Seattle Iron and Metals Corporation

Mixing Zone Study Report

Appendix C
Lower Duwamish Waterway Tidal, Current, and Ambient Metal Concentration Data

FINAL

Table C.1
Current Velocity and Tide Data at Outfall 001

JD289				JD300				JD309			
Hour	ft MLLW[1]	cm/s[2]	simulation	Hour	ft MLLW[1]	cm/s[2]	simulation	Hour	ft MLLW[1]	cm/s[2]	simulation
0	-0.132	6.2		0	-0.46	-9.2		0	6.92	10.7	
0.25		9.1		0.25		-13.7		0.25		9.6	
0.5		3.9		0.5		-19.5		0.5		12.8	
0.75		-8		0.75		-15.4		0.75		14.3	
1	-0.132	1.5		1	-0.132	-16.2		1	6.92	14	
1.25		-6.6		1.25		-18.4		1.25		12.4	
1.5		-22.9		1.5		-16.6		1.5		12.8	
1.75		-6.3		1.75		-14.6		1.75		16.4	
2	0.852	-15.6		2	1.18	-11.5	a	2	6.428	15.7	
2.25		-14.6		2.25		-5.4		2.25		16.4	
2.5		-15.2		2.5		0		2.5		13.9	
2.75		-19.9		2.75		-6.6		2.75		15.6	
3	3.148	-16.4		3	4.788	-5.5		3	5.444	13.6	
3.25		-22.3		3.25		-1.4		3.25		14.5	
3.5		-17.4		3.5		1		3.5		19.1	
3.75		-14.8		3.75		-2.4		3.75		16	
4	5.444	-16.3		4	7.74	1.4		4	4.46	15.3	
4.25		-13.9		4.25		9.2		4.25		13.9	
4.5		-11.8		4.5		8.8		4.5	4.132	11.3	a
4.75		-0.3		4.75		16.8		4.75	3.968	17.8	b
5	7.74	-5		5	10.036	7.6		5	3.804	11.4	
5.25		-4.5		5.25		16.1		5.25		10.7	
5.5		-1.3		5.5		5.1		5.5		10.2	
5.75		2.5		5.75		10.1		5.75		13	
6	9.708	3.4		6	11.348	2	b	6	3.64	9.1	
6.25		3.8		6.25		-3.3		6.25		8	
6.5		4.3		6.5	11.512	22.1	c	6.5		5.5	
6.75		8.9		6.75		19.1		6.75		5.8	
7	10.692	8.8		7	11.676	14.7		7	3.804	9.3	
7.25		6.1		7.25		20.7		7.25		6	
7.5		6.5		7.5		15.9		7.5		5.3	
7.75		7.1		7.75		17.6		7.75		6.3	
8	10.364	14.2		8	10.692	16.7		8	4.46	5.3	
8.25		3.7		8.25		19.3		8.25		4.1	
8.5		15.1		8.5		18.1		8.5		2.5	
8.75		-3.7		8.75		23.8		8.75		6.4	
9	9.38	10.9		9	9.38	18.4		9	5.444	8.2	
9.25		11.2		9.25		22.7		9.25		4.7	
9.5		1.8		9.5		9.8		9.5		8.1	
9.75		15.3		9.75		14.1		9.75		3.8	
10	7.74	10.2		10	7.412	13		10	6.756	9	
10.25		20.7		10.25		7.1		10.25		6.4	
10.5		12.5		10.5		3.9		10.5		7.4	
10.75	6.756	18.5	a	10.75		1.2		10.75		8.1	

