

# **REQUEST FOR PROPOSALS**

**Furthering the understanding of the migration of chemicals from  
consumer products to humans and the environment**

for the project  
**Greening of Chemicals Management in North America**



**Commission for Environmental Cooperation**

**2016**

## **I. Overview**

The Commission for Environmental Cooperation (CEC) is requesting proposals from prospective consultants related to gathering and expanding information on the migration of selected chemicals from manufactured items to humans and the environment.

Specifically, the consultant will be expected to conduct research on the state of existing knowledge regarding the migration of chemicals of interest from manufactured items, and available laboratory test procedures that can be used to measure the migration of these chemicals out of selected items. The consultant will then conduct pilot laboratory testing on the migration of selected chemicals out of selected manufactured items, assess where new methods would need to be developed to address gaps in migration testing, and propose options to focus testing for chemical migration in the second phase of the project.

The CEC is an intergovernmental organization created by Canada, the United States and Mexico under the North American Agreement on Environmental Cooperation (NAAEC). The CEC was established to address regional environmental concerns, help prevent potential trade and environmental conflicts, and promote the effective enforcement of environmental law. The Agreement complements the environmental provisions of the North American Free Trade Agreement (NAFTA).

The CEC's Council, its governing body, approved the project entitled "*Greening of Chemicals Management in North America*" as part of the Operational Plan for 2015–2016, with the purpose of furthering the understanding of the migration of chemicals from manufactured items and subsequent human exposure and/or releases to the environment. For a complete description of the project, including tasks and related budget, please visit the CEC website at: <http://www.cec.org/our-work/projects/greening-chemicals-management-north-america>.

## **II. Terms of Reference**

### **A. Overview and Scope**

The migration of certain chemicals from manufactured items is a concern, as it can lead to human exposure and releases to the environment. The goal of this project is to develop knowledge useful to chemical risk assessment and/or risk management in Canada, Mexico and the United States.

The project is divided into two phases. The goal of the first phase of the project, and the subject of this Request for Proposals (RFP), is to survey existing information on the migration of selected chemicals out of selected manufactured items and conduct pilot testing on selected flame retardants to inform the second phase of the project.

The second phase of the project will consist of performing laboratory testing of chemical migration from selected manufactured items (from Phase I) and subsequent estimation of the potential for human exposure and releases to the environment.

Annex B of this document includes a matrix of manufactured items, a preliminary, non-exhaustive list of chemicals of interest, and testing approaches of interest to be used by the consultant to conduct the literature review.

Annex C of this document includes specific research questions to be addressed under this RFP and a more extensive list of chemicals of interest that complements the list provided in annex B.

Annex D provides details on the pilot testing task of the first phase of this project.

Some of the chemicals and manufactured items for this project were selected based on the 2013–2014 CEC project, *Enhancing Trilateral Understanding of Chemicals in Products in North America*.<sup>12</sup> Prospective consultants are encouraged to review these documents. Samples from the 2013–2014 project will be made available to the selected consultant for pilot testing.

## **B. Description of Services**

The consultant shall coordinate with the CEC's designated contacts to accomplish the following:

1. Development and presentation of a work plan for the contracted activities.  
The consultant will present and discuss the proposed work plan during a project kick-off meeting or teleconference with the CEC Secretariat staff and the project's Steering Committee, to confirm planned activities, deliverables and project timeline.
2. Literature review on the state of knowledge on substance migration:
  - a. Conduct an extensive literature review and report on existing knowledge about selected chemicals migrating from manufactured items (chemicals and items are specified in Annexes B and C). Under this task, initial focus should be placed on the flame retardants and products for which pilot testing will be conducted;
  - b. Research existing laboratory methods for testing and measuring the migration of these chemicals from the manufactured products (Annexes B and C). The research on laboratory methods should *not* include field-testing methods;
  - c. Identify instances where new methods should be developed in order to conduct proper testing for migration of these chemicals from selected manufactured items;
  - d. Provide information on gaps in migration testing methods, options for product categories and specific products to be tested, and recommendations to focus testing for migration of chemicals out of manufactured items in the second phase of the project. This will include such potential areas of focus as method development, based on the research and pilot testing undertaken in the first phase; and
  - e. Produce a report summarizing the findings of the literature review on chemical migration:
    - i. In collaboration with the CEC Program Manager and the project's Steering Committee, the consultant shall develop a detailed outline for the final report,

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<sup>1</sup> Enhancing Trilateral Understanding of Flame Retardants and Their Use in Manufactured Items. Summary Report – Phase I (Supply Chain Analysis of Select Flame Retardants Contained in Manufactured Items Used in Indoor Environment): <http://www3.cec.org/islandora/en/item/11638-enhancing-trilateral-understanding-flame-retardants-and-their-use-in>

