



# Douglas Indian Association Tribal Government

## Sampling and Analysis of Heavy Metals from Sandy Beach



### Site Background

Sandy Beach is located adjacent to the Historic Treadwell Mine Complex. The site is a former Tlingit village located less than a mile from downtown Juneau across Gastineau Channel (Figure 1). The beach is used by tribal members and the general public for collection of traditional food resources as well as for recreational purposes.



Fig. 1. Alaska State Library-Historical Collection  
Left Photo: Treadwell Mines, from the Cyanide Plant  
Right Photo: Tlingit Family and Canoe Douglas Island

### Scope of Work

Sandy Beach sediment, clam tissue, and crab tissue were sampled from upper and lower beach locations that are known to be used for subsistence and recreational purposes. Clam tissue was collected from one location near Douglas Marina, and Crab samples were collected from the intertidal area adjacent to and south of Sandy Beach (Figure 2). Analysis of these samples was performed to determine whether methylmercury, inorganic arsenic, and lead pose a potential risk to tribal members through direct contact or consumption of seafood.

**Contaminants of Potential Concern**  
Sediment: Methylmercury, Inorganic Arsenic, and Lead  
Tissue: Methylmercury and Inorganic Arsenic

Both sediment and tissue samples were also analyzed for total mercury and total arsenic in order to determine the relative contributions of the methylated and inorganic metal species, respectively.

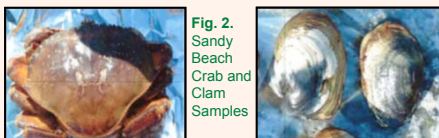


Fig. 2. Sandy Beach Crab and Clam Samples

Location	Media	# of Samples	Analyte
Sandy Beach Lower Intertidal Zone	Sediment	4	Total Mercury, Methylmercury, total arsenic, inorganic arsenic, total lead
Sandy Beach Upper Beach Zone	Sediment	5	Total Mercury, methylmercury, total arsenic, inorganic arsenic, total lead
Gastineau Channel	Dungeness crab tissue, Clam tissue	2 2	Total mercury, methylmercury, total arsenic, inorganic arsenic

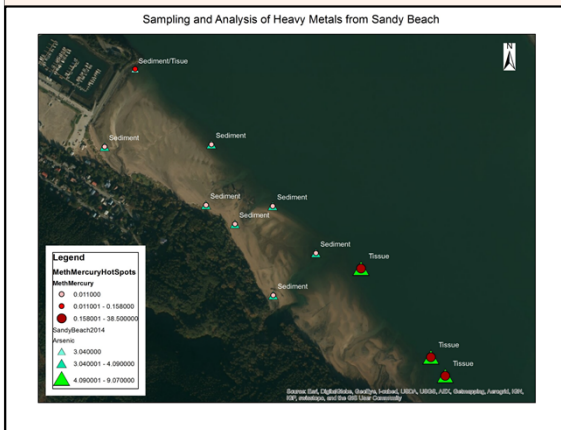
Table 1. Summary of Media, Number of samples, and Analytes

### Results Tissue:

Total arsenic and inorganic arsenic were detected above the reporting limit in all tissue samples. All tissue results exceeded the human health screening level for inorganic arsenic. The analytical results show that inorganic arsenic accounts for about half of the total arsenic content in bivalves and a much lower fraction in crab.

Mercury and methylmercury were detected above the reporting limit in all tissue samples. Methylmercury results exceeded the human health screening level in crab and nearly exceed the human health screening level in clams.

