

Massachusetts Toxics Use Reduction Program Annual Report Fiscal Year 2016



Submitted to:
The Governor of the Commonwealth of Massachusetts
The Commonwealth of Massachusetts House of Representatives
The Commonwealth of Massachusetts State Senate

Prepared by the Office of Technical Assistance and Technology
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Overview and Highlights

Introduction

Unanimously passed by the legislature in 1989 and enacted in 1990, the Massachusetts Toxics Use Reduction Act (TURA) was the first comprehensive state pollution prevention law in the United States. TURA was a result of intensive negotiations among industry, environmentalists, and government, and launched a new approach to addressing the problem of toxics in the environment. The Act set up an innovative combination of regulatory requirements, technical assistance, research and training programs designed to promote the voluntary adoption of cost-effective toxics use reduction techniques.

The Core Strategy of TURA

A cornerstone principle of the law is that the best way to reduce pollution is to address the root cause: the decision to use toxics in the first place. Facilities subject to TURA are required to track and report the amount of toxic chemical use, and the amount that is wasted in production each year. In addition, every other year TURA covered facilities analyze whether or not there are feasible opportunities to change their production processes that result in efficiency improvements, toxics use reduction and waste reduction. Companies make changes in their production processes that reduce chemical use and waste and as a result lower production costs. Because these biennial Toxics Use Reduction Plans often reveal savings opportunities, they lead to voluntary reductions in toxic chemical use while reducing hazardous releases and the generation of toxic wastes. These reductions in turn decrease the risks of major transportation and storage accidents, protect workers from workplace exposures, and create safer products for customer use.

The resulting efficiencies, financial savings, product improvements and improved environmental performance all work together to support the competitive position of Massachusetts businesses. Global chemical restrictions and customer requirements make companies with safer products more competitive.

TURA Program Agencies

TURA is collaboratively implemented by three state entities:

- **MassDEP:** The Massachusetts Department of Environmental Protection (MassDEP) administers the law's annual reporting and biennial planning mandates; licenses Toxics Use Reduction Planners (TUR Planners), who review and approve toxics use reduction plans; reviews and analyzes the data submitted by companies to evaluate progress in reducing toxics use and waste, and prepares an annual public data release. The Department is also charged with promoting TUR as the preferred way to bring facilities into compliance with environmental regulations.
- **OTA:** The Office of Technical Assistance and Technology's (OTA) staff of engineers, chemists and environmental experts provide Massachusetts businesses with free, non-regulatory, and confidential assistance with toxics use reduction, energy and water conservation, and

compliance with relevant regulations. OTA provides onsite, phone and/or email technical support to help businesses save money while improving public and employee health through reducing toxics and conserving resources. OTA also produces fact sheets, case studies, and guidance documents on TURA and environmental compliance, and hosts workshops and other educational events.

- **TURI:** The Toxics Use Reduction Institute (TURI), located at UMass Lowell, is a multi-disciplinary research, education, and policy center. TURI sponsors and conducts research, organizes education and training programs and provides information and technical support to large and small businesses and community organizations. Among other activities, TURI trains TUR Planners; convenes business working groups; conducts science and policy research and analysis; provides grants to businesses, municipalities, community groups, and researchers; provides laboratory testing for safer alternative chemicals and technologies; and maintains a specialized library on toxic chemicals and safer alternatives.

Another key component to the success of the TUR program is the governance structure of the program described below:

- **Administrative Council:** The program is governed by the Administrative Council which coordinates toxics management state-wide, and is responsible for managing the list of chemicals covered under the act. The Administrative Council is chaired by the Secretary of the Executive Office of Energy and Environmental Affairs and includes designees of the Commissioners or Secretaries from five additional state agencies (the Departments of Environmental Protection and Public Health, the Executive Offices of Labor and Workforce Development, Public Safety and Security, and Housing and Economic Development).
- **Advisory Committee:** A multi-stakeholder Advisory Committee provides input to the Administrative Council. The Committee is composed of sixteen members and includes representation of large and small businesses, labor, environmental and health advocacy, and others.
- **Science Advisory Board:** The Science Advisory Board (SAB) includes members from a variety of scientific backgrounds, and works with the Institute to provide a sound scientific basis for program decisions.

Highlights from Fiscal Year 2016

Highlights of TURA program work in Fiscal Year 2016 (FY16) included the following:

Grants: TURI grants supported research to develop safer surfactants for medical device applications and safer solvents for adhesive and paint stripping applications. TURI grantees also worked to promote the adoption of safer alternatives to toxic flame retardants in gyms and safer cleaning processes in food service settings, among other projects.

