

DEPARTMENT OF ECOLOGY
Toxics Cleanup Program

Date: February 25, 2019

To: Robert Nolan, P.E., NWRO-WQP

From: Arthur Kapell, TCP / Aquatics Lands Cleanup Unit (ALCU)

Subject: Lovric's Sea-Craft Sediment Data Report, December 2017
(NPDES Permit WA0501491; FSID 28147524; EIM Study ID LOVRIC17)

Sediment sampling was conducted at Lovric's Sea-Craft (Lovric's) from September 25 – 27, 2017, in accordance with their Ecology approved Sampling and Analysis Plan (SAP),¹ and in support of their National Pollutant Discharge Elimination System (NPDES) Permit WA0501491. The SAP was designed to determine the quality of marine sediments in proximity to three permitted discharge locations. These results have been reported in Lovric's Data Report² (Data Report).

This memo provides Ecology's technical review of the sediment sampling results and the subsequent Data Report in order to determine Lovric's compliance with the Washington State Sediment Management Standards (SMS).³ The SMS are promulgated under the Water Pollution Control Act chapter 90.48 RCW and the Model Toxics Control Act chapter 70.105D as enforceable water quality standards. WAC 173-204-400 specifically gives Ecology the authority to evaluate the potential for a waste discharge to cause a sediment impact.

The subject Data Report is not approved as written. This memo provides comments by Ecology that must be addressed in a revised Data Report before it may be approved; these comments are italicized, bold, and numbered in this report. Please resubmit the Data Report electronically as a redline version enabling "track changes" along with a clean version. Please do not provide an errata sheet (or a new appendix title page) with any changes. The final electronic version should contain changes in their appropriate locations. Once the electronic version is approved, please provide two revised hardcopies to Ecology.

Based on available information, Ecology concludes that there has been an impact to sediments resulting from these permitted discharge locations. Of thirteen sampled stations, nine had at least one exceedance of the marine sediment quality standards (SQS). This includes several SIZmax exceedances throughout the sampled area. It is also noted that two samples taken in May 2016 near Lovric's two marine railways had multiple SQS and SIZmax exceedances.

If there are any questions, please contact me at akap461@ecy.wa.gov or 360.407.7242.

¹ Whatcom Environmental 2017a, *Sediment Sampling and Analysis Plan Lovric's Sea-Craft*. September 11, 2017.

² Whatcom Environmental 2017b, *Sediment Data Report Lovric's Sea-Craft* December 21, 2017.

³ Ecology 2013. Sediment Management Standards, Chapter 173-204 WAC. Ecology Publication No. 13-09-055. Revised Feb2013. Effective Sep2013. <https://fortress.wa.gov/ecy/publications/SummaryPages/1309055.html>.

Facility description

Lovric's Sea-Craft (Lovric's) has operated a commercial ship repair facility at 3022 Oakes Avenue in Anacortes, WA since 1965. Facilities have included a floating dry dock, two marine railways, repair/machine shops, and docks for moorage. Stormwater surface flow from the site is monitored at three discharge locations, the two marine railways known as the Western Marine Railway #1 (MR1), and the Eastern Marine Railway #2 (MR2), and a stormwater drainage pipe beneath the eastern building (East).

Pressure wash water is generated at each of the two railways and at the floating drydock during vessel pressure-washing conducted to prep surfaces for painting. It is captured and collected at troughs located at the base of each railway and pumped to collection tanks for offsite disposal. Other waste disposed of off-site has included waste paint and thinner, spent zinc anodes removed from ships, and used batteries.

Chemical criteria levels (SQS, SIZmax) / Dry weight versus Total Organic Carbon (TOC)

The SMS establishes two levels of numeric criteria for each of 47 chemicals in marine sediments of Puget Sound [Chapter 173-204 WAC]. Chemical concentrations at or below the Sediment Quality Standards (SQS)⁴ criteria are expected to have no adverse effects on biological resources. Concentrations between the SQS and Sediment Impact Zone Maximum (SIZmax)⁵ criteria are expected to have minor adverse effects. Levels above the SIZmax criteria are determined to have more than a minor adverse effect on biologic resources.

(Comment #1) The revised Data Report should compare the sample results with all applicable exceedance criteria. Please identify those SQS exceedances that also exceed SIZmax criteria. As a sample that has exceeded SIZmax criteria has also exceeded SQS criteria, it should only be listed as a SIZmax exceedance.

