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Via Email (without CD enclosures) and Overnight Delivery (with CD enclosures)

Jim Woolford, Director
Office of Superfund Remediation and Technology
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U.S. Environmental Protection Agency
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Washington, DC 20460
(Mail Code 5201-P)

Cami Grandinetti, Program Manager, Remedial Cleanup Program
U.S. Environmental Protection Agency
Region X
1200 Sixth Avenue
Suite 900, ECL-113
Seattle, WA 98101

SUBJECT: Natural Recovery of Sediments Affected by PCBs in Portland Harbor

Dear Mr. Woolford and Ms. Grandinetti:

INTRODUCTION

On July 9, 2015 we wrote to request a meeting with you to present recently collected data and information relevant to the remedy selection process for the Portland Harbor Superfund site. On August 5, we received a letter from Ms. Grandinetti asking us to submit our new data to Kristine Koch of her staff and offering to schedule a conference call. We look forward to speaking with you to present our findings. In the meantime, as you requested, we are forwarding our data and reports, which set forth the key findings from our recent investigations, to Ms. Koch. At this point we will begin sharing them with all stakeholders. We ask that EPA consider our data and reports during the ongoing remedy selection process.

Recent environmental studies were conducted in the Portland Harbor Superfund study area from 2012 to 2014 using NCP-consistent QA/QC protocols similar to other data-gathering efforts used in the RI/FS. These new studies provide an expanded information set that is relevant to

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the RI/FS process and development of a proposed plan for remediation of the Lower Willamette River. Because most of the investigations and data collected for the site's remedial investigation are now as much as ten years old, this expanded information set provides an understanding of current river conditions that is critical to the remedial action decision-making process. In this letter, we briefly summarize four independent lines of evidence demonstrating that the river is now cleaner than it was in 2004, that the ecological assets the river supports are healthier, and that natural recovery processes and focused remedial actions present sustainable solutions for contaminated sediments at Portland Harbor.

INDEPENDENT LINES OF EVIDENCE

Four independent primary lines of evidence demonstrate that:

- PCB concentrations in sediment have significantly declined since 2004,
- PCB concentrations in edible fish have significantly declined since 2002,
- The health of the benthic community is recovering, and
- Predictive models of sediment recovery and food web status have been confirmed.

Surface Sediment Sampling Program

To address current PCB concentrations in surface sediments from the Portland Harbor study area and the upriver reach, more than 125 sediment samples were collected in December 2014 and analyzed for total Aroclors (Kleinfelder 2015). Sediment sample locations were selected on a randomized grid to account for the range of PCB concentrations reported in previous studies performed between 2004 and 2011 and to account for varying river energy zones (e.g., areas of deposition, quiescence or erosion). The concentrations of Aroclor congeners reported in each sample were summed to generate a total PCB concentration for each sample, and the highest method detection limit was used to represent samples in which no Aroclor congener was present at a concentration equal to or greater than the method detection limit.

To assess current PCB sediment concentrations in the context of historical concentrations, the results of the 2014 PCB sampling were compared to total PCB concentrations reported from investigations performed in 2004. A comparison of box plots derived from the 2004 data set and the 2014 data set for total PCB concentrations shows a substantial decline in total PCB concentrations in the Portland Harbor study area (Figure 1). Similar declines in total PCB concentrations were observed when data were plotted as mean concentrations and as surface-weighted average concentrations. Out of 106 samples collected within the site, 66 locations had total PCB concentration equal to or less than 10 µg/kg and 82 locations had less than 20 µg/kg total PCBs.

To assess the significance of the decline in total PCB concentrations from 2004 to 2014, the non-parametric Wilcoxon-Mann-Whitney (WMW) test for comparisons of mean/median was performed on the two data sets. The WMW test showed that the decline was significant at $p<0.05$.

Total median PCB concentrations from 2004 and 2014 were also plotted by river mile in the Portland Harbor study area (Figure 2). Roughly equivalent declines in total PCB concentrations

were observed at each river mile, and the decline was statistically significant ($p<0.05$) at river miles (RMs) 2, 3, 4, 5, 7, and 9.

The foregoing analysis supports the following conclusions:

- A statistically significant decline ($p<0.01$) in median total PCB concentrations in surface sediments of the Portland Harbor study area has occurred over the last ten years.
- Similar ($p<0.01$) declines have also occurred in mean total PCB concentrations and surface-weighted average concentrations.
- The decline in PCB concentrations has been relatively consistent over each river mile in the Portland Harbor study area, which suggests that source control and interim remedial measures alone do not account for the decline, and that natural recovery is occurring to a significant extent.
- Substantial improvement in sediment quality has occurred, and Portland Harbor is cleaner than it was in 2004.