TURI also piloted a new grant program designed specifically for small businesses. The pilot included support for a microbrewery to identify safer equipment cleaning processes; an auto body shop to

reduce its use of lead, solvents, acids and other toxic chemicals; and safer cleaning and sanitizing materials and processes for two day care centers.

OTA Site Visits: OTA made 70 visits to 54 Massachusetts facilities during FY16 and made 164 recommendations regarding regulatory compliance, toxics use reduction, energy conservation and water conservation. Results of these visits included the reduction of toxics, conservation of resources, and financial savings in sectors such as woodworking, plastics processing, and auto repair.

Education and Training: The TURA program provided a number of training programs, demonstration events and educational materials, including the following.

- **Training Programs:** The TURA program provided a wide variety of educational opportunities, including a 7-week TUR planner course; two continuing education conferences; two resource conservation workshops, and four reporting workshops. OTA's Massachusetts Clean Auto Repair (MassCAR) Program resulted in the reduction of hazardous inputs and releases, water usage, and electricity at participating auto repair facilities.
- **Demonstration Events:** TURI sponsored four demonstration events in FY16, helping businesses to learn from one another's achievements in the auto body, paint formulation, electronics and garment cleaning sectors:
 - Alternatives to Solvents Demonstration for Auto Body and Repair Shops
 - Effective TUR in Product Formulation at Franklin Paint
 - Process Water Conservation at Analog Devices, Inc.
 - Professional Wet Cleaning at Quality Cleaners
- **Case Studies and Fact Sheets:** New information resources included an updated case study on ChemGenes Corporation featuring details on the cumulative cost savings resulting from TUR at this facility; a case study on less hazardous cleaning and sanitizing technology at Merrimack Ales; and new fact sheets on artificial turf and on TSCA preemption provisions. Links to these and other TURA program documents can be found in the Appendix.

Regulatory: MassDEP's activities included receiving TUR reports and plans; certifying TUR Planners; conducting inspections; and developing a one-time amnesty program.

- **TUR Reports and Plans:** MassDEP collected 1,524 individual chemical reports from 463 companies.
- **TUR Planner Certification:** MassDEP certified or recertified 145 TUR Planners as having the training and expertise needed to review and approve toxics use reduction plans.
- **Compliance:** MassDEP conducted 277 inspections and issued 16 enforcement actions for failure to properly report.
- **TURA Amnesty:** To encourage facilities to voluntarily return to compliance with TURA reporting requirements, MassDEP implemented the TURA Amnesty program to reduce enforcement actions and late fees. The program, which ran from January 2014 through July 1, 2016, resulted in the receipt of reports on 192 chemicals from 122 facilities.

The Administrative Council and Advisory Committee: The Administrative Council voted to designate toluene diisocyanates (TDI) as a Higher Hazard Substance in FY15. As of the end of FY16, the designation had not been promulgated into regulation due to a statewide regulatory review under Executive Order 562. The review process is anticipated to be completed in FY17.

Science Advisory Board: In FY16, TURI worked with the Science Advisory Board (SAB) to review the current literature on two specific dry cleaning substitutes (decamethylcyclotetrasiloxane and dibutoxymethane) and a related substance (octamethylcyclotetrasiloxane) at the request of a distributor of one of the substances. The scientific review of the dry cleaning substitutes will be used to update TURI's widely-used report, *Assessment of Alternatives to Perchloroethylene in the Dry Cleaning Industry*. TURI also updated the scientific information on the SAB's informational list of 93 More Hazardous Chemicals and presented it to the SAB. This facilitates the Board's ability to provide input on Higher Hazard Substance designations as needed at future meetings and informs the program's information products.

Future Program Directions

In FY17, the TURA program will continue its work to identify Higher and Lower Hazard Substances and will conduct outreach to TURA filers in a wide range of sectors, including users of previously designated Higher Hazard Substances.

OTA will be concentrating outreach efforts on TURA filers in four select Massachusetts industry sectors in FY17: food processing, biotechnology, metal finishing, and chemicals and plastics. These sectors represent hundreds of manufacturing facilities in Massachusetts and exhibit the potential for toxics use reduction and resource conservation opportunities. In FY17, OTA will continue work on a grant focusing on emergency preparedness and building community climate change resiliency. OTA will work with a consultant and Regional Planning Agencies to hold multiple trainings for communities, Local and Regional Emergency Planning Committees, and toxics users on incorporating Toxics Use Reduction as part of emergency planning, especially in relation to extreme weather events associated with climate change. Toxics users that participate in the trainings will be encouraged to reach out to OTA staff to receive technical assistance and planning assistance.