Table C.1
Current Velocity and Tide Data at Outfall 001

JD289				JD300				JD309			
Hour	ft MLLW[1]	cm/s[2]	simulation	Hour	ft MLLW[1]	cm/s[2]	simulation	Hour	ft MLLW[1]	cm/s[2]	simulation
11	6.428	13.6		11	5.444	0.2		11	8.396	7.5	
11.25		14.2		11.25		2.4		11.25		14.9	
11.5		13.3		11.5		4.8		11.5		10.3	
11.75		10.9		11.75		5.6		11.75		11.9	
12	5.444	8.7	b	12	4.46	5		12	9.38	11.3	c
12.25		3.9		12.25		6.5		12.25		11.4	
12.5		1.3		12.5		2.6		12.5		10.8	
12.75		-1.3		12.75		-1.3		12.75		14.4	
13	4.788	5.6		13	4.132	-2.9		13	9.708	15.2	
13.25		-0.1		13.25		-2.8		13.25		11.7	
13.5		0.2		13.5		-4		13.5		12.2	
13.75		-5.1		13.75		0.6		13.75		11.9	
14	5.444	1.4	c	14	4.788	-3.3		14	9.38	16.5	
14.25		0.2		14.25		2.4		14.25		12.6	
14.5		-1.7		14.5		6.3		14.5	9.052	17.8	d
14.75		-5.8		14.75		6.7		14.75		14.5	
15	6.428	-5.2		15	6.428	8.9		15	8.724	12.7	
15.25		-2.5		15.25		12.3		15.25		15.2	
15.5		-4		15.5		10.5		15.5		18.4	
15.75		0.2		15.75		8.1		15.75		19.2	
16	7.74	-2.2		16	8.068	13.4		16	7.412	21.3	
16.25		-2.4		16.25		18		16.25		22.7	
16.5		3.8		16.5		15.9		16.5		15.6	
16.75		-1.3		16.75		15.5		16.75		18.3	
17	9.052	2.4		17	9.708	16		17	6.1	19.5	
17.25		4.3		17.25		18.3		17.25		19.9	
17.5		5.3		17.5		14.5		17.5		14.3	
17.75		9		17.75		21.1		17.75		19.2	
18	10.036	8.7	d	18	10.692	18.9		18	4.788	14.9	
18.25		6.4		18.25		17.6		18.25		17	
18.5		13.4		18.5		19.5		18.5		12.1	
18.75		16		18.75		19.7		18.75		10.6	
19	9.708	14.2		19	10.364	22.9		19	4.132	15.9	
19.25		13.2		19.25		26.8		19.25		10.2	
19.5		12.9		19.5		28.5		19.5		11.5	
19.75		10.5		19.75		28.8		19.75		9.9	
20	8.724	9.5		20	8.724	30.5		20	3.804	9.1	
20.25		9.4		20.25		28.5		20.25		4.9	
20.5		8.5		20.5		35.9		20.5		4.5	
20.75		6.2		20.75		24.3		20.75		4.3	
21	6.756	15.4		21	6.756	20.5		21	4.132	3.1	
21.25		19.5		21.25		19.6		21.25		4.9	
21.5		25.1		21.5		17.1		21.5		5.4	
21.75		30		21.75	4.788	11.5	e	21.75	4.624	5	e

Table C.1
Current Velocity and Tide Data at Outfall 001

JD289				JD300				JD309			
Hour	ft MLLW[1]	cm/s[2]	simulation	Hour	ft MLLW[1]	cm/s[2]	simulation	Hour	ft MLLW[1]	cm/s[2]	simulation
22	4.46	25.8		22	4.132	11.1		22	4.788	8.3	
22.25		25.6		22.25		7.2		22.25		6.3	
22.5		20.1		22.5		4.8		22.5		7.2	
22.75		14.4		22.75		7.2		22.75		6.6	
23	2.492	17.7		23	1.18	-7.5		23	5.772	7.3	
23.25		4.4		23.25		-7.9		23.25		8.6	
23.5		9.8		23.5	0.36	-11.5	f	23.5		11	
23.75		12		23.75	-0.05	-2	g	23.75	6.51	11.3	f
24	0.852	6.5		24	-0.46	-4.8		24	6.756	8.3	

Notes:

1 Tidal data are from the 16th Avenue Bridge Station. Original data taken directly from the Sediment Transport Analysis Report and reported in m MSL. Data were converted to ft MSL using a multiplier of 3.28 and then adding 6.1 to convert to MLLW. Original data available at hourly intervals, data were extrapolated to estimate interim water surface elevations.

2 Current velocity data are from the Seattle Boiler Works Station. Original current velocity data obtained from King County upon request, but also shown as time series in the Sediment Transport Analysis Report (Windward and Quantitative 2008). Current velocities represent the second bin from the surface in the N-S direction, negative velocity indicate the upstream direction and positive velocities indicate downstream direction.

Abbreviations:

ft Feet
MLLW Mean lower low water
MSL Mean sea level

Table C.2

Ambient Metals Concentrations for the Lower Duwamish Waterway[1]