Fish Tissue Sampling Program

In 2002 and 2012, fish tissue from small mouth bass (SMB) collected in the Portland Harbor study area was analyzed for PCB concentrations. Over that time period, PCB concentrations in SMB declined, and the magnitude of that decline was greater than 40%. The decline was found to be statistically significant at $p<0.01$.

Sediment Profile Imaging (SPI) Investigations

In December 2001, as part of preliminary investigations for the remedial investigation, a Sediment Profile Imaging (SPI) survey was performed at 478 stations on the Lower Willamette River between RMs 0 to 15.7 (SEA 2002). In December 2013, 128 stations between RMs 3 and 13 of the 478 stations from the 2001 survey were re-sampled to evaluate changes in sediment conditions during the intervening 12-year period. The 2013 survey generally focused on near shore stations of the 2001 transects except between RMs 4 and 6, where full cross-river transects were re-sampled. The full results from the 2013 survey are presented in Germano (2014).

SPI surveys yield insights to the physical, biological, and chemical conditions of the river system sediments. In particular, SPI surveys provide information regarding the composition, distribution, and health of the benthic community. Significant improvements in benthic community health occurred between the 2001 and 2013 surveys, which classified sampling stations as Stage 1 (characterized by early stage recovery and re-colonization of sediments after a physical or chemical perturbation); Stage 2 (characterized as an intermediate recovery stage); and Stage 3 (characterized by higher order taxa that occupy stable, healthy sedimentary environments).

In 2001, 49% of the co-located samples were Stage 1 compared to only 4.7% in 2013. Reduction of Stage 1 corresponded with substantially increased presence in Stages 2 and higher in 2013. In 2013, 93 (87.7%) of the co-located stations showed evidence of Stage 3 taxa, nearly double the percentage of stations supporting Stage 3 taxa in 2001. Recovery of the benthic community was widespread throughout the site, as improvements in successional

stages were observed in all river segments sampled in 2013, except RM 12 where paired data were already Stage 3 in both years (Table 1). No relationship between recovery of benthic stage and percent reduction in median PCBs was readily apparent; however, the 2014 sediment PCB data has not been analyzed against ecological toxicity endpoints at this time.

Coupled Sediment Recovery/Food Web Model

Based on an agreement reached between the Lower Willamette Group and the EPA in 2006, a mechanistic bioaccumulation model was developed for PCBs in fish tissue and sediments associated with the Portland Harbor study area (Arnot and Gobas, 2004). The model was developed using the SMB tissue sampled in 2002 and sediment data obtained during the period 2002 to 2004.

Subsequent SMB tissue sampling conducted in 2012 and sediment sampling in 2014 provide important information concerning the predictive accuracy and validity of this model. Specifically, the 2012 tissue (mean value of 648 µg/kg) suggests that the surface-weighted average concentration of total PCBs should be in the range of 37 µg/kg. Sediment samples obtained in 2014 indicate the surface-weighted average concentration is approximately 42 µg/kg.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the foregoing investigations and analyses, the following conclusions can be made:

- The weight of evidence supports a conclusion that natural recovery processes are occurring: Portland Harbor sediments are cleaner today than they were in 2004;
- The 2014 sediment investigation confirms the predictions of the coupled sediment recovery/dynamic food web model: PCB concentrations in sediment and fish tissue have declined significantly;
- The 2014 sediment investigation also demonstrates that PCB concentrations in most of the river are consistent with upriver concentrations;
- Natural recovery and remedial measures already in place should continue; and
- Natural recovery and focused remedial actions are sustainable solutions for the river.

We request that EPA consider these lines of evidence in its current remedy selection process. We look forward to presenting this information to you in person or by phone at the earliest

opportunity. In the meantime, if you should have any questions, please contact Mat Cusma of Schnitzer at (503) 265-6339.

Sincerely,

SCHNITZER STEEL INDUSTRIES, INC.

By:
Mathew Cusma

LEGACY SITE SERVICES LLC,
Agent for Arkema Inc.

Frederick Wolf
by Elizabeth Weaver

By:
Frederick Wolf

EXXONMOBIL OIL CORPORATION

Deborah A. Edwards
by Elizabeth Weaver

By:
Deborah A. Edwards

BAE SYSTEMS SAN DIEGO SHIP REPAIR INC. and THE MARINE GROUP LLC

By:
J. W. Ring

cc: Kristine Koch, EPA Region X (letter and attachments via electronic mail; letter via overnight courier with CD enclosures)
Gov. Kate Brown (via U.S. Mail without enclosures)
Sen. Ron Wyden (via U.S. Mail without enclosures)
Rep. Earl Blumenauer (via U.S. Mail without enclosures)

Attachments:

Figure 1 – Comparison of Total PCB Concentrations of in 2004 and 2014
Figure 2 – Comparison of Total PCB Concentrations of in 2004 and 2014 by River Mile
Table 1 – Comparison of Benthic Infaunal Stage for Paired SPI Stations with Reduction of Sediment PCB Concentration

Enclosures:

CDs with copies of the following supporting documents:

1. Arnot JA, Gobas FA. 2004. A Food Web Bioaccumulation Model for Organic Chemicals in Aquatic Ecosystems. Environ Toxicol Chem 23(10):2343-2355.