TURI will continue to provide a range of services including research; education and training; grants for businesses, municipalities, and community organizations; and laboratory testing. Selected focus areas will include the following:

- TURI's academic research program will continue to work directly with Massachusetts businesses to develop and implement research projects.
- TURI will continue its collaborative research project with businesses in the aerospace and defense sector, investigating safer alternatives to hexavalent chromium.
- TURI will roll out the newly designed TUR Planner class, providing a blend of online and in-person training.
- The SAB will review short and long chain perfluorinated chemicals, beginning with PFOS and PFOA.

- The food and beverage processing sector will be a focus for cleaning and sanitization research and small business support.

MassDEP will prioritize an initiative designed to identify “non-filers” and take appropriate enforcement actions to bring facilities into compliance with the reporting and planning requirements. In addition, the agency will implement a new electronic application system for individuals seeking certification or recertification as a TUR Planner and will work on improvements related to TUR planning guidance.

TURA Program Revenue and Expenditures

FY16 Revenues

Chemical Fees: \$2,906,525
TURA Planner Fees: \$26,040
TOTAL: \$2,932,565

FY16 Expenditures

OTA

Personnel Costs: \$623,255
Administrative Costs: \$11,088
Other Costs: \$622
TOTAL: \$634,965

MassDEP

Personnel Costs: \$467,923
Administrative Costs: \$10,621
TOTAL: \$478,543

TURI

Personnel (staff and students): \$1,085,000
Education and training events¹: \$44,200
University research grants and laboratory testing services: \$116,000
Grants to businesses: \$80,300
Grants to community groups, municipalities, and organizations: \$65,300
Administrative: \$38,700
Library and information: \$52,000
Communications, printing, website and educational outreach: \$61,600
Alternatives Assessment and Hazard Evaluation - Including Massachusetts' dues for the
Interstate Chemicals Clearinghouse (IC2): \$36,400
TOTAL: \$1,579,500

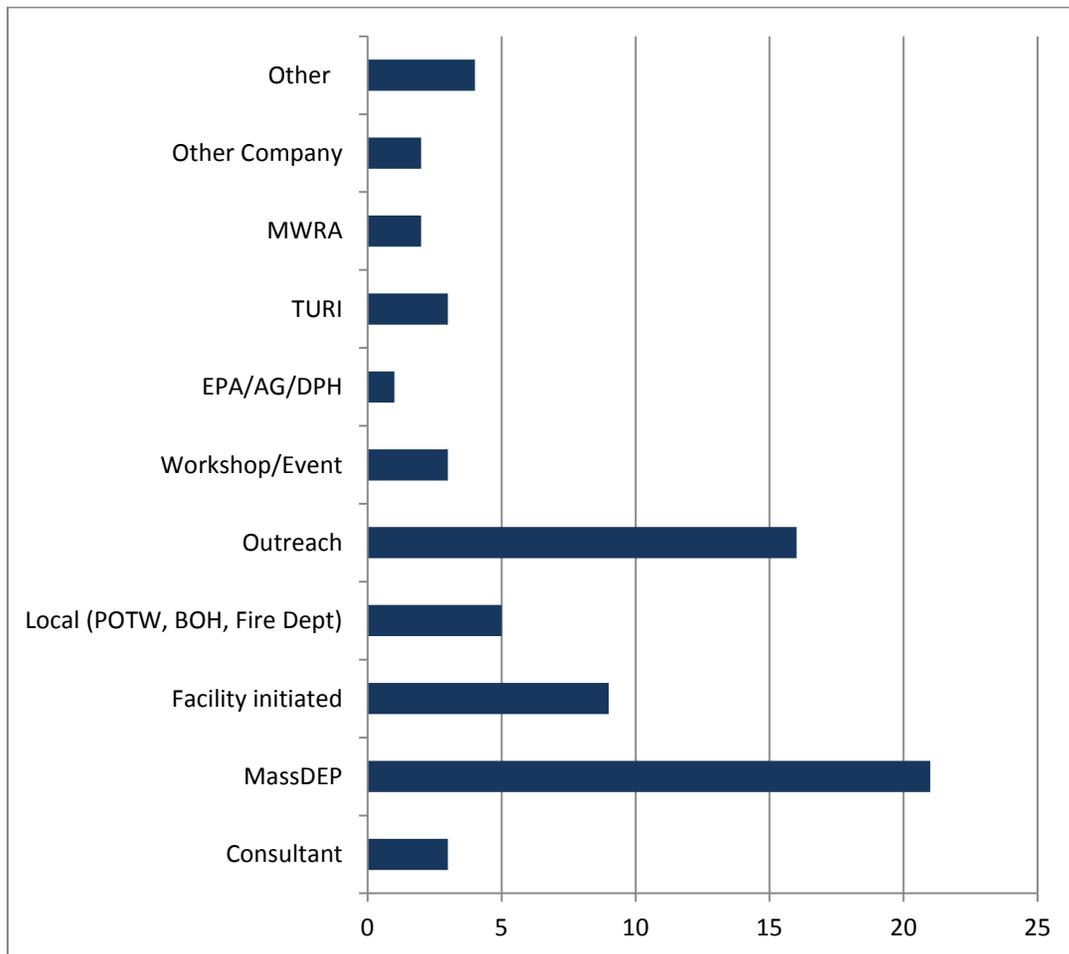
¹ TURI also collected \$43,000 in training registration fees, which went to support staff salaries and operating expenses.