<sup>2</sup> Enhancing Trilateral Understanding of Flame Retardants and Their Use in Manufactured Items. Summary Report – Phase II (Analysis of Select Flame Retardants Contained in Office and Household Furniture): <http://www3.cec.org/islandora/en/item/11641-enhancing-trilateral-understanding-flame-retardants-and-their-use-in>

including ideas for style of presentation, use of graphics, and level of detail, and identify additional sources of information to use. The consultant will provide all supporting data. The content of the report shall address (prospective consultants are encouraged to propose alternative sections/headers and/or alternative report organization):

- Executive summary
- Introduction;
- Available information on chemical migration for selected items/chemicals/tests identified in Annexes B and C
- Available test methods for chemical migration for selected items/chemicals identified in Annexes B and C;
- Information on data and methodology gaps;
- Options on areas to focus migration testing to inform phase II (laboratory testing of samples); and
- References

The intended audiences for this report are government agencies (environmental, health, consumer safety products agencies), academia, international organizations such as UNEP, and the public in general.

- ii. Provide a Microsoft PowerPoint presentation summarizing the project, the methodology, the findings and results. The presentation of project results will be either via teleconference/ videoconference/webinar.
3. Conduct pilot testing for selected flame retardants
    - a. The results of the literature review will inform the selection and pilot testing of recommended methods for measuring the migration of selected flame retardants out of selected manufactured products. Details on the pilot testing are provided in Annex D. Prospective consultants should include in their response to this RFP the level of detection that could be used for testing the migration of flame retardants.
    - b. Develop a Quality Assurance Plan for the pilot testing to be approved by the Secretariat and project's Steering Committee;
    - c. Develop and deliver a pilot testing report for selected flame retardants.
    - d. The consultant will include the methodology and results in the Microsoft PowerPoint presentation indicated in section B.2.e.ii above.

Project activities will take place according to the schedule presented in Table 1 below. The timetable is approximate, and may change. The CEC invites prospective consultants to modify the schedule suggested below, based on their evaluation of the proposed project activities.

Table 1: Deliverables

Task	Activity	Deliverable	Deadline
1	Project kick off meeting via teleconference	Meeting summary record and development of final project workplan, addressing comments from CEC Secretariat and project's Steering Committee	June 2016

2	Periodic reporting	Monthly progress reports, and if required, conference calls with project Steering Committee	Ongoing
3	Delivery of draft Quality Assurance Plan (QAP) for pilot testing	Draft Quality Assurance Plan	July 2016
4	Development of draft report on chemical migration based on literature review	First draft report on chemical migration	August 2016
5	Delivery of final QAP for pilot testing for selected flame retardants	Final QAP for pilot testing	August 2016
6	Pilot testing and delivery of draft pilot testing report	Draft pilot testing report	September 2016
7	Presentation of the findings of literature review on chemical migration and pilot testing results	Presentation of project results via teleconference/ videoconference/webinar and report to the CEC Secretariat and project Steering Committee, including PowerPoint file and supporting document	October 2016
8	Delivery of final pilot testing report for selected flame retardants	Final pilot testing report, incorporating comments from CEC Secretariat and project Steering Committee	November 2016
9	Delivery of final Report on chemical migration	Final report on chemical migration and methods to measure chemical migration, incorporating comments from CEC Secretariat and project Steering Committee	November 2016

### C. Periodic Reporting Requirements

Throughout the project, the consultant will work in close collaboration with the CEC, the project's Steering Committee, and experts to gather information to support delivery of the work. The consultant may consult directly with government officials and other experts, as needed. However, the consultant shall report only to, and receive direction only from, the CEC Program Manager (or designate).

The CEC Secretariat will forward draft deliverables to the project's Steering Committee and other experts, for their review and comment. The CEC Secretariat will arrange teleconferences with the consultant, the Program Manager, and other experts on an as-needed basis. The goal of these meetings will be to present the products and assess progress on the project.

The consultant will prepare short monthly status reports that summarize the following:

- progress in previous month;
- current status;
- anticipated progress in upcoming month;
- potential problems, with description of and reasons for any delays; and
- actions that should be taken by the CEC Secretariat to facilitate the project.

These reports are to be sent to the CEC Program Manager by the first week of the following month, by e-mail.

The consultant will work in his or her own offices.