PQL, SQS/SIZmax exceedances, and data qualifiers

The Practical Quantitation Limit (PQL) of an analytical method is the lowest level at which the method can confidently discriminate between two different values. When the PQL of an individual contaminant has exceeded the SQS chemical criteria for that particular sample, it is to be considered an exceedance per guidance established in WAC 173-204-320(2)(a). The Sediment Cleanup User's Manual II (SCUM II) Section 5.1.1, Sediment Chemistry, states that "PQLs should be at or below applicable standards to meet the study goals." The Ecology approved SAP⁶ (September 11, 2017) has identified laboratory criteria with PQLs that meet Ecology criteria. This indicates that the laboratory performing the analyses did not meet the conditions required in the SAP.

(Comment #2) Where a sample is U-qualified and the reported concentration exceeds SQS or SIZmax criteria, this is an exceedance and shall be reported as such. It may be distinguished from samples where there is no data qualifier or the result is J-qualified (e.g. Table 1).

⁴ Part III of the SMS (WAC 173-204-320).

⁵ Part IV of the SMS (WAC 173-204-420).

⁶ Finalized SAP revision, September 11, 2011. Memo from Xian Li, TCP, to Robert Nolan, WQP-NWRO, approving revised SAP, September 12, 2017.

Results that are J-qualified are considered estimated. Those that are U-qualified but do not exceed applicable criteria are designated as analyzed for but not detected.

Previous sampling in May 2016

On May 9, 2016, two sediment samples were taken at the water's edge near the discharges for MR1 and MR2. They were analyzed for the marine sediment chemicals as well as for tributyltin, which is associated with antifouling paints used in shipyards. Tributyltin is compared against the existing bioaccumulation trigger of 0.073 mg/kg.

SIZmax criteria were exceeded for copper, mercury, and zinc at MR1, and for copper at MR2. Dibenzofuran at MR1 exceeded SQS criteria. Tributyltin exceeded the bioaccumulation trigger at both MR1 and MR2. The data sheets for these two samples and a summary are to be found in the SAP. *(Comment #3) A review of this sampling event should also be included in the Data Report.*

Current sampling in September 2017

The SAP designated fifteen sampling stations grouped in two station clusters, A and B. The A stations are nearest to the two marine railway discharge locations, MR1 and MR2, and the B stations are closest to the East Building (see Figure 1). Due to sampling problems at two of the stations, only thirteen of the proposed fifteen sample stations were collected. A sufficient sample could not be collected at sample station A-2 as it consisted of a rocky substrate, and Station B-2 could not be collected because its location beneath a dock was inaccessible by boat or by foot. The omission of station B-2 is significant as it is the closest station to the outfall near the East Building. *(Comment #4) Should additional sampling be performed, a sample shall be collected at B-2 or another location as near to the East Building outfall as possible.*