The Office of Technical Assistance (OTA)

Assistance Services

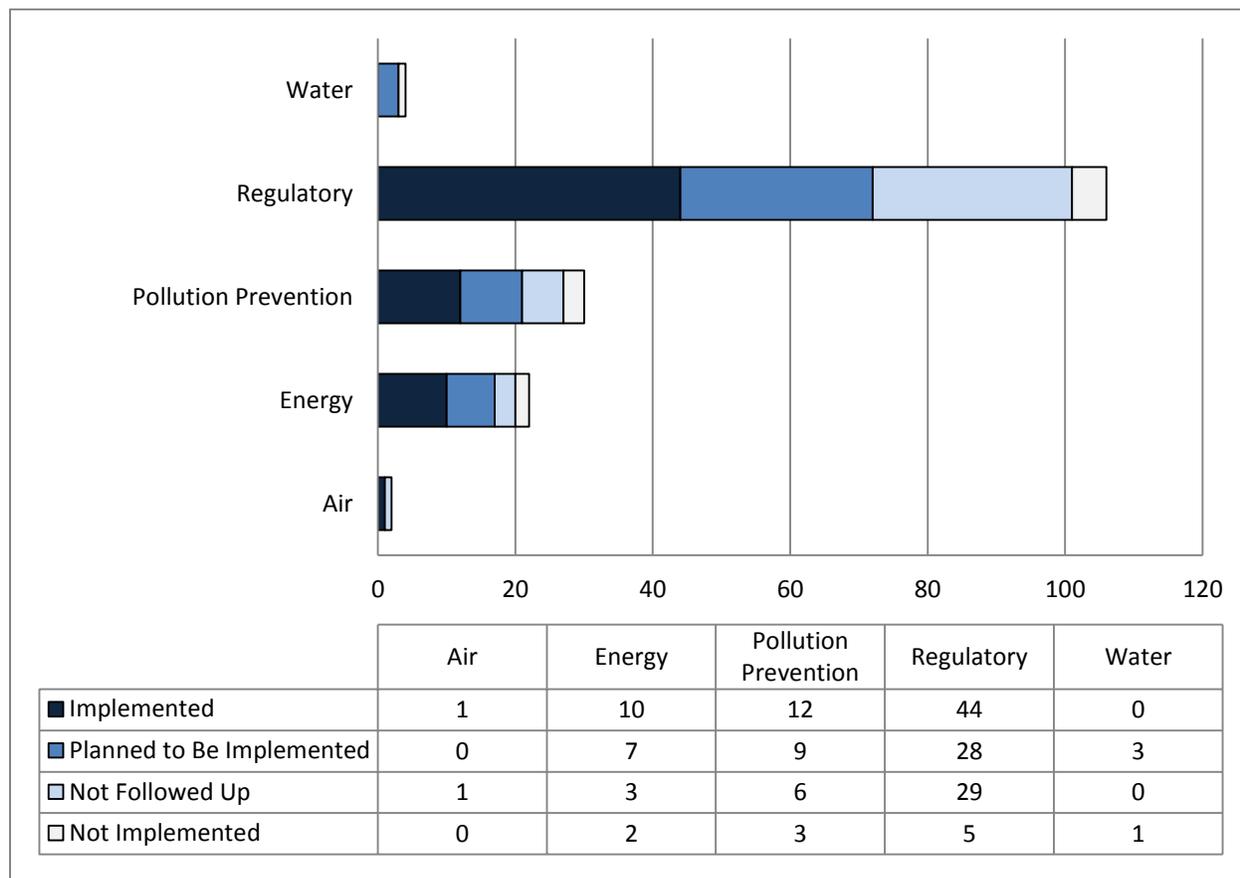
At the core of OTA’s services for Massachusetts businesses is onsite technical assistance. During FY16, OTA scientists and engineers made 70 site visits to 54 Massachusetts facilities in the following sectors: automotive repair and other repair services, food, furniture and fixtures and wood products, chemicals, electronics, fabricated metal products, instruments, life sciences, machinery and other manufacturing industries, rubber and plastics, stone and concrete, textiles, transportation equipment, and electric and gas. Of the 70 visits made, 32 were the result of a referral to OTA from another state or public agency such as MassDEP, U.S. Environmental Protection Agency (EPA), the Massachusetts Office of Business Development, the Department of Occupational Safety, or publically owned treatment works (POTW). 24 visits were the result of OTA outreach activities and TURA workshops and events, and the remaining 16 were company-initiated or from other sources. One company requested OTA engineers tour an additional facility after receiving technical assistance at the first facility. See Figure 1 below for a visual representation of the referrals received during FY16.

