel free to contact Michael Kyte by phone (425) 883-0777 or email (mkyte@golder.com) with any questions or comments on the clam tissue study.

Sincerely,

Mark R. Musial, P.E.
Associate and Project Manager

Michael A. Kyte
Senior Marine Biologist

Attachments: Figure 1 - Clam Sample Locations
Photo Log (Photos 1-3 Illustrating Clam Tissue Sample Area)
Attachment 1 - Selected Summary Pages from Laboratory Report

C:\02-2q\jobs\023-5524\ClamTissueFinal.doc

[5] Laquire, Robert. 2002. Sitka Sportsmen Association. Personal communication to Michael Kyte, Golder Associates. March 30, 2002.

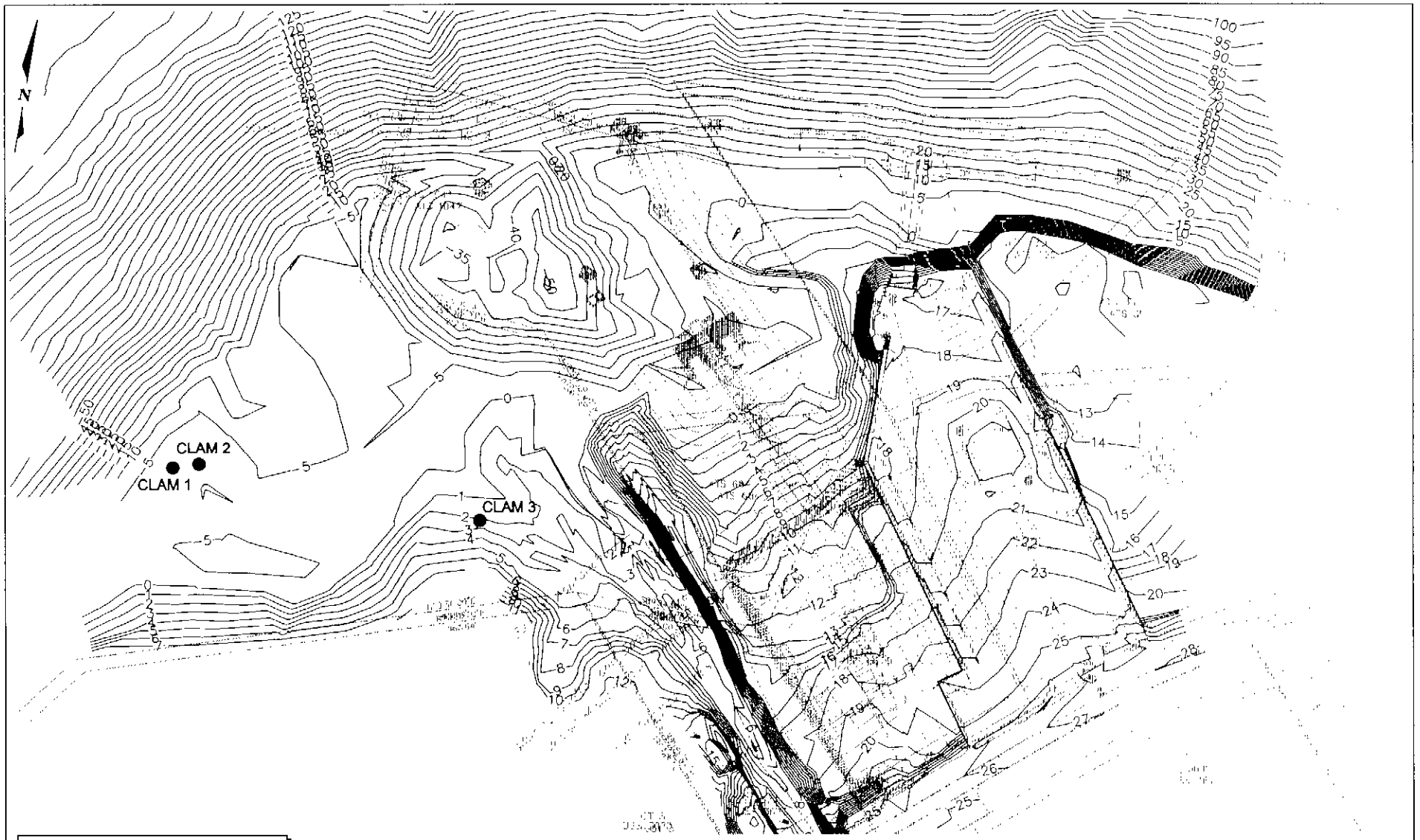

FIGURE 1

CLAM SAMPLE LOCATIONS

ADOT-PF/SITKA FERRY TERMINAL/AK

Golder Associates

PHOTO 1: Clam Harvesters at the same location from which clam tissue samples were taken. Photo taken on Saturday, March 30, 2002.

PHOTO 2: Golder Associates biologists (M. Kyte – foreground, M. Evans) sampling clams on April 1, 2002. Note the Alaska Ferry Terminal and a container shipping facility in the background. The Allen Marine Shipyard is between the sampling location and the ferry terminal. The abundant shell debris and disturbed ground is a result of clam harvesting.

Photo 3: Golder Associates biologists sampling clams on April 1, 2002. Note the Sitka Sportsmen Association shooting range in the background.

ACCREDITED IN ACCORDANCE WITH

Columbia Analytical Services INC.
An Employee-Owned Company

May 3, 2002

Service Request No: K2202038

Mark Musial
Golder Associates, Inc.
1750 Abbott Road, Suite 200
Anchorage, AK 99507

Re: Sitka Dredge/023-5524

Dear Mark:

Enclosed are the results of the sample(s) submitted to our laboratory on April 2, 2002. For your reference, these analyses have been assigned our service request number K2202038.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAC standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3372.

Respectfully submitted,

Columbia Analytical Services, Inc.

Jim Smith
Project Chemist

JS/afs

317 South 13th Avenue • P.O. Box 479 • Kelso, Washington 98626 • Telephone 360/ 577-7222 • Fax 36

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
i	The MRL/MDL has been elevated due to a matrix interference.
X	See case narrative.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