2. Germano & Associates, Inc. 2014. Characterization of the Lower Willamette River with Sediment Profile Imaging: Changes in Space & Time. Prepared by Germano &

Associates, Inc., Bellevue, Washington. Prepared for de maximis, inc., The Woodlands, Texas. June.

3. Kleinfelder. 2015. Sediment Sampling Data Report. Portland Harbor, Portland, Oregon. Prepared by Kleinfelder, Inc., Redmond, Washington. Prepared for de maximis, Inc., The Woodlands, Texas. Kleinfelder Document Number 20153027.001A/SEA15R15419. June 1. (Includes Kleinfelder report text, Appendices, Figures, Tables, QAPP, SAP, NewFields Data Validation Report.)

4. PPT Presentation Slides. August 2014. "Portland Harbor: The State of the River in 2014."

5. TruGround. 2014. Final Proposed PCB Sediment Sampling Strategy. September 29.

6. Kleinfelder. 2015. Statistical Analysis of 2014 Sediment PCB Concentrations. July 28.

7. Legacy Site Services LLC. 2015. An Assessment of the Coupled Sediment Recovery and Dynamic Food Web Model: Predicting the Concentrations of Total PCBs in Lower Willamette River Fish Tissue Based on 2002 to 2012 Sampling Data. August.

8. Integral Consulting, Inc. 2015 Analysis of 2014 Lower Willamette Sediment Data by Paired Difference Tests, Portland Harbor Site. July 31.