Figure 1: Referral Sources FY16



During FY16, OTA engineers provided 164 recommendations to facilities. Of these, more than 64 percent of these concerned regulatory compliance, followed by toxics use reduction, pollution prevention and energy conservation. A small percentage of the recommendations regarded air compliance and water conservation. See Figure 2 below for a visual distribution of the recommendations given.

Figure 2: Recommendations Given with Status in FY16



Of the 164 recommendations made to facilities in FY16, over 68 percent were implemented or planned to be implemented by the facilities. Approximately 67 percent of the 106 regulatory recommendations given were implemented or planned to be implemented. Most of the regulatory recommendations implemented during this fiscal year involved hazardous waste management and air emissions followed by OSHA-related issues, TURA and other regulatory issues.

In FY16, OTA gave 30 pollution prevention (P2) recommendations to facilities. 70 percent of those recommendations were implemented or planned to be implemented.

In FY16, OTA gave 22 energy recommendations (to facilities) in the following categories: audits, building envelope, compressed air, demand management, energy efficiency, energy procurement, HVAC, lighting, pollution prevention, and renewable energy. Approximately 77 percent of those recommendations were implemented or planned to be implemented.

Sample Outcomes of OTA Onsite Technical Assistance Services in FY16

Toxics Use Reduction:

- As a result of a site visit by OTA engineers, one food processing company worked with its supplier to eliminate sodium hydroxide from its cleaning chemicals. The company is now working with its corporate headquarters to eliminate sodium hydroxide from the list of approved chemicals for use by similar facilities across the U.S. This could result in the elimination of thousands of pounds of sodium hydroxide at more than 100 similar facilities throughout the U.S.
- As a result of consulting with OTA experts, a plastics processing company began putting down paper to cover the floor and protect it from overspray during the coating process, greatly reducing the need to use a variety of solvents to clean, reducing VOC releases and saving routine clean-up and disposal costs. This company will continue to work with OTA engineers in FY17 to evaluate options to reduce its use of solvents.

Cost Savings:

- An auto shop was able to save approximately \$9,600 per year as a result of advice from OTA staff and the MassCAR program. OTA was able to clarify hazardous waste management requirements for this shop and informed the staff how to make their process more efficient.
- As a result of recommendations from OTA experts in FY15, a woodworking company replaced all overhead lighting with LEDs in FY16. This change will lead to an estimated annual savings of \$76,819.

Worker Health & Safety with Toxics Use Reduction:

- After an OTA site visit, a life sciences company held a training for employees on the use of isopropyl alcohol and encouraged the attitude that “if a little is good, twice as much is not better” in order to improve worker health and safety and reduce VOC emissions.

Water Conservation:

- After suggestions from OTA engineers in FY08 and FY14, a life sciences company has reduced its use of water by 3.5 million gallons per year starting in FY16. Staff at the company achieved this significant resource conservation by improving process efficiency and repurposing water from the production process.
- In FY16, an aerospace company reported that they had achieved a reduction of 250,000 gallons of water per year as a result of implementing OTA recommendations from FY15. OTA staff had recommended more efficient systems in the facility bathrooms and activity sensors.

The Massachusetts Clean Auto Repair (MassCAR) Grant

In FY16, OTA completed work on the Massachusetts Clean Auto Repair (MassCAR) grant from the US Environmental Protection Agency (US EPA). In FY16, OTA completed the MassCAR curriculum and developed, planned, and executed trainings for auto body and auto repair shops in Marlborough, Worcester, Fitchburg, Bourne, and Boston. The trainings were well attended with a total of 95

participants: 78 participants from auto body shops and 17 from auto repair. OTA also did post-training follow up with all attendees and has performed site visits with those shops wishing to implement some of the changes suggested in the training curriculum. The 95 shops that attended the trainings are not only familiar with the MassCAR curriculum and tools, but also know that OTA can be used as a free and confidential resource. In addition, the trainings generated media coverage in the February 2016 *New England Automotive Report* and *Auto Body News* trade magazines. The full MassCAR Guide and individual fact sheets are now available online and continue to attract auto shops to OTA’s services.