B	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL has been elevated due to a matrix interference.
X	See case narrative.
*	The duplicate analysis not within control limits. See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results (25% for CLP Pesticides).
U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
i	The MRL/MDL has been elevated due to a chromatographic interference.
X	See case narrative.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Golder Associates, Inc.	**Service Request No.:**	K2202038
Project:	Sitka Dredge	**Date Received:**	4/2/02
Sample Matrix:	Sediment		

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for samples designated for Tier III validation deliverables including summary forms and all of the associated raw data for each of the analyses. When appropriate to the method, method blank results have been reported with each analytical test.

Sample Receipt

Six samples were received for analysis at Columbia Analytical Services on 4/2/02. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

Inorganic Parameters

No anomalies associated with the analysis of these samples were observed.

Total Metals Sediment

Relative Percent Difference (RPD) Exceptions:
The Relative Percent Differences (RPD) for the replicate analysis of Antimony and Cadmium in sample ITZ 1 (K2202038-001) were outside the normal CAS control limits. The variability in the results is attributed to the heterogeneous character these analytes of the sample. Mixing techniques within the scope of the EPA methodology were used, but were not sufficient for complete homogenization of this sample.

Matrix Spike (MS) Exceptions:
The low Matrix Spike (MS) recovery of Antimony is a result of a method defect in the EPA 3050B-digestion procedure that can be magnified by certain matrix components. The associated QA/QC (i.e. LCS) indicate the analysis was in control. No further corrective action was taken.

The low Matrix Spike (MS) recovery of Cadmium for sample ITZ 1 is a result of the heterogeneous character this analyte in the sample (see high RPD note above). The associated Laboratory Control Sample (LCS) was acceptable indicating the analysis was in control. No further corrective action was taken.