FIGURE 1

COMPARISON OF TOTAL PCB CONCENTRATIONS IN 2004 AND 2014

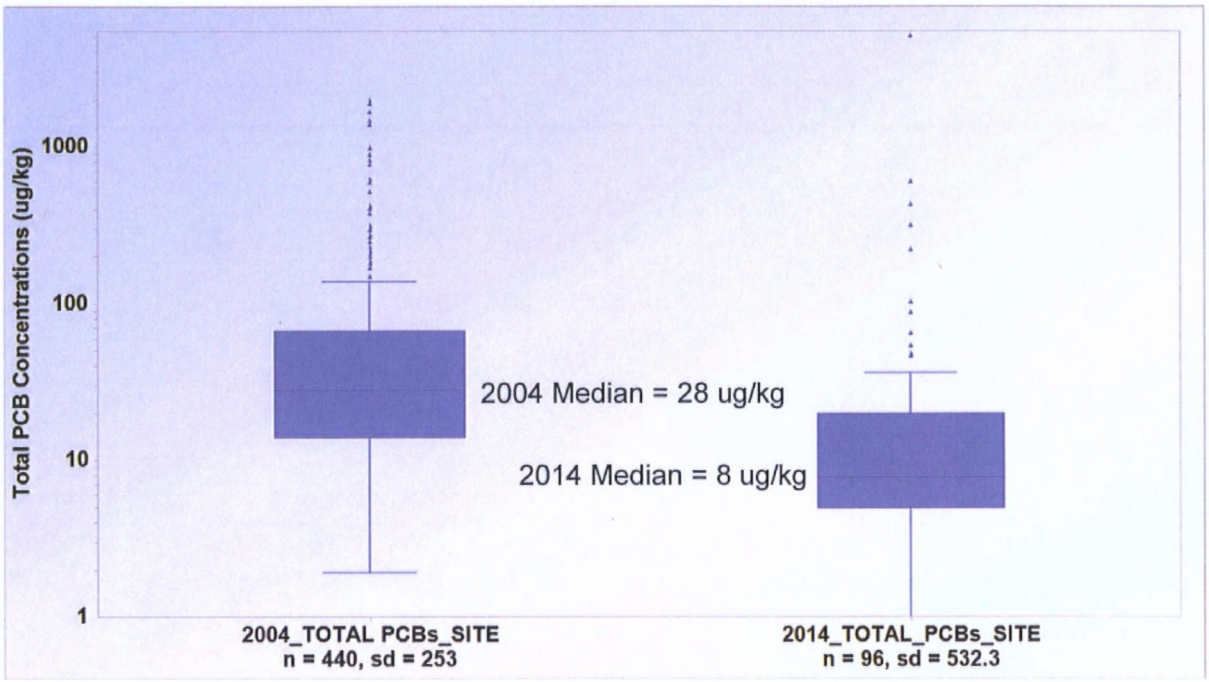
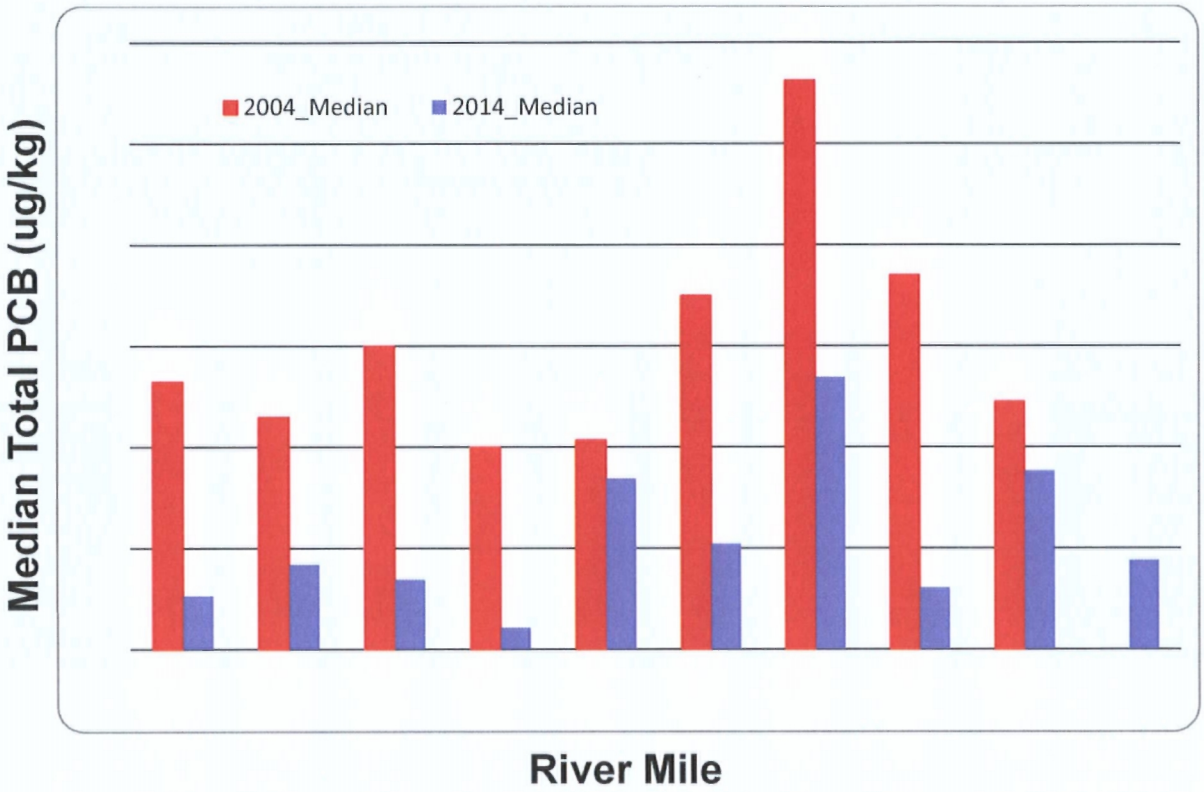


FIGURE 2

COMPARISON OF TOTAL PCB CONCENTRATIONS IN 2004 AND 2014 BY RIVER MILE



Percent Decrease in PCB Concentrations at Each River Mile

River Mile	Decrease
2	80.0%
3	63.4%
4	76.9%
5	89.2%
6	18.5%
7	70.2%
8	52.1%
9	83.5%
10	27.9%

TABLE 1

Comparison of Benthic Infaunal Stage for Paired SPI Stations with Reduction of Sediment PCB Concentration*

River Mile	Stage 1		Stage 2		Stage 2->3		Stage 3		% Reduction in PCBs	No. Co-located Samples
	2001	2013	2001	2013	2001	2013	2001	2013		
2	3	0	2	0	0	1	6	10	80.0	11
3	13	3	0	3	0	5	18	20	63.4	31
4	14	0	0	2	0	3	2	11	76.9	16
5	6	2	0	0	0	2	2	4	89.2	8
6	5	0	0	0	0	1	5	9	18.5	10
7	3	0	0	1	0	3	12	11	70.2	15
8	4	0	0	1	0	2	4	5	52.1	8
9	2	0	0	0	0	0	0	2	83.5	2
10	1	0	0	1	0	0	2	2	---	3
11	0	0	0	0	0	0	2	2	---	2
totals	51	5	2	8	0	17	53	76	62.4	106

* Does not include paired stations where benthic infaunal stage was indeterminate in one or both years