

ANNUAL REPORT

Massachusetts Toxics Use Reduction Program

FISCAL YEAR 2018

**Massachusetts
Toxics Use Reduction**



Report Submitted to:

The Governor of the Commonwealth of Massachusetts

The Commonwealth of Massachusetts House of Representatives

The Commonwealth of Massachusetts Senate

Prepared by the Office of Technical Assistance and Technology in collaboration with the Toxics Use Reduction Institute and the Massachusetts Department of Environmental Protection.

December, 2018

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TURA Agencies

Massachusetts Department of Environmental Protection (MassDEP)

One Winter Street, Boston, MA 02108

(617) 292-5500

www.mass.gov/dep/toxics/toxicsus.htm



Certifies Toxics Use Reduction (TUR) Planners, receives and reviews toxics use reports submitted by companies, provides guidance, takes enforcement actions, and collects chemical use data and makes it available to the public.

Office of Technical Assistance & Technology (OTA)

100 Cambridge Street, Suite 900, Boston, MA 02114

(617) 626-1060

www.mass.gov/eea/ota



A non-regulatory agency within the Executive Office of Energy and Environmental Affairs that provides free, confidential, on-site technical and compliance consultations to Massachusetts businesses and institutions.

Toxics Use Reduction Institute (TURI)

126 John Street Suite 14, Lowell, MA 01854

(978) 934-3275

www.turi.org



Provides education, training, and grants for Massachusetts industry and communities; sponsors research and demonstration sites on safer materials and technologies; provides laboratory and library services and policy analyses; and manages the TURA Science Advisory Board.

Executive Summary

The Toxics Use Reduction Act (TURA) Program works with Massachusetts businesses and communities to reduce the use of toxic chemicals and investigate and promote the adoption of safer alternatives. This work helps to protect human health and the environment, making Massachusetts a safer place to live and work while also promoting the competitiveness of Massachusetts businesses.

In Fiscal Year 2018 (FY18), the TURA program's work included scientific assessment of chemicals for possible addition to the TURA list of reportable substances, research, technical assistance for businesses, grants, educational events and publications.

Toxics Use Reduction Grants

The Toxics Use Reduction Institute (TURI) supported projects that investigated alternatives to chemicals used in industrial and food-manufacturing applications; reduced solvents used in printing, auto shops, textile coating, glass etching, and chromatography; reduced pesticide and herbicide use and encouraged organic land care; and protected athletes from toxic chemical exposure by replacing foam-pit cubes in gyms.

Technical Assistance and Lab Services for Massachusetts Businesses

The Office of Technical Assistance and Technology (OTA) personnel worked closely with 51 Massachusetts facilities and provided recommendations related to regulations, pollution prevention, energy efficiency, and water conservation. With OTA's help during FY18, Massachusetts companies eliminated the annual use of 7.2 million gallons of water, found combined annual cost savings of approximately \$230,000, and eliminated more than 24,500 pounds of toxic chemicals. For example, an industrial automation company eliminated the annual use of 6,000 pounds of trichloroethylene by recapturing and reusing the trichloroethylene. An industrial laundry eliminated the annual use of 12,000 pounds of sulfuric acid by switching chemical vendors in order to be able to purchase less chemical intensive products.

In a new and larger space, the TURI laboratory provided no-cost services to businesses in sectors including metalworking, medical supplies, and adhesives, among others. TURI continued its work to research and test safer alternatives to paint strippers and toxic chemicals used in the aerospace and defense sector.

Conferences and Workshops

TURI held a seven-day course to train new Toxics Use Reduction planners, two Continuing Education conferences, covering topics such as reducing chemicals in water treatment processes and using operations and maintenance for toxics use reduction, and library-based workshops on how to use chemical databases and other tools. OTA held 14 Chemical Safety and Climate Change workshops across Massachusetts.

Educational Materials

TURI published a number of new resources, including technical reports on methylene chloride and synthetic playing fields, videos on Massachusetts businesses that have switched to safer alternatives, and a report describing the competitive impacts of toxics use reduction on businesses. Also, the TURI library provided information in response to a wide variety of inquiries on specific chemicals and publications; queries came from individuals, businesses, state and municipal agencies, and others.

Toxics Use Reduction Reporting and Planner Certification

The Massachusetts Department of Environmental Protection (MassDEP) collected more than 1,400 chemical use reports from 464 companies. 239 Toxics Use Reduction Planners are currently certified as having the training and expertise needed to review and approve toxics use reduction plans.

Toxics Use Reduction Policy Activities

On February 28, 2018, the Administrative Council on Toxics Use Reduction voted to list the category known as C1-C4 Halogenated Hydrocarbons/Halocarbons Not Otherwise Listed (C1-C4 NOL). This initiated the public process according to MGL c.30A to add the category to 301 CMR 41.00 Toxic or Hazardous Substance List.

The Science Advisory Board continued their review of per- and polyfluoroalkyl substances (PFAS) of varying carbon chain lengths. These substances have been detected in water supplies in the Commonwealth, and are a high priority for action nationally and internationally. The Board recommended adding the PFAS substances reviewed in FY18 to the TURA Toxic or Hazardous Substance List; the Board's review of other PFAS will continue in FY19.

Toxics Use Reduction in Massachusetts

Today, Massachusetts is significantly cleaner and safer because of the environmental initiatives of the Toxics Use Reduction Act (TURA).

The 1989 legislation and the Toxics Use Reduction Program it brought about have won awards from Harvard University's John F. Kennedy School of Government and the National Pollution Prevention Roundtable, have been recognized by independent research organizations such as the Worldwatch Institute, and have become a national model for toxics use reduction.

TURA's cornerstone principle is that the best way to reduce pollution and prevent human and environmental exposures to toxics is to address the root cause: the decision to use toxics in the first place. Facilities subject to TURA (TURA Filers) are required to track and report the amounts of toxic chemicals used and generated as waste each year. This provides public information on the use and waste of covered toxic chemicals. In addition, every other year, TURA-covered facilities analyze whether it is in their best interest to adopt toxics use reduction techniques to reduce the use of fewer pounds of toxic chemicals per unit of product produced.

Because the biennial Toxics Use Reduction Plans are designed to reveal cost savings opportunities, they lead to voluntary reductions in toxic chemical use, which lead to reductions in worker exposures, hazardous releases and the generation of toxic wastes.

The resulting efficiencies, financial savings, product improvements and improved environmental performance all work together to support the competitive position of Massachusetts businesses. Public data demonstrating progress by TURA Filers is available through 2014.

“Constant improvement is embedded in our culture and it stems from the TURA planning process. When we first started reporting toxic chemical use and submitting plans to the state 25 years ago, we were fulfilling a requirement. But now, by using safer materials we are viewed as a leader by our customers and are protecting worker health and saving money in the process.”

- Charlie Flanagan, Independent Plating Inc.
(TURA 25th Anniversary Honoree)

Progress by TURA Filers

In the first decade of TURA, taking into account a 45% increase in production, from 1990 to 2000 Massachusetts facilities reduced:

- ◆ toxic chemical use by 40%;
- ◆ toxic byproducts by 58%;
- ◆ toxics shipped in product by 47%; and,
- ◆ on-site releases of toxics to the environment by 90%.

Companies subject to TURA are still making progress. Between 2007 and 2016 those facilities that reported in 2007 and were still manufacturing in Massachusetts in 2016 experienced a 29% increase in production and, taking that increase into account, reduced:

- ◆ toxic chemical use by 26%;
- ◆ toxic byproducts (waste) by 19%;
- ◆ toxics shipped in product by 22%; and,
- ◆ on-site releases of toxics to the environment by 36%.

MassDEP preliminary analysis of the most recent data shows that, between 2014 and 2016, of the Massachusetts facilities that reported with sufficient frequency to evaluate TUR implementation, 86% of facilities reduced use or waste per unit of product on at least one chemical.

Additional information can be found on the MassDEP website under TURA Information Releases and TURI TURAData repository.

Key Projects and Accomplishments (Fiscal Year 2018)

Methylene Chloride: Safer Alternatives for Paint-Stripping Products

Methylene chloride, a component in paint-stripping products widely used in industrial, professional, and consumer markets, can cause acute and chronic effects on the central nervous system. The U.S. National Toxicology Program classifies methylene chloride as "reasonably anticipated to be a human carcinogen." Methylene chloride poisoning has resulted in numerous occupational and consumer deaths during paint-stripping operations. Because of this, there is increasing demand for safer paint-stripping products. There are several alternative products on the commercial market, but they perform much more slowly than the products containing methylene chloride, and some of the replacement chemicals introduce other environmental and health hazards.

