Submission of Case Study on Mis-alignment at the Chemicals Waste Interface

The case studies collected aim to foster a discussion on real-world policy mis-alignment at the chemicals/waste interface in order to discuss and identify potential, or already applied, solutions. The case studies can cover different sectors/issues (e.g. restricted chemicals in materials, such as plastics, impeding recycling or other end of life treatment; need for secondary materials to align with chemical safety policies; issues with chemicals released with waste water from use of recycled raw materials; etc.)

The case studies will be discussed at a workshop in conjunction with the 60th Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology (Joint Meeting) in February. A summary document of the workshop, along with the case studies, will be published. Both the Joint Meeting and the Working Party on Resource Productivity and Waste are being solicited for case studies. Country delegates between the two groups are encouraged to collaborate on submissions.

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1. *Please indicate contact information:*

Delegation (country name; stakeholder organisation): _____
Contact Point Information: _____

United States of America

Doug Krapas, Environmental Manager, Inland Empire Paper Company, and member of the Spokane River Regional Toxics Task Force (SRRTTF.org), organized to address elevated levels of Polychlorinated Biphenyls in the Spokane River watershed

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2. *What industry sector(s) are implicated in the case study? Please refer to the STAN industry list. Example: C17: Manufacturing - Paper and paper products.*

C17: Manufacturing - Paper and paper products, through the recycling of paper products contaminated with PCBs in the inks and pigments used for printing

Due to the ubiquitous nature of PCBs, this issue also affects all municipal wastewater and stormwater systems resulting in pathways to the environment, the burden of which for clean-up is paid for by all citizens and ratepayers.

3. *Indicate the policies and/or legislation which lead to misalignment within the case study, from both the chemicals policy perspective and the waste management perspective. Briefly summarise the context and intent of the policies:*

U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory and the U.S. Clean Water Act (CWA):

SUBCHAPTER R - TOXIC SUBSTANCES CONTROL ACT, PART 761

…pigments that contain 50 ppm or greater PCB may be processed, distributed in commerce, and used in a manner other than a totally enclosed manner until January 1, 1982…40 C.F.R. § 761.3 (g), Reserved after 1999

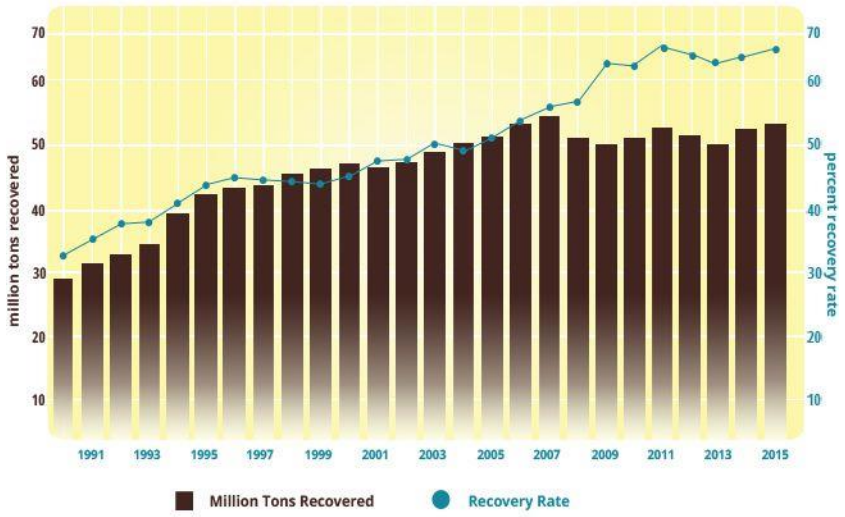
The concentration of inadvertently generated PCBs in products leaving any manufacturing site or imported into the United States must have an annual average of less than 25 ppm, with a 50 ppm maximum" 40 C.F.R. § 761.3 (1)

Current TSCA regulations allow exclusions for the use of pigments and inks to contain PCB concentrations up to 50 ppm. These PCB containing pigments and inks are used in printing of newspapers, magazines, and numerous other printed materials. Paper recyclers of old newsprint, magazine and other waste paper products receive these PCB containing products that ultimately end up in the wastewater discharge of the recyclers. Although PCB concentrations in the recycler's discharge are millions or billions of times lower than the Federal allowance, they are unable to meet stringent water quality standards being set in parts per quadrillion. There are no known commercially available technologies for the removal of PCBs to the levels necessary to meet these water quality criteria, so the only alternative for compliance may be the elimination of paper recycling.

It is also important to note that these same pigments are also used in the manufacture of commercial paint products. Congener fingerprint correlations suggest that leaching of PCB-containing paints are a likely source of PCB contamination directly into receiving waters, stormwater and into municipal wastewater treatment systems.

The U.S. Clean Water Act (CWA) requires that water bodies meet certain water quality criteria established by either Federal or State laws. The current PCB water quality criteria for WA State is 7 parts per quadrillion which is over 7 billion times lower than the TSCA threshold for excluded PCB products (50 ppm). The water quality criteria for PCBs are extremely low and not conducive for efficient and effective removal. There are no commercially available technologies that are effective for reducing PCBs to this level.

Additionally, many states and cities in the U.S. have adopted mandatory recycling policies. Due to these programs, recovery rates in the U.S. are approaching 70%:



The stringent water quality standards being imposed across the U.S. for PCBs is a threat to the future of paper recycling as mills would need to eliminate the source of PCBs coming into their facilities via recycled paper products that are printed with inks allowable under TSCA. It is important to note that paper mills have the capability to remove and destroy over 90% of the PCBs coming into their facilities, but unfortunately that is not sufficient to meet the imposed water quality standards.

4. *Briefly summarise the case study and the mis-alignment issue that it illustrates. This could be mis-alignment leading to health and/or environmental consequences, or leading to economic consequences (e.g. impedes shift to new technologies or business models; increases cost disproportionately to a particular business sector etc.)*

Prior to 1991, Inland Empire Paper Company's (IEP) effluent stream was free of PCBs as confirmed by the Washington State Department of Ecology (Ecology) Class II inspections and NPDES permit application testing. Furthermore, US EPA research studies performed from 1976 to 1978 showed no conclusive evidence of PCBs in pulp and paper mills processing "virgin" wood stock. The State of New York also performed a study of PCBs in paper mill effluents during the period 1976 to 1978. All mills using virgin stock (wood chips, etc.) were eliminated from the study as they found no potential for PCBs in those effluents. IEP used only virgin wood fibre for pulp manufacturing until 1991.

In the 1980's there was a movement towards recycling of paper, resulting in customer demand for recycled fibre in IEP's finished paper products. In addition, a law was enacted in California that required publishers to include a minimum percentage of recycled fibre content:

CA PUBLIC RESOURCES CODE, ARTICLE 2. Recycled-Content Newsprint

42760.

On and after January 1, 1991, every consumer of newsprint in California shall ensure that at least 25 percent of all newsprint used by that consumer of newsprint is made from recycled-content newsprint, if recycled-content newsprint is available at a price comparable to that of newsprint made from virgin material, if the recycled-content newsprint meets the quality standards established by the board pursuant to Section 42775, and if the recycled-content newsprint is available within a reasonable period of time.

42761.

The percentage of newsprint used which is made from recycled-content newsprint shall be calculated in tons used on an annual basis and shall increase to:

(a) Thirty percent on and after January 1, 1994.

(b) Thirty-five percent on and after January 1, 1996.

(c) Forty percent on and after January 1, 1998.

(d) Fifty percent on and after January 1, 2000.

In order to remain a viable business and meet this demand, IEP invested into a new recycling process that began production in September 1991.

In May 2001, Ecology sampled effluents and collected biosolids from five (5) municipal and industrial dischargers to the Spokane River for PCB analysis. Low-level PCB detections were reported from all of the municipal and industrial discharges. Total PCB congeners for IEP's effluent sample were reported at 2,436 pg/L (picograms per Litre), a concentration that is 20.5 million times lower than the TSCA threshold for excluded PCB products (50 ppm).

The Spokane River is on the §303(d) listing for impaired water bodies for PCB contamination. As a result, Ecology is responsible for the development of a water quality attainment plan. The current water quality standard (WQS) for PCBs in WA State is 7.0 parts per quadrillion. This WQS concentration is below current detection limits and is over 7 billion times lower than the TSCA threshold for excluded PCB products (50 ppm). The presence of PCBs in IEP's discharge is ultimately due to the allowance provided by the Federal TSCA guidelines.

The PCB concentrations in IEP's effluent are extremely low and not conducive for efficient and effective removal. There are no commercially available technologies that are effective for reducing already low levels of PCBs to the stringent WQS levels. Currently, the only viable alternative for reducing PCBs from IEP's effluent is the elimination of the recycling process.

Elimination of the recycling process at IEP has the potential to set a precedent throughout the rest of the pulp and paper industry with the elimination or significant reduction of paper recycling in the United States. Furthermore, elimination of recycling may cause IEP irreparable harm due to its inability to offer recycled content paper products. Elimination of paper recycling does not solve the PCB problem, but simply moves it from one location within the environment to another. The enormous amount of paper currently being recycled would need to be disposed of through landfills or incineration, potentially re-entering the environment through groundwater contamination or air emissions.

This same problem exists for municipal wastewater and stormwater systems where the TSCA allowable PCBs are entering their systems via consumer products. The only option available for these types of treatment systems is end-of-pipe technologies that are extremely expensive and insufficient to attain stringent water quality standards, requiring investment in perpetuity.

5. *What policy solutions could address the misalignment or lead to a technological solution that addresses the mis-alignment?*

Due to the extreme misalignment between policies promoting paper recycling, and the Federal TSCA allowance and CWA water quality standards that are millions or even billions of times apart, will require a host of solutions to resolve. The SRRTTF in cooperation with Northwest Green Chemistry recently conducted a workshop to explore solutions with many different stakeholders. Some of the more significant solutions discussed at this workshop are presented below:

Suggestion #1: Develop/Use Alternatives to PCB-Containing Products:

The trace amount of PCBs that are present in various pigments are not used in the manufacture of these pigments, but are inadvertently produced as a by-product through the complex reaction of chlorinated solvents used in the manufacturing process. Alternative methods using non-chlorinated solvents are available to manufacture pigments that are currently produced using chlorinated solvents in some cases.

Suggestion #2: Reduce the TSCA/Global Allowance for PCBs:

Modify the TSCA regulations to reduce the allowable levels of PCBs in products from the current 50 ppm maximum/25 ppm average to a lower threshold. Industry experts believe that most of the pigments manufactured

today using improved quality control methods can be produced at much lower levels than the current TSCA allowance. This will likely require global consideration since most pigments are manufactured outside the U.S. Suggest working with pigment manufacturers to establish a lower, more reasonable PCB allowance standard that is consistent with modern manufacturing methods.

Suggestion #3: Incentivize the Research and Development of Non-Chlorinated Alternatives:

The manufacturing of pigments used in paints and inks is an international industry. Most base pigments are manufactured overseas. Incentivize the international community to research and develop non-chlorinated alternatives to the current PCB containing products. Encourage pigment manufacturers to develop alternative manufacturing processes or eliminate certain PCB-containing pigments. In order to provide these incentives, we need to remove or reduce the regulatory constraints that currently make the development of new products prohibitively burdensome and expensive.

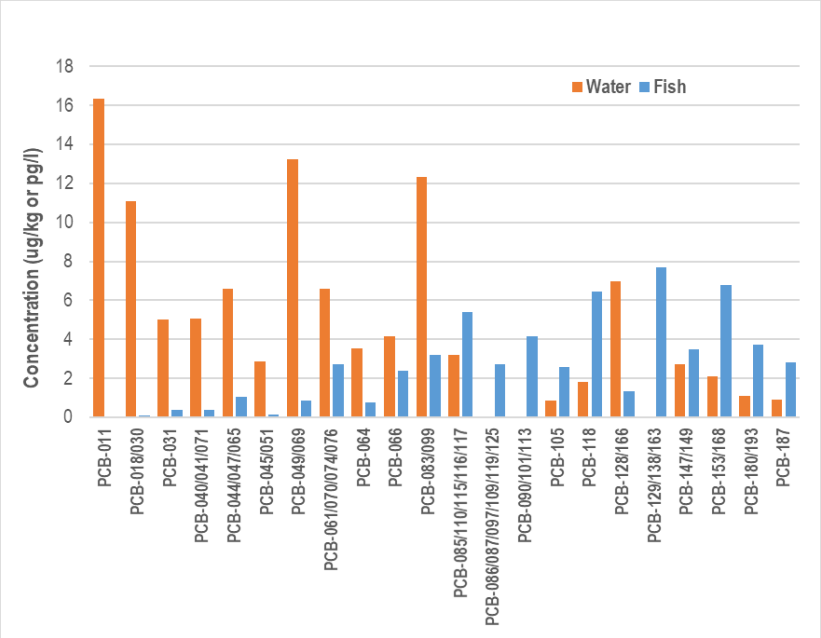
Suggestion #4: Reassess the Current Use Authorizations:

Reassess the current use authorizations for certain PCB uses to determine whether they may now pose an unreasonable risk to human health and the environment. Section 6(e)(2)(B) of the Toxics Substance Control Act (TSCA) provides EPA with the authority to issue regulations allowing the use and distribution in commerce of PCBs in a manner other than in a totally enclosed manner, if the EPA Administrator finds that the use and distribution in commerce will not present an unreasonable risk of injury to health or the environment. The 50 ppm level for excluded products in the TSCA regulations has allowed for the use of chemical products that have entered the ecosystem through the recycling process and other pathways that now present an unreasonable risk of injury to health and the environment. Therefore, U.S. EPA is obligated to make changes to its rules and regulations to protect human health and the environment.

Suggestion #5: Monochloro-biphenyls and Dichloro-biphenyls should be excluded from total PCB regulation:

Mono and dichloro-biphenyls have generally been regarded as having lower bioaccumulation and human health and environmental impacts than more highly substituted PCB congeners. Information published in peer reviewed literature and presented by U.S. EPA and the Agency for Toxic Substances and Disease Registry (ATSDR) shows that the physical/chemical properties of mono and dichloro-biphenyls do not favour the accumulation of these congeners in biological tissues, including fish, relative to more highly chlorinated PCB congeners. Further, these congeners generally play a smaller role in concerns over PCB contamination in aquatic systems. Research on the fate and transport of PCBs in the aquatic environment has established that the bioaccumulation of PCB congeners in aquatic organisms including fish is related to the degree of chlorine substitution.

PCB congener data from the Spokane River published by the Washington State Department of Ecology indicates that mono and dichloro-biphenlys comprise a small component of total PCB found in fish. Work performed by the Spokane River Regional Toxics Task Force found that although lower congener levels were prevalent in the water column there was little to no bioaccumulation in fish tissue:



In addition to lower expected bioaccumulation, the level of human and environmental health concern attributed to mono and dichloro-biphenyls is generally also lower than that of more highly chlorinated congeners. For example, none of these congeners are among the 12 congeners identified by U.S. EPA as "dioxin-like" that are generally considered to pose the largest PCB related environmental and human health concerns. EPA, in a summary of conclusions from their 1996 cancer reassessment, states, "The types of PCBs that tend to bioaccumulate in fish and other animals and bind to sediments happen to be the most carcinogenic components of PCB mixtures." (However, it is important to note that comprehensive toxicological data for each individual congener are not currently available.)

Further, in U.S. EPA's "Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories," only one of 18 congeners recommended for quantitation to support the development of fish consumption advisories is a dichloro-biphenyl (2,4'-CB, PCB-8). The recommendation to include this congener is based on a NOAA procedure for using congener data to estimate total PCB concentrations rather than on specific toxicity concerns. No mono- or dichlorobiphenyl congeners are identified as either first or second priorities "for potential environmental importance based on potential for toxicity, frequency of occurrence in environmental samples, and relative abundance in animal tissues."

A significant percentage of PCB congeners associated with the recycling process are monochloro, dichloro, trichloro and tetrachloro-biphenyls. The lower chlorine congeners are known to have lower toxicity and are not as persistent and bio-accumulative as higher chlorine congeners, resulting in a low potential for exposure to humans. Because of this low risk factor, monochlorinated and dichlorinated biphenyls are not regulated in the European Union and Canada.

If it is determined the environmental benefit of recycling outweighs that of not recycling, provide the recyclers of paper an offset or exclusion for PCBs attributable to those allowable under the TSCA regulations.

Suggestion #6: Holistic Regulatory View:

Challenge regulatory agencies to consider a more holistic view of the environmental, time-cost-benefit and socio-economic effects of implementing their conflicting regulations (TSCA/CWA, State recycling laws/WQS, etc.). Agencies need to set attainable regulatory goals/standards to incentivize industry to drive technological solutions. Agencies need to perform cradle-to-grave life cycle assessments to determine overall environmental benefit.

Suggestion #7: Market Drivers:

Encourage end-users to adopt policies for printed materials to use alternative inks and pigment formulations that are non-chlorinated thus reducing the potential for PCBs in their finished products.

Encourage end-users to adopt purchasing policies with lower PCB thresholds for products both purchased and manufactured by their companies.

Educate all of those along the supply chain on this issue and encourage reducing the potential for PCBs in their finished products.

Increase public awareness of this issue to provide consumers with options for purchasing products with reduced levels of PCBs.

6. *What questions/topics stemming from this case study could be addressed at the workshop?*

Bring inks, pigments and dye industries to the table to determine if alternative non-PCB or lower than what is current allowed products are available for distribution in commerce. Several U.S. companies have taken it upon themselves to lower their own procurement levels well below the current TSCA allowance.

Work with end users of inks, pigments and dyes to determine if non chlorinated products can supplant the current chlorinated products.

Encourage enforcement of regulated levels of PCB. The U.S. EPA requires that suppliers self-report. A study performed in Japan by METI found a number of pigments exceeded regulated limits.

7. *If applicable, what functional use code and product or article code category(ies) apply to the case study. For OECD harmonised use, product/article use codes see: http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/jm/mono(2017)14&doclanguage=en*

Ink toner and colorant products

8. *Link(s) to relevant documentation of the case study:*

Nestler, A., Heine, L., and Montgomery, A. (June 28, 2019). Pigments and inadvertent polychlorinated biphenyls (iPCBs): Advancing no and low iPCB pigments for newsprint, and paper and paperboard packaging. Prepared for the Spokane River Regional Toxics Task Force. Retrieved from http://srrttf.org/wp-content/uploads/2019/07/Final20190628_iPCBs-and-Pigments.pdf

Heine, L., and Trebilcock, C. (October 16, 2018). Inadvertent PCBs in Pigments: Market Innovation for a Circular Economy. Prepared for the Spokane River Regional Toxics Task Force. Retrieved from http://srrttf.org/wp-content/uploads/2019/07/NGC-inadvertant-PCB-White-Paper-for-SRRTTF-20181016.pdf

Japan Ministry of Economy, Trade, and Industry (METI). (2012). Administrative Guidance for Manufacture/Import etc., of Organic Pigments Containing By-product PCBs. Retrieved 5/30/2019 from https://www.meti.go.jp/policy/chemical_management/english/cscl/files/publications/revie

w/guidance_for_pigments_120213.pdf

Rodenburg, Lisa, Jia Guo and Robert Christie. (2015) "Polychlorinated biphenyls in pigments:" Coloration Technology. Retrieved from https://ecology.wa.gov/DOE/files/5e/5eba04f9- d41f-4e9f-ad9c-a98a01a431ca.pdf

Washington State Chemical Action Plan; https://ecology.wa.gov/Waste-Toxics/Reducing-toxic-chemicals/Addressing-priority-toxic-chemicals/PCBs

Grossman, 2013. Elizabeth. Nonlegacy PCBs: Manufacturing By-Products Get a Second Look. Environmental Health Perspectives. March 121(3). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3621189/

Spokane Regional Toxics Task Force; http://srrttf.org