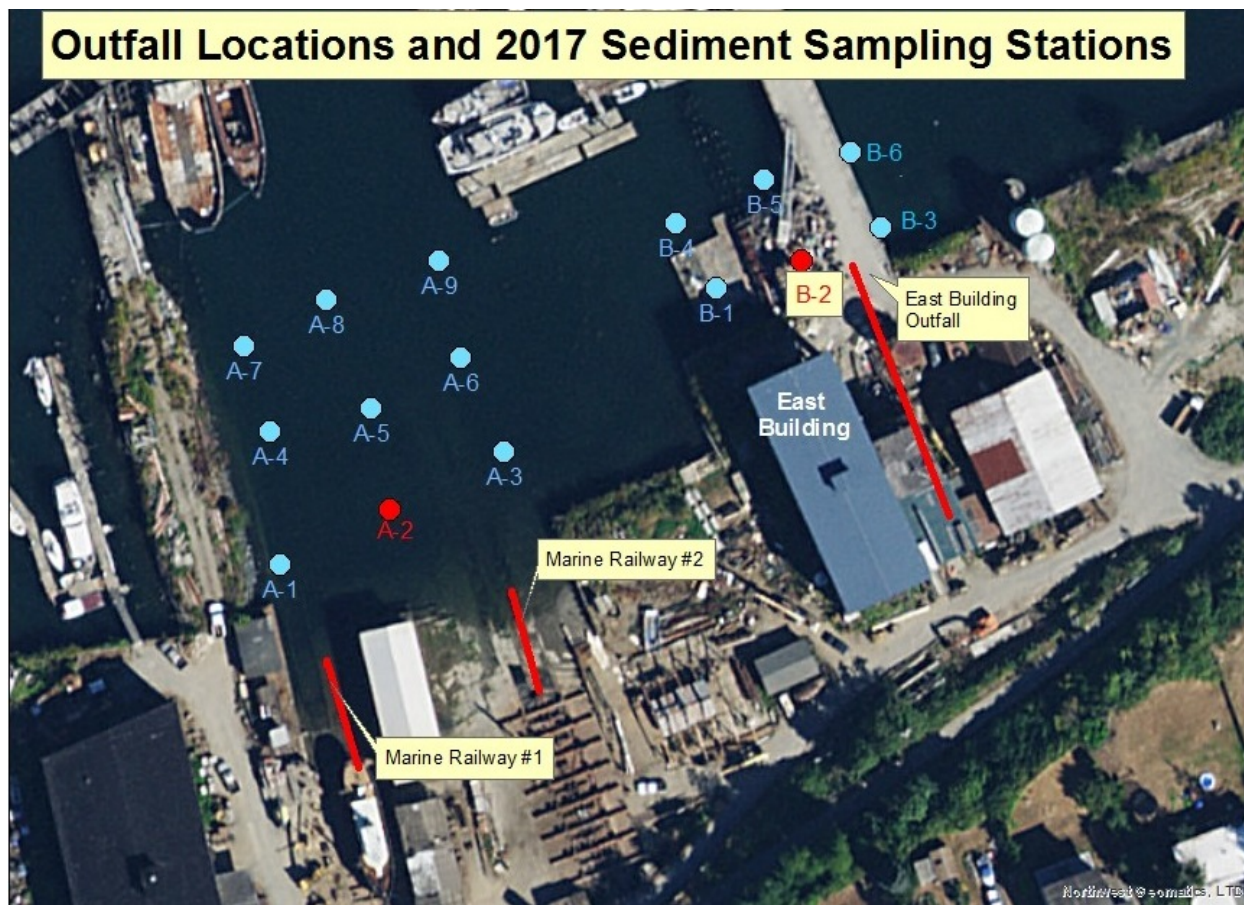


Figure 1: Sampling locations. Stations that were not sampled are indicated in red.

Sample analysis

All samples were to be analyzed for the full list of conventional parameters (ammonia, grain size, total organic carbon, total sulfides, and total volatile solids), 47 SMS chemicals, and organotins. Bioassays were not performed for this study as Lovric’s waived the potential use of confirmatory bioassays for the proposed sampling event, indicating that they would accept the chemical results.⁷

All fifteen samples were to be collected at depths between 0 and 10 cm. However, as the sampling device could not penetrate more than five cm at stations B-1, B-3 and B-6, those samples were collected at depths between 0 and 5 cm.

(Comment #5) The Data Report should include a reference to the Environmental Information Management (EIM) Study ID, LOVRIC17 which establishes the connection between the analytical results and the sampling events.

⁷ Ecology 2017. Robert Nolan, WQP-NWRO to Xuan Li, TCP-HQ/Aquatic Lands Cleanup Unit memo: Lovric’s Sea-Craft Inc. (NPDES Permit WA-0501491; FSID 21847524), Sediment Sampling and Analysis Plan, September 12, 2017.

Data results

General observations

The stations with the highest number of SQS and SIZmax criteria exceedances are at A-1 and B-1 (Figure 2), which are the closest of the stations sampled to MR1 (A-1) and the East Building (B-1). Another station, B-2, was closer to the East Building, but was inaccessible at the time of sampling.

Those stations in the B cluster that are either unqualified or J-qualified exceedances of chemical criteria are limited in the draft Data Report to PAHs at B-1, B-3, and B-4. However, a significant number of chemicals are U-qualified SQS or SIZmax exceedances and were not identified in the Data Report. Future sampling with improved laboratory procedures may provide additional information to clarify which stations would have, or not have, SQS exceedances. This cannot be determined without additional sampling.

Copper levels exceeded SIZmax criteria at A-1 and A-7. Two stations monitored in May 2016 also had copper exceedances of SIZmax. Benzoic acid exceeded SIZmax criteria at more stations (8) than any other chemical, with seven of eight in the A cluster and one of five in the B cluster. These results were J-qualified. Figure 1 indicates the number of SQS exceedances at each station where there was an exceedance.