The Matrix Spike (MS) recovery criteria for Copper, Lead and Zinc for sample ITZ 1 are not applicable. The analyte concentrations in the sample were significantly higher than the added spike concentrations, preventing accurate evaluation of the spike recoveries.

No other anomalies associated with the analysis of these samples were observed.

Total Metals Tissue

No anomalies associated with the analysis of these samples were observed.

Approved by _____ **Date** 5/2/02

Organochlorine Pesticides by EPA Method 8081A

Method Reporting Limit (MRL) Exceptions:
The Method Reporting Limits have been elevated for 4,4'-DDE and 4,4'-DDT in samples ITZ 1 and ITZ2. The chromatogram indicated non-target components that prevented accurate quantification at the reporting limit. The results have been flagged to indicate the matrix interference. All efforts were made through various clean-up methods to reduce the matrix interference however the screening level of 6.9ppb for total DDT could not be met due to this interference.

No other anomalies associated with the analysis of these samples were observed.

PCB Aroclors by EPA Method 8082

No anomalies associated with the analysis of these samples were observed.

Organotin Compounds

Sample Notes and Discussion:
The initial porewater extraction did not yield enough water for porewater analysis. Per Golder the analysis for Organotin would be performed on the soil and reported on a total basis.

Results for the Organotins will be reported at a later date.

Volatile Organic Compounds by EPA Method 8260B

Initial Calibration (ICAL) Exceptions:
The primary evaluation criterion was exceeded for the following analytes in Initial Calibration (ICAL) ID 1479: 2-Butanone (MEK), Tetrachloroethene (PCE) and sec-Butylbenzene. In accordance with CAS standard operating procedures and as specified in the analytical method, an alternative evaluation was performed using the average relative standard deviation of all analytes in the calibration. The calibration meets the alternative evaluation criteria.

Surrogate Exceptions:
The upper control criterion was exceeded for the following surrogate(s) in samples ITZ 1, ITZ 2, ITZ 3 and MB KWG0202342-4: Toluene-d8. No target analytes were detected above the Method Reporting Limit in the samples. The error associated with an elevated recovery equates to a high bias. The quality of the sample data has not been significantly affected. No further corrective action was feasible.

The upper control criterion was exceeded for the following surrogate in ITZ 3MS KWG0202342-4, ITZ 3DMS KWG0202342-5, LCS KWG0202342-3: Toluene-d8. The associated matrix spike recoveries of target compounds were in control, indicating the analysis was in control. The surrogate outlier has been flagged accordingly. No further corrective action was feasible.

No other anomalies associated with the analysis of these samples were observed.

Semivolatile Organic Compounds by EPA Method 8270C

Initial Calibration (ICAL) Exceptions:
The primary evaluation criterion was exceeded for the following analytes in Initial Calibration (ICAL) ID CAL1435: Benzoic Acid, Pentachlorophenol, N-Nitrosodi-n-propylamine, and Hexachlorocyclopentadiene. In accordance with CAS standard operating procedures and as specified in the analytical method, an alternative evaluation was performed using the average relative standard deviation of all analytes in the calibration. The calibration meets the alternative evaluation criteria.

Matrix Spike (MS) Exceptions:
The Matrix Spike recovery of Phenol for sample ITZ 1DMS was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicates the analytical batch was in control. The matrix spike outlier does not indicate a significant data quality problem. No further corrective action was feasible.

Approved by _____ **Date** 5/2/a

The matrix spike recovery of Pentachlorophenol for sample ITZ 1MS/DMS was outside the lower control criteria because of suspected matrix interference. The sample was re-analyzed, and produced similar results. No recovery was detected in the spiked samples. The results indicate a potential low bias for this compound in this matrix. The results of the original analysis are reported.

The control criteria for the Matrix Spike recovery of Pyrene for sample ITZ 1MS/DMS is not applicable. The analyte concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

Laboratory Control Sample (LCS) Exceptions:
The spike recovery of Benzoic Acid in the Duplicate Laboratory Control Sample (DLCS) KWG0202327-6 was outside the lower control criterion. The analyte in question was not detected in the associated field samples. The error associated with reduced recovery equates to a potential low bias. The recovery for this analyte was within control criterion in the LCS KWG0202327-6 with acceptable RPDs. The data has been flagged to indicate the low recovery.