TURI worked with University of Massachusetts Lowell (UMass Lowell) faculty and students to identify, test, and develop a safer paint stripper. This project provided learning benefits to the research students, intellectual property to UMass Lowell, and will provide health and safety benefits to the users.

Over the course of this research, three existing safer chemicals were identified that, when combined in a certain ratio, remove most paint coatings within 20 minutes, which is comparable to the time it takes for products that contain methylene chloride. While trying to find a viable solution, the TURI researchers filtered out any chemicals with significant known toxicity issues and then worked with the safer chemicals to develop a solution that performed as well as methylene chloride. In addition, a toxicology firm and two other universities provided independent environmental health and safety evaluations. The next step is for the UMass Lowell Office of Technology Commercialization to identify industry partners to commercialize this new paint stripper formulation.



Test board used to demonstrate the effectiveness of the alternative paint stripper at the TURI Laboratory

Chemical Safety and Climate Change Preparedness

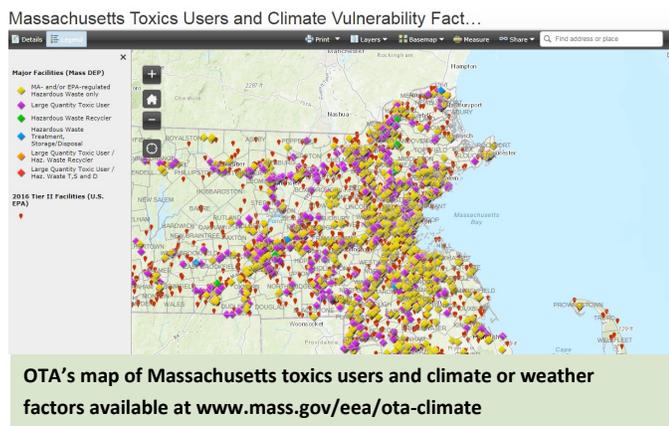
When facilities that use and store hazardous chemicals lose power or are otherwise impacted by severe weather, they risk losing business and pose health and safety risks to workers, communities and the environment. In anticipation of these foreseen challenges, in FY18, OTA provided training to businesses, first responders, and state and local officials on emergency planning requirements and the use of pollution prevention as a tool to reduce the risk of industrial accidents.

OTA has also met with individual fire departments and Regional (or Local) Emergency Planning Committees to share resources and discuss their specific needs. OTA will continue this work in FY19.

To reduce the risk of industrial accidents and toxic releases to the environment in communities, in FY18, OTA:

- ◆ Held 14 workshops in partnership with the Central Massachusetts Regional Planning Commission, the Franklin Regional Council of Governments, the Montachusett Regional Planning Commission, the Merrimack Valley Planning Commission, the Northern Middlesex Council of Governments, the Pioneer Valley Planning Commission, and the Southeastern Regional Planning and Economic Development District;
- ◆ Trained over 400 Massachusetts company personnel, first responders, and consultants on emergency preparedness regulations and pollution prevention techniques;
- ◆ Met with four Massachusetts Local and Regional Emergency Planning Committees;
- ◆ Presented at the annual Association of Environmental Health and Sciences Foundation's "Soils, Sediments, Water & Energy" Conference in October 2017, a seminar for the Massachusetts Facilities Administrators Association (MFAA) in December 2017, and the Boston Harbor Now Working Port Idea Exchange in January 2018;
- ◆ Presented on the "Superstorms and Superfund Sites: Preventing Toxic Exposures from Climate Change Disasters" webinar organized by the Boston University School of Public Health and the Collaborative on Health and the Environment;
- ◆ Produced a short video to illustrate the concepts behind incorporating chemical safety and toxics use reduction into climate change preparedness titled "Building Chemical Safety Into Climate Change Resiliency Planning;" and,

- ◆ Developed a web-based resource repository on topics related to industrial emergency preparedness and pollution prevention worker safety resource located at www.mass.gov/eea/ota-climate.



Success Stories

- ◆ Following a Chemical Safety and Climate Change workshop, OTA was approached by a company interested in engaging with the local fire department in developing a plan that is in compliance with the Clean Air Act Accidental Release Prevention Requirements (40 CFR Part 68). OTA approached the fire department to help start the conversation, creating a model for more effective collaboration between first responders and toxics users.
- ◆ As a result of attending the Chemical Safety and Climate Change workshop, a coalition of municipalities learned about Massachusetts Department of Industrial Accidents workplace safety grants and was awarded more than \$80,000 for safety training.
- ◆ OTA provided guidance for staff from Connecticut's Department of Energy and Environmental Protection, and emergency management personnel from the City of Nashua, New Hampshire who were interested in developing similar programs or trainings.



An OTA "Chemical Safety and Climate Change" workshop

- ◆ OTA is supporting the City of New Bedford with the implementation of their Municipal Vulnerability Preparedness plan by assisting city facilities with chemical safety and climate change preparedness.

Artificial Turf: Safer Alternatives for Sports Fields

Responding to ongoing requests for assistance from municipalities, schools and other institutions, TURI continued to provide information and assistance related to artificial turf and organic management of natural grass playing fields.

Tire crumb used in artificial turf fields contains a large number of chemicals of concern, including metals such as lead and zinc; polyaromatic hydrocarbons (PAHs); volatile organic compounds (VOCs) such as benzene, benzothiazole, hexane, and toluene; phthalate esters; and other substances. Artificial turf fields can also have a range of environmental impacts, including contributing to urban heat island effects, leaching metals such as zinc into runoff, and eliminating natural green space along with the ecosystem services that green space provides. Organic management of natural grass fields provides a safer alternative to artificial surfaces.

Among other services to Massachusetts communities, TURI provided a grant to support a parent-designed project on Martha's Vineyard to establish organic management of natural grass sports fields; contracted with a laboratory to test alternative infills; provided a webinar about playing surfaces; and created a video that provides an overview of concerns related to artificial turf.



The first frame of TURI's artificial turf video showing crumb rubber infill

Grant Projects (Fiscal Year 2018)

Each year, TURI allocates grants to Massachusetts businesses, community groups, municipalities, and industry-academic research partnerships to further the development, implementation, and dissemination of toxics use reduction strategies.

In FY18, TURI gave roughly \$140,000 to 11 businesses, community groups, and municipalities, and roughly \$90,000 to 4 academic-industry research partnerships.

The projects addressed many areas, including industrial cleaning, educational facilities, gymnastics, manufacturing, food processing, pesticide reduction, and textile coatings. See Appendix I for complete details on the grant projects.

Industry Grants

- ◆ Kettle Cuisine (Lynn): Worked with the UMass Lowell Food Safety Lab to find alternatives to sodium hydroxide used for cleaning
- ◆ Lytron (Woburn): Phased out trichloroethylene from its cleaning process
- ◆ OFS Fitel (Sturbridge): Investigated integral recycling of hydrogen fluoride used in glass-etching processes



The new pressure gravity filler purchased by US Pack with TURI funds helps to reduce the use of acetone, ethylene glycol and methanol used in manufacturing automotive, industrial and household cleaning products.

- ◆ US Pack (Leominster): Reduced chemicals used in production and cleaning through equipment efficiency

Small Business Grants

- ◆ Auto Collision Shop at Assabet Valley Technical High School (Marlboro): Invested in water-based gun-washing cleaning solutions, reducing the use of hazardous solvents
- ◆ Becks Printing (North Adams): Purchased an embroidery machine instead of a screen-printing machine, avoiding the need for ink/cleaning chemicals
- ◆ Walker's Gymnastics and Dance (Lowell): Replaced foam cubes containing flame retardants in gymnasium landing pits

Academic Research Grants

- ◆ Bradford Industries (Lowell), partnering with Dr. Ram Nagarajan of UMass Lowell: Found and evaluated alternatives to the toxic solvent dimethylformamide used in textile coating applications
- ◆ Dr. Chris Hansen, Assistant Professor, Department of Mechanical Engineering, UMass Lowell, partnering with Raytheon: Investigated replacements for chlorinated solvents used in industrial applications
- ◆ Mexichem Specialty Compounds (Leominster), partnering with Drs. Jayant Kumar and Ram Nagarajan of UMass Lowell: Developed safer alternatives to antimony trioxide used in wire and cable products
- ◆ Waters Corporation (Milford), partnering with Dr. Hsi-Wu Wong of UMass Lowell: Identified and developed replacements for harmful solvents used in liquid chromatography

Community and Municipal Grants

- ◆ The Field Fund (Martha's Vineyard): Develop organic playing fields instead of installing synthetic fields
- ◆ Silent Spring Institute (Newton): Work with the Massachusetts Breast Cancer Coalition to reduce high school students' exposures to carcinogens and endocrine-disrupting chemicals



Bee Friendly Williamstown volunteers planting a public field with organic pollinator-friendly plants.