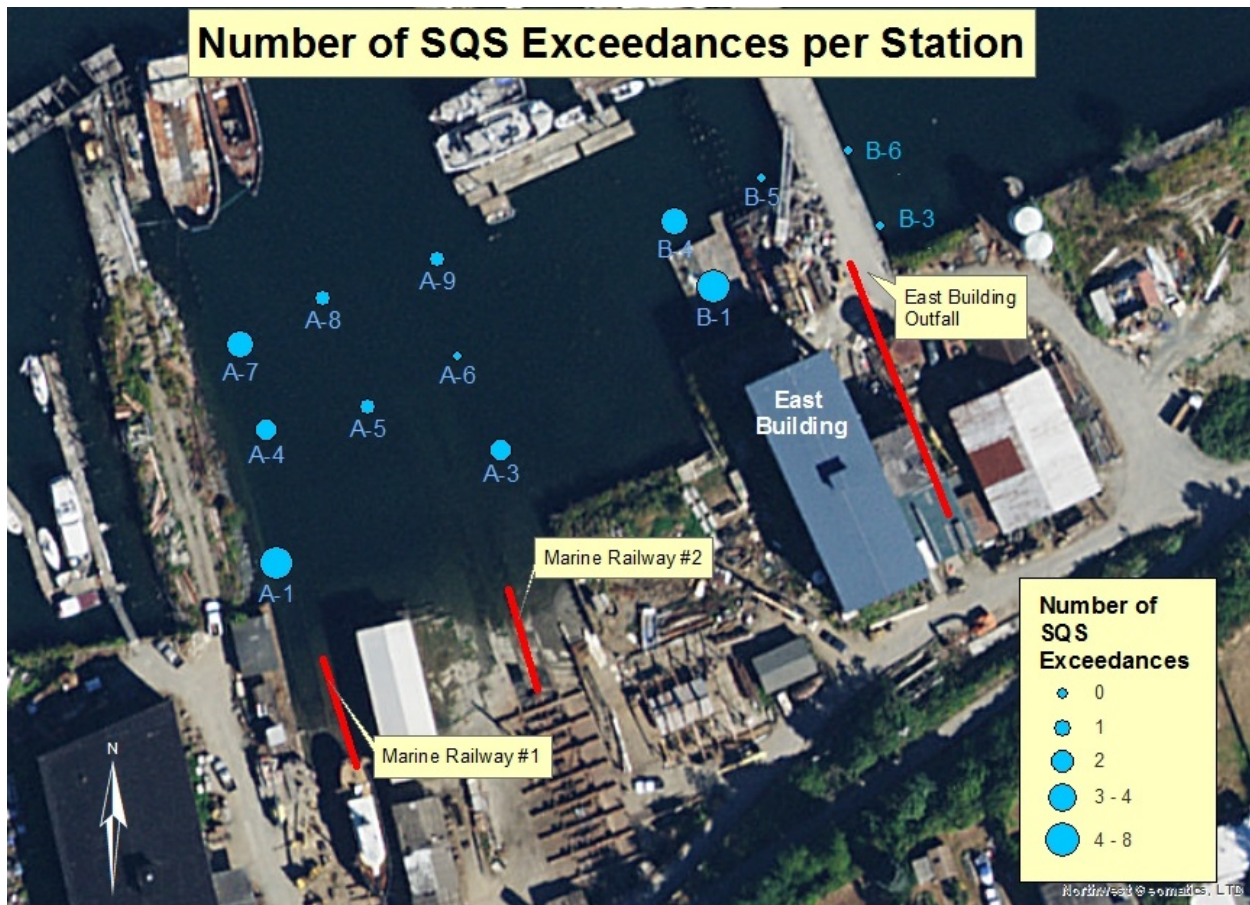


Figure 2: The number of SMS exceedances at each station in 2017.

Laboratory concerns

PQL exceedances

These are incidences where the PQL has exceeded the SQS or SIZmax criteria. This indicates that the laboratory performing the analyses has not met the conditions required in the SAP, approved by Ecology on September 11, 2017. As noted on page 10 of the approved SAP, the contract laboratories are expected to meet the requirements for deliverables.

Specific observations

Copper results

The SQS and SIZmax criteria are the same for copper. As a result, the sampling in September 2017 identifying two SQS exceedances of the copper criteria at A-1 and A-7 (Figure 3) are actually SIZmax exceedances. ***(Comment #6) These are to be reported as SIZmax exceedances of SMS criteria in the Data Report.*** Note also that there were copper exceedances in this area from the two samples collected in May 2016, which also exceeded SIZmax copper criteria.

Other Metals

Zinc exceeds SQS criteria at station A-1, which is the closest station to MR1. Station A-1 also has the highest concentrations of copper. Their concentrations exceed the dry weight criteria by a factor of approximately 2.9 for copper and 1.8 for zinc. Together with A-4, which has the third highest exceedances for copper and zinc, there is a pattern of decreasing concentrations as you move down current from MR1. Stations closest to the East Building and farthest from MR1 have, for the most part, the lowest concentrations of copper and zinc.