Method Reporting Limit (MRL) Exceptions:
Sample(s) ITZ 1, ITZ 2, ITZ 3 required dilutions due the presence non-target analytes interfering with compounds of interest. The reporting limits have been elevated accordingly.

No other anomalies associated with the analysis of these samples were observed.

Approved by_____ Date 5/2/12

CHAIN OF CUSTODY

Analytical Services, Inc. — An Employee-Owned Company

1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222 • FAX (360) 636-1068

SR#: K220'20'56

PAGE 1 OF 1 COC #

PROJECT NAME	Sitka Dredge
PROJECT NUMBER	023-5524
PROJECT MANAGER	Mark Musial
COMPANY/ADDRESS	Golder Associates
	1750 Abbot Road, Suite 200 Anchorage AK 99507-3443
PHONE #	(907)344-6001
FAX #	(907)344-6011
SAMPLER'S SIGNATURE	M. Evans

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐	Volatile Organics 624☐ 8260☐	Hydrocarbons (*see below) Gas☐ 8021☐ BTEX☐ Diesel☐ Oil☐	☐ Fuel Fingerprint (FIO) ☐ NW-HCID	Oil & Grease/TRPH 413.1☐ 418.1☐ 1664 SGT☐ 1664 HEM☐	PCB's Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081A☐ 8141A☐ 8151A☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	PAHS 8310☐ SIM☐	GC/MS-SIM PAH☐ Phenol☐ Phthalates☐	Metals, Total or Dissolved (See list below)	Cyanide☐ Hex-Chrom☐	pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS (circle) NH_3-N, COD, Total-P, TKN, TOC, DOC (circle)	TOX 9020☐ AOX 1650☐ 506☐	Tissue analysis as per quote				REMARKS
Clam 1	4/1/02	0950	4	Tissue	1															X				
Clam 2	4/1/02	1040	5	Tissue	1															X				
Clam 3	4/1/02	1056	6	Tissue	1															X				

011408

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required

___ II. Report Dup., MS, MSD as required

___ III. Data Validation Report (Includes all raw data)

___ IV. CLP Deliverable Report

___ V. EDD

X ¥1.75 per quote

INVOICE INFORMATION

P.O. #

Bill To: Golder Associates
1750 Abbot Road Suite 200
Anchorage AK 99507

TURNAROUND REQUIREMENTS

____ 24 hr. ____ 48 hr.

____ 5 Day

X Standard (10-15 working days)

____ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORHTWEST OTHER:_____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
M. Evans	Tracy Black		
Signature	Signature	Signature	Signature
1600 4/1/02	CAS		
Date/Time	Date/Time	Date/Time	Date/Time
M. Evans	Black		
Printed Name	Printed Name	Printed Name	Printed Name
Golder	4/2/02 1020		
Firm	Firm	Firm	Firm

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Golder Associates Inc.
Project: Sitka Dredge/023-5524
Sample Matrix: Tissue

Service Request: K2202038
Date Collected: 4/1/02
Date Received: 4/2/02

Solids, Total

Prep Method: NONE
Analysis Method: Freeze Dry
Test Notes:

Units: PERCENT
Basis: Wet

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
Clam 1	K2202038-004	4/16/02	13.5	
Clam 2	K2202038-005	4/16/02	12.0	
Clam 3	K2202038-006	4/16/02	14.2	

Approved By: _____ Date: 4/24/02

1A052595

METALS
-1-
INORGANIC ANALYSIS DATA SHEET

Client: Golder Associates Inc.
Project No.: 023-5524
Project Name: Sitka Dredge
Matrix: TISSUE

Service Request: K2202038
Date Collected: 04/01/02
Date Received: 04/02/02
Units: MG/KG
Basis: Wet