To measure pollution prevention successes and outcomes, OTA collected surveys online as well as pre- and post-MassCAR training. For each best practice, participants were asked if they already completed a particular pollution prevention practice, had no interest in implementing the practice, or were interested in adopting the practice. No pollution prevention was accounted for those shops already implementing or not interested in a pollution prevention activity. For those who indicated interest in adopting a pollution prevention practice, the survey assumes a 30 percent implementation rate and calculates accordingly. The following tables show survey results and impact estimates:

Table 1: Estimated reductions in hazardous inputs and releases, water used, and cost

(a) Facility/Source	(b)P2 Activity	(c) Pounds of hazardous inputs and releases reduced (estimated)	(e) Gallons of water conserved	(f) Dollars saved from (c) – (e) only
23 Shop Survey Responses	Lighting Retrofit			\$11, 730
27 Shop Survey Responses	Low-Flow Faucet Aerators		17,010	\$272
22 Shop Survey Responses	Water-Based Paints	25,740 lb VOCs		
24 Shop Survey Responses	Safer Gun Washer	15,120 lb VOCs		
27 Shop survey Responses	Less-Toxic Pre-Wash	162 lb VOCs		
21 Shop survey Responses	Lead-Free Wheel Weights	523 lb lead		
18 Shop survey Responses	Oil Filter Crusher	3,780 lb hazardous waste		
15 Shop survey Responses	Water-Based Parts Cleaner	4,500 lb VOCs		
15 Shop survey Responses	Water-Based Brake Cleaner	450 lb VOCs		

Table 2: Estimated reductions in gallons of hazardous inputs and outputs

Survey Responses	P2 Activity	Hazard Reduced
24 Shop Survey Responses	Safer Gun Washer	2,160 gallons of hazardous waste reduced
12 Shop Survey Responses	Antifreeze Recycler	1,080 fewer gallons of waste antifreeze generated
21 Shop survey Responses	Solvent Recycler	850.5 fewer gallons of solvent purchased

Building Chemical Safety into Climate Change Resiliency Planning Grant

In FY16 OTA continued work on the community resiliency and chemical safety US EPA Grant. With the grant, OTA is working with Regional Planning Agencies (RPAs) to educate Local Emergency Planning Commissions (LEPCs) and toxics users on incorporating toxics use reduction into emergency preparedness to reduce risks of chemical releases resulting from increased risks of storms and floods in an era of global climate change. The grant period is from October 2015 to September 2018.

Here is a summary of what OTA has accomplished under the grant during FY16:

- Created a Chemical Safety and Climate Change Resiliency outreach flyer;
- Distributed mailings and emails to all RPAs regarding this project and funding opportunity;
- Presented at a Massachusetts Department of Public Health Earth Day event called *Building Resilience to Climate Impacts in Massachusetts: A Public Health Symposium*; and
- Assembled GIS data to create an online map for RPAs that identify sites and populations of interest.

The Environmentally Preferable Purchasing (EPP) Program for the Commonwealth

OTA is a key partner in the Massachusetts’ Environmentally Preferable Products Procurement Program (EPP Program) Task Force. The EPP sets minimum environmental standards on products purchased through statewide contracts by Executive Agencies in the Commonwealth whenever such products and services are readily available, perform to satisfactory standards, and represent the best value to the Commonwealth. The Task Force provides input into these standards, and according to the 2015 EPP report, the purchases made on statewide eco-purchasing contracts have grown to \$400 million. The 2015 Calendar Year Report of the Environmentally Preferable Purchasing Toxics Reduction Task Force is now available online.

OTA Publications

ChemGenes Corporation: In April 2016, OTA published an updated case study featuring ChemGenes Corporation of Wilmington, MA. With assistance from OTA and TURI, company reduced its use of chloroform by more than 50,000 lb, hexane by more than 10,000 lb, and silica gel by more than 8,000 lb per unit of production saving the company \$220,000 annually. In the long term, ChemGenes expects to reduce the use of hexane and ethyl acetate by 27,000 pounds over the next three years.

Toxics Use Reduction Institute (TURI)

The Toxics Use Reduction Institute (TURI) at UMass Lowell provides research, training, technical support, laboratory services, and grant opportunities to reduce the use of toxic chemicals while enhancing the economic competitiveness of Massachusetts businesses. TURI also manages the SAB and conducts policy analyses that form the basis of TURA program decision-making on chemical listing, de-listing and categorization, ensuring the development of sound policies with a strong grounding in science. TURI collaborates with diverse groups, including communities, businesses, academic institutions, and government and public entities to develop innovative approaches and share best practices.