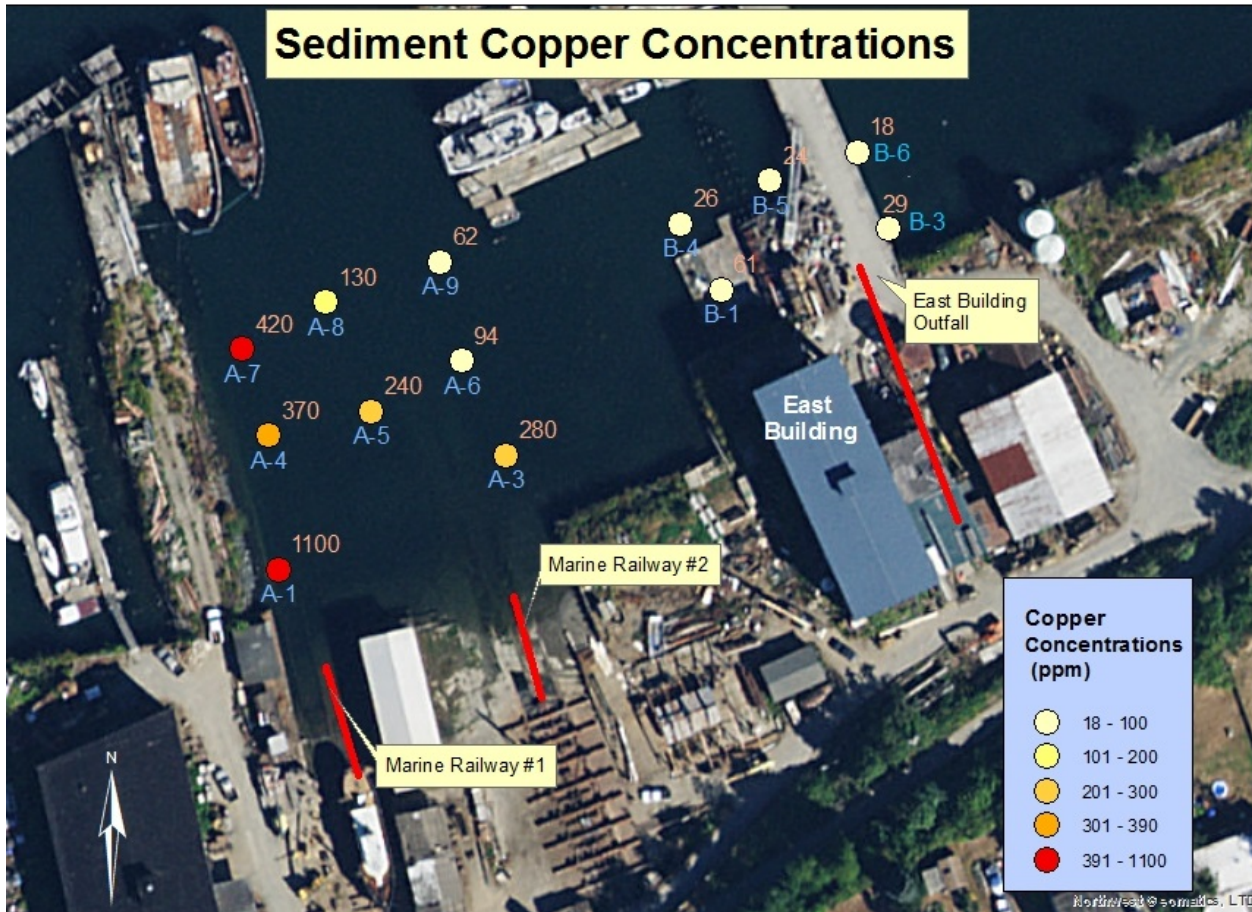


Figure 3: Copper concentrations (ppm) in sediments. Note that exceedances of SIZmax criteria are in red.

Organotins

The default analysis for tributyltin (TBT), proposed by Ecology and DMMP agencies, is based on bulk sediments. The sample tributyltin concentrations are compared against the existing bioaccumulation trigger of 73 $\mu\text{g}/\text{kg}$. Three of the samples, A-1, A-7, and A-8, are noted in the Data Report as exceeding 73 $\mu\text{g}/\text{kg}$. As bioassays were excluded by the permittee, TCP interprets these results as exceeding SMS standards for TBT. The Data Report also contains the results for monobutyltin, dibutyltin, and tetrabutyltin, but marine criteria do not exist for these chemicals.

Organic chemicals

Benzoic acid (Figure 4) has the most exceedances of any analyzed contaminant. Eight of the thirteen stations sampled exceed the benzoic acid SIZmax criteria of 650 mg/kg, including seven of eight exceedances in the A cluster and one in five in the B cluster. These samples are all J-qualified, indicating a degree of uncertainty in their results.

Although benzoic acid is a naturally occurring chemical, it is also associated with boatyards. Of the three highest exceedances at A-1, A-4, and A-5, station A-1 is the highest, at 1,700 mg/kg. The lowest concentrations are mostly in the B cluster, with the exception of the SIZmax exceedance at B-3. TCP interprets these results as indicating a trend towards higher benzoic acid concentrations adjacent to the marine railways.