#### **D. Quality of Deliverables**

The consultant is responsible for providing deliverables of **publishable quality** (i.e., copy-edited prior to submission) in English and, when applicable, for the technical editing of the materials. The consultant will submit to the CEC Secretariat all written material (including complete drafts and final reports) in Microsoft Word, following the format of the CEC's *Report Template* and adhering to the precepts of the *Guidelines for CEC Documents and Information Products*, as supplemented by the CEC's English style guide (available at: <http://www.cec.org/about-us/opportunities/useful-documents>). Supporting documents for tables, figures and maps will be submitted with the report in their original file format (e.g., Excel or ArcGIS). Note that all amounts shall be presented in metric units. The CEC Secretariat will be responsible, when applicable, for translation, printing, publication and distribution of products from this activity.

Upon delivery by the consultant of a final version of the report or other written materials under the project, the CEC reserves the right to a 15-business day period to review the document(s), notify the consultant of any potential issues or errors, and return the document(s) to the consultant for appropriate corrections, at no extra cost. In all cases, contract payments will be withheld if products submitted to the CEC fail to fulfill the quality and formatting requirements specified above. In the event that the consultant neglects to make the required corrections or if, following corrections, a deliverable remains unsatisfactory, the document shall be edited or revised by a third party designated by the Secretariat, the cost of which shall be deducted from the consultant's fees at a rate of C\$60 per hour.

#### **E. Plagiarism**

Plagiarism is the act of conveying someone else's original expression or creative ideas as one's own and can be a violation of copyright law. Neither intentional nor unintentional plagiarism is acceptable to the CEC. The consultant must follow good scholarly methodology in preparing reports and deliverables under the contract, including systematic referencing in footnotes or in-sentence references, for any secondary sources, quotations, data, etc., that do not originate with the author. Sources for tables and figures reproduced from other literature must be given in a "Source" attribution immediately below the table or figure. Failure to properly reference the source of such borrowed material constitutes plagiarism and will be considered a breach of contract. For further information, see *Guidelines for CEC Documents and Information Products*, <http://www.cec.org/about-us/opportunities/useful-documents>. In addition, for every written deliverable submitted, the consultant must use iThenticate software, or an equivalent software approved by the Commission, to validate the written product in question and must forward the

plagiarism review results to the CEC at the time of document submission. Contract payments will be retained if products do not fulfil these requirements.

### **III. Requirements and Proposal Evaluation**

#### **A. Mandatory Requirements**

*To be eligible for further consideration, all consultants must fulfill the following basic requirements.*

##### **1. In-country Ability**

The consultant, as well as all their personnel and subconsultants, must reside and be authorized to work legally in Canada, Mexico or the United States of America. If travel is required, the consultant must possess valid documentation to travel within these countries.

##### **2. Key Personnel**

For the purposes of this RFP, the term "consultant" may refer to either a group or company or a single individual.

If a proposal is submitted by a consortium of individuals or institutions, a "lead" consultant should be designated to take responsibility for ensuring overall coordination, the coherence of activity outputs, and the integration of information and ideas.

##### **3. Qualifications Required**

The consultant and key support personnel must be qualified, competent and experienced in the subject area. The consultant must demonstrate competency, understanding and documented experience in research on analytical methods, especially as that experience relates to the detection and analysis of chemicals in manufactured items. The consultant must demonstrate knowledge of and experience in the process of measuring the migration of chemicals from manufactured items, and have access to necessary testing facilities and equipment.

The consultant must be fluent in both written and spoken English; proficiency in Spanish and/or French is considered an asset.

The consultant shall demonstrate competency and past work with country governments and/or international agencies and industry; and within at least two of the following countries: Canada, the United States and Mexico.

##### **4. Proposal Submission**

It is the intention of the CEC Secretariat to include the **Terms of Reference (Section II)** of this document) in the contract negotiated with the successful applicant. Therefore, prospective consultants should refer to these for more detailed information on the project and the services to be provided. Prospective consultants are requested not to reiterate the Terms of Reference in their submissions, but are invited to suggest modifications to enhance the proposal.

Proposals must include the following:

- A brief statement of interest and intent. This statement should be based upon and serve to demonstrate the consultant's experience and subject knowledge. The statement should address desired results; guidelines (parameters within which results are to be accomplished);

resources (human, financial, technical, or organizational support available to help accomplish the results); and other aspects deemed applicable by the consultant. The purpose of this statement is to demonstrate not only the consultant's general and specific familiarity with the subject area, but also to highlight writing skills;

- A general work plan for carrying out this project;
- Proposed methodology;
- Suggested modifications to the Terms of Reference, and the reasons for such modifications;
- Resumes of the key personnel involved in the project;
- Detailed cost breakdown, including number of person/days of key and other personnel, direct and indirect costs, travel costs and applicable taxes;
- Description of relevant experience and any other relevant information;
- Two samples of previous work;
- Two letters of recommendation from previous assignments; and
- Three References must be presented upon request.