Education and Training

Throughout the year, TURI hosts various events, including workshops, conferences, webinars, and training courses on TURA, TUR planning, and toxics. Education and training activities in FY16 included the following:

TUR Planner Training Course: Every year, TURI presents a seven-day course to train new TUR Planners. TURI continued to reformat the course from a purely live classroom format to a blended format consisting of online slide lectures and live classroom sessions for group workshop exercises and discussion. The objective is to make the course more efficient. Basic informational slide presentations will be available online, where participants can listen on their own schedule and at their own pace, while classroom sessions will be devoted to workshop exercises, group discussion, and team project work. This will shorten the time participants must devote to classroom sessions away from their normal duties, and make it easier for those travelling from a distance. Six additional course modules were added online in preparation for the Fall 2016 course (FY17); this completes the online component of the training course.

TUR 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, to improve their skills, and to assist them with maintaining their certifications. At the Fall 2015 conference, TURA program staff and subject matter experts engaged participants on a range of topics including a review of best practices in proactive chemicals management. This session was delivered by the peer mentoring workgroup facilitated by a TURI grant. The Spring Continuing Education Conference included a "back to basics" track to review core principles of TUR planning and sessions on process modernization, process safety and water conservation presented in collaboration with the Massachusetts Chemistry and Technology Alliance.

Resource Conservation Course: The TURA Amendments of 2006 built on the TURA program's success by focusing attention on additional ways to improve environmental and financial performance. These include applying TUR analysis techniques to optimize use of water, energy, and other resources, as well as encouraging TUR filers to reduce their use of toxics below TURA thresholds and of substances outside TURA's scope. Together, these areas comprise Resource Conservation. Two days of trainings were delivered to meet the education requirements for TUR Planner Resource Conservation certification.

“Beyond the MSDS” 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 several times in FY16 – as an in-person 2-hour class, as a poster presentation at the BizNGO Annual Conference in Boston, and as part of UMass Lowell and Simmons College classes.

Grants

TURI provided grants to industry, University of Massachusetts researchers, small businesses, municipalities and community organizations to advance toxics use reduction goals in a wide variety of sectors.

Industry Demonstration, Mentoring and Research Grants

TURI grants supported demonstration events, mentoring and research to address research and development needs related to development of safer alternatives to toxic chemicals in specific applications.

Demonstrations: In FY16, TURI provided two demonstration grants. Analog Devices, Inc. received a grant to demonstrate its advances in process water conservation to TUR Planners. Under this demonstration grant, Analog held an event showcasing multiple water conservation projects, and provided a tour of its facility to 26 attendees. At Analog, reverse osmosis and ultrafiltration membrane devices are used in conjunction with ion exchange (IX) resin technology to treat the incoming public water supply to remove ions that interfere with the ability to create semiconductors. At the demonstration event, participants had the opportunity to learn about how Analog achieved a dramatic reduction in its water use while achieving financial savings.

Franklin Paint’s demonstration event provided TUR Planners and others with insight into how the company reduced toxics while improving the quality of its paint. This event included an on-site presentation and facility tour for 19 attendees. Franklin Paint has eliminated the use of two TURA reportable substances and reduced the use of three others, resulting in an annual decrease of 900,000 pounds of reportable toxic use. The company not only significantly reduced toxics use, but increased production over the same time period. Attendees were also able to view a new lifting device that protects workers from musculoskeletal injuries.

Mentoring: Siemens Healthcare Diagnostics hosted a second year of a peer mentoring workgroup on proactive chemicals management. The company collaborated with Analog Devices, Inc. Biogen, Entegris, Essilor USA, EMD Millipore, MassMEP and Waters Corporation. TURI provided facilitation and supporting research. Each meeting focused on a specific topic, such as supply chain management or internal controls. Meetings were generally led by one of the members of the group, except when a subject matter expert on a topic such as green chemistry delivered a presentation. The group also presented at a TURA Continuing Education Conference. This workgroup completed its efforts in FY16. Participants explained that the sharing of tools and business practices was beneficial in this emerging area of proactive chemicals management.

Research: TURI also provides funding for research projects designed to help Massachusetts companies develop solutions for some of their more challenging uses of toxic chemicals. These projects can include research and development of new processes, materials and/or chemicals that can significantly reduce or eliminate the use of toxic chemicals. This research also educates the next generation of engineers, scientists and decision makers about toxics, green chemistry and safer materials.