- ◆ Town of Williamstown: Promoted ways to reduce the use of herbicides and pesticides to protect bee populations
- ◆ Worcester Public Schools: Undertook a significant new initiative to minimize the use of products containing asthmagens and hazardous chemicals in school buses and kitchens

Confidential Technical Assistance (Fiscal Year 2018)

OTA provides Massachusetts businesses with free, non-regulatory, and confidential assistance for toxics use reduction, energy and water conservation, regulatory compliance and waste reduction. The technical assistance providers often help businesses save money while improving public and worker health through reducing toxics and conserving resources. OTA also holds trainings and produces content to inform toxics users about safer alternatives, toxics use reduction techniques, best practices, technologies, and environmental compliance topics.

During FY18, OTA worked closely with 51 Massachusetts facilities and provided recommendations related to regulations, pollution prevention, toxics use reduction, energy efficiency, and water conservation.

During follow-up with facilities in FY18, OTA recorded that, as a result of OTA recommendations, companies

- ◆ eliminated the annual use of 7.2 million gallons of water;
- ◆ found combined annual cost savings of approximately \$230,000; and,
- ◆ eliminated more than 24,500 pounds of toxic chemicals, including 10,300 pounds of designated TURA Higher Hazard Substances (trichloroethylene, methylene chloride, and n-propyl bromide), and 14,200 pounds of other TURA Listed chemicals (e.g. sodium hydroxide and sulfuric acid).

Brass Instruments Maker Eliminates the Use of Two Highly Toxic Chemicals

In FY18, S.E. Shires of Holliston, MA, worked with OTA to produce a case study featuring their work to implement OTA recommendations and eliminate the use of trichloroethylene and methylene chloride.

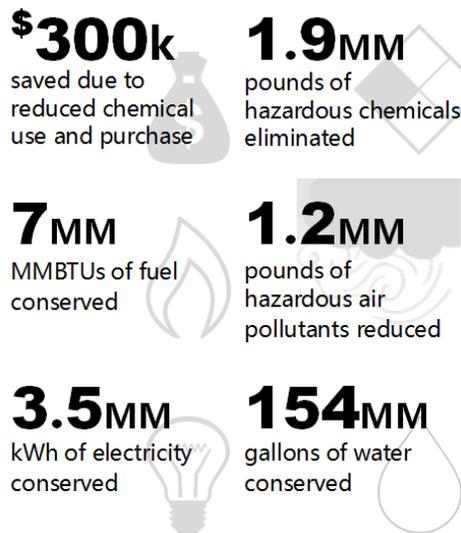


Photo credit: S.E. Shires

S.E. Shires trumpets on display at the Holliston, MA, facility

Ten Years of OTA Technical Assistance Results

Analysis done during FY18 shows that over the last ten years, OTA helped 420 Massachusetts companies. As a result, based on company-reported data tracked by OTA between 2007 and 2017, companies have achieved these combined annual savings:



Among the companies that contributed to the FY18 chemical use reduction numbers are:

- ◆ An industrial automation company that eliminated the annual use of 6,000 pounds of trichloroethylene by recovering and reusing the trichloroethylene; and,
- ◆ An industrial laundry that eliminated the annual use of 12,000 pounds of sulfuric acid by switching chemical vendors in order to be able to purchase less chemical intensive products.

Consultations with OTA technical assistance providers are bound by statutory confidentiality, which ensures that companies can form and maintain open partnerships with OTA.

Through these relationships, OTA's technical assistance providers are able to help companies discover opportunities to reduce their use of toxic or hazardous materials and achieve cost savings in the process.

Technical assistance usually consists of a site visit, report delivery with recommendations based on the facility's needs and interests, and email and phone communications to discuss finer points and assist with the implementation of recommendations. In order to maximize the benefit to the company, for each visit, a team of technical assistance providers is selected based on the company's stated needs and interests.

Of the 51 facilities assisted during FY18, 20% of the facilities found OTA's help valuable enough to request additional meetings or site visits. One facility requested four visits from an OTA technical assistance provider within the span of three months to assist them with hazardous waste compliance issues and best practices to reduce exposures to toxic chemicals.

Laboratory Services and Technical Assistance (Fiscal Year 2018)

Laboratory Services

TURI's laboratory continues to provide free testing services to Massachusetts companies looking for safer cleaning alternatives. **In FY18, the lab tested the performance of safer cleaning alternatives for ten Massachusetts companies in the metalworking, military, microwave, medical supply, and advanced ceramic components sectors.**

Additionally, the lab completed 23 fee-for-service testing projects for formulators of cleaning products. These projects were part of the companies' efforts to have products certified for Green Seal, EPA Safer Choice or UL Ecologo. Of these, four companies were from Massachusetts.

The lab continued to offer services to industry and the Commonwealth in janitorial cleaning. The lab worked with the Massachusetts Toxics Reduction Task Force, the Massachusetts OSD EPP Purchasing Program, and various cities across the state, helping both state agencies and schools move to greener janitorial cleaning chemicals and systems.

In FY18, TURI moved to new offices in Boott Mills, Lowell, and gained a new and larger laboratory space. The expanded space allows lab staff to conduct more comprehensive trainings with student groups and facilitates shared testing with companies and with research partners.



New laboratory space at TURI's offices

Photo credit: Joel Howe

Library and Information Services

The TURI Library responds to information requests from businesses, state and municipal agencies, nongovernmental organizations, and individuals. During FY18, information requests included queries about:

- ◆ specific chemicals (e.g., dimethyl formamide [DMF], mercaptan);

- ◆ industrial processes (e.g., lithium battery recycling, cyanide plating baths);
- ◆ alternatives assessment (e.g., alternatives to perchloroethylene in dry cleaning, crumb rubber used in artificial turf);
- ◆ safer alternatives (e.g., alternatives to difluoroethane used in canned air and perchloroethylene for cleaning non-ferrous metal tubes); and,
- ◆ health and environmental effects of various chemicals (e.g., neonicotinoids, benzene).

Technical Assistance Focus: Food Processing Sector

Food and beverage manufacturers in Massachusetts use various hazardous chemicals to meet their cleaning and sanitizing needs. TURI is working with this sector to identify and test alternatives to improve efficiency and worker safety. OTA has a dedicated technical assistance provider for the food and beverage industry.

In FY18, TURI and OTA participated in a multi-agency collaborative effort, led by the Lowell Center for Sustainable Production, to provide technical assistance, expertise, and workshops to Massachusetts food processors and beverage manufacturers. Funded through a grant to UMass Lowell from the US Environmental Protection Agency, the effort included five workshops across the state, one webinar and several on-site consultations with companies seeking to reduce their use of toxics.

In addition, TURI began working with Kettle Cuisine to reduce the use of sodium hydroxide used in cleaning applications. Processes using sodium hydroxide were optimized to reduce use, and alternatives were identified. In FY19, testing of alternatives will be done at the facility.



A worker at the Kettle Cuisine facility in Lynn, MA

Education and Training (Fiscal Year 2018)

Demonstration Events

TURI organizes industry demonstration events to highlight the efforts of facilities that have reduced their use of toxic chemicals and the TUR Planners that have helped in the process. **During FY18, TURI held a demonstration event to honor Mark Richey Woodworking, Inc. of Newburyport.** The company reduces chemical use through a solvent recycling unit, an ultrasonic spray gun cleaner, and low-VOC finishes on its products. It also conserves energy using a wind turbine and solar array, reduces waste by using a biomass boiler, and protects worker health via a high-efficiency dust collection process.