## **B. Other Information to be Provided**

Potential consultants are encouraged to submit any additional information that they believe will assist the CEC Secretariat in the evaluation of their proposal. However, the proposal should not exceed six (6) pages, exclusive of applicant resumes, samples of previous work, or corporate brochures.

## **C. Type of Contract to be Used for These Services**

The CEC Secretariat intends to use its standard milestone-based contract for these services. A sample is available upon request. If the contract is negotiated with a consortium, the CEC will offer the consultants the option to have separate contracts between each consultant and the CEC.

All work within the contract must be completed by November 30, 2016.

## **D. Selection Procedure**

The consultant deemed best qualified will be selected on the basis of a competitive process, in accordance with sections 2.5-2.7 of the *CEC Consultant Services Procurement Manual*, available at <<http://www.cec.org/about-us/opportunities/useful-documents>>.

Proposals that the CEC Secretariat determines to be complete will be evaluated according to the procedure described below. Prospective consultants who submit proposals determined by the CEC Secretariat to be incomplete will be so notified in writing.

Each complete proposal that is submitted will be evaluated by the CEC Secretariat according to the following criteria, with a point rating assigned for each:

<b>Evaluation Criteria</b>	<b>Maximum Point Rating</b>
Understanding of project requirements, adequacy of work plan	20
Suitability of the proposed approach	20
Consultant's experience and qualifications and competency of key personnel	40
Consultant's ability to analytically approach the subject, and writing ability	10



A minimum score of 80 will be required for the prospective consultant's proposal to be eligible for further consideration. Cost efficiency will be taken into account in the evaluation.

Proposals in response to this request will be evaluated by the CEC Program Manager and designated technical reviewers, who will form an Evaluation Committee. Each member of the Evaluation Committee will receive a copy of the proposals and will be asked to rate each proposal using the evaluation criteria and its maximum point ratings given above.

The CEC Program Manager will arrange for a conference call/meeting among the members of the Evaluation Committee to discuss the ratings, arrive at final scores, and, subsequently, a ranking of all proposals. The strengths and weaknesses of each proposal, in terms of the evaluation criteria, will be noted and summarized. Once the selection has been made, each prospective consultant will be provided with their score—if requested—along with their comparative ranking. However, neither the evaluations nor the scores of other bidders will be provided.

### **E. Estimated Level of Resources Required**

The budget for this activity is expected to range between C\$85,000 to C\$95,000 (Canadian dollars), including professional fees and expenses. Reimbursable expenses are detailed in the CEC standard contract, available upon request; in addition, the cost of using iThenticate software to detect plagiarism (US\$50) should also be considered.

For universities and nongovernmental organizations, note that the CEC accepts that overhead be charged for administration and other indirect costs up to 15% of the total value of the contract.

If the proposal were presented by a consultant established in Mexico, the applicable value-added tax will be 0%, in accordance with Article 29, section IV, paragraph a) of Mexico's VAT Act, as these are technical services that were engaged from abroad.

If a currency other than Canadian dollars is used, the consultant should indicate the total cost of the professional services in Canadian dollars as well as the currency of choice, for comparison purposes.

### **F. Basis of Payment Required**

The consultant will be paid based on the specific milestones to be detailed in the consultant's contract.

Payment shall be made only for *bona fide* consultant fees and legitimate expenses incurred in accordance with the contract for professional services, and only upon receipt and documented acceptance by the Secretariat of statement(s) of account/invoice(s) from the consultant. Settlement of invoices that are acceptable for payment will normally be made 30 days from the date of receipt by the Commission.

## **G. Financial and Other Confidential Information**

For this proposal, the CEC Secretariat will not require the submission of any confidential information nor will the CEC Secretariat require information regarding insurance, bonding financial status, or company ownership.

## **H. Conflict of Interest**

“Conflict of interest” means, but is not limited to, a situation where a consultant’s personal interest is sufficiently connected with professional duties under the contract, such that it results in a reasonable apprehension that said personal interest may influence the exercise of professional responsibilities under the contract. For example, a direct conflict of interest exists when the consultant is also a CEC government official, or is related to or closely affiliated with a CEC government official, CEC staff member or third party involved with the performance of the services.