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### Table 2. Tissue Analytical Results

Sampling Station	USEPA RSL Fish Ingestion	Units	S Beach-05 14043001	S Beach-05 14043003	S Beach-10 14043008	S Beach-11 14043009
Tissue Type			Bivalve	Bivalve	Crab	Crab
Tissue			Lower beach		Nearshore	
Arsenic		mg/kg	2.85	3.65	9.07	3.19
Inorganic Arsenic	0.0028	mg/kg	1.65	1.67	0.040	0.024
Mercury		ng/g	33.7 J	37.9 J	61.7 J	49.1 J
Methylmercury	15	ng/g	13.1 J	13.5 J	38.5 J	32.2 J

ORANGE = Result exceeds the U.S. Environmental Protection Agency Regional Screening Level for

Fish Ingestion using a target hazard quotient of 0.1

### Sediment

#### Arsenic:

Total arsenic and inorganic arsenic were detected in all sediment samples. Half of the analytical results for total arsenic exceeded the human health screening level of 3.7 mg/kg (ADEC Table B1). Total arsenic concentrations with the highest values were detected in the Northern half of the lower beach sediments. The highest detected value for inorganic arsenic 4.50mg/kg was located near the Glory Hole at the South end of the upper beach.

#### Mercury:

Total mercury was detected in all samples at concentrations that exceed the ecological threshold effects level for sediment of 130 nanograms per gram (ng/g). As was the case with inorganic arsenic, the highest concentration of total mercury was found on the upper beach near the Glory Hole. All of the detected concentrations of methylmercury exceeded the ecological screening level of 1.01 ng/g (USEPA Region 5 Ecological Screening Level for sediment).

#### Lead:

Lead was detected in all sediment samples at concentrations that range from 5.4 to 10.2 mg/kg. None of the lead detections exceeded the ecological threshold effects level for sediment of 30.2 mg/kg. The highest lead concentration was detected at sampling station located near the Douglas Harbor jetty.

### Table 3. Sediment Analytical Results

Sampling Station: ID Date Lab id	ADEC Table B140+ Inches	USEPA RSL for Residential Soil	Marine Sediment TEL	USEPA Region 5 Ecological Screening Level	Unit	SBeach-01 14042801	SBeach-02 14042902	SBeach-03 14042904	SBeach-04 14042905	SBeach-05 14043002	SBeach-06 14043004	SBeach-07 14043005	SBeach-08 14043006	SBeach-09 14043010	S h
Arsenic	3.70	-	7.24		mg/kg	4.09	3.86	3.96	3.71	3.25	3.04	3.34	5.40	3.4	3
Inorganic Arsenic		0.39	7.24		mg/kg	4.38	4.50	3.85	3.70	2.34	2.76	0.728	1.66	0	3
Lead		30.2			mg/kg	6.56	5.40	6.68	8.48	7.56	7.91	7.71	9.83	5	5
Mercury	25,000	130			ng/g	469 J	262 J	381 J	383 J	202 J	242 J	339 J	200 J	2	2
Methylmercury		780			ng/g	0.011 U	0.013 U	0.010 U	0.010 U	0.158 J	0.137 J	0.010 U	0.029 J	0	0
Total Solids					%	78.45	78.60	78.60	93.51	83.86	79.41	79.20	83.61	8	8

BLUE = Result exceeds the Alaska Department of Environmental Conservation Table B1 Value for Zones with more than 40 inches of rain annually

RED = Result exceeds the U.S. Environmental Protection Agency Regional Screening Level for Residential Soil May 2013

GREEN = Result exceeds the Marine Sediment Threshold Effects Level (MacDonald et al. 1996)

PURPLE = Result exceeds the U.S. Environmental Protection Agency Region 5 Ecological Screening Level

### Conclusions

#### Exposure Risks:

Based on these combined analytical results, Sandy Beach sediments, clam tissue and crab tissue pose an exposure risk to humans. Sediments pose a threat through direct exposure to inorganic and total arsenic concentrations in sediments. Clam and crab tissue from Sandy Beach sediments or nearby offshore waters also contain concentrations of inorganic arsenic that exceed USEPA human health screening levels for consumption of fish tissue. Methylmercury concentrations in crab tissue in Sandy Beach exceed the USEPA human health screening levels for the consumption of fish tissue.

### Literature cited

Alaska Digital Archives Photos (Figure 1)  
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