Photo credit: Mark Richey Woodworking

Mark Richey (right) leading a tour of the Mark Richey Woodworking facility

Special Trainings

When needed, the TURA program provides customized training sessions for special groups. In fall 2017, TURI hosted a multi-day information session for a group of professionals and graduate students from South Korea. TURI staff delivered an abbreviated version of the TUR Planner Certification Course and arranged two industry site visits to see toxics use reduction methodology in action. Then in spring 2018, TURI, OTA and MassDEP hosted a group of "Delegates for a Chemical Safety Community in South Korea," consisting of Korean business leaders, government officials, and representatives from environmental agencies who wished to learn about best practices for chemical safety and toxics reduction.

"Beyond the SDS" Workshop

The TURI library conducts ongoing outreach and workshops for researchers and TUR Planners, educating them about databases, tools and information to better identify hazards of chemicals. This workshop was provided five times in FY18 for classes of 10 to 26 attendees.

Toxics Use Reduction Planner Certification Course

Every year, TURI conducts an intensive course to train new Toxics Use Reduction Planners (TUR Planners). Recorded online sessions are available online, where participants can learn at their own pace, while the seven classroom sessions are devoted to workshop exercises, group discussion, and team project work to develop a TUR Plan based on an example facility. The course culminates with a group presentation designed as a pitch to management about the chosen toxics use reduction option featured in the Plan. In FY18, professionals from the communications, metal-finishing, recycling, engineering, consulting, and food industries were trained as TUR Planners.

Toxics Use Reduction Planner Continuing Education Conferences

TURI offers semi-annual Continuing Education conferences for TUR Planners to ensure that they have the most up-to-date information on chemical hazards, alternatives, and opportunities. It allows them to improve their skills and assists them with maintaining their certifications. At the fall 2017 conference, topics included reducing chemicals in water treatment, life cycle assessment, engaging facility workers in TUR planning, and using TURI's P2OASys (Pollution Prevention Options Assessment System) evaluation tool. The spring 2018 conference included sessions on endocrine disrupting chemicals of concern, emerging technologies, overcoming barriers to TUR implementation, working with stakeholders, and reducing waste in the food and beverage industry.

Central Massachusetts Business Environmental Network (CMBEN)

The Central Massachusetts Business Environmental Network (CMBEN) is a network of environmental health and safety professionals serving industry in Central Massachusetts. The network meets to discuss and hear presentations on environmental health and safety topics. OTA sits on the board of CMBEN and helps to coordinate meetings and topics. During FY18, CMBEN held meetings on topics including Environmental Management Systems, and updates regarding e-permitting, source registration, and Greenhouse Gas Emissions reporting.

Toxics Use Reporting and Planner Certification (Fiscal Year 2018)

Toxics Use Reporting

Each July 1, large-quantity toxics users in TURA-covered industry sectors submit an annual report to MassDEP on each TURA-listed chemical used in above-threshold amounts during the previous calendar year. These reports supplement the federal Toxics Release Inventory (TRI) reports that must be submitted on the same date to document the quantities of chemical released to the environment or shipped offsite to be managed as waste. The TURA report documents the quantities of chemicals used, processed, or manufactured.

In FY18, MassDEP processed 1,400 individual chemical use reports from 464 facilities. MassDEP also replaced its reporting system, and improved the reporting forms to make it simpler to submit the required data.

Managing the reporting process involves:

- ◆ assisting filers with the reporting process
- ◆ checking reports for accuracy and compliance
- ◆ following up on chemical use report and plan summary anomalies
- ◆ identifying facilities that failed to submit required reports, plan summaries, and fees
- ◆ taking enforcement actions as necessary
- ◆ processing fees

Toxics Use Reduction Planner Certification

In even calendar years, large quantity toxic users must analyze whether or not there are changes to their production processes that would reduce toxics use and waste and reduce production costs sufficiently to be in the company's interest to adopt. These Toxics Use Reduction Plans (TUR Plans) must be reviewed and approved by a MassDEP-certified Toxics Use Reduction Planner (TUR Planner).

The plans are a powerful tool for promoting toxics use reduction: The data show that typically in each planning cycle over 70% of the companies completing a TUR Plan find at least one toxics use reduction technique they choose to implement.

Facilities that have completed three sequential plans can opt to substitute a similar analysis of its use of water or electricity, generation of solid waste, or use of non-TURA-listed toxic substances on every other planning year. These Resource Conservation Plans must be reviewed and approved by a MassDEP-certified TUR Planner that has also been specifically certified for Resource Conservation Plans. Alternatively, the

business may incorporate TUR planning into its existing Environmental Management System (EMS). The EMS Progress Reports must also be reviewed and approved by a MassDEP-certified TUR Planner who is qualified to review EMS.

TUR Planners can be approved as General Practice TUR Planners, who are allowed to review and approve plans developed by any facility, or Limited Practice TUR Planners, who are allowed to review and approve plans at their place of employment only.

General Practice TUR Planners are required to take the TUR Planner Certification Course offered by TURI and pass an exam offered by MassDEP.

As of the end of FY18, there were 239 MassDEP certified TUR Planners, including:

- ◆ 143 General Practice Planners
- ◆ 96 Limited Practice Planners

Of these 239 certified TUR Planners:

- ◆ 18 were also certified Resource Conservation Planners
- ◆ 33 were also certified as EMS Planners
- ◆ 23 were also both Resource Conservation and EMS Planners

In FY18, MassDEP reviewed the qualifications of 10 new TUR Planners; MassDEP also reviewed the successful completion of the required continuing education credits for 129 TUR Planners who were renewing their certifications. The TUR Planner Exam was offered on December 8, 2017.

Toxics Use Reduction Planner Continuing Education Credit Approval

TUR Planners can maintain certification by attending certain TURA program training and education events that offer TUR Planning continuing education credits. Other organizations may request approval from MassDEP to offer TUR Planner continuing education credits for their workshops and events. During FY18, MassDEP approved 30 courses offered by non-TURA program organizations for continuing education credit.



Participants in the FY18 TUR Planner course offered by TURI

TURA Enforcement and Data Analysis (Fiscal Year 2018)

TURA Compliance Training and Outreach

In FY18, MassDEP updated the TURA Reporting Instructions and Appendices, the Guide to TURA Online Filing, and the short document providing information on the latest changes to TURA reporting and expected changes for the next year. In addition, the agency updated the TURA Planning, Resource Conservation Planning, and Environmental Management System Planning guidance documents.

MassDEP worked with OTA and TURI to provide four TURA Reporting and Planning Training sessions in spring 2018. These annual trainings provide a refresher course on TURA reporting and planning and the eDEP portal that companies use to submit their information.

Enforcement

MassDEP administers the regulatory components of the TURA program and supports the work of the other TURA agencies with data and policy analysis, strategic planning, training outreach, and education.

During FY18, MassDEP inspected 66 TURA filers and screened another 166 facilities to determine if they were subject to TURA. These inspections and screenings resulted in:

- ◆ four enforcement actions for failure to fully comply with reporting and planning requirements
- ◆ six Notices of Non-Compliance (NON) for failure to submit complete or timely TURA reports

In addition, in a new compliance assurance technique, MassDEP sent out formal Requests for Information to six facilities believed to have a high likelihood of being subject to the program. One of these proved to be out of compliance, received an NON, and submitted the required reports.

Six new companies availed themselves of the TURA self-disclosure policy in FY18, reporting a total of nine previously never reported chemicals.

Fee Revenue

TURA-regulated facilities must pay annual fees, unless they have obtained a financial hardship waiver. In FY18 there were no fee-waiver requests. MassDEP collected:

- ◆ \$2,503,965 in annual fees and statutory late fees
- ◆ \$8,375 in fees from TUR Planners who applied for the DEP's certification or recertification

Appendix VII contains FY18 expense information.

Data Analysis

MassDEP manages the TURA data and information releases on the reported chemical use data and toxics use reduction progress. In FY18, MassDEP worked to significantly update and expand the analysis of reported TURA data with a particular focus on evaluating the implementation of toxics use reduction.

The most recent data available derive from the 2016 calendar-year use reports that were due on July 1, 2017. 464 facilities submitted a total of 1400 individual chemical reports on 124 different chemicals. These facilities:

- ◆ used a total of 670 million pounds of these chemicals
- ◆ generated 71 million pounds of chemical as byproduct (chemical waste)
- ◆ released 4 million pounds of chemical waste as pollution
- ◆ transferred 31 million pounds of chemical waste offsite for further treatment or management

The data indicate that over three quarters of the facilities that are subject to TURA have adopted measures that reduce the use and waste of their chemicals, and more than half have eliminated reportable uses of one or more chemicals.

More information and analysis is available in the MassDEP information release and TURI TURADData repository.

Toxics Policy (Fiscal Year 2018)

Administrative Council on Toxics Use Reduction

The TURA program is governed by the Administrative Council which coordinates toxics management statewide and is responsible for managing the TURA Toxic or Hazardous Substances List. The Administrative Council is chaired by the Secretary of the Executive Office of Energy and Environmental Affairs and includes representatives from five additional state agencies.

Fiscal Year 2018 Council Members

- ◆ Secretary Matthew Beaton, Executive Office of Energy and Environmental Affairs (Chair)
Designee: Daniel Sieger, Assistant Secretary for Environment
- ◆ Commissioner Martin Suuberg, Department of Environmental Protection
Designee: Greg Cooper, Director, Business Compliance and Recycling Division, Bureau of Air and Waste
- ◆ Commissioner Monica Bharel, Department of Public Health
Designee: Dr. Marc Nascarella, Director of Toxicology
- ◆ Secretary Rosalin Acosta, Executive Office of Labor and Workforce Development
Designee: Michael Flanagan, Manager, Department of Labor Standards Safety and Health Programs
- ◆ Secretary Daniel Bennett, Executive Office of Public Safety and Security
Designee: Jennifer Hoyt, Chief Fire Protection Engineer
- ◆ Secretary Jay Ash, Executive Office of Housing and Economic Development
Designee: John Chapman, Undersecretary for the Office of Consumer Affairs and Business Regulation

Council Vote to List C1-C4 Halogenated Hydrocarbons/Halocarbons Not Otherwise Listed

On February 28, 2018, the Administrative Council on Toxics Use Reduction voted to list the category known as C1-C4 Halogenated Hydrocarbons/Halocarbons Not Otherwise Listed (C1-C4 NOL).

Preceding the vote, development of the C1-C4 NOL category originally resulted from discussions surrounding the addition of n-propyl bromide (nPB) to the TURA list in 2009. The TURA Science Advisory Board discussed the fact that certain

halogenated hydrocarbons that could be easily used to substitute for nPB were not regulated and posed similar environmental and health hazards as nPB. At public meetings of the Advisory Committee and Administrative Council, both boards discussed preventing businesses from making regrettable substitutions (replacing a toxic chemical with an equally toxic chemical due to lack of regulation or information).

Between 2016 and 2018, the C1-C4 NOL category was discussed at public meetings of the Advisory Committee and Administrative Council. During FY18, TURI completed a policy analysis for the C1-C4 NOL category to summarize the results of the Science Advisory Board's work on this group of compounds. It also provided an estimate of potential users of the chemicals in this category, information on safer alternatives, resources for filers, regulatory context, and implications for the TURA program.

Response to Request for Policy Development on Nanomaterials

During FY18, the TURA program continued to work to respond to the November 2016 request that was sent to Massachusetts Secretary of Energy and Environmental Affairs Matthew Beaton regarding policy development for nanomaterials. Thirteen environmental, labor, and advocacy groups coauthored the request that nanomaterials be assessed to ensure that they are used and disposed of in a manner that protects environmental and worker safety in the Commonwealth. Starting December of 2017, OTA administered a survey to gather information from respondents that use, process, or manufacture nanomaterials in Massachusetts. Throughout the year, OTA continued collecting results; the survey remained open at the start of FY19.

Fiscal Year 2018 Members of the Advisory Committee to the Administrative Council on Toxics Use Reduction

A multi-stakeholder Advisory Committee provides input to the Administrative Council. The Committee includes representation of large and small businesses, labor, environmental and health advocacy, and others. FY18 members were:

- ◆ Robert Audlee, Stainless Steel Coatings;
- ◆ Sylvia Broude, Toxics Action Center;
- ◆ Kathryn Flannery, Department of Labor Standards;
- ◆ Andrew Goldberg or Jillian Riley, Attorney General's Office;
- ◆ Tolle Graham, Massachusetts Coalition for Occupational

Safety and Health;

- ◆ Joon Han, AB Cleaners;
- ◆ William Judd, Industrial Compliance Group;
- ◆ Mark Monique, The Savogran Company;
- ◆ Gary Nedelman, Mexichem;
- ◆ Mark Rossi, Clean Production Action;
- ◆ Kari Sasportas, Cambridge Public Health Department;
- ◆ Elizabeth Saunders, Clean Water Action;
- ◆ Lucy Servidio, Capaccio Environmental Engineering;
- ◆ Ronald Westgate, Philips Lightolier; and,
- ◆ Rebecca Weidman, Massachusetts Water Resources Authority.

Fiscal Year 2018 Members of the Science Advisory Board

The Science Advisory Board works with TURI to provide a sound scientific basis for program decisions and includes members from a variety of scientific backgrounds. FY18 members were:

- ◆ Amy Cannon;
- ◆ Robin Dodson;
- ◆ Christy Foran;
- ◆ Hilary Hackbart;
- ◆ Wendy Heiger-Bernays;
- ◆ Denise Kmetzo;
- ◆ Margo Levine Newman;
- ◆ Heather Lynch;
- ◆ Christine Rioux;
- ◆ Kenneth Weinberg; and,
- ◆ David Williams.

Science Advisory Board Work on Per- and Poly-Fluoroalkyl Substances

In FY18, the Science Advisory Board continued review of the current literature on per- and poly-fluoroalkyl substances (PFAS) of varying carbon chain lengths.

These substances have been detected in water supplies in the Commonwealth, and are a high priority for action nationally and internationally. In FY17, the Board recommended adding two eight carbon chain length (C8) substances, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic

acid (PFOS) and their salts, which are very persistent, bioaccumulative and toxic, to the TURA List of Toxic and Hazardous Substances. In FY18, the Board reviewed additional PFAS — perfluorohexane sulfonic acid (PFHxS) (C6), perfluorohexanoic acid (PFHxA) (C6), perfluorobutanesulfonic acid (PFBS) (C4), and perfluoro-n-butyric acid (PFBA) (C4) — and recommended them and their salts for listing. The Board also began review of PFHpA (C7) and PFNA (C9) in FY18; this work will continue into FY19. In FY18, TURI developed four detailed environmental health and safety summaries for the PFAS compounds. They summarize current information available on these chemicals, including the results of a detailed review of existing peer reviewed literature and information submitted by stakeholders and Science Advisory Board members. These environmental health and safety summaries are used by the Board as the basis for their review of each chemical.

Economic Impacts for Businesses

Many businesses are saving on their annual operating costs as a direct result of toxics use reduction or resource conservation efforts. There are also cases in which businesses choose to make changes that actually increase their annual operating costs. In FY18, TURI published a report, "Toxics Use Reduction and Resource Conservation: Competitive Impacts for Massachusetts Businesses," that presents examples of both experiences, notes the individual business factors that have influenced their decisions, and considers the competitiveness benefits these businesses have experienced.

Massachusetts Toxics Use Reduction Taskforce

Executive Order 515 mandated that executive branch state agencies make the switch from ordinary products to Environmentally Preferable Products (EPPs) whenever they represent the "best value" for the job. The Executive Order also called for the creation of a Toxics Reduction Task Force to provide targeted technical assistance and guidance to agencies. OTA co-chairs the Toxics Reduction Task Force with staff from the Operational Services Division (OSD). OTA and TURI are key partners in the Massachusetts EPP Program. In FY18, the Task Force evaluated TURI's Pollution Prevention Options Assessment System (P2OAsys) tool for use in evaluating environmentally preferable cleaning products for inclusion in the statewide contract FAC85: Environmentally Preferable Cleaning Products, Programs, Equipment and Supplies. The Task Force has been evaluating these products on a case-by-case basis. If approved by the Task Force, P2OAsys would streamline this process and allow more complete analysis of alternatives.



APPENDICES to ANNUAL REPORT

Massachusetts Toxics Use Reduction Program

FISCAL YEAR 2018

**Massachusetts
Toxics Use Reduction**



Report Submitted to:

The Governor of the Commonwealth of Massachusetts
The Commonwealth of Massachusetts House of Representatives
The Commonwealth of Massachusetts Senate

Prepared by the Office of Technical Assistance and Technology in collaboration with the Toxics Use Reduction Institute and the Massachusetts Department of Environmental Protection.

December, 2018

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Appendix I: Grants

Annual TURA Program Grants

Each year, TURI allocates grants to Massachusetts businesses, community groups, municipalities, and industry-academic research partnerships to further the development, implementation, and dissemination of toxics use reduction strategies.

In Fiscal Year 2018, TURI gave roughly \$140,000 to 11 businesses, community groups, and municipal groups, and roughly \$90,000 to 4 academic-industry research partnerships.

Food Processing

- ◆ Kettle Cuisine of Lynn, a hand crafter of small batch, all natural soups for restaurants, foodservice operators and grocery retailers, worked with the UMass Lowell Food Safety Lab to find safer cleaning and sanitizing formulations or methods that are less hazardous than sodium hydroxide.

Auto Shops

- ◆ Auto Collision Shop at Assabet Valley Technical High School of Marlboro purchased new equipment and a water-based gun washing solution that eliminates the use of hazardous solvents. Other auto body shops have proven that a water-based alternative is effective and less expensive. Instead of disposing of used solvent as hazardous waste, the school can filter and reuse the water-based solution for many years. Students benefit from a healthier work environment while learning about environmentally friendly practices to take with them into their work places after they graduate.

Safer Cleaning

- ◆ Worcester Public Schools undertook a significant new initiative to minimize the use of products containing asthmagens and hazardous chemicals in school buses and kitchens. The goal is to prevent transmission of pathogens while maintaining a healthy environment for students and staff. The project team converted school bus and kitchen sanitation practices and products to systems that are safer for human health and the environment. Working with manufacturers, the project team piloted and evaluated safer cleaning and disinfection products, equipment and work practices for use on farm-to-table fresh produce and meats, kitchen surfaces and equipment and school buses.

Organic Landscapes

- ◆ The Field Fund, Inc. of Martha's Vineyard is working to preserve and maintain Martha's Vineyard's playing fields using an organic, systems-based approach rather than installing synthetic fields. By not installing synthetic fields, the Island community aims to preserve its natural landscapes, protect ponds, fragile habitats, and single source aquifer, as well as protect young athletes from toxic exposures. To improve maintenance on natural grass playing fields, The Field Fund purchased an aerator. This is part of a larger effort to eliminate the use of synthetic fertilizers, pesticides and herbicides and develop an organic management plan for playing fields on Martha's Vineyard.
- ◆ The Town of Williamstown, a pollinator-friendly community, seeks to change residential and institutional landscaping practices by promoting ways to reduce the use of pesticides and herbicides that scientists believe are harming bee populations. The town created a team to host training programs for landscape professionals and homeowners, conduct tours of pollinator-friendly gardens, and work with local partners on educational opportunities for adults and children.

Youth Education

- ◆ Silent Spring Institute of Newton partnered with the Massachusetts Breast Cancer Coalition to reduce high school students' exposures to common carcinogens and endocrine-disrupting chemicals. The project team visited 12 high school science classrooms to help students identify common toxic chemical exposures in their homes and adopt strategies that reduce these exposures. The team did this through hands-on curriculum and Silent Spring's free mobile app Detox Me that guides users through more than 270 research-based recommendations for reducing exposures to common indoor pollutants. Students also participated in a peer-to-peer mentoring program that connected them to youth who have participated in studies that measure chemical levels in the body.

Manufacturing & Laboratories

- ◆ OFS of Sturbridge, a manufacturer of fiber optic solutions, investigated integral recycling of hydrogen fluoride, a highly toxic chemical that is used for etching glass. The company aims to minimize worker exposure by implementing a closed-loop recycling process to reuse hydrogen fluoride, thereby reducing the handling and waste of the toxic chemical. Integral recycling also improves efficiency by maintaining a consistent acid etch rate and reducing production down time for bath recharging.
- ◆ US Pack, Inc. of Leominster, a leading contract manufacturer of custom liquid specialty products, invested in capital equipment to make cleanup more efficient and produce more precise production batches. The new 10-head pressure gravity filler reduces the use of a variety of chemicals, including acetone, ethylene glycol and methanol, used in manufacturing automotive, industrial and household cleaning products. By upgrading its equipment, the company can potentially reduce the use of toxic chemicals by over 19,000 pounds per year.
- ◆ Lytron of Woburn, a designer and manufacturer of cold plates, chassis, chillers, cooling systems, and heat exchangers, aims to phase out trichloroethylene (TCE) from their cleaning process. The company worked with the TURI Lab to identify safer chemistries by (1) identifying a solvent that can work in a vacuum degreaser to remove lubricating oils from aluminum flat and fin parts and (2) researching aqueous cleaners that can remove copper tube lubricants from copper brazed parts. By removing TCE from their cleaning process, the company reduces health risks to employees and improve efficiency.
- ◆ Assistant Professor Hsi-Wu Wong of the UMass Lowell Department of Chemical Engineering partnered with Waters Corporation of Milford to identify safer solvents for use in liquid chromatography equipment that identifies and quantifies chemical compounds in complex mixtures. The final solvent formulations are intended to replace the harmful solvents currently in use including methanol, acetonitrile, and tetrahydrofuran.
- ◆ Assistant Professor Christopher Hansen of the UMass Lowell Department of Mechanical Engineering investigated replacements for chlorinated solvents used in industrial applications. The research team identified alternatives using an extensive database of solvents based on technical criteria and then verified the predicted performance at a lab-scale.

Flame Retardants

- ◆ Walker's Gymnastics and Dance of Lowell purchased new foam cubes that do not contain flame retardants for two landing pits used in the gym. Landing pits provide safe cushioned landing spots as gymnasts train on the equipment. Standard foam cubes contain hazardous flame retardant chemicals that can cause health effects such as endocrine disruption, which is of significant concern to young children.
- ◆ Professors Jayant Kumar of the UMass Lowell Department of Physics and Ram Nagarajan of the Department of Plastics Engineering partnered with Mexichem Specialty Compounds of Leominster, the largest supplier of PVC-based cable and wire products in Massachusetts. The research team worked to develop safer alternatives to antimony trioxide, a widely-used flame retardant that is listed as a probable carcinogen by the International Agency for Research on Cancer (IARC). This research leveraged UMass Lowell's expertise in safer flame retardants to reduce the use of toxic flame retardants in wire and cable product lines in Massachusetts.

Textiles

- ◆ Becks Printing in North Adams purchased an embroidery machine. The new embroidery machine eliminates the need for a screen printing machine that would have required extensive chemical use both in inks and cleaning solutions.
- ◆ Professor Ram Nagarajan of the UMass Lowell Department of Plastics Engineering partnered with Bradford Industries of Lowell to find and evaluate safer solvent blends to replace the use of the toxic solvent dimethylformamide (DMF). Using the Hansen Solubility Parameters in Practice (HSPiP) software tool, Prof. Nagarajan's team narrowed down possible alternatives that will meet Bradford's performance requirements for its textile coating applications.

Appendix II: Selected Events and Workshops

TURA Program Workshops

Each year the TURA program agencies hold workshops to provide continuing education for Toxics Use Reduction Planners, regulatory guidance and updates, and tools and resources for businesses to enhance their ability to implement pollution prevention. Some of these workshops and events are described in greater detail in the main report.

Fiscal Year 2018 Events and Workshops

- ◆ "Beyond the SDS" webinar, Lowell, MA, September 12, 2017.
- ◆ "Beyond the SDS" workshop, Lowell, MA, October 2, 2017.
- ◆ "Beyond the SDS" presentation in a Simmons College course, Boston, MA, October 4, 2017.
- ◆ "Beyond the SDS" workshop, Lowell, MA, February 9, 2018.
- ◆ "Building Chemical Safety into Climate Change Preparedness" workshops for local governments and first responders in Springfield, Lowell, Worcester, Devens, Haverhill, Middleborough, and Turners Falls MA on September 20, 12, 18, 28, October 18, 20, and November 2, 2017.
- ◆ "Building Chemical Safety into Climate Change Preparedness" workshops for toxics users in Lowell, Taunton, Holyoke, Haverhill, Greenfield, Charlton, and Leominster, MA on March 1, 2, 13, 27, 27, April 3, 12, 26, 2018.
- ◆ "Champions of Toxics Use Reduction" recognition event, State House, Boston, MA, June 12, 2018.
- ◆ "DIY Cleaning Products" workshop presented by TURI lab staff and two UMass Lowell students, Lowell High School, Lowell, MA, November 2, 2017.
- ◆ "Green Your Bottom Line" food and beverage sector workshop, in partnership with the Lowell Center for Sustainable Production, Lowell, MA, September 27, 2017.
- ◆ Mark Richey Woodworking Demonstration Event, Newburyport, MA, October 19, 2017.
- ◆ Toxics Use Reduction Planners certificate course, Westford Regency Conference Center, Westford, MA, September 28, October 5, 12 and 26, 2017.
- ◆ Toxics Use Reduction Planning training for 18 visitors from South Korea, including students, faculty, industry representatives and NGOs, Lowell, MA, July 17-19, 2017.
- ◆ TURA Fall Continuing Education Conference, Taunton, MA, November 16, 2017.
- ◆ TURA Spring Continuing Education Conference, Marlborough, MA, April 25, 2018.
- ◆ TURA/TRI Reporting Workshops, in Newburyport, Worcester, Greenfield, and Fall River, MA, on May 10, 22, 24, and 31, 2018.
- ◆ TUR Planner Certification Exam, Boston, MA December 8, 2016.
- ◆ UMass Lowell Sustainability Engineering Camp: TURI Green Cleaning Laboratory hosted 13 high-school students for a half-day of hands-on development of alternative cleaning solutions, July 2017.

Appendix III: Selected Publications

TURA Program Publications

The TURA program produces, curates and updates:

- ◆ Informational fact sheets on chemicals, technologies and pollution prevention techniques
- ◆ Case studies
- ◆ Regulatory guidance

Fiscal Year 2018 Reports, Journal Articles, and Videos

- ◆ "Assessment of Safer and Effective Alternatives to Methylene Chloride for Paint Stripping Products," TURI technical report, July 2017. Available at https://www.turi.org/TURI_Publications/TURI_Reports/Assessment_of_Safer_and_Effective_Alternatives_to_Methylene_Chloride_for_Paint_Stripping_Products
- ◆ DeFranco, K., Lamb, D., Kleinschmidt, D., Kessel, K., and Morose, G., "Evaluation of Hexavalent Chromium Free Bond Primers for Aerospace and Defense Applications," Products Finishing, August 1, 2017. Available at <https://www.pfonline.com/articles/evaluation-of-hexavalent-chromium-free-bond-primers-for-aerospace-and-defense-applications>
- ◆ "Little Leaf Farms Avoids Using Toxics," video resource, TURI, May 2018. Available at https://www.turi.org/Our_Work/Business/Industry_Sectors/Food_and_Beverage
- ◆ "Merrimack Ales in Lowell Finds Safer Ways to Clean and Sanitize," video resource, TURI, February 2018. Available at https://www.turi.org/Our_Work/Business/Small_Businesses/Breweries
- ◆ "OTA Chemical Safety and Climate Change Resilience," video resource, OTA, June 2018. Available at <https://www.mass.gov/video/ota-chemical-safety-and-climate-change-resilience>
- ◆ "Safer Alternatives for Athletic Fields" video resource, TURI, July 2017. Available at https://www.turi.org/Our_Work/Community/Artificial_Turf
- ◆ "Sports Turf Alternatives Assessment: Chemicals in Alternative Synthetic Infills: Thermoplastic Elastomer (TPE)," TURI report, August 2017. Available at https://www.turi.org/Our_Work/Community/Artificial_Turf/Infills_TPE
- ◆ "Toxics Use Reduction and Resource Conservation: Competitiveness Impacts for Massachusetts Businesses," TURI report, September 2017. Available at https://www.turi.org/TURI_Publications/TURI_Reports/Competitiveness_Impacts_for_Massachusetts_Businesses

Fiscal Year 2018 Fact Sheets and Case Studies

- ◆ "Food Manufacturer Shrinks Chemical Use: Cape Cod Potato Chips Changes Oil Testing Process to Eliminate Use of Two Chemicals," TURI, February 2018. Available at https://www.turi.org/TURI_Publications/Case_Studies/Food_and_Beverage/Cape_Cod_Potato_Chips_-_Food_Manufacturer_Shinks_Chemical_Use.2018
- ◆ "INCOM, Inc. Massachusetts Company Conserves Water and Reduces Waste," OTA, March 2018.
- ◆ "Massachusetts Chemical & Materials Fact Sheet: Engineered Nanomaterials," TURI, August 2017 (revised December 2017). Available at https://www.turi.org/TURI_Publications/TURI_Chemical_Fact_Sheets/Nanomaterials_Fact_Sheet
- ◆ "Microbrewery Shines with Safer Cleaning and Sanitizing Technology: Merrimack Ales of Lowell Tests and Scores with Safer Alternatives," TURI, April 2018. Available at https://www.turi.org/TURI_Publications/Case_Studies/Microbreweries/Merrimack_Ales_Tests_Safer_Cleaning_and_Sanitizing_Technology
- ◆ "Rousselot Achieves Water Savings by Modernizing Process for Changing Markets," OTA, January 2018.

Appendix IV: Selected Presentations and Webinars

About Presentations and Webinars

Throughout the year, TURA program staff present a wide variety of pollution prevention and regulatory topics to audiences at TURA program events and at events held by partner organizations. As presentations may have been repeated at multiple venues, this list includes both categories.

Fiscal Year 2018 Presentations and Webinars

- ◆ Bizzozero, R., "Examples of TUR Outcomes," presented at the four TURA/TRI Reporting Workshops in Newburyport, Worcester, Greenfield, and Fall River, May 10, 22, 24, and 31, 2018.
- ◆ Bizzozero, R., "Form S Reporting Challenges," presented at the four TURA/TRI Reporting Workshops in Newburyport, Worcester, Greenfield, and Fall River, May 10, 22, 24, and 31, 2018.
- ◆ Bizzozero, R., "Welcome to the South Korean Ministry of the Environment and Industry Delegates," OTA and MassDEP presentation for Korean delegation of industry representatives and regulators, Boston, MA, April 12, 2018.
- ◆ Butow, M., "Beyond the MSDS," presentation in Simmons College's "Toxicology and Health" course, Boston, MA, October 4, 2017.
- ◆ Butow, M., "Nanotechnology Use and Implications" webinar, December 7, 2017.
- ◆ Cain, L., "Errors Common to Form S and Form R Reporting," presented at the four TURA/TRI Reporting Workshops in Newburyport, Worcester, Greenfield, and Fall River, May 10, 22, 24, and 31, 2018.
- ◆ Eliason, P., "Implementing the Massachusetts Toxics Use Reduction Act," International Symposium, Seoul, Korea, March 29, 2018.
- ◆ Eliason, P., "Relaunching the P2OASys Tool for TUR Planners" webinar, January 8, 2018.
- ◆ Eliason, P., "The Massachusetts Toxics Use Reduction Act" for Korean delegation of industry representatives and regulators, Lowell, MA, April 12, 2018.
- ◆ Eliason, P., "The Massachusetts Toxics Use Reduction Institute (TURI)," MA Sustainable Communities and Campuses Conference, Plymouth, MA, April 27, 2018.
- ◆ Eliason, P., "The Toxics Use Reduction EMS," Central Massachusetts Business and Environment Network (CMBEN), Worcester, MA, September 12, 2017.
- ◆ Eliason, P., "Toxics Use Reduction Planning as a Strategy for Even More Effective Management of Chemicals at Your Facility," Northrup Grumman Corporation, June 18, 2018.
- ◆ Harriman, L., Tenney, H., and Eliason, P., "The Massachusetts Toxics Use Reduction Institute (TURI): A Resource You Should Know About" presented at the four TURA/TRI Reporting Workshops in Newburyport, Worcester, Greenfield, and Fall River, May 10, 22, 24, and 31, 2018.
- ◆ Hope, W., "Online Reporting Tool for Form R Reporting," presented at the four TURA/TRI Reporting Workshops in Newburyport, Worcester, Greenfield, and Fall River, May 10, 22, 24, and 31, 2018.
- ◆ Hope, W., "Online Reporting Tool for Form S Reporting," presented at the four TURA/TRI Reporting Workshops in Newburyport, Worcester, Greenfield, and Fall River, May 10, 22, 24, and 31, 2018.
- ◆ Kincannon, F., "Garden Club Federation of Massachusetts, Environmental Studies School," Environmental Studies School, Lowell, MA, September 23, 2017.
- ◆ Kincannon, F., "The Massachusetts Toxics Use Reduction Act (TURA): Services for Businesses and Communities," Massachusetts Chemical Safety & Climate Change Preparedness Training – NMCOG, Lowell, MA, September 12, 2017.
- ◆ Kincannon, F., "The Massachusetts Toxics Use Reduction Act (TURA): Services for Businesses and Communities,"

- Massachusetts Chemical Safety & Climate Change Preparedness Training – MVPC, Haverhill, MA, October 18, 2017.
- ◆ Marshall, J., "P2OASys Update," 2nd Annual International Technical Workshop on Climate Risk, Kennebunk, ME, October 26, 2017.
 - ◆ Marshall, J., "Upgrade and Relaunch of P2OASys," IC2 Webinar, October 31, 2017.
 - ◆ Massey, R. "Federal and State Chemicals Policy," presentation in Tufts University's Occupational and Environmental Health class, Boston, MA, November 13, 2017.
 - ◆ Massey, R. "Sports Fields: A Toxics Use Reduction Perspective." Non-Toxic Portsmouth, Portsmouth, NH, February 15, 2018.
 - ◆ Massey, R., Onasch, J., "Sports Fields: Assessing the Alternatives" webinar, February 27, 2018.
 - ◆ McCarthy, A., Byra, H., "Clean and Green: DIY Cleaners and Best Practices," Mass Haverhill PTA 2nd Annual Health Summit, Waltham, MA, November 16, 2017.
 - ◆ McCarthy, A., "Chemical Hazard Resources: Where to Find Them and How to Use Them," Green Chemistry and Engineering Conference, Portland, OR, June 20, 2018.
 - ◆ Morose, G., "Safer and Effective Alternatives to Methylene Chloride for Paint Stripping Products," EPA Workshop on Furniture Refinishing and Methylene Chloride, Boston, MA, September 12, 2017.
 - ◆ Morose, G., "Safer Solutions for Methylene Chloride" webinar, June 5, 2018.
 - ◆ Onasch, J., "Alternatives to Perchloroethylene in Dry Cleaning," IC2 webinar, April 3, 2018.
 - ◆ Onasch, J., "Green Your Bottom Line [in the Food and Beverage Industry]," US Small Business Administration Webinar, December 12, 2017.
 - ◆ Onasch, J., "The Massachusetts Toxics Use Reduction Institute: Services for Businesses and Industry," OTA Chemical Safety Workshop, Charlton, MA, April 12, 2018.
 - ◆ Onasch, J., "Toxics Use Reduction in Food & Beverage," NEWMOA and VT DEC Dairy Summit, Norwich, VT, February 12, 2018.
 - ◆ Onasch, J., "Reducing Toxics in Small Businesses," Assabet Valley Regional Technical High School, Marlborough, MA, January 25, 2018.
 - ◆ Onasch, J., "Toxics Use Reduction as a Sustainability Tool," A&WMA Conference, Hartford, CT, June 28, 2018.
 - ◆ Onasch, J., "Toxics Use Reduction in Breweries," Night Shift Brewing, Everett, MA, June 11, 2018.
 - ◆ Peck, S., "Online Reporting Resources and People to Contact," presented at the four TURA/TRI Reporting Workshops in Newburyport, Worcester, Greenfield, and Fall River, May 10, 22, 24, and 31, 2018.
 - ◆ Peck, S., "Overview of Federal TRI and State TURA Reporting," presented at the four TURA/TRI Reporting Workshops in Newburyport, Worcester, Greenfield, and Fall River, May 10, 22, 24, and 31, 2018.
 - ◆ Peck, S., "Some Measures of Success of the Massachusetts Toxics Use Reduction Program," OTA and MassDEP presentation for Korean delegation of industry representatives and regulators, Boston, MA, April 12, 2018.
 - ◆ Skogstrom, T., "OTA Resources & Climate Change Preparedness," Building Chemical Safety and Climate Preparedness Workshops 2017-2018; Working Port Conference, Boston, MA, January 24, 2018; Superstorms and Superfund Sites, Preventing Toxic Exposures from Climate Change Disasters Webinar, March 13, 2018; Cambridge LEPC, Cambridge, MA, April 4, 2018; Tri-EPIC LEPC, Southbridge, MA, June 12, 2018.

Appendix V: Selected Press Coverage

TURA Program Press Coverage

This list includes mainly external coverage of the TURA program's work during Fiscal Year 2018.

Fiscal Year 2018 Press Coverage

- ◆ Aguirre, E., "Students Win NSF Graduate Research Fellowships," UMass Lowell News, May 5, 2018. Available at <https://www.uml.edu/News/stories/2018/Students-NSF-Fellowships.aspx>
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Appendix VI: OTA Recommendations and Implementation Status

OTA Free and Confidential Technical Assistance

Technical assistance usually consists of a site visit, report delivery with recommendations based on the facility's needs and interests, as well as email and phone communications to discuss finer points and assist with the implementation of recommendations.

Fiscal Year 2018 OTA Recommendations

During Fiscal Year 2018, OTA engineers provided 136 recommendations to the businesses and facilities that received visits. 70 percent of these recommendations concerned regulatory compliance topics and 30 percent concerned pollution prevention or resource conservation topics like toxics use and waste reduction, energy conservation, and water conservation. By July 2018, 71 percent of all Fiscal Year 2018 recommendations were implemented or still under consideration.

Approximately 74 percent of regulatory recommendations given were implemented or planned to be implemented. Many regulatory recommendations concern air emissions and permitting, hazardous waste, chemical storage requirements, worker safety, and chemical reporting and fee requirements.

Of the recommendations that did not concern regulatory compliance, 51 percent concerned toxics use reduction, 34 percent concerned energy conservation, and a small percent concerned water conservation and other topics. Toxics and waste reduction recommendations that were implemented concern process changes or increased production process efficiency, safer chemical substitutions, recycling to reduce the use of chemicals, and improved maintenance practices. Energy efficiency or renewable energy recommendations that were implemented mainly concerned energy efficiency incentives and funding opportunities.

While it may be possible for facilities to implement some recommendations immediately, in most cases, changes take over a year to evaluate and implement; and, therefore, over a year to yield results. OTA technical assistance providers take great care in allowing business personnel enough time to consider and evaluate the feasibility of recommendations. This means that, in some cases, OTA technical assistance providers were not able to follow up with some companies visited near the conclusion of Fiscal Year 2018. In Fiscal Year 2018, approximately 24 percent of recommendations given had not been followed-up on by technical assistance providers by June 2018. Those businesses will receive continuing assistance and follow-up during Fiscal Year 2019.

Four percent of all recommendations given were recorded as "not implemented" for reasons of time constraints and financial or other barriers.

Appendix VII: TURA Program Revenue and Expenditures

Fiscal Year 2018 Revenues

TURA fees collected:	\$2,504,000
TUR Planner fees:	\$8,400
Total revenues:	\$2,512,400

Fiscal Year 2018 Expenditures

OTA

Personnel costs:	\$617,100
Administrative costs:	\$19,600
Other costs:	\$300
Total:	\$637,000

MassDEP

Personnel costs:	\$305,500
Administrative costs:	\$6,300
Total:	\$311,800

TURI

Personnel (staff and students) ¹ :	\$1,165,100
Education and training events ² :	\$40,100
University research and laboratory support:	\$69,100
Grants to businesses, community groups, and municipalities:	\$144,700
Administrative costs:	\$22,700
Library and information support:	\$24,600
Communications, printing, website and educational outreach:	\$119,200
Total:	\$1,585,500

¹ Personnel expenditures include \$88,200 for research assistants working on industry grant and laboratory projects.

² TURI also collected \$31,800 in training registration fees, which went to support staff salaries and operating expenses.