The consultant will inform the CEC Secretariat of any circumstance that existed prior to the execution of this contract, or that could manifest during the performance of this contract, which could constitute a conflict of interest. The consultant will complete and sign, on behalf of all his or her personnel, the attached *Declaration of Acceptance and Impartiality and Independence* (see Annex A). The consultant will also take note of the *CEC Consultant Services Procurement Manual*, available at <<http://www.cec.org/about-us/opportunities/useful-documents>>.

## **I. Deadlines for Proposal Submission and Decision**

The proposal, including all relevant attachments, must be received by the CEC Secretariat offices by **17:00 EDT on 3 June 2016**. Proposals submitted after this deadline will not be considered.

**Proposals must be submitted via e-mail to [ocabrera@cec.org](mailto:ocabrera@cec.org), with a copy to [nalliu@cec.org](mailto:nalliu@cec.org).** Proposal format may be in Microsoft Word or Adobe PDF format. Once the proposal has been submitted electronically, the CEC will confirm receipt within three business days. If receipt is not confirmed by e-mail within this time, **applicants must contact the CEC**. The contact person is:

Orlando Cabrera-Rivera  
Program Manager, Environmental Quality and Climate Change  
Commission for Environmental Cooperation  
393, rue St-Jacques Ouest, bureau 200  
Montreal, QC, Canada H2Y 1N9  
Tel: 514-350-4323; Fax: 514-350-4314

The CEC Secretariat intends to select the consultant and notify the applicants within a reasonable period of time following the proposal submission deadline.

ANNEX A (see also Schedule D in CEC standard contract)

## CONSULTANT'S DECLARATION OF ACCEPTANCE AND IMPARTIALITY AND INDEPENDENCE FOR CONTRACT

I, the undersigned,

Last Name: \_\_\_\_\_ First Name: \_\_\_\_\_

### ACCEPTANCE

☐

hereby declare that I accept to serve as consultant in the subject contract.

### IMPARTIALITY AND INDEPENDENCE

*(If you accept to serve as a consultant, please check one of the two following boxes. The choice of which box to check will be determined after you have taken into account, inter alia, whether there exists any past or present relationship, direct or indirect, with any of the Parties to the North American Agreement on Environmental Cooperation ("NAAEC") or their Commission for Environmental Cooperation ("CEC") representatives, Secretariat staff, and/or third parties involved in the performance of this contract, whether financial, professional, familial, or of another kind and whether the nature of any such relationship is such that disclosure is called for pursuant to the criteria set out below. Any doubt should be resolved in favor of disclosure.)*

☐

**I am impartial and independent** with respect to the NAAEC Parties and their CEC representatives, CEC Secretariat staff, and third parties involved in the performance of this contract, and intend to remain so; to the best of my knowledge, there are no facts or circumstances, past or present that need be disclosed because they are likely to give rise to justifiable doubts as to my impartiality or independence, and that may constitute a conflict of interest.

OR

☐

**I am impartial and independent** with respect to the NAAEC Parties and their CEC representatives, Secretariat staff, and/or third parties involved in the performance of this contract, and intend to remain so; **however**, I wish to call your attention to the following facts or circumstances which I hereafter disclose because they might be of such a nature as to give rise to justifiable doubts as to my impartiality or independence, and that may constitute a conflict of interest. Where facts or circumstances exist that might give rise to the latter such doubts, I may set out measures I intend to take to mitigate or eliminate any doubts regarding my impartiality and independence, and/or a possible conflict of interest. (Use separate sheet and attach.)

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

## ANNEX B: Matrix of Chemicals and Manufactured Items of Interest

### CEC Greening Chemicals Management in North America

Task 2: Furthering the Understanding of the Migration of Chemicals from Manufactured Items and Subsequent Human Exposure and/or Releases to the Environment.