Sample Name: Clam 1
Lab Code: K2202038-004

Analyte	Analysis Method	MRL	MDL	Dil.	Date Extracted	Date Analyzed	Result	C	Q
Antimony	200.8	0.007	0.003	5	4/18/02	4/23/02	0.008		
Arsenic	200.8	0.07	0.04	5	4/18/02	4/23/02	1.72		
Cadmium	200.8	0.007	0.005	5	4/18/02	4/23/02	0.153		
Chromium	6010B	0.1	0.1	1	4/18/02	4/23/02	0.5		
Copper	200.8	0.013	0.007	5	4/18/02	4/23/02	0.955		
Lead	200.8	0.026	0.013	50	4/18/02	4/23/02	16.3		
Mercury	7471A	0.005	0.002	1	4/23/02	4/23/02	0.005	B	
Nickel	200.8	0.03	0.01	5	4/18/02	4/23/02	0.69		
Silver	200.8	0.003	0.001	5	4/18/02	4/23/02	0.022		
Zinc	200.8	0.07	0.01	5	4/18/02	4/23/02	10.2		

% Solids: NA

Comments:

METALS

-1-

INORGANIC ANALYSIS DATA SHEET

Client: Golder Associates Inc.
Project No.: 023-5524
Project Name: Sitka Dredge
Matrix: TISSUE

Service Request: K2202038
Date Collected: 04/01/02
Date Received: 04/02/02
Units: MG/KG
Basis: Wet

Sample Name: Clam 2

Lab Code: K2202038-005

Analyte	Analysis Method	MRL	MDL	Dil.	Date Extracted	Date Analyzed	Result	C	Q
Antimony	200.8	0.006	0.002	5	4/18/02	4/23/02	0.008		
Arsenic	200.8	0.06	0.04	5	4/18/02	4/23/02	2.02		
Cadmium	200.8	0.006	0.005	5	4/18/02	4/23/02	0.161		
Chromium	6010B	0.1	0.1	1	4/18/02	4/23/02	0.6		
Copper	200.8	0.012	0.006	5	4/18/02	4/23/02	0.946		
Lead	200.8	0.023	0.012	50	4/18/02	4/23/02	27.2		
Mercury	7471A	0.005	0.002	1	4/23/02	4/23/02	0.006		
Nickel	200.8	0.02	0.01	5	4/18/02	4/23/02	0.75		
Silver	200.8	0.002	0.001	5	4/18/02	4/23/02	0.014		
Zinc	200.8	0.06	0.01	5	4/18/02	4/23/02	10.6		

% Solids: NA

Comments:

METALS

-1-

INORGANIC ANALYSIS DATA SHEET

Client: Golder Associates Inc.

Project No.: 023-5524

Project Name: Sitka Dredge

Matrix: TISSUE

Service Request: K2202038

Date Collected: 04/01/02

Date Received: 04/02/02

Units: MG/KG

Basis: Wet

Sample Name: Clam 3

Lab Code: K2202038-006

Analyte	Analysis Method	MRL	MDL	Dil.	Date Extracted	Date Analyzed	Result	C	Q
Antimony	200.8	0.007	0.003	5	4/18/02	4/23/02	0.003	B	
Arsenic	200.8	0.07	0.04	5	4/18/02	4/23/02	1.57		
Cadmium	200.8	0.007	0.006	5	4/18/02	4/23/02	0.518		
Chromium	6010B	0.1	0.1	1	4/18/02	4/23/02	0.6		
Copper	200.8	0.014	0.007	5	4/18/02	4/23/02	0.893		
Lead	200.8	0.003	0.001	5	4/18/02	4/23/02	0.846		
Mercury	7471A	0.005	0.002	1	4/23/02	4/23/02	0.010		
Nickel	200.8	0.03	0.01	5	4/18/02	4/23/02	0.44		
Silver	200.8	0.003	0.001	5	4/18/02	4/23/02	0.003	B	
Zinc	200.8	0.07	0.01	5	4/18/02	4/23/02	12.0		

% Solids: NA

Comments: