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Status of Minnesota's Toxics in Packaging Program

2011 Biennial Summary Report



Minnesota Pollution Control Agency

November 2011

Legislative Charge

Minnesota Statutes § 115A.965 Prohibitions on selected toxics in packaging; Subdivision 7 Report:

By September 1 of each odd-numbered year, the commissioner shall prepare and submit to the environment and natural resources committees of the senate and house of representatives, the finance division of the senate committee on environment and natural resources, and the house of representatives committee on environment and natural resources finance a report to include:

(1) enforcement actions taken by the commissioner under this section for the reporting period; and

(2) for each exemption granted, the identity of the party requesting the exemption, a brief description of the packaging, and the basis for granting the exemption.

Author

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Contributors / acknowledgements

Member states and staff of the Toxics in Packaging Clearinghouse

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Minnesota Pollution Control Agency

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Status of Minnesota's Toxics in Packaging Program

Legislative Background

In 1991, the Minnesota Legislature passed the "Prohibitions on Selected Toxics in Packaging" law (Minn. Stat. § 115A.965, 1992 Session Laws Ch. 337, Sec. 50). The bill was based on model legislation drafted two years earlier by a working group in the Coalition of Northeastern Governors (CONEG), with active cooperation of a wide range of stakeholders from environmental groups, industry, and governmental agencies.

The law prohibits the intentional introduction of lead, cadmium, mercury, or hexavalent chromium into packaging or the components of packaging that is offered for sale or is being distributed for promotional purposes. It also prohibits the incidental presence of these metals at concentrations exceeding 100 parts per million (ppm) total by weight for the four metals.

Minnesota is one of 19 states that have adopted the model "toxics in packaging" legislation. Because most packagers and package manufacturers selling into the U.S. market distribute to at least one of the 19 states, the packaging laws are seen (by some) as a national standard in the absence of federal legislation, at least for major domestic packaging manufacturers and distributors. The law was one of the first to pursue a "source reduction" strategy, which strives to keep unwanted material out of the recycled and discarded waste stream entirely by eliminating the use of that unwanted material. The law applies to manufacturers, distributors, and suppliers of packaging as well as to manufacturers of packaged products. The law requires these parties to maintain on file current certificates of compliance that show they are following the packaging law.

Joint Action

In 1992, a number of states with enacted laws formed the Toxics in Packaging Clearinghouse (TPCH) under the auspices of CONEG to encourage consistent and streamlined implementation of each state's Toxics in Packaging law. Administration of TPCH was transferred to the Council of State Governments (CSG), and then to the Northeast Recycling Coalition (NERC) in 2005. Currently there are ten state members of the Clearinghouse and nine states that have toxics in packaging laws but who are not members of the Clearinghouse. Since the 2009 Biennial Report, membership in TPCH has not changed.

TPCH Member States	States with Legislation/Not TPCH Members
1. California	1. Florida
2. Connecticut	2. Georgia
3. Illinois	3. Maine
4. Iowa	4. Maryland
5. Minnesota	5. Missouri
6. New Hampshire	6. Pennsylvania
7. New Jersey	7. Vermont
8. New York	8. Virginia
9. Rhode Island	9. Wisconsin
10. Washington	

The legislation in some non-member states does not include enforcement authority. This is cited by those states as a barrier to implementation of the law and TPCH membership. Responsibility for enforcement also varies among the states; in some states the authority clearly rests with the environmental agency, in other states it clearly rests with the agency responsible for trade/consumer protection, and in some states it is not clear which agency has primary authority.

Clearinghouse member states consider exemption requests jointly to ensure that all parties receive the same information and to minimize the administrative costs borne by individual states. The clearinghouse receives

and answers requests for information and clarification from businesses, governments, and stakeholder groups. Current information may be found at the clearinghouse website, http://www.toxicsinpackaging.org.

In the interest of obtaining information needed for good decision-making, the TPCH offers ex officio membership to industrial representatives. The Steel Recycling Institute, the American Plastics Council, and Paper Recycling Coalition currently participate. In 2009, there were two member associations representing various parts of the glass and glass decorating industry, the Association of Safe Glass and Ceramic Decorators and the Society for Glass and Ceramic Decorated Products. Neither of these associations renewed their membership at the end of FY 2010. The Clearinghouse also draws on a network of technical experts.

Enforcement Actions

As a member of TPCH, Minnesota participated in discussions of and supported enforcement actions by other state members for packaging that was used and sold by national retailers. See the attached 2010 and 2011 TPCH Annual Reports for additional information.

No enforcement actions were undertaken individually by the MPCA during this reporting period.

Exemptions Requested and Granted

In FY10, an attorney representing some glass decorators submitted a written request for exemption for 'natural materials' used in glass enamel coatings containing lead exceeding 100 ppm. TPCH turned down the exemption request on the grounds that comparable materials are available that meet the requirements of toxics in packaging laws, i.e., lead is not intentionally added, lead is present at less than 100 ppm, and coating manufacturers are not intentionally adding high lead 'natural materials' to their formulations. The Society for Glass and Ceramic Decorated Products resigned from TPCH shortly after this decision was made by TPCH member states.

No other exemptions were formally requested or granted.

Current Activities

Minnesota joined the Toxics in Packaging Clearinghouse in 1993 and has remained an active member continuously since that time.

During the reporting period, the TPCH:

- Continued to communicate with states that have legislation but are not TPCH members, regarding toxics in packaging issues and possible membership in TPCH.
- Coordinated and communicated on toxics in packaging issues with the U.S. Environmental Protection Agency and trade groups that are not represented as ex officio members of TPCH, such as the Institute of Packaging Professionals.
- Carried out a laboratory round robin laboratory assessment project under contract with the California Department of Toxic Substances Control. This is described in further detail below.

California contract to perform round robin laboratory assessment

The 2007 and 2009 packaging assessment projects carried out by TPCH indicated significant variation in laboratory sample preparation methods, analytical methods, and results. The California Department of Toxic Substances Control (DTSC) contracted with TPCH to conduct a round robin study of laboratory performance. The study was carried out in FY 2011 and the final report was issued in July 2011.

The final report "Laboratory Round Robin Test Project: Assessing Performance in Measuring Toxics in Packaging" is attached.



Annual Report

Toxics in Packaging Clearinghouse July 1, 2009 – June 30, 2010

Prepared by Patricia Dillon, TPCH Program Manager Approved by Members on November 9, 2010

This report summarizes the activities and accomplishments of the Toxics in Packaging Clearinghouse from July 1, 2009 to June 30, 2010 (FY10), under the management of the Northeast Recycling Council, Inc. (NERC). The first section highlights TPCH accomplishments in FY10. The remainder of the document is organized by major activity.

FY10 HIGHLIGHTS

- Received an EPA New England Environmental Merit Award in April 2010 for its achievements in reducing the toxicity of packaging entering the solid waste stream. EPA's Environmental Merit Award is an annual award that recognizes outstanding environmental advocates who have made significant contributions toward preserving and protecting our natural resources.
- Generated significant press coverage from a press release for the TPCH report, An Assessment of Heavy Metals in Packaging: 2009 Update.
- Launched 3rd packaging screening project using x-ray fluorescent (XRF) technology to detect the presence of regulated metals in packaging.
- Received a contract from the California Department of Toxic Substances Control to conduct a comparative assessment of test results generated by independent laboratories to assure that toxics in packaging performance objectives are met.

ADMINISTRATION

- Meetings
 - Convened monthly conference calls of full membership (14 organizations). An average of 15 people participated on each conference call, representing 11 of the 14 member organizations (states and industry) on average.
 - Suspended biannual membership meetings in FY11 due to member state travel and budget restrictions. Plan to convene next face-to-face membership meeting in October 2010 in Hartford, CT.
 - Recorded and distributed minutes for all conference calls to members, and maintained TPCH central file of minutes.

♦ Program Management and Reporting

- Prepared and distributed to members the FY09 Annual Report.
- Prepared FY11 work plan and budget, which were approved by members in July 2010.
- Renewed annual agreement with NERC to provide administrative services to TPCH.

♦ TPCH Financial Management

- Appendix A provides a financial summary for FY10. TPCH began FY10 with a reserve account balance of \$75,079.55 and ended the fiscal year with \$72,103.21. TPCH missed its revenue target by just \$1,000, which is notable in this economy. Operating expenses were \$5,106 less than budget. The net reduction in TPCH reserve funds in FY10 was the result of cost overruns in FY09 on the EPA-funded grant for the 2nd XRF compliance screening project, which were debited from the CA SEP funds, and hence the TPCH reserve account, in FY10.
- The unrestricted California Supplemental Environmental Project (SEP) account allowed TPCH to conduct a "pilot" assessment of laboratory test results (see Testing/Research section for details); and covered the cost overrun from FY09 for the 2nd TPCH XRF compliance screening project.

Additional Sources of Funding

TPCH received a contract for \$11,000 in June 2010 from the California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) to conduct a comparative analysis of test results for heavy metals in packaging by independent laboratories. The project period runs from June 15, 2010 through June 30, 2011.

Grant/Contract Administration

- Submitted paperwork to secure contract with CA DTSC (see above).
- No other active grants/contracts in FY10.

GENERAL INQUIRIES & EXEMPTION REQUESTS

General Inquiries

Received and responded to103 general inquiries by telephone and email, an average of two
inquiries per week. The number of inquiries in FY10 was down 30 percent compared to
FY08 and FY09, which were exceptionally busy years due to outreach around the 1st and 2nd
compliance screening projects. Appendix B provides a brief analysis of the general inquiries,
focusing on the types of organizations requesting information and assistance.

• Exemption Requests

Received no new exemption requests.

MODEL LEGISLATION & INTERPRETATIONS

• Updates to Model

In October 2009 the Summary to the Model Legislation was updated to reflect prior revisions to the Model, specifically the removal of the phase-in provisions for incidental presence. The paragraph on "provisions of Certificates of Compliance" was also modified for consistency with the Model. The revisions to the Summary to the Model are in Appendix C.

♦ Interpretations

Extensive time spent the first half of the fiscal year on correspondence and discussions regarding the application of the definition of "packaging component" to the exemption for glass bottles with vitrified labels; and the application of this definition in the absence of such

an exemption. These discussions resulted in several documents that summarize the position of TPCH and member states, as well as Website changes, including:

- Letters to law firm providing TPCH position on the above queries. See Appendix D for initial letter dated September 10; additional correspondence (not attached) provided further clarification.
- Background document summarizing the history of the glass exemption. See Appendix E.
- Updates to the TPCH Exemptions page on the Website, including a TPCH position statement, which is provided as Appendix F.
- Modification to the Frequently Asked Question (FAQ) on the TPCH Website. See Appendix G, #3.

EDUCATION & OUTREACH

• TPCH Compliance Screening Report – Press Release

In July 2009 distributed a press release on the TPCH report, *An Assessment of Heavy Metals in Packaging: 2009 Update*. See Appendix H.

Press coverage of the report in publicly available electronic sources is found in Appendix I. (Note: tracking of press coverage is very informal, and therefore, this list is not comprehensive.) It's notable that the report's findings were distributed to some key target audiences, including Packaging Digest, Flexible Packaging Association, and the Home Fashion Products Association. TPCH reports were also the subject of articles and blogs by the legal community.

♦ TPCH Website

The Website was visited by 18,661 unique visitors in FY10 or 1,555 visitors per month. The table below shows the visitors to the TPCH Website every month in FY10 and a comparison to FY07 through FY09.

The first 4 months of the fiscal year (July through October) logged the most visitors, likely due to the late June 2009 release of the report, *An Assessment of Heavy Metals in Packaging: 2009 Update*. Overall, FY10 saw a decline in Website visitors compared to FY09 when the 2nd XRF screening project and related company communications about failed packages were underway. Despite the decline from the prior fiscal year, Website visitors for FY10 were three times more than FY07 when statistics were first recorded.

The top five countries visiting to the TPCH website in FY10 were: the United States followed by China, Hong Kong, Canada, and Taiwan.

Month	Unique Visitors	Number of Visits	Pages Visited
July 2009	1804	3033	10436
Aug 2009	1759	3006	9237
Sept 2009	1805	3070	9200
Oct 2009	1718	3011	9575
Nov 2009	1542	2585	8151
Dec 2009	1287	2564	7406
Jan 2010	1473	2732	8472
Feb 2010	1314	2183	6988
March 2010	1608	2729	8655
April 2010	1489	2516	7808
May 2010	1465	2486	7139
June 2010	1397	2290	7301
Total	18,661	32,205	100,368
FY10 Averages	1,555 visitors/month	1.7 visits/visitor	3.1 pages/visit
FY09 Averages	1,860 visitors/month	1.7 visits/visitor	3.9 pages/visit
FY08 Averages	1,212 visitors/month	1.5 visits/ visitor	3.1 pages/visit
FY07 Averages	576 visitors/month	1.4 visits/visitor	2.8 pages/visit

The following additions and updates were made to the Website:

- Posted 16 new and revised Frequently Asked Questions. See details below.
- Revised the Summary of the Model Legislation for consistency with the Model, as noted above.
- Revised the Exemptions page for consistency with Model and to update information on the glass exemption, as discussed above.
- Revised the sample Certificate of Compliance to reflect Iowa's requirement.
- Posted announcement on TPCH receipt of 2010 EPA Environmental Merit Award.
- Updated comparative analysis of state legislation, including glass exemptions, as additional information from states was available.

• Frequently Asked Questions: New & Revised

Developed and approved guidance for the regulated community in the form of Frequently Asked Questions (FAQs) posted on the TPCH Website. A major focus for FAQ additions and revisions focused on Certificates of Compliance. FAQs developed and posted in FY10 included:

- Test methods
- Certificates of Compliance (8 FAQs on the basics such as content, who should sign, records retention, required documentation, when to update)
- Exemption Vitrified Labels (revised)
- How to Generate a Certificate of Compliance (5 FAQs)
- Single or multiple Certificates of Compliance (revised for consistency with sample Certificate of Compliance)

See Appendix G for the full text of the above FAQs.

Presentations

- Member states presented on toxics in packaging at the following events:
 - CT DEP Hazardous Waste Advisory Committee, February 2010 (David Westcott)
- TPCH staff provided slides on packaging screening results for a presentation at the Western Pollution Prevention Network Conference in San Diego, CA on October 28-29, 2009. Presentation by Bill Smith, City of Tacoma, Washington.

• Awards & Recognition

TPCH Received an EPA New England Environmental Merit Award in April 2010 for its achievements in reducing the toxicity of packaging entering the solid waste stream. EPA's Environmental Merit Award is an annual award that recognizes outstanding environmental advocates who have made significant contributions toward preserving and protecting our natural resources. TPCH received publicity for the award through EPA's press release and member state announcements/press releases, including CT, IA and NH. Following receipt of the award, several U.S. Congressman and Senators sent congratulatory letters to TPCH.

• Articles and News Briefs

- As summarized above, TPCH received considerable coverage in industry and professional electronic publications of its 2009 report. See Appendix I.
- A New Hampshire State press release on NH DES enforcement of Barnes & Noble packaging resulted in some Northeast region press coverage. See Appendix J for a copy of the press release.
- In addition, the NERC Bulletin carried the following articles on TPCH activities. The NERC Bulletin is an electronic newsletter with approximately 600 subscribers.
 - TPCH Still Detecting Lead and Cadmium in Retail Packaging in Violation of State Toxics in Packaging Laws, NERC Bulletin, September 2009
 - Barnes & Noble Pays Fine in NH for Lead in Store Bag, NERC Bulletin, February 2010.
 - TPCH Receives EPA Region 1 Environmental Merit Award, NERC Bulletin, May 2010.

MEMBERSHIP

- ♦ TPCH Bylaws
 - Revised bylaws in September 2009 to add a section, *Approval of Membership Requests*. The definitions of several membership categories were also refined.

• TPCH Members

- TPCH had 14 members (10 states and 4 industry members) at the close of the fiscal year.
- In FY10 TPCH lost its newest industry advisory member, the Association of Safe Glass and Ceramic Decorators, when the organization dissolved. The glass industry continues to be represented in TPCH by the Society for Glass and Ceramic Decorated Products (SGCDpro).

♦ Member Communication

Routine correspondence with members was predominantly via email, and included conference call agendas and minutes, queries, requests for document review, and compliance issues.

• Member Recruitment

No significant member recruitment activities this fiscal year. Low level efforts to recruit Vermont are ongoing.

COMPLIANCE/ENFORCEMENT

♦ 2008 Compliance Screening Project

Member states pursued enforcement actions in FY10 against several companies with noncompliant packages identified through the 2008 TPCH compliance screening project. Most notably, Washington and Iowa initiated enforcement actions against Barnes & Noble for its shopping bag that contained lead-based inks/coatings in June 2009. These actions culminated in an Administrative Fine by Consent Agreement executed by New Hampshire in the amount of \$3,000. For more information, see NH DES press release in Appendix J.

Several other state enforcement initiatives are pending.

♦ 2010 Compliance Screening Project

TPCH initiated its 3rd XRF compliance screening project in FY10. The goals of this project are to assess compliance with state toxics in packaging laws in a target sector; and provide member states with this information in order to pursue coordinated state enforcement efforts. The project targets imported flexible PVC packaging from "dollar" stores. See Appendix K for a more detailed summary.

In FY10, states secured packages from six "dollar" stores, plus samples from "dollar" bins from two other retailers, for initial screening by TPCH. Innov-X Systems provided TPCH with a free loaner XRF instrument for this initial screening. Following the initial screening, a list of failed packages (16) was distributed to member states, who secured additional samples in their states, where available. In next fiscal year (July 2010), TPCH will screen the additional samples and provide results to states for use in coordinated state enforcement efforts. TPCH will also prepare a brief report on the overall screening results for public distribution.

Member State Follow Up Testing

Several member states invested additional state resources this fiscal year for laboratory testing of alleged non-compliant packages and packages from manufacturers/distributors with a prior history of non-compliance, as well as screen packages using in-house XRF instruments.

TESTING/RESEARCH

• Pilot Comparative Assessment of Laboratory Test Results

In FY10, TPCH undertook a pilot demonstration of laboratory test results to assess the performance of commercial laboratories in measuring total concentration of heavy metals in packaging samples. TPCH has been aware of testing irregularities since its first screening project in 2007. In some cases, especially with flexible PVC, there was poor correlation between XRF screening results and commercial laboratory test results. A subsequent comparative analysis of sample preparation methods by the CA DTSC demonstrated the importance of selecting appropriate dissolution methods for packaging material, and specifically, flexible PVC matrices.

In FY10, TPCH took a single flexible PVC package that had failed XRF screening for cadmium (at 475 ppm) and sent a piece to four different laboratories with the instructions to analyze the sample for total concentration of the 4 restricted heavy metals using EPA SW-846 Method 3052 for the sample digestion. The results were highly variable as expected, but astonishing nonetheless, with results ranging from a low of 22 ppm to a high of 660 ppm of cadmium. Of the four laboratories, two reported total concentration of cadmium over 350 ppm, and therefore indicated a package that failed toxics in packaging requirements, while two reported total concentration of cadmium under 100 ppm, and or a package that was below the limit for heavy metals and in compliance with state toxics in packaging requirements.

TPCH will further explore the variability in laboratory testing in FY11 through a contract with the CA DTSC, as described in the next section.

♦ CA DTSC Contract for Comparative Assessment of Laboratory Test Results

TPCH received a contract from the CA DTSC for \$11,000 in June 2010 to expand its comparative assessment of laboratory test results. This round robin test program will send multiple packaging samples to independent laboratories to assess inter-laboratory consistency/variability. One packaging type (flexible PVC) was chosen for this project to limit the number of variables. The project will develop best practices for testing flexible PVC for compliance with toxics in packaging statutes; and demonstrate the challenges and problems of obtaining consistent inter-laboratory results. The project will run through the first half of FY11.

Appendix A

FY 2010 Financial Summary

TPCH Reserve Account*

Opening Balance (7/1/09): \$75,079.55 Closing Balance (6/30/09): \$72,103.31

* Account includes CA SEP funds & carryover funds from prior fiscal years

FY2010 Revenues & Expenses

	BUDGET	ACTUALS	Variance from Budget	% of Budget
Revenue	Revenue			
Membership Dues	\$ 53,000.00	\$ 52,000.00	\$ (1,000.00)	98%
Interest	\$ 700.00	\$ 398.05	\$ (301.95)	57%
Total				
Revenue	\$ 53,700.00	\$ 52,398.05	\$ (1,301.95)	98%
Expenses	Expenses			
Administrative fees	\$ 10,000.00	\$ 10,000.00	\$-	100%
Personnel	\$ 37,278.00	\$ 35,198.81	\$ (2,079.19)	94%
Meeting Expense	\$ 1,000.00	\$ -	\$ (1,000.00)	0%
Telephone	\$ 600.00	\$ 303.67	\$ (296.33)	51%
Postage & Delivery	\$ 200.00	\$ 98.19	\$ (101.81)	49%
Printing and copying	\$ 200.00	\$ 4.75	\$ (195.25)	2%
Internet	\$ -	\$ 143.54	\$ 143.54	NA
Office Supplies	\$ -	\$ -	\$ -	NA
Meeting Expense	\$ -	\$ -	\$ -	NA
Travel	\$ 1,940.00	\$ 363.04	\$ (1,576.96)	19%
Testing	\$ -		\$ -	NA
Equipment Purchases	\$ 1,000.00	\$ 1,000.00	\$ -	100%
Total				
Expenses	\$ 52,218.00	\$ 47,112.00	\$ (5,106.00)	90%

CA SEP Account Summary

Balance Carried Over From Fiscal Year 2009					\$ 48,347.80
FY10 Expenses Charged to CA SEP:					
Adjustment for FY09 personnel (cost overrun for 2 nd screening project)					\$ 11,020.00
Laboratory Testing Fees (pilot project)					\$ 1,705.00
Purchase packaging samples (from dollar store for 3 rd XRF screening project)					\$ 13.00
Total Expenses:					\$ 12,738.00
Balance to Carry Over to Fiscal Year 2011				\$ 35,609.80	

Appendix B

Analysis of Inquiries

In FY10, TPCH received and responded to103 general inquiries, an average of two per week. Below is a brief analysis of the inquiries, focusing on the types of organizations that requested information and assistance. The majority of callers requested basic information on toxics in packaging requirements and how to generate a Certificate of Compliance. The complete inquiry log was distributed to member states in separate correspondence.

- By type of organization:
 - ➢ 50 companies (manufacturers, distributors, retailers)
 - ▶ 17 attorneys
 - ➢ 17 testing organizations
 - ➢ 2 trade associations
 - ➢ 5 governmen
 - ➢ 2 consultants
 - ▶ 1 non-profit
 - \succ 1 other
 - ➢ 5 unknown
- By industry sector (for companies & trade organizations only):
 - 26 manufacturers/distributors of finished goods
 - > 23 packaging & packaging components (manufacturers & distributors)
 - \succ 1 retailers
 - ➢ 1 paints/inks manufacturer
 - 1 unknown
- By country:
 - ➢ 88 U.S.-based organizations
 - ➤ 10 foreign-based organizations
 - ➢ 5 unknown
- By mode of inquiry (note: some queries were by both phone & email):
 - ➢ 72 telephone calls
 - ➢ 42 emails

Appendix C

Model Toxics in Packaging Legislation Modifications to Summary Text October 2009

Summary

The legislation calls for the reduction of lead, mercury, cadmium and hexavalent chromium in packaging or packaging materials used or sold within the state.

Manufacturers and distributors have two years from the effective date of the law to clear inventory and make necessary adjustments to their operations in order to comply with the law.

The legislation prohibits the intentional introduction of the four heavy metals during manufacturing or distribution. Further, M-manufacturers and distributors of packaging or packaging materials would be are required to reduce the sum of the concentration levels of incidentally introduced lead, cadmium, mercury and hexavalent chromium to 600 parts per million two (2) years after the legislation is signed into law; 250 parts per million 3 years after it is signed into law; and 100 parts per million <u>or less.</u> 4 years after it is signed into law; and network the intentional introduction of the four heavy metals during manufacturing or distribution.

The legislation provides an exemption for packaging made from recycled materials; packages and packaging components manufactured prior to the effective date of the legislation; packaging that is essential to the protection, safe handling or function of the package's contents - for example, medical products related to radiation therapy, x-rays, etc.; packages and packaging components for which there is no feasible alternative; reusable packaging for products that are subject to other federal or state health, safety, transportation, or disposal requirements (i.e., hazardous waste); packaging having a controlled distribution and reuse (i.e., beverage containers subject to mandatory deposit requirements); and packaging or packaging component that is glass or ceramic where the decoration has been vitrified and when tested, meets specific requirements.

Manufacturers and suppliers of packaging and packaging components are required to furnish a certificate of compliance to the purchasers of packaging. (This applies to companies who actually put their products in the package and does not apply to the retailer or the individual consumer). Certificates must be furnished to state agencies and The public and the state have access to these certificates upon request.

The legislation also provides for a review process by the state to determine the effectiveness of the Act. More specifically, that review will address the need to continue the recycling exemption and will determine if other toxic substances contained in packaging should be subject to reduction.

Appendix D

September 10 Letter on Interpretation on Glass Exemptions



September 10, 2009

Mr. William Anderson Williams Mullen 1666 K Street, NW Suite 1200 Washington D.C. 20006

Dear Mr. Anderson:

Member states of the Toxics in Packaging Clearinghouse (TPCH) have reviewed and discussed your letter of June 12, 2009 pertaining to vitrified labels on glass containers. Your letter requested a response to the following question:

Whether in the absence of the exemption for vitrified labels on glass, the maximum allowable concentration of 100 parts per million ("ppm") as the sum of regulated metals incidentally present in a package or packaging component applies to the enamels comprising the vitrified label itself or to the final glass package, once the enamel has been fired onto it.

First, TPCH member states agree that each enamel used to create a vitrified label is considered a distinct packaging component for the purposes of toxics in packaging laws, and therefore, in the absence of an exemption is subject to the 100 ppm concentration limit for the sum of the four heavy metals incidentally present in a packaging component. As a packaging component, enamels are also subject to the "no intentional introduction" requirement.

The Model Toxics in Packaging Legislation lists examples of packaging components to include, but not be limited to, "coatings" and "inks." Further, some state toxics in packaging laws expand the list of packaging components to include "dyes," "pigments," "adhesives," "stabilizers," and "any other additives." These lists are not intended to be exhaustive, but rather examples of packaging components. While "enamels" are not specifically listed, items with a similar function, namely inks, pigments, and dyes are listed, providing the intent to include additives that provide color or print/graphics to packaging within the definition of packaging component.

Second, in creating the exemption for vitrified labels on glass and ceramic packaging, TPCH recognized the unique nature of the vitrification process in which the heavy metals are bound to the glass substrate, and become less available to contaminate the environment through landfilling or incineration of packaging. State members agree that the exemption was NOT intended to alter the fundamental definition of a packaging component.

Finally, with regard to testing protocols for the purposes of certification to state toxics in packaging laws in the absence of the exemption, the enamels should be tested separately and prior to their application in the vitrification process since they are considered packaging components. Sample preparation and test protocols should measure total concentration of the four heavy metals – lead, cadmium, mercury, and hexavalent chromium – in the enamels. ASTM Method C1606-04, *Standard Test Method for Sampling Protocol for TCLP Testing of Container Glassware*, applies to the preparation of glassware that will be subject to solubility tests under the glass exemption, and therefore is NOT applicable to enamels (as packaging components) prior to their application to the glassware.

I hope this sufficiently answers your query. If you have any questions, please contact Patricia Dillon (<u>info@toxicsinpackaging.org;</u> 802 254-8911) and she will coordinate communication with TPCH member states.

Sincerely,

Sharon a. yergeau

Sharon A. Yergeau Chair, Toxics in Packaging Clearinghouse

Cc:

Ron Ohta, CA Department of Toxic Substances Control David Westcott, CT Department of Environmental Protection Kathleen Hennings, Iowa Department of Natural Resources Becky Jayne, IL Environmental Protection Agency John Gilkeson, MN Pollution Control Agency Sharon Yergeau, NH Department of Environmental Services Dana Lawson, NJ Department of Environmental Protection Peter Pettit, NY Department of Environmental Conservation Beverly Migliore, RI Department of Environmental Management Alex Stone, WA Department of Ecology Patricia Dillon, Toxics in Packaging Clearinghouse Andy Bopp, Association for Safe Glass and Ceramic Products Sandy Spence, Society for Glass and Ceramic Decorated Products



Appendix E Background Document on Glass Exemption

November 5, 2009 Revised November 23, 2009

Background

In 1996 the TPCH devoted a significant amount of meeting and conference call time to the issue of vitrified glass and whether an exemption for such from the law was justified. As part of this process, member states approved on September 27, 1996 the Society of Glass & Ceramic Decorator's (SGCD) request to consider a glass container with a vitrified label a single package component and directed CONEG staff to add a new Q&A:

- Q: Is a glass or ceramic packaging component that has been produced in such a manner that its decoration has been vitrified and become part of the glass or ceramic matrix to be considered a single packaging component?
- A: Yes. Scientific evidence indicates that when materials used to produce the glass or ceramic packaging are vitrified they become part of the glass and ceramic substrate and are therefore considered part of the packaging component.

Shortly thereafter, on November 19, 1996 the TPCH approved a new exemption to the model legislation for vitrified glass:

g. A glass or ceramic package or packaging component which has a vitrified label when sample is prepared according to ASTM C1606-04 and tested in accordance with the Toxicity Characteristic Leaching Procedures of US EPA Test Method and publication SW 846, 3rd edition, Test Methods for Evaluating Solid Waste, does not exceed 1.0 ppm for cadmium, 5.0 ppm for hexavalent chromium and 5.0 ppm for lead. Mercury shall not be exempted by this provision.

The rationale for the exemption was that heavy metals present in ceramic enamel, either because it is naturally occurring or intentionally added, are "vitrified" or chemically bonded onto the substrate, becoming an integral part of the glass or ceramic material. If properly applied, the metals are highly resistant to leaching in landfills or to volatilization in incinerators, minimizing any environmental harm. The main benefit of the exemption to the glass industry is that it essentially negates the restriction on "intentional introduction" and allows more than 100 ppm of incidental presence. The result of considering a glass container with a vitrified label to be a single packaging component was that, in essence, it removed the 100 ppm limit on the incidental presence of the restricted metals in the enamels. Testing after application could dilute the concentration of the heavy metals and not measure the metals, since they would be bound to the glass. Normally, the enamel would be a separate packaging component and be tested prior to application.

On March 14, 2006 the TPCH changed the FAQ that said vitrified labels on glass were a single packaging component, changing the question to instead ask whether they are subject to Toxics in Packaging requirements and eliminating any reference to single packaging component.

- *Q*: Are ceramic enamels or decals that have been vitrified, such that they become part of the glass or ceramic matrix, subject to the toxics in packaging requirements?
- A: Glass and ceramic containers with vitrified labels or decorations that can pass the leachability test specified in the law are exempt from the restriction on "intentional use" of the regulated metals. The exemption applies when the sample is prepared according to ASTM C1606-04 and tested in accordance with the Toxicity Characteristic Leaching Procedures of US EPA Test Method and

publication SW 846, 3rd edition, Test Methods for Evaluating Solid Waste, and does not exceed 1.0 ppm for cadmium, 5.0 ppm for hexavalent chromium and 5.0 ppm for lead. Mercury is not exempt.

Situation

On June 12, 2009 the TPCH received an inquiry pertaining to vitrified labels on glass containers:

Whether in the absence of the exemption for vitrified labels on glass, the maximum allowable concentration of 100 parts per million ("ppm") as the sum of regulated metals incidentally present in a package or packaging component applies to the enamels comprising the vitrified label itself or to the final glass package, once the enamel has been fired onto it.

The basis for the inquiry, according to the letter, was that "the manufacturer now knows as a result of testing that the raw enamels prior to firing contain a regulated metal. Further, we understand that some of the individual raw enamels may contain greater than 100 ppm of total regulated metals."

Discussion

The exemption allows intentional introduction, so "in the absence of the exemption," there is no legal argument for intentional introduction. This is especially relevant because six of the current ten member states have never passed the exemption for glass and ceramic packages with vitrified labels and two more states adopted the exemption but it has expired or will expire in January 2010 (see Table 1). It would also now appear that the TPCH overstepped its authority in 1996 when it added the Q&A that a vitrified label and the glass to which it had been applied was a single packaging component because the interpretation in the Q&A provided a way to avoid the 100 ppm limit on incidental presence Although the scientific argument for the single-package interpretation was the foundation of the exemption that the member states adopted for the model, only the state legislatures of the member states can create exemptions to their laws or modify statutory definitions. Given the above, state members voted to respond to the inquiry that "each enamel used to create a vitrified label is considered a distinct packaging component for the purposes of toxics in packaging laws, and therefore, in the absence of an exemption is subject to the 100 ppm concentration limit for the sum of the four heavy metals incidentally present in packaging component." Further, the "enamels are also subject to the 'no intentional introduction' requirement."

Table 1

State	Comparison to model language							
	g. A glass or ceramic package or packaging component which has a vitrified label when sample is							
	prepared according to ASTM C1606-04 and tested in accordance with the Toxicity Characteristic							
	Leaching Procedures of US EPA Test Method and publication SW 846, 3rd edition, Test Methods for							
	Evaluating Solid Waste, does not exceed 1.0 ppm for cadmium, 5.0 ppm for hexavalent chromium and							
	5.0 ppm for lead. Mercury shall not be exempted by this provision.							
CA	Same as model, but specifies use of CA Waste Extraction Test and limits exemption to paint or applied							
	ceramic of less than 0.06 % by weight of lead. Exemption expires on 1/1/2010.							
СТ	Same as model (permanent exemption), except "Mercury not exempted" clause not yet adopted.							
IA	No exemption							
IL	No exemption							
MN	No exemption							
NH	Same as model (permanent exemption)							
NJ	• Exemption for glass and ceramic package with vitrified label, same as model, but expired 1/1/2000.							
	• Exemption for glass containers with ceramic labeling used to contain pharmaceutical preparations or							
	cosmetics expired 1/1/95.							
NY	 No exemption for glass and ceramic package with vitrified label. 							
	Glass containers intended for reuse or refilling that use pigments in or on the container that exceed							
	maximum levels of contamination prior to 1/1/94.							
RI	No exemption							
WA	No exemption							

Prepared by Sharon Yergeau, NH DES, and reviewed by TPCH member states.

Appendix F

TPCH 2009 Statement on Glass Exemption



January 25, 2010

The Toxics in Packaging Clearinghouse (TPCH) recently received an inquiry regarding the interpretation of "packaging component" *in the absence of the vitrified label exemption* for glass and ceramic packages (exemption 5g). TPCH responded that *in the absence of an exemption*, each enamel used to create a vitrified label is considered a distinct packaging component for the purposes of toxics in packaging laws, and therefore is subject to the 100 ppm concentration limit for the sum of the four regulated metals incidentally present in any packaging component. Further, the enamels are also subject to the "no intentional introduction" requirement.

It should be noted that the TPCH previously recommended that the various TPCH member states adopt an exemption that reflected the properties of vitrification, and treat glass with vitrified labels as one packaging component. As with all provisions of the model legislation, however, exemptions are only applicable if enacted into law by the individual states, as each state has its own body of law.

The model legislation's glass exemption does not exist in eight of the ten current TPCH member states. Accordingly, *in the absence of an exemption* for vitrified labels on glass, such items are given the same status under the toxics in packaging laws as are all other packages and packaging components. That is, there can be no intentional introduction of any of the regulated metals into any packaging component and the sum total concentration of all the regulated metals cannot exceed 100 parts per million.

Finally, because there have been no recent changes in the requirements of the laws in member states, there is no need for an implementation period.

Appendix G

Frequently Asked Questions

1) Test Methods (approved July 14, 2009)

Q: What test procedure should the laboratory perform to determine compliance with toxics in packaging laws?

A: It is important to note that the goal of analytical testing is to determine the total concentration of the four regulated metals. For any analytical method to accurately measure the total concentration of metal, the metal must be completely liberated from the matrix. To achieve this, the matrix must be completely digested, dissolved, or broken down. Therefore, proper sample preparation is critical to obtain meaningful results. The choice of sample preparation depends on the type of sample (matrix).

All methods used must carefully document the amount of sample digestion, with 100% dissolution as the goal.

Sample Preparation Methods

• Plastics, some Inks

Many labs use EPA Methods 3050B or 3051 for sample preparation. These methods are described as providing "total metals;" however, the methods were designed for hazardous waste and site characterizations. For the purposes of product or package component testing, the goal is to determine the true presence and total concentration of metals in the component. In practice, TPCH has found that these methods are NOT sufficiently aggressive to completely digest/dissolve plastic matrices. In fact, the method summary for EPA Method 3050B states that it is NOT the proper method for preparing samples where *total* metals concentration is desired. Instead, EPA Method 3052 provides an aggressive acid and microwave energy combination to effectively break down the organic matrices such as plastics and some inks. Although EPA Method 3052 prescribes the use of hydrofluoric acid (HF) in some instances, HF is **not** required for effective digestion of typical plastic/PVC type package components. Rather, HF is required ONLY if the matrix is siliceous (i.e., contains silica) in nature.

The key parameter to be reported is the extent of dissolution of the matrix, with 100% being the acceptable target. Some trial and error may be expected when testing a new packaging component.

• Papers, Cardboards, Metals, some Inks

For other types of matrices such as paper, metal, or some inks, EPA Method 3050B may be appropriate, as long as the matrix is completely digested. Method 3052 may be necessary in order to completely break down organic matrix of some inks. Laboratory reports should specify what method was used to prepare the sample and indicate whether the matrix was completely dissolved.

• Glass & Ceramics

To qualify for the exemption for glass and ceramic packages with vitrified labels in section 5g of the Model Legislation, the sample must be prepared according to ASTM C1606-04; and tested in accordance with the Toxicity Characteristic Leaching Procedure of US EPA Test Method; publication SW-846, 3rd edition, Test Method for Evaluating Solid Waste. The concentration of metals in packaging cannot exceed 1.0 ppm for cadmium, 5.0 ppm for hexavalent chromium and 5.0 ppm for lead to qualify for this exemption. Mercury is not exempted by this provision.

Laboratory Choice

Regardless of test method used or material type tested, TPCH recommends that the laboratory selected to perform the analysis be accredited by a nationally recognized accrediting organization and have demonstrated proficiency in analyzing the type of materials or packaging components.

Note: The US Consumer Product Safety Commission has published guidance on their website: <u>http://www.cpsc.gov/ABOUT/Cpsia/cpsia.HTML</u>.

Test Method: CPSC-CH-E1002-08, Standard Operating Procedure for Determining Total Lead (Pb) in Non-Metal Children's Products, February 1, 2009

TPCH notes that while this method is similar to EPA Method 3052, complete sample digestion is not explicitly described. States may accept test results from this method if the laboratory is able to sufficiently document that complete sample digestion of the matrix occurred.

2) Certificates of Compliance (approved September 19, 2009)

Important note: As with other aspects of the toxics in packaging requirements, individual states with toxics in packaging laws may have different or additional requirements applicable to the Certificate of Compliance. A review of the pertinent states' requirements may be necessary for a complete understanding of the requirements.

Q. What is the required content in a Certificate of Compliance?

A. The Certificate of Compliance given to the purchaser of a package or packaging component is a statement that the package or packaging component is in compliance with the toxics in packaging requirements. This necessarily means that the certifying entity is affirming that (a) none of the four regulated metals was <u>intentionally</u> introduced into the package or packaging component and (b) that the total <u>incidental</u> presence of the four metals does not exceed the maximum allowable concentrations. A <u>sample Certificate of Compliance</u> is provided on the TPCH website.

Q. What is the required content of a Certificate of Compliance based on a claim that the package or packaging component is exempt from the toxics in packaging requirements?

A. If the basis for the Certificate of Compliance is that the package or packaging component is exempt from the toxics in packaging requirements, the Certificate of Compliance must
 TPCH FY10 Annual Report (July 1, 2009 – June 30, 2010)

state the specific basis upon which the exemption is claimed. A <u>sample Certificate of</u> <u>Compliance</u> based on a claim of exemption is provided on the TPCH website.

Q. Who is required to sign the Certificate of Compliance?

A. The Certificate of Compliance must be signed by an authorized official of the manufacturer or supplier of the package or packaging component.

Q. How long must the manufacturer or supplier of the packaging or packaging component keep the Certificate of Compliance?

A. According to the Model Legislation, the manufacturer or supplier of the package or packaging component must keep a copy of the Certificate of Compliance "on file." Records retention requirements may differ from state to state. The TPCH recommends that the manufacturer or supplier retain the Certificate of Compliance for as long as the package or packaging component is in use by the purchaser of the package or packaging component.

Q. How long must the purchaser of the package or packaging component keep the Certificate of Compliance?

A. The purchaser of the package or packaging component must keep a copy of the Certificate of Compliance on file and retain it for as long as the package or packaging component is in use by that purchaser.

Q. Must the manufacturer or supplier produce a copy of the Certificate of Compliance to any government agency?

A. Yes, upon request.

Q. What requirements apply if a manufacturer or supplier of a package or packaging component reformulates or creates a new package or packaging component?

A. If the manufacturer or supplier of a package or packaging component reformulates or creates a new package or packaging component, the manufacturer or supplier must provide the purchaser with a new or amended certificate of compliance.

Q. What type of information or documentation must the supplier of a package or packaging component have as the basis for the Certificate of Compliance?

A. The model legislation does not specify the kind of information or documentation that must serve as the basis for the Certificate of Compliance. Of course, it is in the certifying company's best interest to have complete and verifiable information that supports the contents of the Certificate of Compliance. Companies should do what is reasonably necessary to stand behind their certification. In cases where the company has existing documentation or analytic data to verify that the package complies, further testing may not be necessary and that documentation may be used to meet the Certificate of Compliance requirements. A certification prepared without testing should be based on verifiable evidence that there has been "no intentional introduction" and no "incidental presence." However, for

those companies that cannot document the amount of heavy metals in their package or packaging components, or know them to be present as incidental trace contaminants, a certain level of testing will be necessary. The test methodchosen and its lower detection limit are at the discretion of the company and may vary from company to company and from package type to package type, provided that the test is capable of demonstrating that the total of the four regulated metals is below regulatory limits. (See subsequent FAQ for more information on test methods.) It is not expected that each and every package will be individually tested, although that is certainly the company's option. Instead, random sampling on a reasonable statistical basis is considered to be a sufficient level of testing to demonstrate compliance. In certain instances, additional information may be required.

3) Exemption – Vitrified Labels (revisions approved January 12, 2010; note: paragraph 2 added)

Q: Are ceramic enamels or decals that have been vitrified, such that they become part of the glass or ceramic matrix, subject to the toxics in packaging requirements?

A: Glass and ceramic containers with vitrified labels or decorations that can pass the leachability test specified in the law are exempt from the restriction on "intentional use" of the regulated metals. The exemption applies when the sample is prepared according to ASTM C1606-04 and tested in accordance with the Toxicity Characteristic Leaching Procedures of US EPA Test Method and publication SW 846, 3rd edition, Test Methods for Evaluating Solid Waste, and does not exceed 1.0 ppm for cadmium, 5.0 ppm for hexavalent chromium and 5.0 ppm for lead. Mercury is not exempt.

It is important to note that, although the Model includes an exemption for vitrified labels, only two of the ten member states' laws (NH and CT) currently recognize the exemption. In states without the exemption, each enamel used to create a vitrified label is considered a distinct packaging component for the purposes of toxics in packaging laws, and therefore subject to the 100 ppm concentration limit for the sum of the four regulated metals incidentally present in any packaging component. Further, the enamels are also subject to the 'no intentional introduction' requirement.

4) Generating a Certificate of Compliance (approved January 12, 2010)

Q: How do we generate a Certificate of Compliance?

A: A <u>Certificate of Compliance</u> can be prepared in two ways. One option is to request Certificates of Compliance for each packaging component from your suppliers. Based on your suppliers' certifications and your knowledge of your processing steps (that is, none of the regulated metals is intentionally added), you can prepare a Certificate of Compliance for your packaging. The other option is to test your packaging for the presence of the regulated metals. Testing will indicate if the sum of the regulated metals is below 100 ppm. If the regulated metals are detected, even if the sum of the four metals falls below 100 ppm, it is prudent to check with suppliers regarding intentional introduction.

Q: Who is responsible for providing a Certificate of Compliance?

A: The Model legislation states that a <u>Certificate of Compliance</u> shall be furnished by its manufacturer or supplier to its purchaser. In addition, any member of the public may request a Certificate of Compliance from a manufacturer or supplier of packaging or of a packaging component. "Manufacturer" is defined as "any person producing a packaging or packaging component" and "supplier" is defined as "any person who sells, offers for sale, or offers for promotional purposes packaging or packaging components which shall be used by any other person to package a product."

Q: How does a manufacturer generate a Certificate of Compliance?

A: Manufacturers should secure <u>Certificates of Compliance</u> for each packaging component from their suppliers, then use these certifications and knowledge of its own processing steps (that is, none of the regulated metals is intentionally added) to prepare a Certificate of Compliance for its packaging.

Q: How does a packaging supplier obtain a Certificate of Compliance?

A: Packaging suppliers should secure <u>Certificates of Compliance</u> for each packaging component from the manufacturer or supplier of the packaging component. The packaging supplier may choose to prepare a single Certificate of Compliance based on the certifications of its manufacturers or suppliers. If the manufacturer is the first supplier in the packaging supply chain, the packaging or packaging component should be tested to determine the presence of the regulated metals.

Q: How does a supplier generate a Certificate of Compliance if the manufacturer or supplier does not supply one?

A: If the manufacturer or supplier will not provide certification, the supplier must test the package for the presence of the regulated metals. If the regulated metals are detected, even if the sum of the four metals falls below 100 ppm, it is prudent to discontinue the purchase of the package until the manufacturer or supplier certifies that the regulated metals are not due to intentional introduction.

5) Single or Multiple Certificates of Compliance (revised FAQ approved March 9, 2010)

Q: Can a manufacturer or supplier use one Certificate of Compliance for all of its packages or packaging components, or is a separate Certificate of Compliance necessary for each type?

A: The Model Legislation requires that manufacturers and suppliers of packaging and packaging components furnish a Certificate of Compliance to purchasers and to members of the public upon request. Because the Model does not specify a separate Certificate of Compliance for each package, manufacturers and suppliers may include multiple packages on a single Certificate of Compliance, provided it is updated as required.

It may not be practical to group packaging certifications because of the differences in packaging composition. If one COC is used to certify the compliance of many different packages or components and one of those components or packages later is found to be non-compliant, the Certificate of Compliance would be false. Many states have monetary penalties for making false statements. These penalties may be assessed for false Certificates of Compliance (e.g., certifying a material that is not compliant). It is up to the manufacturer

or supplier and their level of comfort with relying on composite COCs (see sample Certificate of Compliance).



Appendix H

FOR IMMEDIATE RELEASE July 23, 2009

Contact: Patricia Dillon, Program Manager Toxics in Packaging Clearinghouse Tel: (802) 254-8911 Email: <u>info@toxicsinpackaging.org</u> www.toxicsinpackaging.org

TOXIC HEAVY METALS STILL FOUND IN PACKAGING, VIOLATING STATE LAWS

Major U.S. manufacturers, distributors, and retailers are cracking down on illegal packaging.

Fourteen percent of retail packaging failed a screening test for toxic heavy metals and are likely in violation of state laws, according to a report just released by the Toxics in Packaging Clearinghouse (TPCH, or Clearinghouse). Imported products using flexible polyvinylchloride (PVC) packaging and the printing inks and colorants used on shopping and produce bags were most likely to contain these toxic metals, including lead and cadmium, known environmental and health hazards.

The report, *An Assessment of Heavy Metals in Packaging: 2009 Update*, found that lead concentrations detected in printing inks and colorants used on plastic bags were typically 20 times greater than the legal limit established by states. Toxics in packaging laws in 19 states prohibit the intentional use of any amount of lead, cadmium, mercury, and hexavalent chromium. These laws also establish a maximum concentration limit of 100 parts per million (ppm) for the incidental, or unintentional, presence of the four metals combined.

Lead or cadmium were also found in 52% of flexible PVC packaging, mostly imported from China and Pakistan, making these imports the most likely to be in violation of state laws. Flexible PVC, a "heavy-duty" plastic material, is frequently used to package home furnishings, pet supplies, cosmetics, and inexpensive toys. Metals, including cadmium and lead compounds, can be used as heat and ultraviolet stabilizers in PVC resin to control degradation during processing and use.

These findings were based on the screening of over 400 packaging samples using x-ray fluorescent (XRF) analysis by the TPCH, with support from the U.S. Environmental Protection Agency.

TPCH contacted companies whose packaging failed the screening tests to alert them about the results. "Most companies were responsive," noted Sharon Yergeau, the TPCH representative from New Hampshire and current Chairperson. "We were dealing primarily with major national brands. They recalled products from retail shelves that were packaged in noncompliant packaging. In one case, seven shipping containers of product were turned around at a U.S. port due to lead-containing inks in its packaging."

"We were also pleased to see these companies put in place new quality assurance procedures that will hopefully prevent these heavy metals from winding up on retail shelves in the future," said Yergeau. "With increased awareness about tainted products imported into the U.S. from Asia over the past few years, companies can't take for granted that their suppliers are delivering packaging in compliance with state laws. Some level of testing is necessary to avoid costly recalls and state penalties."

Walmart is already taking this proactive approach. The largest U.S. retailer now requires suppliers to provide a certificate of compliance with state toxics in packaging laws or submit packaging samples for testing before they can sell their products in Walmart stores.

State officials are working cooperatively to educate companies through the TPCH and bring packaging into compliance with our state packaging laws, according to Ron Ohta of the California Department of Toxic Substances Control (DTSC). "We will enforce our laws if companies do not cooperate with us," he said. Just last year, the State of California reached <u>a</u> <u>settlement with Forever 21</u> that resulted in fines.

Penalties for non-compliance can vary by state. In New York, for example, the penalties for violations of the Hazardous Packaging Act are up to \$10,000 for the first violation and up to \$25,000 per violation for each violation thereafter, with each package on the shelf constituting a separate and distinct violation. Similarly, in Connecticut, a violation could result in a penalty of \$10,000 per day per violation.

"The Clearinghouse and member states plan to undertake additional compliance screening. Companies can expect more aggressive enforcement of state toxics in packaging laws in the future," said David Westcott of the Connecticut Department of Environmental Protection.

The Clearinghouse was created to support states and help coordinate the implementation of individual states' toxics in packaging laws. The TPCH, which is administered by the Northeast Recycling Council, Inc. (NERC), serves as a central location for processing information requests from external constituencies and promoting compliance with the laws.

Of the 19 states with toxics in packaging laws, 10 states -- California, Connecticut, Illinois, Iowa, Minnesota, New Hampshire, New Jersey, New York, Rhode Island, and Washington -- collaborated on this study.

The report, *An Assessment of Heavy Metals in Packaging: 2009 Update*, is available for download from the TPCH website at <u>www.toxicsinpackaging.org</u>.

Appendix I

Articles on An Assessment of Heavy Metals in Packaging: 2009 Update

Center for Health Environment & Justice, "<u>PVC Packaging Found to Contain Toxic Metals</u> <u>Banned in 19 States</u>," issue 20, September 29, 2009.

Container-Board.com: Corrugating Industry News and Information, "<u>Toxics Metals Found in</u> <u>14% of Retail Packaging</u>," July 29, 2009.

Bureau Veritas, "<u>Toxics in Packaging Clearinghouse (TPCH) Releases 2009 Update on Heavy</u> <u>Metals in Packaging</u>," 09B-173, August 2009.

Bureau Veritas, US Compliance Insider: A Reference Manual for the Apparel and Home Textiles Industries, publication date unknown.

Dorsey & Whitney, LLP, "Toxics in Packaging Laws," July 30, 2009.

EnvironmentalExpert.com, "<u>Restricted substances in imported US packaging</u>," November 18, 2009.

Flexible Packaging Association, Flexible Packaging Industry News, "<u>Toxic Heavy Metals Still</u> <u>Found in Packaging</u>, Violating State Laws," July 23, 2009. (posted press release)

Jaffe Legal News Service, "<u>Study: Many Manufacturers Not Complying with Toxics in</u> <u>Packaging Laws</u>," August 27, 2009.

Home Fashions Products Association, 7/29/09 email distributed by attorneys for HFPA, Robert Leo and Diane Weinberg; alerted members to report findings about PVC in packaging of home furnishings products and forwarded TPCH press release.

Mondaq News Service, <u>"Many Manufacturers Not Complying With Toxics In Packaging Laws Face Stiff</u> <u>Fines And Retailers' Bans</u>", article by Mark P. Miller and Tiffany L. Carpenter of Wildman, Harrold, Allen & Dixon, LLP, March 18, 2010.

NERC Email Bulletin, "<u>TPCH Still Detection Lead & Cadmium in Retail Packaging in Violation</u> of <u>State Toxics in Packaging Laws</u>" September 2009.

NEWMOA, P2 News, "<u>Toxic heavy metals found in packaging in violation of state laws</u>," July 24, 2009

Packaging Digest, "<u>Toxic Heavy Metals Found in 14 Percent of Retail Packaging</u>," July 23, 2009.

Packaging Gateway.com, "<u>Toxic Heavy Metals Making Way into Retail Packaging</u>," July 29, 2009.

Paper Shipping Sack Manufacturers' Association, Inc., <u>Compliance with Toxics in Packaging</u> Requirements: Multiwall Packaging Complies with Toxics in Packaging Requirements, 2009.

P2RX, National P2 News Archives, "<u>Toxic heavy metals found in packaging in violation of state</u> <u>laws</u>," July 24, 2009.

Raymond Communications, The Bulletin, "<u>Environmental Group Claims Heavy Metals are</u> <u>Common in Retail Packaging</u>," July 31, 2009.

QSX Instruments, Inc., "<u>Toxics in Packaging: 2009 Update</u>," July 27, 2009. (Note: company manufactures Quickshot XRF instruments.)

Skyray XRF, "2009 Toxics in Packaging Update," July 25, 2009.

TAPPI's PLACE Weekly WrapUp, "<u>Toxic Heavy Metals Found in 14 Percent of Retail</u> <u>Packaging</u>," July 29, 2009. Links to Packaging Digest article. Note: TAPPI is an association for the worldwide pulp, paper, packaging, and converting industries.

Links to TPCH Report: California Product Stewardship Council

Appendix J

Press Release from NH DES Media Center

FOR IMMEDIATE RELEASE: DATE: February 1, 2010 CONTACT: Sharon Yergeau, 603 271-2918 Jim Martin, 603 271-3710

Barnes & Noble Pays Fine for Lead in Store Bag First Fine for Toxics in Packaging Levied in NH

Concord, NH - Commissioner Thomas S. Burack of the New Hampshire Department of Environmental Services announced today the execution of an Administrative Fine by Consent Agreement with Barnes & Noble, Inc. of New York City in the amount of \$3,000. The Agreement resolves alleged violations of the state's Toxics in Packaging laws.

Under the terms of the agreement, Barnes & Noble, which operates five retail stores in New Hampshire, has not admitted liability for the alleged violations but will pay administrative fines totaling \$3,000 to the State. The fines resolve allegations that the company distributed plastic store bags that contained high levels of lead and failed to submit Certificates of Compliance upon request.

In June and in August 2008, the Toxics in Packaging Clearinghouse (TPCH), which coordinates implementation of the law on behalf of ten state members, notified Barnes & Noble of the potential violation and requested a Certificate of Compliance and supporting documentation to prove compliance. State toxics in packaging laws require the submittal of Certificates of Compliance within 60 days of receiving a request. Commissioner Burack said, "New Hampshire passed the toxics in packaging law in 1990, so this is not a new law. We conduct outreach with nine other states through the TPCH, which provided Barnes & Noble the opportunity to address problem without enforcement."

Once contacted by the States of Iowa and Washington in the spring of 2009, Barnes & Noble began removing non-compliant bags from circulation. Payment of the administrative fine followed an Administrative Order issued to Barnes & Noble by DES in September 2009. The Barnes & Noble response to the Administrative Order included a statement that the company had removed the non-compliant bags from all of its New Hampshire stores prior to the date of the Administrative Order.

For more information on this case or on New Hampshire's toxics in packaging law, contact Sharon Yergeau, Planning, Prevention & Assistance Unit, at 603 271-2918.

Appendix K 2010 TPCH Cooperative Sample Screening Project

Proposed Action Plan

Rev. May 10, 2010

Project Goal: Embark on a national initiative to screen packaging from targeted sectors to determine compliance with state toxics in packaging laws. The results will be used for state enforcement and to determine whether screening projects to date have resulted in source reduction of the restricted heavy metals in packaging.

Target Sector(s): PVC packaging obtained from "dollar" stores, also known as "single price retailers" (SPR).

Rationale:

- In the two previous TPCH screening projects, PVC packaging originating from overseas, particularly Asian countries had a high rate of non-compliance.
- Lead and cadmium are inexpensive plasticizers more likely to be used in the packaging of inexpensive products, which are abundant in "dollar" stores and readily accessible to TPCH members.
- Several different PVC packages from one dollar store were the subject of previous TPCH testing and the non-compliant packaging appear to persist.

Task	Timeframe	Staffing/Resources
Sample Collection	May 1 – May 31, 2010	All states
Sample XRF Screening	May 15 – June 30, 2010	Becky & Kathleen
		or TPCH rental?
Data Analysis	July 2010	Patty
Follow Up Lab Testing	July - August 2010	CA SEP funds
Initiate Coordinated State	August - September 2010	Interested states
Enforcement		

Project Timeframe & Resources

Sample Collection Strategy

- Total number of samples: ~100 from 4 5 different stores.
- A range of product types packaged in PVC will be collected, including, but not limited to: Toys, hardware, pet chews/toys, personal care items, home furnishings, and sports items.
- When possible the same item will be purchased at the same retailer in multiple states.



Annual Report

Toxics in Packaging Clearinghouse July 1, 2010 – June 30, 2011

Prepared by Patricia Dillon, TPCH Program Manager Approved by Members on November 8, 2011

This report summarizes the activities and accomplishments of the Toxics in Packaging Clearinghouse from July 1, 2010 to June 30, 2011 (FY11), under the management of the Northeast Recycling Council, Inc. (NERC). The first section highlights TPCH accomplishments in FY11. The remainder of the document is organized by major activity as identified in the TPCH work plan.

FY11 HIGHLIGHTS

- Executed research project, funded by the California Department of Toxics Substances Control (DTSC), assessing the performance of seven national and regional laboratories in measuring the concentration of the four restricted metals – lead, cadmium, mercury, and hexavalent chromium – in packaging samples.
- Published report on the above research project, <u>Laboratory Round Robin Test Project:</u> <u>Assessing Performance in Measuring Toxics in Packaging</u>, and developed an outreach strategy for its release. (Actual release date: July 13, 2011.)
- Completed third packaging screening project using x-ray fluorescent (XRF) technology to detect the presence of regulated metals in packaging. (Report to be published in FY12.)
- Member states used results of XRF screening project for coordinated state enforcement of state toxics in packaging laws. Seventeen manufacturers, distributors and retailers were contacted by six TPCH member states and brought into compliance with state laws through voluntary actions, which included stopping the distribution and sale of the packaging in member states.
- Received \$50,000 contract from the California DTSC to evaluate the performance of independent laboratories in analytical testing of glass packaging for toxics in packaging, and to identify test methodologies that provide equivalent results to EPA SW 846 Method 3052 which requires the use of hydrofluoric acid (HFl) for glass matrices.
- Member states performed <u>analytical testing on reusable shopping</u> bags demonstrating that these bags are no more likely to contain restricted heavy metals than single use bags.

ADMINISTRATION

- Meetings
 - Convened 10 monthly conference calls of full membership (13 organizations). An average of 13 people participated on each conference call, representing 9 of the 10 member states on average. In March, TPCH began using GoToMeeting for its monthly calls to facilitate document review and real-time collaboration.
 - Convened a 2-day face-to-face annual membership meeting on October 5-6, 2010 in Hartford, CT with 15 attendees.

• Recorded and distributed minutes for all conference calls to members, and maintained TPCH central file of minutes.

Program Management and Reporting

- Prepared and distributed to members the FY10 Annual Report.
- Prepared FY12 work plan and budget, which were approved by members in July 2011.
- Renewed annual agreement with NERC to provide administrative services to TPCH.
- Semi-annual reporting on TPCH activities and accomplishments to the NERC Board of Directors.

♦ TPCH Financial Management

- Appendix A provides a financial summary for FY11. TPCH began FY11 with a reserve account balance of \$72,103.21 and ended the fiscal year with \$76,922.80. Operating expenses were \$8,738 less than budget, mostly due to a shift in personnel costs from the TPCH general expenses to DTSC laboratory performance project. TPCH missed its revenue target by \$3,000, which is not surprising in this economy.
- The unrestricted California Supplemental Environmental Project (SEP) account allowed TPCH to cover member states' travel to the October 2011 Annual Meeting (\$2,069.83), product testing including XRF rental (\$2,315.34), and purchasing packaged products for screening and laboratory analysis (\$235.36). As of June 30, 2011, the remaining balance in the California SEP account was \$30,715.26.

Additional Sources of Funding

The California DTSC awarded two contracts to the Toxics in Packaging Clearinghouse (TPCH) to conduct studies to evaluate laboratory performance in testing for toxics in packaging.

- In June 2010, California DTSC awarded TPCH a contract for \$11,000 to perform a round-robin study to evaluate the performance of testing laboratories in determining compliance with toxics in packaging statutes. This project was executed in FY11, and subsequently closed out in the first quarter of FY12 (July 2011). More information on the project goals and deliverables are found in the Testing/Research section of this Annual Report.
- In March 2011, TPCH received a second contract from California DTSC for \$50,000 to conduct a performance evaluation of independent laboratories in analytical testing of glass packaging for toxics in packaging. This project will be executed in FY12. More information on the project goals and deliverables are found in the Testing/Research section.

Grant/Contract Administration

- Fulfilled its obligations under the first California DTSC contract to evaluate laboratory performance with the delivery of a final report in July 2011.
- Submitted paperwork to secure contract with California DTSC for glass matrices project (see above).

• Executive Committee

The TPCH Executive Committee was reappointed in October 2010, after serving a 2-year term. The Executive Committee included: Sharon Yergeau, Chair; Ron Ohta, Vice Chair, Kathleen Hennings, Member at Large; and Peter Pettit, Member at Large. In June 2010,

Sharon Yergeau resigned from the Executive Committee due to reassignment within her organization. Ron Ohta became Acting Chair, pending the nomination and approval of the Executive Committee. The new Executive Committee was approved on July 12, 2011, including: Ron Ohta, California, Chair; Kathleen Hennings, Iowa, Vice-Chair; Peter Pettit, New York, Member-At-Large; and Alex Stone, Washington, Member-At-Large.

GENERAL INQUIRIES & EXEMPTION REQUESTS

General Inquiries

Received and responded to 96 general inquiries by telephone and email, an average of two inquiries per week. The number of inquiries in FY11 was similar to FY10. Twenty percent of the total inquiries in FY11 requested information on reusable shopping bags and the applicability of toxics in packaging requirements. Appendix B provides a brief analysis of the general inquiries, focusing on the types of organizations requesting information and assistance.

• Exemption Requests

Received no new exemption requests.

MODEL LEGISLATION & INTERPRETATIONS

• Updates to Model

A minor revision was made to the Summary of the Model Legislation to strike the following sentence, which is no longer needed:

Manufacturers and distributors have two years from the effective date of the law to clear inventory and make necessary adjustments to their operations in order to comply with the law.

For the revised text of the Summary of the Model Legislation, see Appendix C.

Interpretations

Reusable shopping bags were in the news this fiscal year due to reports that some bags may contain lead, and as a result, this issue was on the agenda of TPCH. The applicability of state toxics in packaging laws to reusable shopping bags varies by state. Only California's statute explicitly exempts reusable bags, if they meet specific design parameters. TPCH monitored the issue and posted a new Frequently Asked Question, while a few states undertook testing of reusable bags. See the Testing/Research section of this Annual Report for additional information.

EDUCATION & OUTREACH

• TPCH Website

In FY11, the Northeast Recycling Council changed their Website host. Statistics on overall visitors to the TPCH Website are no longer easily accessible, as the domain names affiliated with NERC are now merged into one report. Periodically, TPCH will track visitors to specific pages on the TPCH website.

The following additions and updates were made to the Website:

TPCH FY11 Annual Report (July 1, 2010 – June 30, 2011)

- Posted two new and revised Frequently Asked Questions (FAQs).
 - Reusable bags (October 2010)
 - Product vs. packaging update to include state variability (March 2011)
 - See Appendix D for complete text of FAQs.
- Revised the Summary of the Model Legislation for consistency with the Model, as noted above.
- Posted Washington and Iowa reusable bag testing results and press release
- Posted letter to the Tampa Tribune Editor to correct misinformation
- Posted information on the two California DTSC contracts for laboratory testing
- Updated comparative analysis of state legislation as additional information from states was available.

Presentations

- TPCH staff did not make any presentations in FY11.
- Articles, News Briefs and Press Releases
 - State press releases covered toxics in packaging issues and cited TPCH, including:
 Washington and Iowa find most reusable bags tested safe, June 2, 2011
 - The NERC Bulletin carried the following articles on TPCH activities. The NERC Bulletin is an electronic newsletter with approximately 600 subscribers.
 - Most Reusable Bags Tested Safe, June 2011
 - TPCH Awarded Two Contracts for Testing Packaging, April 2011
 - TPCH Holds Annual Membership Meeting & Elects Board Members, November 2010
 - TPCH staff updated the press distribution list in preparation for the release of two TPCH reports in 2011

Industry Standards

TPCH provided input and comments on 3 electronics industry standards regarding performance requirement for toxics in packaging to ensure consistency with the Model Toxics in Packaging Legislation, including:

- IEEE P1680.2 Environmental performance of imaging equipment
- IEEE P1680.3 Environmental performance of televisions
- UL Environment, Standard for the Sustainability of Mobile Phones

MEMBERSHIP

- TPCH Members
 - TPCH had 13 members (10 states and 3 industry members) at the close of the fiscal year.
 - In FY11 TPCH lost its representation by the glass industry, when the Society for Glass and Ceramic Decorated Products (SGCDpro) did not renew its membership. TPCH maintains its contacts with this industry association, and will communicate with them as needed on glass issues should the need arise.

Member Communication

Routine correspondence with members was predominantly via email, and included conference call agendas and minutes, queries, requests for document review, and compliance issues.

• Member Recruitment

- Communication with EPA Region 4 (Southeast) and Florida Department of Environmental Protection to try to generate some interest in TPCH. Contact with Florida was as a result of reusable bag press coverage in Florida. No interest was generated by either Florida or EPA Region 4 as a result of TPCH outreach.
- Low level efforts to recruit Vermont are ongoing.

COMPLIANCE/ENFORCEMENT

♦ Medea Vodka/FSJ Imports

In December 2010, TPCH member states were made aware of a vodka bottle that had an electronic LED programmable label. TPCH requested a Certificate of Compliance and supporting documentation from FSJ Imports, based in New York State. The company provided Certificates of Compliance but no supporting documentation. The State of Washington sent the label to its testing laboratory for analysis for restricted metals, and the sample was found to contain lead. Communication with FSJ Imports and resolution of this issue will continue into FY12.

♦ 2008 Compliance Screening Project

New Hampshire wrapped up its enforcement initiative that resulted from this project in FY11. An Administrative Order brought against Pet Smart by New Hampshire for noncompliant packaging, initially discovered in the 2008 Compliance Screening Project, was settled in June 2011. This settlement will likely result in a \$15,000 administrative fine, split between New Hampshire and TPCH.

◆ 2010 Compliance Screening Project

TPCH conducted its third XRF compliance screening project in FY11, targeting packaging from "dollar stores." In July 2010, TPCH screened samples from six dollar stores and from "dollar" bins at two other retailers using an XRF instrument. Following the initial screening, a list of failed packages was distributed to member states, who visited the same retailers, if located in their states, and purchased the same or similar products. In August 2010, TPCH screened the new samples, in addition to the initial failed packages, using XRF analysis to determine whether the non-compliant packaging was being sold and distributed in multiple states. Member states used the results of the XRF screening to undertake coordinated state enforcement, where multiple states notified the brand owners, distributors, and/or retailers of failed packaging samples to bring them into compliance with state laws.

Packaging samples were collected from seven member states (CA, IA, NH, NJ, NY, RI and WA) for XRF screening. Following XRF screening, six member states sent a total of 26 letters to manufacturers, distributors, and retailers for 23 unique packages that failed XRF screening. Seven companies received letters from multiple states. A total of 17 unique manufacturers, distributors, and retailers were notified of non-compliant packages. All packaging samples were either brought into compliance or the product was discontinued.

The execution of coordinated state enforcement highlighted the variation in state laws, and specifically, who is legally responsible for compliance under individual state laws and the statutory authority of the state agency in enforcing its law.

TPCH FY11 Annual Report (July 1, 2010 – June 30, 2011)

• Reusable Shopping Bags

Following press coverage of reusable shopping bags that contained lead, the states of Iowa and Washington undertook testing of reusable shopping bags purchased in their states. Only one bag was found to contain toxic metals above limits allowed by the states' laws. In addition, two bags had removable inserts that contained metals above the regulatory limit. One bag and one insert came from Washington. The second insert came from a bag purchased in Iowa. The two companies in Washington whose bag and bag insert were found to contain unacceptable levels of lead were notified of the results. Both companies fully cooperated with the state. The bag that failed was removed from distribution, and the state conducted further testing to assure the problem was resolved. Similarly, Iowa worked with the supplier to address the problem.

TESTING/RESEARCH

♦ California DTSC Contract for Comparative Assessment of Laboratory Test Results TPCH received a contract from the California DTSC for \$11,000 in June 2010 to conduct a comparative assessment of laboratory analysis of packaging samples. In this round robin test program 8 packaging samples were sent to seven laboratories, including 4 international testing laboratories, 2 regional laboratories, and the California DTSC Environmental Chemistry Laboratory.

Overall, the quality and consistency in laboratory testing results were better than the TPCH expected, given past experiences with laboratory test data. Nonetheless, over half the laboratories (4 of 7) reported one or more inaccurate results. One of the most shocking outcomes of the study was for a laboratory with offices nation-wide that reported inaccurate results for 5 of the 8 packaging samples they tested.

The report, <u>Laboratory Round Robin Test Project: Assessing Performance in Measuring</u> <u>Toxics in Packaging</u>, on the findings of this research will be distributed and posted on the TPCH Website in July 2011. A guidance document on laboratory testing, targeting the packaging supply chain and testing laboratories, will be released along with the report. In conjunction with California DTSC staff, TPCH developed an outreach strategy for the report, which will include a nationally distributed press release.

• TPCH 2010 Screening Project

As highlighted in the Compliance/Enforcement section of this Annual Report, TPCH conducted its third XRF compliance screening project in FY11. The goals of this project were to assess compliance with state toxics in packaging laws in a target sector, specifically, "dollar stores"; and to identify non-compliant packaging for coordinated enforcement by member states. The project targeted imported flexible PVC packaging from "dollar" stores.

A total of 61 packaging samples were screened using XRF technology. Twenty-four (39.3%) of the packaging samples failed the screening test for either cadmium or lead. All the retail stores (8), where packaging was obtained, sold products in non-compliant packaging. Non-compliant packaging was not confined to specific product sectors.

Publication of the results of this study was delayed to allow states to pursue enforcement. The final report on this project is expected in December 2011 (FY12).

TPCH FY11 Annual Report (July 1, 2010 - June 30, 2011)

• Reusable Shopping Bags

Prompted by media reports about the safety of reusable shopping bags, Iowa and Washington tested bags obtained in their states using XRF analysis, followed by laboratory testing of samples to confirm screening results. Of the 31 reusable bags tested, only 2 bags – 1 from Iowa and one from Washington – while most complied with state toxics in packaging laws. Washington and Iowa issued a press release with the results and concluded that reusable shopping bags were no more likely to contain metals restricted by state laws than single use bags. The Washington test results and the joint Washington and Iowa press release were posted on the TPCH Website.

Washington Analysis of Packaging for Children's Products

As part of the implementation of the Children's Safe Product Act (CSPA), the Washington State Department of Ecology (Ecology) screened approximately 300 children's products and their packaging using XRF analysis. Those packages showing high levels of metals from the XRF were subjected to laboratory analysis for 10 metals. In addition, select packaging samples were analyzed for phthalates and bisphenol A. The 10 metals of interest to Ecology, included 3 of the 4 metals restricted by toxics in packaging laws, specifically, lead, cadmium, and chromium; 3 additional metals found in the reporting requirements of CSPA—antimony, cobalt and arsenic; and 4 additional metals impacting the Puget Sound - copper, zinc, tin and nickel.

Two packaging samples were found to be in violation of toxics in packaging legislation and six samples found restricted phthalates at levels ranging from 170,000 to 240,000 parts per million, 17% and 24% by weight, respectively. Metals such as antimony were found at levels approaching 2,000 parts per million (0.2%).

♦ California DTSC Contract for Laboratory Testing of Glass Matrices

TPCH received a contract for \$50,000 in March 2011 from the DTSC to conduct a performance evaluation of independent laboratories in analytical testing of glass packaging for toxics in packaging. The project will also identify test methodologies that provide equivalent results to EPA SW 846 Method 3052 that requires the use of hydrofluoric acid for glass matrices. This project period runs from March 1, 2011 through December 31, 2012.

In FY11, the project began with preparation and approval of the Quality Assurance Project Plan (QAPP), data quality objectives (DQO) and decision rules. The project will be completed in FY12 and a report published on the results.

Appendix A

FY 2011 Financial Summary

TPCH Reserve Account*

Opening Balance (7/1/09): \$72,103.31 Closing Balance (6/30/09): \$76,922.80

* Account includes CA SEP funds & carryover funds from prior fiscal years

FY2011 Revenues & Expenses

	BUDGET	ACTUALS	Variance from Budget	% of Budget
Revenue	Revenue			
Membership Dues	\$ 52,000.00	\$ 49,000.00	\$ (3,000.00)	94%
Interest	\$ 400.00	\$ 208.48	\$ (191.52)	52%
Total Revenue	\$ 52,400.00	\$ 49,208.48	\$ (3,191.52)	94%
Expenses	Expenses			
Administrative fees	\$ 10,000.00	\$ 10,000.00	\$ -	100%
Personnel	\$ 38,097.00	\$ 31,735.87	\$ (6,361.13)	83%
Meeting Expense	\$ 1,000.00	\$ 718.20	\$ (281.80)	72%
Telephone	\$ 400.00	\$ 329.64	\$ (70.36)	82%
Postage & Delivery	\$ 200.00	\$ 70.52	\$ (129.48)	35%
Printing, Copying, Supplies	\$ 200.00	\$ 6.16	\$ (193.84)	3%
Internet	\$ 140.00	\$ 77.56	\$ (62.44)	55%
Travel	\$ 2,000.00	\$ 360.80	\$ (1,639.20)	18%
Testing	\$ 0.00	\$ 0.00	\$ -	NA
Equipment Purchases	\$ 0.00	\$ 0.00	\$ -	NA
Total Expenses	\$ 52,037.00	\$ 43,298.75	\$ (8,738.25)	83%

CA SEP Account Summary

Balance Carried Over From Fiscal Year 2010				
FY11 Expenses Charged to CA SEP:				
Member state travel to TPCH Annual Mee	\$ 2,069.83			
XRF testing and laboratory analysis (inclu				
Round Robin Test Project)				\$ 2,315.34
TPCH/NERC Personnel				
Purchase packaging samples for XRF screening a laboratory analysis				
	\$ 4,894.54			
Balance to Carry Over to Fiscal Year 20	\$ 30,715.26			

Appendix B

Analysis of Inquiries

In FY11, TPCH received and responded to 96 general inquiries, an average of two inquiries per week. Below is a brief analysis of the inquiries, focusing on the types of organizations that requested information and assistance. The majority of callers requested basic information on toxics in packaging requirements and how to generate a Certificate of Compliance. The single most requested topic (with 20 inquiries or ~20 %) was information on reusable shopping bags and the applicability of toxics in packaging requirements. The complete inquiry log was distributed to member states in separate correspondence.

- By type of organization:
 - ➢ 54 companies (manufacturers, distributors, retailers)
 - ➢ 8 attorneys
 - ➤ 7 testing organizations
 - ➤ 5 press
 - ➤ 5 government
 - ➤ 4 academics
 - ➤ 3 consultants
 - ➢ 3 non-profit
 - \geq 1 other
 - 5 unknown
- By industry sector (for companies only):
 - ➢ 31 manufacturers/distributors of finished goods
 - > 20 packaging & packaging components (manufacturers & distributors)
 - ➢ 3 retailers
- By mode of inquiry (note: some queries were by both phone & email):
 - ➢ 57 telephone calls
 - \succ 42 emails

Appendix C

Model Toxics in Packaging Legislation Modifications to Summary Text October 2010

Summary

The legislation calls for the reduction of lead, mercury, cadmium and hexavalent chromium in packaging or packaging materials used or sold within the state.

Manufacturers and distributors have two years from the effective date of the law to clear inventory and make necessary adjustments to their operations in order to comply with the law.

The legislation prohibits the intentional introduction of the four heavy metals during manufacturing or distribution. Further, manufacturers and distributors of packaging or packaging materials are required to reduce the sum of the concentration levels of incidentally introduced lead, cadmium, mercury, and hexavalent chromium to 100 parts per million or less.

The legislation provides an exemption for packaging made from recycled materials; packages and packaging components manufactured prior to the effective date of the legislation; packaging that is essential to the protection, safe handling or function of the package's contents - for example, medical products related to radiation therapy, x-rays, etc.; packages and packaging components for which there is no feasible alternative; reusable packaging for products that are subject to other federal or state health, safety, transportation, or disposal requirements (i.e., hazardous waste); packaging having a controlled distribution and reuse (i.e., beverage containers subject to mandatory deposit requirements); and packaging or packaging component that is glass or ceramic where the decoration has been vitrified and when tested, meets specific requirements.

Manufacturers and suppliers of packaging and packaging components are required to furnish a certificate of compliance to the purchasers of packaging. Certificates must be furnished to state agencies and the public upon request.

The legislation also provides for a review process by the state to determine the effectiveness of the Act. More specifically, that review will address the need to continue the recycling exemption and will determine if other toxic substances contained in packaging should be subject to reduction.

Appendix D

Frequently Asked Questions

1) New FAQ on reusable bags, October 2010.

Q: Are reusable bags that are sold or distributed and designed for repeated use considered "packaging," and therefore, subject to the Model Toxics in Packaging Legislation?

A: Yes, reusable bags are subject to toxics in packaging requirements under the Model Toxics in Packaging Legislation. The Model and state laws based on the Model apply to the distribution and sale of packaging and packaging components. The Model Toxics in Packaging Legislation defines "package" as a container providing a means of marketing, protection or handling of a product, including unsealed receptacles such as carrying cases, crates, bags, and tubs. Therefore, toxics in packaging requirements would apply to a reusable bag when sold or distributed (e.g., as a promotion) to a customer. Regulated entities should also check the laws of states, where reusable bags are sold or distributed, for specific exemptions or additional requirements. For example, in California reusable bags that meet certain design parameters are exempt from toxics in packaging requirements.

2) **"Package" versus "product"**, updated March 2011 to include state variability. Newly added text is bolded.

Q: Are mugs, steins, tumblers, vases and similar items subject to the law when holding candy, beverages, flowers or other products?

A: In cases where the items are manufactured as products (e.g., decorative mugs) and only incidentally hold other items during final distribution to the end user, the product is not considered a package. One or more of the following would have to apply. The items: are not designed solely to contain and protect the goods inside for transport and handling during distribution; have intrinsic value as an artistic or useful object in themselves which is often reflected in the selling price if sold; and are intended to be retained beyond the life of the item inside and not promptly discarded after the contents have been consumed or used. Some states, however, may consider these items packaging, if they are used for marketing (e.g., a mug with a company logo or treat bags with brand names printed on them).

In cases where the item is used solely to deliver another product (e.g., a beverage sold at a food counter), the item is considered a package. An exemption for "controlled distribution and reuse" may apply if the item is not normally discarded after the product inside has been consumed. Further, a container sold without being filled with a product, such as an empty coffee cup or empty decanter for home use, is a product itself and not subject to the law.



LABORATORY ROUND ROBIN TEST PROJECT: ASSESSING PERFORMANCE IN MEASURING TOXICS IN PACKAGING

Final Report

Submitted to the California Department of Toxic Substances Control Under Contract No. 09-T9112

By

Toxics in Packaging Clearinghouse Administered by the Northeast Recycling Council, Inc.

July 2011

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EXECUTIVE SUMMARY

The California Department of Toxics Substances Control (DTSC) contracted with the Northeast Recycling Council Inc. (NERC), the administrator of the Toxics in Packaging Clearinghouse (TPCH), to perform a round-robin study to evaluate the performance of testing laboratories in determining compliance with toxics in packaging statutes. At the request of DTSC, the study specifically focused on the potential for inconsistencies in testing results for polyvinyl chloride (PVC) matrices.

For the past five years, TPCH has screened packaging for compliance with state toxics in packaging laws using x-ray fluorescent (XRF) analysis. XRF analysis is a rapid and inexpensive screening tool for measuring the elemental composition of samples, including the four metals restricted by state laws – cadmium, lead, mercury, and hexavalent chromium.¹ Companies claimed compliance and submitted supporting laboratory test reports for many of the packages that failed the TPCH screening tests. When TPCH compared XRF screening results obtained for packaging samples with laboratory analysis, TPCH learned that the results obtained from laboratory analysis did not necessarily correlate with XRF screening results. The underlying cause of the discrepancy between XRF and laboratory analysis appeared to be the selection of appropriate dissolution methods for preparing packaging samples for analysis. Simply put, if the sample is not completely digested, the restricted metals, if present, are not sufficiently liberated from the plastic and cannot be completely measured by the laboratory analytical equipment, since analytical instruments, such as ICP, measure the concentration of substances in the solution. By ensuring complete dissolution of the matrix, analytical results demonstrated a much better correlation with XRF screening results. Ultimately, a lack of correlation between XRF and laboratory analysis, as well as inconsistent laboratory results, led to the decision to conduct this round-robin study.

For this project, TPCH sent eight identical packaging samples to seven analytical laboratories for determination of the total concentration of the four metals (cadmium, lead, mercury, and hexavalent chromium) restricted by state toxics in packaging laws.² Of the eight packaging samples, seven were expected to contain cadmium and/or lead, based on XRF screening results. One of the seven samples was a reference sample with a known

¹ XRF measures total chromium, not hexavalent chromium. If chromium is detected using XRF, laboratory analysis would be needed to determine if the chromium is hexavalent chromium.

² Given the cost of laboratory analysis, two laboratories were asked to only analyze for cadmium and lead, which were expected in the samples, based on XRF screening.

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concentration of cadmium and lead. The remaining sample was a control sample that contained no detectable cadmium or lead. Laboratories were not informed prior to testing that they were participating in a comparative assessment of laboratory performance in measuring toxics in packaging. DTSC requested that the study focus on PVC packaging samples since this matrix poses particular challenges for sample digestion. TPCH also requested that one non-PVC sample routinely subject to TPCH screening using XRF analysis be included in the study. The non-PVC sample was included to provide a preliminary, although extremely limited, assessment of laboratory performance for non-PVC samples.

Sixteen percent of the test results (9 of 56 samples) were considered "unacceptable," defined as varying by more than 25 percent from established baseline reference points. Only one sample out of 56 (<2 percent) resulted in a "false negative," that is, a test result that indicates compliance with state laws when the sample contained restricted metals, and therefore, was not in compliance with state laws. No laboratories, however, reported "false positives," that is, detected cadmium or lead in samples that the XRF results demonstrated were in compliance with state toxics in packaging laws.

Over half the laboratories (4 of 7) reported one or more unacceptable result; one of these laboratories produced unacceptable results for 5 of 7 samples, including all PVC samples that contained cadmium and/or lead. For the non-PVC sample and the control sample (PVC with no detected metals), all laboratories submitted consistent test results (i.e., variance not greater than 25 percent of baseline reference points).

Given past experiences with laboratory test data in comparison to XRF screening results, overall, the quality and consistency in laboratory testing results was better than expected (with the exception of one laboratory). One possible explanation is that laboratory analysis for total concentration of heavy metals has improved over the past couple of years, likely due to the new sample preparation protocols published by the Consumer Product Safety Commission (CPSC) for testing of children's products.³

The test results did not vary based on the sample preparation methodology reported by the laboratory. For example, the three laboratories with the best overall performance (i.e., no unacceptable results) reported using one of the following test methods: EPA SW-846 Method

³ Test Method CPSC-CH-E1002-08, Standard Operating Procedure for Determining Total Lead (Pb) in Non-Metal Children's Products, February 1, 2009.

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3050B/3051, CPSC-CH-E1002-08.1, or EPA SW-846 Method 3052. U.S. Environmental Protection Agency (EPA) <u>SW-846 Method 3050B and3051A</u>⁴ are designed to measure "total recoverable metals," while CPSC-CH-E1002.08.1 and <u>EPA SW-846 Method 3052</u>⁵ is appropriately used to determine the total concentration of metals through complete sample decomposition. In addition, three of the four labs that reported using EPA SW-846 Method 3052 had one or more unacceptable results. The laboratory that performed the worst in this study (with 5 of 7 samples with unacceptable results) reported using EPA SW- 846 Method 3052. Follow up queries with laboratories that produced unacceptable results revealed that the samples were not completely dissolved in solution.

Some valuable lessons were learned from this round-robin testing project, resulting in the following recommendations.

When requesting testing services from laboratories, it is important to communicate testing requirements and data quality objectives, specifically, total concentration of the restricted metals, which is possible only through complete sample decomposition. Achieving these data quality objectives appears more important than the stated test method of the laboratory.

If total sample decomposition is <u>not</u> achieved, this fact must be reported on the test report as it strongly impacts the accuracy of the results. This is very important when dealing with laboratories that typically conduct analyses for "total recoverable" metals (hazardous waste or site characterization) as they might not be as familiar with requests for absolute total concentration of metals in products, packaging, or otherwise unique matrices.

Testing Laboratories should:

 Evaluate their current sample preparation methods for determining the restricted metals content of PVC matrices to ensure that the methods used achieve complete decomposition of the sample. Complete sample decomposition should be considered as the objective of methods such as EPA SW-846 Method 3052 or an equivalent

 ⁴ EPA SW-846 Method 3050B, Acid Digestion of Sediments, Sludges, and Soils; EPA SW-846 Method 3051A, Microwave Assisted Acid Digestion of Sediments, Sludges, Soils, and Oils.
 ⁵ EPA SW-846 Method 3052, Microwave Assisted Acid Digestion of Siliceous and Organically Based Matrices

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methodology. Note that EPA SW-846 Method 3052 does NOT require the use of hydrofluoric acid for decomposition of organically-based matrices like PVC.

- Consider adding a comment field to test reports that document whether the sample was totally decomposed (e.g., percent dissolution of the sample). TPCH has found that the data quality objective of "total sample decomposition" is the most important factor in accurate reporting under toxic in packaging statutes. A simple statement of the test method used does not convey this information, as the application of test methods by laboratories differ, as shown in this study.
- Re-analyze samples if total sample decomposition is not achieved. Some matrices may require experimentation with sample preparation methods until total sample decomposition is achieved.

Regulated entities such as manufacturers. purchasers, and retailers should:

- Communicate the data quality objective of "total sample decomposition" to laboratories and request that laboratories include in their test reports information on sample decomposition. This information will provide regulated entities with some assurance that appropriate test methods were used by the laboratory for determining compliance with state toxic in packaging laws.
- If test reports indicate that any amount of the four metals restricted by state laws are
 present in the sample, it is prudent to follow-up with laboratories to determine whether
 the sample was totally decomposed, if this information is not available on the test
 report. If the sample was not totally decomposed, the analysis, including sample
 preparation, should be repeated.

1.0 INTRODUCTION

The California Department of Toxics Substances Control (DTSC) contracted with the Northeast Recycling Council Inc. (NERC), the administrator of the Toxics in Packaging Clearinghouse (TPCH), to perform a round-robin study to evaluate the performance of testing laboratories in determining compliance with toxics in packaging statutes. At the request of DTSC, the study specifically focused on the potential for inconsistencies in testing results for polyvinyl chloride (PVC) matrices.

DTSC develops technical assistance and outreach to educate stakeholders (manufacturers, distributors, suppliers, and purchasers of packaging and packaging components, such as retailers, as well as testing laboratories). Outreach and assistance includes such topics as best practices for compliance testing pursuant to toxics in packaging statutes. The overall goals of this round-robin testing project are to increase awareness of 1) the challenges and problems of obtaining consistent laboratory results, and 2) the importance of communicating data quality objectives to laboratories.

2.0 BACKGROUND & CONTEXT FOR THE PROJECT

For the past five years, TPCH has screened packaging for compliance with state toxics in packaging laws using x-ray fluorescent (XRF) analysis. XRF analysis is a rapid and inexpensive screening tool for measuring the elemental composition of samples, including the four metals restricted by state laws – cadmium, lead, mercury, and hexavalent chromium.⁶ When TPCH compared XRF screening results obtained for packaging samples with laboratory analysis, TPCH learned that the results obtained from laboratory analysis did not necessarily correlate with XRF screening results.

The following sections discuss the results of several past projects and studies conducted by TPCH and its member states that compared results obtained by XRF and laboratory analysis of packaging samples. Ultimately, a lack of correlation between XRF and laboratory analysis, as well as inconsistent laboratory results, led to the decision to conduct this round-robin study.

⁶ XRF measures total chromium, not hexavalent chromium. If chromium is detected using XRF, laboratory analysis would be needed to determine if the chromium is hexavalent chromium.

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2.1 TPCH 2006 XRF Screening Results Compared to Laboratory Analysis

TPCH and its member states have encountered irregularities with laboratory test results since its first packaging screening project using XRF analysis in 2006⁷. In this initial project, TPCH found a poor correlation between XRF screening results performed by TPCH and laboratory test results submitted by companies to demonstrate compliance with state laws. Companies claimed compliance and submitted supporting laboratory test reports for almost 70% of the packages that failed the TPCH screening tests. Several possible explanations for these inconsistencies were proposed, including the selection and implementation of sample preparation methodologies by testing laboratories. More specifically, TPCH speculated that testing laboratories might be measuring "leachable," "total recoverable," or "environmentally available" metals in the packaging samples, rather than absolute "total concentration" as required by state statutes.

The DTSC Environmental Chemistry Laboratory (ECL) conducted further testing to assist TPCH in identifying the underlying causes of the discrepancy between XRF screening results and laboratory test reports. Three of the TPCH packaging samples were analyzed by XRF and by Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES). The XRF analysis was conducted by ECL using a portable XRF instrument and by one of its XRF equipment vendors, Oxford Instruments, using a bench-top unit. For the ICP-AES analysis, ECL prepared the samples according to EPA SW- 846 Method 3050B using acid digestion over a hot plate; the methodology for ICP-AES analysis of metals was EPA SW-846 Method 6010B.

Table 1 compares the results for the packaging samples. For all three samples, the ICP-AES test results were inconsistent with the XRF screening results obtained by three different organizations, each using a different device (2 Oxford Instrument models and a Niton analyzer). The ICP-AES results were at least an order of magnitude less than the XRF results for all samples. The ICP-AES only detected metal concentrations over 100 ppm when the XRF results indicated concentrations greater than 1,000 ppm. Based on these ICP-AES results, two of the three samples would be in violation of state laws, while one sample (the textile bag) would appear to be in compliance with the 100 ppm limit of state toxics in packaging laws.

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⁷ See the report, Assessment of Heavy Metals in Packaging: Screening Results Using a Portable X-Ray Fluorescent Analyzer, 2007, available at http://www.toxicsinpackaging.org/adobe/TPCH_Final_Report_June_2007.pdf.

		XRF Results			ICP- AES ⁴ Results
Sample Description	Restricted Metal	TPCH ¹	DTSC ECL ²	Oxford Instruments ³	DTSC
Shonning Bog 1	Lead	1,296	718	1,163	138
Shohhing pag T	Chromium	494	279	161	30.2
Channing Dag 2	Lead	9,334	12,752	9,203	322
Shopping Bag 2	Chromium	2,548	2,188	1,617	71.6
Textile Bag	Cadmium	430	360	591	20.4
- Flexible PVC	Lead	404	432	565	19.2

TABLE 1: COMPARISON OF CALIFORNIA XRF AND ICP-AES RESULTS (PPM)

1 Performed using a Niton XLt797; results are an average of two readings of a sample with a minimum thickness of 5mm.

2 DTSC XRF testing was performed using Oxford Instruments, X-MET 3000TX; results were the average of two readings; shopping bag samples were 32 layers thick (2-3 mm); the textile bag was 8 layers thick (1mm).

3 Oxford Instruments tested the samples using a bench-top energy-dispersive x-ray fluorescence spectrometer, Oxford Instruments Model XGT 1000WR-Type II.

⁴ Samples digested with 1:1 HNO3 (and 30% H2O2, and 1:1 HCl, if applicable) over a hot plate. Digests were cooled, filtered and made to final volume with deionized H2O (EPA SW-846 Method 3050B). Metal analysis of the digests was by ICP-AES (EPA SW-846 Method 6010B).

The Connecticut Department of Environmental Protection obtained similar results when it submitted four different TPCH flexible PVC samples to an accredited contract laboratory for analysis. The instructions given to the laboratory were to analyze for "total metals concentration" in the samples. Table 2 summarizes the results of these laboratory tests compared to the TPCH XRF measurements. The laboratory test results were only 3 to 9 percent of the XRF screening results. The lab report referenced "6010/E200.7" for lead and cadmium analysis. It appears they performed a "total recoverable metals" analysis, instead of a total metals analysis. When later questioned, the lab manager admitted they had "incomplete digestion" and therefore "unknown recovery" of the metals contained in the samples.

EPA SW-846 Sample Preparation

Method 3050B uses nitric acid and hydrogen peroxide added to a representative sample and heated on a hot plate. This method is not a total digestion technique for most samples. It is a very strong acid digestion that will dissolve almost all elements that could become "environmentally available." By design, elements bound in silicate structures are not normally dissolved by this procedure since they are not usually mobile in the environment. The method may also fail to completely liberate metals bound in polymeric matrices. The method states: "If absolute total digestion is required use Method 3052."

<u>Method 3051A</u> is a microwave assisted acid digestion method designed to mimic Method 3050B. Since this method is not intended to accomplish total decomposition of the sample, the extracted analyte concentrations may not reflect the total content in the sample.

The scope and application of <u>Method 3052</u> states that it is applicable to the microwave assisted acid digestion of organic matrices and other complex matrices and that the technique is not appropriate for regulatory applications that require the use of leachate preparations (such as Method 3050). It further states that Method 3052 is appropriate for those applications requiring a total decomposition in response to a regulation that requires total sample decomposition.

XRF A NALYSIS				
Sample Description (All PVC matrices)	Restricted Metal	TPCH XRF Screening ¹	Contract Laboratory ²	
T. D.	Cadmium	500	21.2	
Toy Bag	Lead	137	11.8	
Small Electrical Appliance Bag	Cadmium	320	17.3	
Textile Bag 1	Cadmium	990	31.8	
Textile Bag 2	Cadmium	528	31.2	

TABLE 2: CT LABORATORY RESULTS COMPARED TO TPCH XRF ANALYSIS

¹Using Niton XLt 797

² Using EPA SW-846 Method 6010/E200.7

Given the laboratory test results obtained by both DTSC and the Connecticut contract laboratory, in hindsight, it was not surprising that many of the companies that received failure notifications from TPCH in 2006 claimed compliance based on independent laboratory test results.

2.2 DTSC 2008 EVALUATION OF SAMPLE PREPARATION METHODOLOGIES

In 2008, DTSC sought answers to the discrepancies between XRF screening and its laboratory "wet chemistry" (i.e., chemical digestion and analysis) test results, specifically for the hard-to-digest PVC matrices. DTSC compared several sample digestion methods specified in <u>EPA SW-846</u>, which are summarized in the left sidebar, followed by analysis using ICP-AES. Method 3050B utilizes acid digestion over a hot plate, while Methods 3051A and 3052 employ a more rigorous approach to sample dissolution using microwave assisted acid digestion.

As shown in Table 3, the concentration of heavy metals in the packaging samples detected by ICP-AES analysis increased as more rigorous sample preparation methods were used to digest the sample and liberate the

Sample	Elements	XRF Screening	3050B/ICP	3051/ICP Microwave	3052/ICP Microwave Contract Lab A	3052/ICP Microwave Contract Lab B
	Cadmium	ND	ND	ND	NA	ND
1	Lead	1,300	138	779	NA	1,101
	Chromium	420	30	198	NA	264
	Cadmium	ND	ND	ND	NA	ND
2	Lead	650	74	544	NA	561
	Chromium	ND	18	135	NA	142
	Cadmium	ND	ND	ND	ND	ND
3	Lead	257	154	187	332	305
	Chromium	ND	37	55	143	81

TABLE 3: DTSC COMPARISON OF EPA SW-846 SAMPLE PREPARATION METHODS: CONCENTRATION (PPM) OF METALS IN FLEXIBLE PVC PACKAGES

ND = not detected; NA = not applicable

metals. EPA SW-846 Method 3052 achieved the most consistent and comparable results to XRF analysis, while Method 3050B resulted in significantly lower concentrations of heavy metals in all samples tested, compared to Method 3052 and XRF analysis.

These results are not surprising since the two sample preparation methods differ in their stated objective. Method 3050B (Acid Digestion of Sediments, Sludges and Soils) is designed to measure "total recoverable metals." Section 1.2 of the Scope and Applications specifically states: "This method is not a total digestion technique for most samples. It is a very strong acid digestion that will dissolve almost all elements that could become 'environmentally available.'" The scope goes on to say: "If absolute total digestion is required use Method 3052." Method 3052 (Microwave Assisted Acid Digestion of Siliceous and Organically Based Matrices) is appropriately used to determine the total concentration of cadmium and lead in flexible PVC because PVC is organic. Section 1.3 of Scope and Application states "The goal of this method is total sample decomposition and with judicious choice of acid combinations this is achievable for most matrices."

The results obtained by DTSC demonstrated the importance of selecting appropriate dissolution methods for packaging material, and specifically, flexible PVC matrices. Simply put,

if the sample is not completely digested, the cadmium and lead are not sufficiently liberated from the plastic and cannot be completely measured by the laboratory analytical equipment, since analytical instruments, such as ICP, measure the concentration of substances in the solution. By ensuring complete dissolution of the matrix, analytical results demonstrate a much better correlation with XRF screening results.

2.3 TPCH 2010 PILOT ROUND ROBIN

In early 2010, TPCH decided to test its hypothesis that testing laboratories may not be applying appropriate sample preparation methods for the detection of total concentration of restricted metals, as required by state toxics in packaging laws through a pilot round robin testing program. TPCH sent a flexible PVC packaging sample⁸ to four testing laboratories with instructions to analyze the sample for compliance with toxics in packaging requirements. Instructions were communicated to the laboratories using standard laboratory protocols; for example, three laboratories had standard test request forms while one lab asked for written instructions to accompany the sample. The packaging sample was screened by TPCH using XRF analysis prior to shipping, and based on these results, was expected to contain cadmium. The results for cadmium are shown in Table 4. The variability in results was astounding, but not unexpected given TPCH's past experience. Of the four laboratories, two detected cadmium concentrations in excess of 100 ppm, while two laboratories (#3 and #4) reported cadmium under 100 ppm. Only Lab 4 concluded that the packaging sample was in compliance with toxics in packaging requirements, while Lab 3 reported "does not comply" since the sum of the 4 restricted heavy metals exceeded 100 ppm.

The results of this pilot project indicated a need for a more extensive study of laboratory performance in measuring the total concentration of restricted heavy metals in packaging. As a result, DTSC contracted with TPCH to conduct this round-robin study.

⁸ The sample was cut into five equal-sized pieces; four of the samples were sent to four laboratories for testing using "wet" chemistry and one piece was retained by TPCH.

Laboratory	Instructions to Lab	Sample Preparation & Test Methods ¹	Cadmium (ppm)
State of Illinois XRF Analysis ²	Not applicable	Not applicable	475 +/- 7
Lab 1	Memo requested testing for toxics in packaging and, specifically, total concentration	Laboratory SOP equivalent to EPA SW-3052 & ICP; cryogenic mill used to grind sample	660
Lab 2	Test request form; checked box on form for toxics in packaging	Not specified	385
Lab 3 Lab 3 Lab 3 Lab 3 Checked box on form for toxics in packaging		ICP	78
Lab 4	Test request form that provided space to list required tests; requested testing for toxics in packaging and, specifically, total concentration using EPA SW 3052 for sample preparation or equivalent	EPA 3050B/3051 Acid Digestion Method/ICP	22

TABLE 4: PILOT ROUND ROBIN LABORATORY RESULTS

1 As referenced in Service Agreement and/or Laboratory Test Report

2 Using an Innov-X Systems Alpha Series analyzer

3.0 PROJECT METHODOLOGY

For this project, TPCH sent eight identical packaging samples to seven analytical laboratories for determination of the total concentration of the four metals (cadmium, lead, mercury, and hexavalent chromium) restricted by state toxics in packaging laws.⁹ Laboratories were not informed prior to testing that they were participating in a comparative assessment of laboratory performance. Instructions were communicated to the laboratories using standard laboratory protocols; for example, contacting designated customer service representative and

⁹ Given the cost of laboratory analysis, two laboratories were asked to only analyze for cadmium and lead, which were expected in the samples, based on XRF screening.

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submitting required test request forms. After receiving test reports, TPCH staff followed up with laboratories, as needed, to obtain additional information.

3.1 SELECTION OF AND INSTRUCTIONS TO LABORATORIES

TPCH selected laboratories to participate in the "blind" study using two criteria. The laboratories selected met one of the following criteria:

- Prominent national or international laboratory that routinely performs toxics in packaging testing for manufacturers, suppliers, distributors and retailers subject to toxics in packaging laws. These laboratories were identified through TPCH and member state archives of correspondence with companies and retailers that submitted test reports to demonstrate compliance with state toxics in packaging laws. Four laboratories participating in the study met this criterion;¹⁰or
- 2) Laboratories used by TPCH member states to support enforcement efforts. Three of the seven laboratories participating in the study met this criterion. Included in this group were the DTSC ECL and two independent laboratories.

For this study, it was important to seek analytical services in the same manner as a regulated entity. TPCH wanted its samples handled and its reports communicated like any other samples processed by the selected laboratory. Therefore, requests for testing services were communicated to the laboratories using standard laboratory protocols. This typically involved contacting a designated customer service representative, filling out a test request form, and signing a service agreement. Some test request forms or protocols provided an opportunity to specify test requirements or methods, while others were simply comprised of boxes to check (e.g., toxics in packaging.)

Table 5 generically describes each laboratory and the request for testing services made by TPCH. This report does not identify laboratories by name since the purpose of this report is to assess laboratory performance overall in testing for toxics in packaging, and NOT to single out laboratories based on their performance, whether "good" or "bad."

¹⁰ A fifth laboratory declined to test TPCH samples, citing that the company only provides services to manufacturers and retailers.

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Laboratory	Description of Laboratory	Instructions to Lab		
1	State laboratory	Test request form		
	,	Metals scan for toxics in packaging		
		Test request form		
2	State contract lab – regional	 Checked box for RoHS Metals (Hg, Cd, CrVI, Pb) nor systemar convice representative 		
		instructions		
2	National/international serving	Test request form		
5	regulated entities	Checked box for toxics in packaging		
4	National/international serving	Test request form		
	regulated entities	 Checked box for toxics in packaging 		
E	National/international serving	Test request form		
5	regulated entities	Checked box for toxics in packaging		
G	National/international serving	Memo requested testing for toxics in		
0	regulated entities	packaging, and specifically, total concentration		
7	State contract laboratory – national	Memo requesting testing for total		
,		concentration using EPA SW-846 Method 3052		

TABLE 5: LABORATORIES PARTICIPATING IN STUDY

3.2 SELECTION AND PREPARATION OF PACKAGING SAMPLES

DTSC requested that the study focus on PVC packaging samples since this matrix poses particular challenges for sample digestion. TPCH also requested that one non-PVC sample routinely subject to TPCH screening using XRF analysis be included in the study. The non-PVC sample would provide a preliminary, although very limited, assessment of laboratory performance for non-PVC samples.

As shown in Table 6, the study included five PVC samples with varying concentrations of cadmium and/or lead as detected through portable XRF screening¹¹ plus one non-PVC plastic with inks/colorants. The description of the metals concentration in the samples – high, medium, and low – are relative to the concentrations typically detected by TPCH in packaging samples, and are NOT a statement about the impact on the environment and/or human health. Laboratories also received two control samples, a reference sample with known concentrations

¹¹ XRF screening performed using either an Innov-X Systems Alpha Series or NITON XLt and standard operating procedures provided by the manufacturer.

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Sample	Sample Description	Metals Concentration ¹		
1	PVC Cadmium – High concentration	687		
2	PVC Cadmium Medium concentration	404	<lod< th=""></lod<>	
3	PVC Cadmium - Low concentration	207	<lod< th=""></lod<>	
4	PVC Cadmium & Lead	273	245	
5	PVC Lead – Medium concentration ²	648	413	
6	Non-PVC plastic with ink/colorant ³	<lod<sup>3</lod<sup>	441	
7	PVC – no detection of restricted metals	<lod< th=""><th><lod< th=""></lod<></th></lod<>	<lod< th=""></lod<>	
8	PVC reference sample ⁴	250	350	

TABLE 6: PACKAGING SAMPLES

LOD – Below level of detection

¹ Determined by XRF analysis using Innov-X System Alpha Series analyzer.

²There were no PVC samples that contained lead only, so a sample with medium lead concentration was selected that also contained cadmium

³HDPE shopping bag

⁴The metal concentration was reported on the certificate of analysis.

of cadmium and lead (sample 8) and a PVC sample without any of the four restricted metals as determined by XRF analysis (sample 7).

Each packaging sample was cut into eight equal-sized pieces. One piece was sent to each laboratory for testing using "wet" chemistry and one piece was retained by TPCH.

3.3 EVALUATION OF TEST RESULTS FROM LABORATORIES

For each sample, the concentration of cadmium and lead reported by the laboratories was compared to three baseline reference points:

- 1) XRF measurement as determined by TPCH. See Table 6 above.
- 2) Mean of all laboratory results for that sample. Before calculating the mean, any outlier test results were removed from the data set for that sample. An outlier was defined as a test result that varied by more than 40 percent from both reference points 1 and 3.¹²
- 3) DTSC laboratory result as determined by EPA SW-846 Method 3052.

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¹² Four of the five "outlier" test results were more than 60 percent different than reference points 1 and 3.

The number of unacceptable results was reported for each sample. A laboratory result was considered "unacceptable" if there was greater than 25 percent variation from all three baseline reference points for one or both metals, if applicable. If a lab result had greater than 25 percent variation for only one or two of the reference points, it was considered acceptable.¹³

Some samples contained both cadmium and lead. For these samples, laboratories were evaluated on their performance in determining the concentration of both metals. Laboratory performance was reported by sample (which considered whether the results for both metals were acceptable or unacceptable) and by data points (which considered cadmium and lead results separately). For the sample, if the result for one metal was "unacceptable," then the sample result was considered unacceptable.

4.0 RESULTS

Eight samples were analyzed by each of the seven laboratories for a total of 56 samples. In these eight unique samples, there were a total of 10 data points, that is, where lead and cadmium were expected to be detected, based on TPCH XRF screening. Three samples, including the reference sample, had both cadmium and lead (as shown in Table 6 above), for a total of 70 data points evaluated in this study. ¹⁴

Table 7 summarizes the performance of laboratories as well as the reported sample preparation methods for each laboratory. All laboratories analyzed the samples using Inductively Coupled Plasma (ICP) spectrometry. Appendix A provides the laboratory results for each of the 8 samples.

¹³ In this study, analysis was performed on retail packaging samples, and therefore, a reference sample was not available to evaluate laboratory performance. TPCH decided to select multiple reference points, rather than a single reference point, to compare laboratory results, to reduce the potential for bias if one reference point was not accurate.

¹⁴ Laboratories analyzed all samples for four metals – cadmium, lead, mercury, and hexavalent chromium—with two exceptions. Given the cost of laboratory analysis, TPCH requested analysis for only lead and cadmium from two laboratories. This report evaluates laboratory performance in detecting the metal(s) suspected of being present in the sample only (cadmium and/or lead). None of the laboratories, when applicable, detected the other metals in any of the samples above the detection limit.

			Overall Performance			
Laboratory	Description of Laboratory	Reported Sample Preparation Method	Number of Unacceptable Sample Results (out of 8 total samples analyzed by each lab)	Number of Unacceptable Data Points ¹ (out of 10 total data points analyzed by each lab)	Number of False Negatives ²	
1	State laboratory	EPA SW-846 Method 3052	0	0	0	
2	State contract laboratory – regional	EPA SW-846 Method 3052	1	1	0	
3	National/ international serving regulated entities	CPSC-CH-E1002-08.1 ³	0	0	0	
4	National/ international serving regulated entities	Microwave digestion with nitric acid	1	1	0	
5	National/ international serving regulated entities	EPA SW-846 Method 3050B/3051	04	0	0	
6	National/ international serving regulated entities	Laboratory SOP equivalent to EPA SW- 3052; cryogenic mill used to grind sample	2	2	0	
7	State contract laboratory - national	EPA SW-846 Method 3052	5	7	1	
	TOTAL		9	11	1	

TABLE 7: SUMMARY OF LABORATORY TEST RESULTS

¹ Data points were defined as the expected detection of cadmium and/or lead in a sample, based on TPCH XRF screening. Some samples were expected to contain both cadmium and lead. For these samples, laboratories were evaluated on their performance in determining the concentration of the metals separately. Four samples had 1 data point; three samples had 2 data points; and one control sample had 0 data points.

² A "false negative" occurs when laboratory results indicate compliance with toxics in packaging requirements, when the restricted metals are present.

³ CPSC-CH-E1002-08, Standard Operating Procedure for Determining Total Lead (Pb) in Non-Metal Children's Products, February 1, 2009. This method is similar to EPA SW-846 Method 3052, however, complete sample digestion is not explicitly described. ⁴ Results for this laboratory includes 7 samples. TPCH suspects that the laboratory analyzed the "packaging" that contained the reference sample and not the reference material. Numerous requests to the laboratory to confirm this assumption were not answered. This sample was NOT in tabulations of "unacceptable" results.

Overall Laboratory Performance

- The reported concentrations of restricted metals in 16.1 percent (9 of 56) of the samples varied more than 25 percent from the three baseline reference points. Similarly, the number of data points for cadmium and/or lead that varied by more than 25 percent from the baseline reference points was 15.7 percent (11 of 70 data points).
- Over half the laboratories (4 of 7) reported one or more unacceptable result. Three of these laboratories had one or two unacceptable results, while the fourth produced unacceptable results for 5 of 7 samples, including all PVC samples that contained cadmium and/or lead.
- The laboratory (#7) with the overall poorest correlation with the reference samples was a laboratory under contract with a TPCH member state for hazardous waste analysis.
- Only one test result (from Laboratory #7) resulted in a "false negative," that is, a reported concentration of restricted metals below the 100 ppm threshold for compliance with the incidental limit for toxics in packaging in state laws.¹⁵
- No laboratories reported "false positives," that is, detected cadmium or lead in samples that the XRF results demonstrated were in compliance with state toxics in packaging laws.

Test Methods

- The test results did not vary based on the sample preparation methodology reported by the laboratory. For example, the three laboratories with the best overall performance (i.e., no unacceptable results) reported using one of the following test methods: EPA SW-846 Method 3050B/3051, CPSC-CH-E1002-08.1, or EPA SW-846 Method 3052. In addition, three of the four labs that reported using EPA SW-846 Method 3052 had one or more unacceptable results. The laboratory that performed the worst in this study (with 5 of 7 samples with unacceptable results) reported using EPA SW-846 Method 3052.
- It is important to note that in follow up queries with laboratories that produced unacceptable results, two laboratories, including Laboratory #7, revealed that the samples were not completely dissolved in solution. This information was not communicated to TPCH initially.

¹⁵ Toxics in packaging laws prohibit the intentional use of any amount of the four restricted metals, and limit the incidental presence of the four metals combined to 100 ppm. Laboratories often report "pass" or "fail" based on the 100 ppm limit since this is measurable. A false negative would indicate compliance with state laws when one or more of the restricted metals should be detected in the sample.

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Results for Sample Analysis

Appendix A provides the laboratory results for each packaging sample.

- For the non-PVC sample and the control sample (PVC with no detected metals), all laboratories submitted consistent test results (i.e., variance not greater than 25 percent of baseline reference points).
- One laboratory (#7) submitted test results with a variance from the reference samples greater than 25 percent for all PVC samples that contained cadmium and/or lead (samples 1 through 5 and 8). Yet, this laboratory submitted results consistent with other laboratories and the XRF reference data point for the non-PVC sample. Upon inquiry, it was discovered that the samples had not been completely dissolved in solution. The laboratory clearly did not achieve the stated objective of the test method, which is "total sample decomposition," which is critical to the validity of the reported results.

5.0 DISCUSSION & CONCLUSIONS

Laboratory Performance

The quality and consistency in laboratory testing results (with the exception of one laboratory) was unexpected, given past experiences with laboratory test data in comparison to XRF screening results. While 16 percent of the test results varied by >25 percent from the reference points, only one sample out of 56 (<2 percent) resulted in a "false negative" (i.e., a test result that would indicate compliance with state laws.) One possible explanation is that laboratory analysis for total concentration of heavy metals has improved over the past couple of years, likely due to the new sample preparation protocols published by the Consumer Product Safety Commission for testing of children's products.¹⁶ This conclusion is supported by the TPCH Pilot Round Robin test data shown in Table 4. Two of the laboratories (Laboratories #4 and #5) that performed well in this study also participated in the pilot (listed in that study as Laboratories #3 and #4), where they reported false negatives.

¹⁶ Test Method CPSC-CH-E1002-08, Standard Operating Procedure for Determining Total Lead (Pb) in Non-Metal Children's Products, February 1, 2009.

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Test Methods & Communications with Laboratories

When requesting testing services from laboratories, it is important to communicate testing requirements and data quality objectives, specifically, the performance criteria of complete matrix decomposition, which is required in order to obtain the true total concentration of the restricted metals. Achieving these data quality objectives appears more important than the stated test method of the laboratory.

If complete sample matrix decomposition is <u>not</u> achieved, this fact must be reported on the test report as it strongly impacts the accuracy of the results. This is very important when dealing with laboratories that typically conduct analyses for "total recoverable" metals (hazardous waste or site characterization) as they might not be as familiar with requests for absolute total concentration of metals in products, packaging, or otherwise unique matrices.

Conventional communication mechanisms with laboratories may not be ideal for achieving the abovementioned goals. For example, most of the laboratories participating in the study utilize standardized test request forms and "check" boxes. Further, when requesting testing services, TPCH was directed to a designated customer service representative, some of whom were more knowledgeable than others. This concern may be overcome by having detailed conversations with the laboratory, including assurances from the technical staff, before securing the laboratory's testing services.

PVC Matrices

This study dealt with a limited number of unique samples, including only one non-PVC plastic sample. However, based on the available results, it appears that PVC samples are more challenging to completely decompose in solution, than more traditional "environmental" samples such as soils and sludges. This may explain, for example, why the state contract laboratory that routinely performs hazardous waste analyses provided test results consistent with XRF analysis and other laboratories for the non-PVC plastic material with inks/colorants.

Finally, laboratory certifications and accreditations may not guarantee the ability to perform test methods required to certify to or demonstrate compliance with toxics in packaging requirements.

6.0 RECOMMENDATIONS

Some valuable lessons were learned from this round-robin testing project, resulting in the following recommendations.

Testing Laboratories should:

- Evaluate their current sample preparation methods for determining the restricted metals content of PVC matrices to ensure that the methods used achieve complete decomposition of the sample matrix. EPA SW-846 Method 3052 or an equivalent methodology should be considered as the objective of this method is complete sample matrix decomposition.
- Note that EPA SW-846 Method 3052 does NOT require the use of hydrofluoric acid for decomposition of organically-based matrices like PVC. Over the years, a number of laboratories or their customers have reported to TPCH that the laboratory will not use Method 3052 as it requires the use of hydrofluoric acid. A careful review of the sample preparation procedure for Method 3052 reveals that hydrofluoric acid is not required. Rather, a combination of other acids (e.g., hydrochloric acid, nitric acid, hydrogen peroxide) may accomplish the goal of complete sample matrix decomposition.
- Consider adding a comment field to test reports that document whether the sample matrix was completely decomposed (e.g., percent dissolution of the sample). The data quality objective of "complete sample matrix decomposition" is the most important factor in accurate reporting under toxic in packaging statutes. A simple statement of the test method used does not convey this information, as the application of test methods by laboratories differ, as shown in this study. Providing information on whether the test method used by the laboratory achieved complete sample matrix decomposition (or not) will allow regulated entities and state agencies to better evaluate the data provided in laboratory testing reports. Re-analyze samples if complete sample matrix decomposition is not achieved. Some matrices may require experimentation with sample preparation methods until complete sample matrix decomposition is achieved. Re-analyzing samples is particularly important if any amount of the restricted metals is detected in the initial test, since further or complete decomposition of the sample matrix may result in detection of one or more of the restricted metals in excess of the regulatory limits.

Regulated entities such as manufacturers. purchasers, and retailers should:

- Communicate the data quality objective of "complete sample matrix decomposition" to laboratories and request that laboratories include in their test reports information on sample matrix decomposition. This information will provide regulated entities with some assurance that appropriate test methods were used by the laboratory for determining compliance with state toxic in packaging laws. Providing this information up front in test reports will also save all stakeholders (regulated entities, laboratories, state agencies) the time of having to ask for this information or dig through laboratory records for this information if laboratory test reports are questioned by state agencies.
- If test reports indicate that any amount of the four metals restricted by state laws are present in the sample, it is prudent to ask laboratories whether the sample matrix was completely decomposed, if this information is not available on the test report. If the sample matrix was not totally decomposed, the analysis, including sample preparation, should be repeated.

State agencies with toxics in packaging requirements should:

- Conduct outreach to laboratories and regulated entities about the findings of this study.
- Consider additional round-robin studies for non-PVC matrices to evaluate laboratory performance.

APPENDIX A: LABORATORY RESULTS

The tables below summarize laboratory results for cadmium and/or lead, if expected in the sample, based on XRF analysis. Cadmium and lead results are reported for the PVC control sample (sample 7) that was not expected to contain either metal.

Note: Unacceptable laboratory results, as summarized in Table 7 in Section 4.0, are highlighted in orange in the tables below. Any laboratory results with greater than 25 percent variability from all three baseline reference points was considered an "unacceptable" result. If a lab result was greater than 25 percent for only one or two of the reference points, it was considered acceptable.

Laboratory	Cd (ppm)	Variance from CA DTSC	Variance from Mean	Variance from TPCH XRF
TPCH XRF	687			
Lab 1	730		5.8%	6.3%
Lab 2	778	6.6%	12.8%	13.3%
Lab 3	805	10.3%	16.7%	17.5%
Lab 4	678	-7.1%	-1.7%	-1.2%
Lab 5	732	0.3%	6.1%	6.6%
Lab 6	475	-34.9%	-31.1%	-30.8%
Lab 7	271	-62.9%	-60.7%	-60.5%
Mean ¹	689.9			

Sample 1: PVC Cadmium – High concentration

 Mean⁻
 689.9

 ¹ Lab 7 result considered an "outlier" and not included in mean.

Laboratory	Cd (ppm)	Variance from CA DTSC	Variance from Mean	Variance from TPCH XRF
TPCH XRF	404			
Lab 1	400		2.0%	0%
Lab 2	423	5.8%	7.8%	4.6%
Lab 3	351	-12.3%	-10.5%	-13.2%
Lab 4	375	-6.3%	-4.4%	-7.3%
Lab 5	465	16.3%	16.3%	15.0%
Lab 6	352	-12.0%	-12.0%	-12.9%
Lab 7	60.2	-85.0%	-84.7%	-90.1%
Mean ¹	392.3			

Sample 2: PVC Cadmium – Medium concentration

¹Lab 7 result considered an "outlier" and not included in mean.

Sample 3: PV	Cadmium –	Low concentration
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Laboratory	Cd (ppm)	Variance from CA DTSC	Variance from Mean	Variance from TPCH XRF
TPCH XRF	207			
Lab 1	200		-6.6%	-3.2%
Lab 2	188	-6.0%	-12.2%	-9.0%
Lab 3	240	20.0%	12.0%	16.1%
Lab 4	205	2.5%	-4.3%	-0.8%
Lab 5	231	15.5%	7.8%	11.8%
Lab 6	226	13.0%	5.5%	9.4%
Lab 7	113	-43.5%	-47.2%	-63.5%
Mean ¹	214.2			

 Mean¹
 214.2

 ¹ Lab 7 result considered an "outlier" and not included in mean.

Laboratory	Cd (ppm)	Variance from CA DTSC	Variance from Mean	Variance from TPCH XRF	Pb (ppm)	Variance from CA DTSC	Variance from Mean	Variance from TPCH XRF
TPCH XRF	273				245			
Lab 1	330		8.1%	21.0%	220		16.0%	-10.2%
Lab 2	332	0.6%	8.7%	21.8%	225	2.3%	18.6%	-8.2%
Lab 3	318	-3.6%	4.1%	16.6%	193	-12.3%	1.8%	-21.2%
Lab 4	235	-28.8%	-23.0%	-13.8%	119	-45.9%	-37.3%	-51.4%
Lab 5	309	-6.4%	1.2%	13.3%	190	-13.6%	0.2%	-22.4%
Lab 6	308	-6.7%	0.9%	13.0%	191	-13.2%	0.7%	-22.0%
Lab 7	93.6	-71.6%	-69.3%	-65.7%	58.6	-73.4%	-69.1%	-75.7%
Mean ¹	305.3				189.7			

Sample 4: PVC Cadmium & Lead

¹Lab 7 result considered an "outlier" and not included in mean.

Sample 5: PVC Lead – Medium concentration

Laboratory	Cd (ppm)	Variance from CA DTSC	Variance from Mean	Variance from TPCH XRF	Pb (ppm)	Variance from CA DTSC	Variance from Mean	Variance from TPCH XRF
TPCH XRF	648				413			
Lab 1	690		0.8%	6.6%	380		14.3%	-7.9%
Lab 2	688	-0.3%	0.5%	3.1%	320	-15.8%	-3.8%	-20.8%
Lab 3	760	10.1%	11.0%	17.4%	337	-11.3%	1.4%	-18.3%
Lab 4	732	6.1%	6.9%	13.1%	315	-17.1%	-5.3%	-23.6%
Lab 5	769	11.4%	12.3%	18.8%	345	-9.2%	3.8%	-16.4%
Lab 6	468	-32.2%	-31.6%	-27.7%	298	-21.6%	-10.4%	-27.8%
Lab 7	110	-84.1%	-83.9%	-83.0%	61.6	-83.8%	-81.5%	-85.1%
Mean ¹	684.5				332.5			

¹Lab 7 result considered an "outlier" and not included in mean.

Laboratory	Pb (ppm)	Variance from CA DTSC	Variance from Mean	Variance from TPCH XRF
TPCH XRF	441		_	_
Lab 1	460		13.1%	4.4%
Lab 2	373	-18.9%	-8.3%	-15.3%
Lab 3	436	-5.2%	7.2%	-1.0%
Lab 4	431	-6.3%	5.9%	-2.2%
Lab 5	399	-13.3%	-1.9%	-9.4%
Lab 6	423	-8.0%	4.0%	-4.0%
Lab 7	418	-9.1%	2.7%	-5.1%
Mean	406.8			

Sample 6: Non-PVC with Ink/colorant

Sample 7: PVC – No detection of metals

Laboratory	Cd (ppm)	Pb (ppm)
TPCH XRF	<lod< th=""><th><lod< th=""></lod<></th></lod<>	<lod< th=""></lod<>
Lab 1	<2.0	<20
Lab 2	<0.5	<5
Lab 3	<1.2	<4.8
Lab 4	<10	<10
Lab 5	ND	ND
Lab 6	3	ND
Lab 7	ND	ND

<LOD – Below level of detection

ND – Not detected

Laboratory	Cd (ppm)	Variance from CA DTSC	Variance from Mean	Variance from TPCH XRF	Pb (ppm)	Variance from CA DTSC	Variance from Mean	Variance from TPCH XRF
COA ¹	250				350			
Lab 1	210		5.8%	-16.0%	390		28.1%	11.4%
Lab 2	149	-29.9%	-24.9%	-40.4%	226	-42.1%	-25.8%	-35.4%
Lab 3	231	10.0%	16.4%	-7.6%	347	-11.0%	14.0%	-0.9%
Lab 4	183	-13.1%	-8.0%	-27.0%	278	-28.6%	-8.5%	-20.5%
Lab 5	ND ²				ND			
Lab 6	199	-5.2%	0.3%	-20.4%	314	-19.5%	3.2%	-10.3%
Lab 7	219	4.3%	10.4%	-24.6%	271	-30.5%	-11.0%	-13.0%
Mean	198.4				304.4			

Sample 8: PVC Reference Sample

¹Certificate of Analysis (COA) was verified by the supplier by XRF analysis: Cd 265 ppm; Pb 330 ppm.

²TPCH suspects that the laboratory analyzed the "packaging" that contained the reference sample and not the reference material. Numerous requests to the laboratory to confirm this assumption were not answered. This sample was NOT in tabulations of "unacceptable" results.