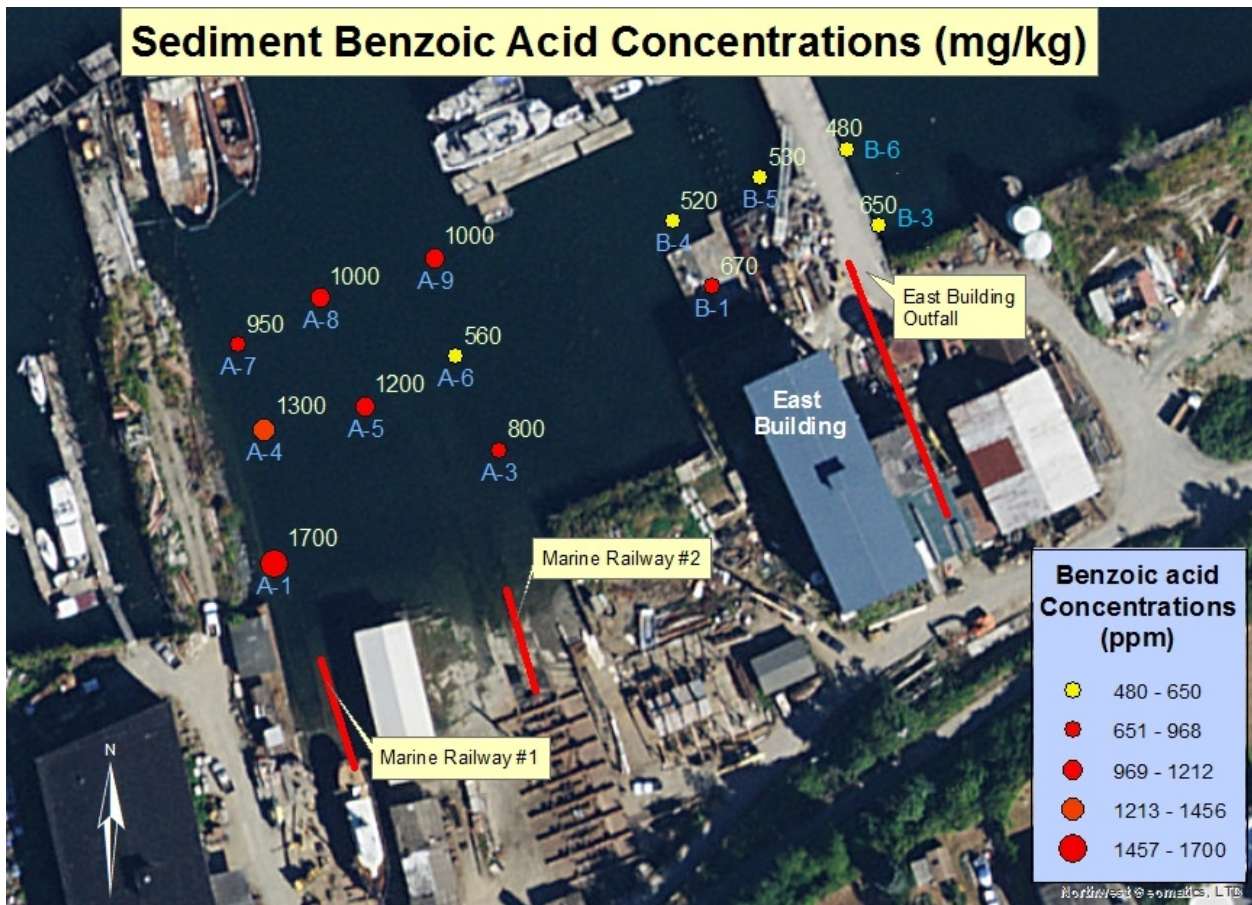


Figure 4: Benzoic acid concentrations in sediment. Note, SIZmax exceedances are identified in red.