Date	Sample	Matrix	Depth	Analyte	Result	Unit
10/30/96	L9806-7	LL SALT WTR	8.7	Copper, Dissolved, ICP-MS	0.368	µg/L
11/06/96	L9841-7	LL SALT WTR	9	Copper, Dissolved, ICP-MS	0.436	µg/L
11/13/96	L9885-36	LL SALT WTR	8	Copper, Dissolved, ICP-MS	0.598	µg/L
11/20/96	L9927-36	LL SALT WTR	9	Copper, Dissolved, ICP-MS	0.456	µg/L
11/25/96	L9928-36	LL SALT WTR	8.5	Copper, Dissolved, ICP-MS	0.482	µg/L
10/30/96	L9806-5	LL SALT WTR	7.5	Copper, Dissolved, ICP-MS	0.727	µg/L
11/06/96	L9841-5	LL SALT WTR	8	Copper, Dissolved, ICP-MS	0.378	µg/L
11/13/96	L9885-34	LL SALT WTR	7	Copper, Dissolved, ICP-MS	0.496	µg/L
11/20/96	L9927-34	LL SALT WTR	8.5	Copper, Dissolved, ICP-MS	0.371	µg/L
11/25/96	L9928-34	LL SALT WTR	7	Copper, Dissolved, ICP-MS	0.476	µg/L
10/30/96	L9806-9	LL SALT WTR	6.5	Copper, Dissolved, ICP-MS	0.354	µg/L
11/06/96	L9841-9	LL SALT WTR	7	Copper, Dissolved, ICP-MS	0.486	µg/L
11/13/96	L9885-38	LL SALT WTR	6	Copper, Dissolved, ICP-MS	0.444	µg/L
11/20/96	L9927-38	LL SALT WTR	7.5	Copper, Dissolved, ICP-MS	0.506	µg/L
11/25/96	L9928-38	LL SALT WTR	6	Copper, Dissolved, ICP-MS	0.529	µg/L
Average					0.4738	µg/L
10/30/96	L9806-7	LL SALT WTR	8.7	Lead, Dissolved, ICP-MS	0.018	µg/L
11/06/96	L9841-7	LL SALT WTR	9	Lead, Dissolved, ICP-MS	0.0702	µg/L
11/13/96	L9885-36	LL SALT WTR	8	Lead, Dissolved, ICP-MS	0.0298	µg/L
11/20/96	L9927-36	LL SALT WTR	9	Lead, Dissolved, ICP-MS	0.019	µg/L
11/25/96	L9928-36	LL SALT WTR	8.5	Lead, Dissolved, ICP-MS	0.0558	µg/L
10/30/96	L9806-5	LL SALT WTR	7.5	Lead, Dissolved, ICP-MS	0.0353	µg/L
11/06/96	L9841-5	LL SALT WTR	8	Lead, Dissolved, ICP-MS	0.027	µg/L
11/13/96	L9885-34	LL SALT WTR	7	Lead, Dissolved, ICP-MS	0.0282	µg/L
11/20/96	L9927-34	LL SALT WTR	8.5	Lead, Dissolved, ICP-MS	0.02	µg/L
11/25/96	L9928-34	LL SALT WTR	7	Lead, Dissolved, ICP-MS	0.0342	µg/L
10/30/96	L9806-9	LL SALT WTR	6.5	Lead, Dissolved, ICP-MS	0.02	µg/L
11/06/96	L9841-9	LL SALT WTR	7	Lead, Dissolved, ICP-MS	0.031	µg/L
11/13/96	L9885-38	LL SALT WTR	6	Lead, Dissolved, ICP-MS	0.022	µg/L
11/20/96	L9927-38	LL SALT WTR	7.5	Lead, Dissolved, ICP-MS	0.022	µg/L
11/25/96	L9928-38	LL SALT WTR	6	Lead, Dissolved, ICP-MS	0.0343	µg/L
Average					0.03112	µg/L
10/30/96	L9806-7	LL SALT WTR	8.7	Zinc, Dissolved, ICP-MS	1.88	µg/L
11/06/96	L9841-7	LL SALT WTR	9	Zinc, Dissolved, ICP-MS	1.36	µg/L
11/13/96	L9885-36	LL SALT WTR	8	Zinc, Dissolved, ICP-MS	1.52	µg/L
11/20/96	L9927-36	LL SALT WTR	9	Zinc, Dissolved, ICP-MS	1.46	µg/L
11/25/96	L9928-36	LL SALT WTR	8.5	Zinc, Dissolved, ICP-MS	2.13	µg/L
10/30/96	L9806-5	LL SALT WTR	7.5	Zinc, Dissolved, ICP-MS	2.09	µg/L
11/06/96	L9841-5	LL SALT WTR	8	Zinc, Dissolved, ICP-MS	1.21	µg/L
11/13/96	L9885-34	LL SALT WTR	7	Zinc, Dissolved, ICP-MS	1.65	µg/L
11/20/96	L9927-34	LL SALT WTR	8.5	Zinc, Dissolved, ICP-MS	1.21	µg/L

Table C.2

Ambient Metals Concentrations for the Lower Duwamish Waterway[1]

Date	Sample	Matrix	Depth	Analyte	Result	Unit
11/25/96	L9928-34	LL SALT WTR	7	Zinc, Dissolved, ICP-MS	2.38	µg/L
10/30/96	L9806-9	LL SALT WTR	6.5	Zinc, Dissolved, ICP-MS	1.26	µg/L
11/06/96	L9841-9	LL SALT WTR	7	Zinc, Dissolved, ICP-MS	1.91	µg/L
11/13/96	L9885-38	LL SALT WTR	6	Zinc, Dissolved, ICP-MS	1.72	µg/L
11/20/96	L9927-38	LL SALT WTR	7.5	Zinc, Dissolved, ICP-MS	1.56	µg/L
11/25/96	L9928-38	LL SALT WTR	6	Zinc, Dissolved, ICP-MS	2.73	µg/L
Average					1.738	µg/L

Notes:

1 All samples were collected from the Michigan Street Station located near Slip 3 at depth within the salt wedge. Data were used in the King County Combined Sewer Overflow Water Quality Assessment for the Duwamish River and Elliott Bay and were obtained from King County upon request.