#### Products, Chemicals and Migration Methodologies of Focus for Scoping Phase

Product Category and Chemical	Examples of Products of Interest	Non-exhaustive list of Chemicals of Interest (see additional chemicals of interest in Annex C-I)	Examples of testing areas of interest (laboratory testing methods only)
<u>Children's Products and Flame Retardants</u>	<b>Foam &amp; Textile-Containing Products (especially products for babies and toddlers). Examples include:</b> <ul style="list-style-type: none"> <li>nursing pillows,</li> <li>changing table pads,</li> <li>children's upholstered furniture,</li> <li>play tents &amp; tunnels,</li> <li>foam blocks,</li> <li>car seats,</li> <li>children's pajamas, and</li> <li>plush toys</li> </ul>	Start with 16 FRs from Project 15 (See Annex C-I); other chemicals from Annex C-I and additional chemicals identified in literature review	<p>Human Exposure</p> <ul style="list-style-type: none"> <li>Oral Exposure (migration into saliva)</li> <li>Dermal exposure (migration into simulated sweat)</li> </ul> <p>Environmental Release</p> <ul style="list-style-type: none"> <li>Releases to air (indoor and outdoor emissions) and water (wastewater);</li> <li>Releases from landfill leachate (laboratory testing of simulated leachate)</li> </ul>
<u>Children and other Products and Durable Water Repellent Chemicals</u>	<b>Especially products for babies and toddlers:</b> start with children's products investigated for FRs & plasticizers; include plush toys and water-repellent outdoor clothing for children and adults.	Start with PFOS and PFOA, long-chain PFCs and short-chains (alternatives); other chemicals from Annex C-I and additional chemicals identified in literature review	
<u>Children's Products and Plasticizers</u>	Toys with PVC/flexible plastic, plush toys	Start with DEHP, DINP, iso-DEHP, DEHA, DPHP, DBP, BBP, DnOP, DIDP, DIBP; other chemicals identified in literature review	

Product Category and Chemical	Examples of Products of Interest	Non-exhaustive list of Chemicals of Interest (see additional chemicals of interest in Annex C-I)	Examples of testing areas of interest (laboratory testing methods only)
<u>Upholstered Furniture and Home Office Chairs and Flame Retardants</u>	<ul style="list-style-type: none"> <li>foam,</li> <li>textile,</li> <li>hard plastic, and</li> <li>other components analyzed in Project 15</li> </ul>	Start with 16 FRs from Project 15 (See Annex C-I); other chemicals from Annex C-I and additional chemicals identified in literature review	<p>Human Exposure</p> <ul style="list-style-type: none"> <li>Particulate matter formation due to mechanical forces applied to product or article surfaces</li> <li>Emission testing (chamber testing)</li> <li>Dermal Exposure (migration into simulated sweat)</li> </ul>
<u>Mattresses and Flame Retardants</u>	<ul style="list-style-type: none"> <li>crib mattress,</li> <li>children's sleep mats (cots),</li> <li>adult foam mattress,</li> <li>pillow-top mattress</li> </ul>	Start with 16 FRs from Project 15 (see Annex C-1) (with focus on those found in furniture); other chemicals from Annex C-I and additional chemicals found in literature review.	<ul style="list-style-type: none"> <li>Specific for furniture: Photolysis under simulated indoor lighting conditions</li> <li>Specific for mattresses: Migration after treating with synthetic urine</li> </ul> <p>Environmental Release</p> <ul style="list-style-type: none"> <li>Releases to air (indoor and outdoor emissions) and water (wastewater);</li> <li>Releases from landfill leachate (laboratory testing of simulated leachate)</li> </ul>
<u>Electronics and Flame Retardants</u>	<ul style="list-style-type: none"> <li>tablets,</li> <li>personal computers/ laptops,</li> <li>wires and cables,</li> <li>semiconductors,</li> <li>sealants,</li> <li>lubricants,</li> <li>cellphones</li> </ul>	Start with Dechlorane Plus, DBDPE, TBBPA, additive organohalogen FRs in plastic housing, alternatives to decaBDE; other chemicals from Annex C-I and additional chemicals found in literature	<p>Human Exposure</p> <ul style="list-style-type: none"> <li>Dermal exposure – potential exposure/direct contact of the surface of articles/migration into simulated sweat</li> <li>Emission testing during service-life (e.g., air, water, dust, solar radiation, heat)</li> </ul> <p>Environmental Release</p> <ul style="list-style-type: none"> <li>Releases to air (indoor and outdoor emissions) and water (wastewater);</li> <li>Releases from landfill leachate (laboratory testing of simulated leachate)</li> </ul>

## ANNEX C Chemicals of Interest and Research Questions

### Annex C-I: Chemicals of Interest

#### Flame Retardants in Children's Products, Upholstered Furniture and Home Office Chairs, Mattresses

Flame Retardants from CEC Project 15 (2013-2014) *Enhancing Trilateral Understanding of Chemicals in Products in North America*:

- 2-Propanol, 1-chloro-, phosphate (TCPP), CAS RN 13674-84-5
- 1-Propanol, 2-chloro-, phosphate (TCPP Isomer), CAS RN 6145-73-9
- 2-Propanol, 1,3-dichloro-, phosphate (3:1) (TDCPP), CAS RN 13674-87-8
- 1,2-Benzenedicarboxylic acid, 3,4,5,6- tetrabromo-bis(2-ethylhexyl) ester (TBPH), CAS RN 26040-51-7
- 1,1'-(1,2-Ethanediyl)bis[2,3,4,5,6-pentabromo-; or Decabromodiphenyl ethane (DBDPE), CAS RN 84852-53-9
- 2,3,4,5-Tetrabromobenzoic acid 2-ethylhexylester (TBB), CAS RN 183658-27-7
- Phosphoric acid, triethyl ester (TEP), CAS RN 78-40-0
- Ethanol, 2-butoxy-, phosphate (3:1) (TBEP), CAS RN 78-51-3
- Phosphoric acid, tris(methylphenyl) ester (TCP), CAS RN 1330-78-5
- Phosphoric acid, bis(methylphenyl) phenyl ester, CAS RN 26446-73-1
- Phenol, isopropylated, phosphate (3:1) (PIP), CAS RN 68937-41-7
- 2-(2-Hydroxyethoxy)ethyl 2-hydroxypropyl 3,4,5,6-tetrabromobenzenedicarboxylate, CAS RN 20566-35-2
- 3,4,5,6-Tetrabromo-1,2- benzenedicarboxylic acid, mixed esters with diethylene glycol and propylene glycol, CAS RN 77098-07-8
- Tris(2-chloroethyl) phosphate (TCEP), CAS RN 115-96-8
- 1,1'-[1,2-Ethanediylbis(oxy)]bis[2,4,6-tribromobenzene] or 1,2-bis (2,4,6-Tribromophenoxy) ethane (TBE), CAS RN 37853-59-1
- Hexabromocyclododecane (HBCD), CAS RN 3194-55-6
- Triphenyl phosphate (TPP), CAS RN 115-86-6

Additional Flame Retardants of Interest:

- Alternatives to decaBDE: [https://www.epa.gov/sites/production/files/2014-05/documents/decabde\\_alternatives.pdf](https://www.epa.gov/sites/production/files/2014-05/documents/decabde_alternatives.pdf). Alternatives and their different uses are in Table 2-3 on page 3-6 in [https://www.epa.gov/sites/production/files/2014-05/documents/decabde\\_final.pdf](https://www.epa.gov/sites/production/files/2014-05/documents/decabde_final.pdf)
- PBDEs and additional organohalogen FRs not listed above (flame retardants containing chlorine or bromine bonded to carbon)
- Phenol, 4-(1,1-dimethylethyl)-, phosphate (3:1), CAS RN 78-33-1
- Alkenes, C12-24, chloro, CAS RN 68527-02-6
- Alkenes, C12-30  $\alpha$ -, bromo chloro, CAS RN 68527-01-5
- Phosphoric acid, tris(2-ethylhexyl) ester, CAS RN 78-42-2
- Phosphoric acid, bis(2-ethylhexyl) ester, CAS RN 298-07-7
- 1H-Indene, 2,3-dihydro-1,1,3-trimethyl-3-phenyl-, octabromo deriv., CAS RN 155613-93-7
- Benzene, 1,2,4,5-tetrabromo-3,6-bis(pentabromophenoxy)-, CAS RN 58965-66-5

- Phosphoric acid, bis[(1,1-dimethylethyl)phenyl] phenyl ester, CAS RN 65652-41-7
- Phosphoric acid, isodecyl diphenyl ester CAS RN 29761-21-5
- Phosphoric acid, (1,1-dimethylethyl)phenyl diphenyl ester CAS RN 56803-37-3

### Flame Retardants in Electronics

Flame retardants listed above, and:

- Additional phosphorus-based FRs
- Tetrabromobisphenol A (TBBPA), CAS RN 79-94-7
- Melamine, CASN RN 108-78-1
- Ethyl 2-(2-aminothiazol-4-yl)-2-methoxyiminoacetate (ATE), CAS RN 60846-15-3
- Dechlorane Plus, CAS RN 2385-85-5
- 1,2-Bis(tetrabromophthalimido) ethane (EBTBP), CAS RN 32588-76-4