All 2-methylphenol results have PQL values that exceed criteria concentrations and are to be noted as PQL exceedances in the Data Report. Also, the reported concentrations for 2-methylphenol, 4-methylphenol, benzyl alcohol, and phenol in stations A-1, A-6, and A-9 are given as less than the reported PQLs. *(Comment #7) When this occurs, the concentrations should be reported at the same value as the PQLs.*

Phthalates

All butyl benzyl phthalate samples except B-1 and B-6 had PQLs exceeding the SQS criteria. ***(Comment #8) These are to be reported as PQL exceedances of the SQS criteria.***

As is mentioned in the Data Report, bis(2-ethylhexyl)phthalate concentrations exceeded the SQS criteria at station A-7 and exceeded the SIZmax criteria at A-4. Both exceedances are J-qualified. ***(Comment #9) Please edit the exceedance at A-4 to identify it as a SIZmax exceedance.***

Polycyclic Aromatics

There are unqualified or J-qualified SQS PAH exceedances at four stations, A-1, A-3, B-1, and B-4. These stations are closest to each of the three discharge locations. The exceedances include HPAHs (A-1, B-4), LPAHs (B-1), anthracene (B-1), benzo[g,h,i]perylene (A-1), chrysene (A-1, B-4), fluoranthene (A-1, A-3, B-1, B-4), indeno[1,2,3-c,d]pyrene (A-1), and phenanthrene (B-1).

Chlorinated Organics

The Data Report indicates that no chlorinated organics were detected at the site due to dilution factors when performing the analysis, resulting in laboratory detection limits for most chlorinated organics exceeding SQS criteria. ***(Comment #10) These samples are to be reported as PQL exceedances of the SQS criteria.*** Those that are classified as non-detects were 1,4-dichlorobenzene and hexachlorobutadiene at B-1 and pentachlorophenol at B-3.

Chlorinated organics have a number of uses, including degreasing, as a wood preservative, and as a chemical solvent. The lack of data concerning these chemicals is a significant loss in evaluating contamination at this site. In the future, proper laboratory procedures should be followed to ensure that the lab can meet approved SAP PQL requirements. ***(Comment #11) It is important to note that if additional sampling takes place at Lovric's, chlorinated organics analyses should be repeated by a qualified to conduct such analyses.***

Site-specific considerations

Station B-6

As the TOC value for station B-6 was less than 0.5% TOC (0.44%), the results have been compared with the SQS Apparent Effects Threshold (AET) numeric criteria for marine sediment. All of the contaminants with concentrations greater than the SQS criteria were U-qualified, indicating that ***(Comment #12) the PQLs exceeded the criteria concentration and should be reported as such.***

Conclusions

Controlling contaminant discharge

The WQP should review BMP and other procedures at Lovric's in order to ensure that the NPDES permit does not allow the discharge of chemicals that may cause exceedances of SMS standards.

What are the next steps?

- Resubmittal of the Data Report - This memo provides comments by Ecology that must be addressed in a revised Data Report before it may be approved; we have indicated these comments as italicized and bolded. Please resubmit the Data Report electronically as a redline version enabling "track changes" along with a clean version. Once the electronic version is approved, please provide two revised hardcopies to Ecology.
- WQP and TCP should review the NPDES permit to determine ways to further reduce or eliminate the discharge of chemicals that will exacerbate SMS exceedances.

Table 1 – Chemicals exceeding SQS or SIZmax criteria, ordered by station and data qualifier

Station	No Data Qualifier		J-Qualified Data		U-Qualified Data	
	SQS Exceedances with No Qualifier	SIZmax Exceedances with No Qualifier	SQS J-Qualified Exceedances	SIZmax J-Qualified Exceedances	SQS U-Qualified Exceedances	SIZmax U-Qualified Exceedances
A-1	Benzo(g,h,i)perylene Chrysene HPAH Indeno(1,2,3-c,d)pyrene Zinc	Copper	Fluoranthene	Benzoic acid	1,4 Dichlorobenzene Butyl benzyl phthalate Hexachlorobutadiene Pentachlorophenol	1,2,4-Trichlorobenzene 1,2-Dichlorobenzene 2,4-Dimethylphenol 2-Methylphenol Benzyl alcohol Hexachlorobenzene
A-3			Fluoranthene	Benzoic acid	See U-qualified SQS exceedances for Station A-1	See U-qualified SIZmax exceedances for Station A-1
A-4				Benzoic acid Bis(2-ethylhexyl) phthalate	See U-qualified SQS exceedances for Station A-1	See U-qualified SIZmax exceedances for Station A-1
A-5				Benzoic acid	1,4 Dichlorobenzene Butyl benzyl phthalate Pentachlorophenol	See U-qualified SIZmax exceedances for Station A-1 + Hexachlorobutadiene
A-6					See U-qualified SQS exceedances for Station A-5	See U-qualified SIZmax exceedances for Station A-1 + Hexachlorobutadiene
A-7	Zinc	Copper	Bis(2-ethylhexyl)phthalate	Benzoic acid	See U-qualified SQS exceedances for Station A-1	See U-qualified SIZmax exceedances for Station A-1
A-8				Benzoic acid	See U-qualified SQS exceedances for Station A-5	See U-qualified SIZmax exceedances for Station A-1 + Hexachlorobutadiene