### Durable Water Repellent Chemicals

- Perfluorooctane sulfonate (PFOS), CAS RN 1763-23-1 and perfluorooctanoic acid (PFOA), CAS RN 335-67-1; long-chain perfluorinated chemicals (PFCs) and short-chains (alternatives);
- Nonanoic acid, hepta-decafluoro, CAS RN 375-95-1
- Decanoic acid, nona-decafluoro-, CAS RN 335-76-2
- Undecanoic acid, heneicosa-fluoro-, CAS RN 2058-94-8
- Dodecanoic acid, tricosafuoro-, CAS RN 307-55-1
- Tetra-decanoic acid, heptacosa-fluoro-, CAS RN 376-06-7
- Penta-decanoic acid, nonacosa-fluoro-, CAS RN 141074-63-7
- Hexa-decanoic acid, hentria-contafluoro-, CAS RN 67905-19-5
- Perfluoro-hepta-decanoic acid, CAS RN 57475-95-3
- Octa-decanoic acid, pentatria-contafluoro-, CAS RN 16517-11-6
- Perfluoro-nona-decanoic acid, CAS RN 133921-38-7
- Perfluoro-eicosanoic acid, CAS RN 68310-12-3
- 8:2 fluorotelomer alcohol, CAS RN 678-39-7
- 10:2 fluorotelomer alcohol, CAS RN 865-86-1
- 12:2 fluorotelomer alcohol, CAS RN 39239-77-5
- And PFCAs with carbon chain lengths from 9 to 20 inclusive, their salts and their precursors. Precursors, i.e., chemicals that could transform or degrade to long-chain PFCAs. Precursors are defined as any chemicals where the perfluorinated alkyl moiety has the formula  $C_nF_{2n+1}$  (where  $8 \leq n \leq 20$ ) and is directly bonded to any chemical moiety other than a fluorine, chlorine or bromine atom.

### Plasticizers

- Di(2-ethylhexyl)phthalate (DEHP), CAS RN 117-81-7
- iso-DEHP
- Di-isononyl phthalate (DINP), CAS RN 28553-12-0
- Bis(2-ethylhexyl)adipate (DEHA), CAS RN 103-23-1

- Di-2-propylheptyl phthalate (DPHP), CAS RN 53306-54-0
- Dibutyl phthalate (DBP), CAS RN 84-74-2
- Butyl benzyl phthalate (BBP), CAS RN 85-68-7
- Di-n-octylphthalate (DnOP), CAS RN 117-84-0
- Diisodecyl phthalate (DIDP), CAS RN 68515-49-1 and 26761-40-0
- Diisobutyl phthalate (DIBP), CAS RN 84-69-5

## **Annex C-II:**

### **Non-Exhaustive List of Guiding Research Questions to be Considered by the Consultant**

#### Based on existing literature:

- What information is available on chemical migration for selected products and chemicals?
- What information is available on laboratory test methods for the testing approaches of interest?
- Which specific chemicals in each group are most likely to be present/predominant in the products of interest?
- For testing migration of flame retardants out of products, would focusing on additive vs. reactive FRs be a useful approach?
- What information is available on releases to the outdoor environmental from indoor deposition of flame retardants found in electronics in home/office?



## Annex D: Details of Pilot Testing

### Pilot Testing, Part 1 – Presence of Certain Flame Retardants in Existing CEC Samples

The consultant will test an adequate number of samples to determine the presence of the flame retardants listed below. Existing laboratory test methods shall be used.

Chemical Name	Chemical Short Name	Chemical CAS
1,2-Benzenedicarboxylic acid, 3,4,5,6-tetrabromo-bis(2-ethylhexyl) ester	TBPH	26040-51-7
2,3,4,5-Tetrabromobenzoic acid 2-ethylhexylester	TBB	183658-27-7
Ethanol, 2-butoxy-, phosphate (3:1)	TBEP	78-51-3

### Pilot Testing, Part 2 – Migration of Certain Flame Retardants from CEC Samples

The consultant will test an adequate number of samples from Pilot Testing, Part 1 (above) to demonstrate chemical migration of the flame retardants from the samples and using all the testing approaches listed below. Laboratory test methods for both human health and environmental releases are to be used by the contractor when delivering/undertaking this pilot testing.

#### Testing Approaches:

- Particulate matter formation
- Air emission testing (chamber testing)
- Dermal exposure
- Simulated (landfill) leachate
- Simulated entry into wastewater

#### Flame Retardants to be tested:

Chemical Name	Chemical Short Name	Chemical CAS
2-Propanol, 1-chloro-, phosphate	T CPP	13674-84-5
2-Propanol, 1,3-dichloro-, phosphate (3:1)	TDCPP	13674-87-8
1,2-Benzenedicarboxylic acid, 3,4,5,6-tetrabromo-bis(2-ethylhexyl) ester	TBPH	26040-51-7
2,3,4,5-Tetrabromobenzoic acid 2-ethylhexylester	TBB	183658-27-7
Ethanol, 2-butoxy-, phosphate (3:1)	TBEP	78-51-3
Triphenyl phosphate	TPP	115-86-6

#### **For both parts of the pilot testing:**

- Samples consist of foam, fabric, hard plastic and stuffing from upholstered furniture and home office chairs from a previous CEC project
- All samples will be provided by the CEC
- The samples will be shipped by the CEC from Montreal, Canada, at CEC expense.