Station	No Data Qualifier		J-Qualified Data		U-Qualified Data	
	SQS Exceedances with No Qualifier	SIZmax Exceedances with No Qualifier	SQS J-Qualified Exceedances	SIZmax J-Qualified Exceedances	SQS U-Qualified Exceedances	SIZmax U-Qualified Exceedances
A-9				Benzoic acid	See U-qualified SQS exceedances for Station A-5	See U-qualified SIZmax exceedances for Station A-1 + Hexachlorobutadiene
B-1	Anthracene LPAH Phenanthrene		Fluoranthene Fluorene	Benzoic acid	Pentachlorophenol	See U-qualified SIZmax exceedances for Station A-1
B-3					1,4 Dichlorobenzene Butyl benzyl phthalate	See U-qualified SIZmax exceedances for Station A-1 + Hexachlorobutadiene n-Nitrosodiphenylamine
B-4	Chrysene HPAH		Fluoranthene		See U-qualified SQS exceedances for Station A-5	See U-qualified SIZmax exceedances for Station A-1
B-5					See U-qualified SQS exceedances for Station A-1	See U-qualified SIZmax exceedances for Station A-1
B-6*					Hexachlorobenzene	See U-qualified SIZmax exceedances for Station A-1 + n-Nitrosodiphenylamine

* As the TOC for station B-6 was 0.44% and outside the recommended range of 0.5 to 3.5% for organic carbon normalization, B-6 samples are compared against Marine Sediment AETs.

Table 2 – SIZmax (in bold and italics) and SQS exceedances. Note: exceedance ratio equals contaminant concentration divided by its SQS criteria. Rows are grouped by data qualifier.

Actual exceedances (no data qualifiers)

(SIZmax exceedances in bold and italics)

Scale of exceedances



Chemical Name	Stations												
	A-1	A-3	A-4	A-5	A-6	A-7	A-8	A-9	B-1	B-3	B-4	B-5	B-6
anthracene									1.23				
benzo(g,h,i)perylene	1.26												
chrysene	1.27										1.09		
copper	2.82					1.08							
HPAH	1.15										1.15		
indeno(1,2,3-c,d)pyrene	1.47												
LPAH									1.35				
phenanthrene									1.80				
zinc	1.80					1.15							

Estimated exceedances (J-qualified)

Chemical Name	Stations												
	A-1	A-3	A-4	A-5	A-6	A-7	A-8	A-9	B-1	B-3	B-4	B-5	B-6
benzoic acid	2.62	1.23	2.00	1.85		1.46	1.54	1.54	1.03				
bis(2-ethylhexyl) phthalate			2.95			1.30							
fluoranthene	2.00	1.03							1.13		2.56		
fluorene									1.70				

U-qualified exceedances (criteria > PQL)

(SIZmax exceedances in bold and italics)

Scale of exceedances

1	2	3	4	5	6	7	8
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Chemical Name	Stations												
	A-1	A-3	A-4	A-5	A-6	A-7	A-8	A-9	B-1	B-3	B-4	B-5	B-6
1,2,4-trichlorobenzene	2.94	3.17	3.28	3.72	3.83	3.11	3.72	3.83	1.56	6.67	3.44	2.78	1.57
1,2-dichlorobenzene	2.30	2.48	2.57	2.91	3.00	2.43	2.91	3.00	1.22	5.22	2.70	2.17	1.60
1,4-dichlorobenzene	1.71	1.84	1.90	2.16	2.23	1.81	2.16	2.23		1.33	2.00	1.61	
2,4-dimethylphenol	1.83	4.14	3.28	4.14	3.45	3.45	3.45	3.45	2.76	2.41	3.45	2.59	2.76
2-methylphenol	1.59	1.90	1.51	1.90	1.59	1.59	1.59	1.59	1.27	1.11	1.59	1.19	1.27
benzyl alcohol	1.37	1.64	1.30	1.64	1.37	1.37	1.37	1.37	1.10	1.23	1.37	1.03	1.10
butyl benzyl phthalate	1.08	1.16	1.20	1.37	1.41	1.14	1.37	1.41		2.45	1.27	1.02	1.27
dibenzo(a,h)anthracene										1.00			
dimethyl phthalate													1.13
hexachlorobenzene	2.30	2.48	2.57	2.91	3.00	2.43	2.91	3.00	1.22	5.22	2.70	2.17	1.14
hexachlorobutadiene	1.36	1.46	1.51	1.08	1.11	1.44	1.08	1.11		1.94		1.28	7.27
n-nitrosodiphenylamine										1.09			2.00
pentachlorophenol	1.44	1.67	1.33	1.61	1.44	1.39	1.39	1.44	1.11		1.39	1.06	1.11