TURI worked with several Massachusetts businesses to identify specific challenges in identifying and testing less hazardous substances for their manufacturing. Two projects were supported at UMass Lowell in FY16:

- Development of Safer Oligosaccharide-based Surfactants as Alternatives to Octylphenol Ethoxylates – Associate Professor Ramaswamy Nagarajan and his research team tested glucose-based and pectin-based alternatives, working with Siemens Healthcare Diagnostics.
- Safer Alternatives for Contact Adhesives – Assistant Professor Chris Hansen and his research team identified safer solvents and tested the viscosity and bond strength of new adhesive formulations, working with ITW Polymer Sealants.

In addition, TURI conducted research on potential safer alternatives to methylene chloride for paint stripping, a challenge identified by Savogran Company and Belcastro Furniture Restoration. Building on this research, the U.S. EPA selected a student team from UMass Lowell to receive a People, Prosperity and the Planet (P3) \$15,000 award. Working with their mentors, Research Professor and TURI Project Manager Greg Morose and TURI Laboratory Director Jason Marshall, the students worked to test the performance of safer alternative formulations for paint stripping.

Small Business Grants

Dry Cleaners: In FY16, TURI provided grants to four dry cleaners to completely eliminate their use of perchloroethylene and become dedicated professional wet cleaners:

- Luongo's Cleaners, Bedford
- New Season Cleaners, Needham
- Premier Cleaners, Westford
- True Blue Cleaners, Cambridge

TURI also provided a grant to Quality Cleaners in Springfield, a dedicated professional wet cleaner, to demonstrate the wet cleaning process and describe its benefits to dry cleaners in Western Massachusetts.

Other Small Business Grants: Other small business grants were provided to a microbrewery, an auto shop and two day care facilities.

- Merrimack Ales in Lowell received a grant to test how well chemical activation technology works for cleaning and sanitizing equipment used in the beer brewing process. The successful application of chemical activation technology would greatly reduce caustic sodium hydroxide and acids used for cleaning.

- Mike's Auto Body in Fall River received a grant to purchase safer alternatives for wheel weights, wheel cleaning, paint gun washing, brake cleaning and general degreasing. The work reduced the use of lead, solvents, acids and other toxics.
- WORD, Inc. and Rainbow Bears Child Care Centers received grants to replace cleaning, sanitizing and disinfection formulations with safer products. Both facilities also worked with Assistant Professor Ryan Bouldin of Bentley University (community grant mentioned below) to reduce flame retardants and phthalates that can be found in nap mats and plastic toys.

Municipal and Community Grants

Each year TURI sponsors a competitive grants program available for community organizations and municipal departments to create and promote healthier communities by raising awareness and educating people about safer alternatives to toxics. The projects described below were funded in FY16.

Bentley University, *Safe, Healthy, Affordable, Responsible Environments (SHARE) for Early Childhood Education*: The project team aimed to reduce exposure of children to phthalates and flame retardants, classes of chemicals known to disrupt hormones. The chemicals are typically found in plastic toys, sleeping mats, cushions and other products used in childcare centers. Assistant Professor Ryan Bouldin and his team collaborated with several childcare facilities to learn what products they use and test the products for phthalates and flame retardants. They investigated and piloted environmentally preferable options. Data were collected on product testing results, cost of product replacement and childcare providers' awareness of environmental health and chemical exposure issues. Model case studies based on these results will help all Massachusetts early childhood education facilities implement their own toxics use reduction plans.

Greenfield Health Department, *Go Green Safer Sanitizers for Food Service*: Health Inspector Bri Eichstaedt and the project team reduced toxics use in food service by compiling information on certified green cleaning products, practices and benefits. The Greenfield Health Department held public and private information sessions with food establishments to introduce alternative, less toxic sanitizers and cleaners. This project is modeled on a previous TURI grant to the Franklin County Regional Council of Governments.

Town of Natick, *Pesticide Reduction in Residential and Municipal Land Management*: The Town of Natick's Land Facilities and Natural Resources team piloted organic land care practices on three municipal properties – the Bacon Free Library, Memorial Elementary School soccer field and the new John J. Lane Park. Starting in the fall, these properties undertook a complete technical review, in which soil nutrients, site conditions and playability factors were analyzed. Sustainability Coordinator Jillian Wilson-Martin and the project team monitored the pilot properties for two years and will use the data to determine its ability to transition the additional 67 acres of school properties, playing fields and other land managed by the Town. Using the pilot sites as demonstrations of the success of organic lawn care, the project team educated residents by hosting a garden tour and conducting a series of workshops on pesticide-free lawn care and other natural lawn care best practices.

Silent Spring Institute, *Reducing Reliance on Flame Retardants Used in Gymnastic Facilities*: Research Fellow Courtney Carignan of the Harvard School of Public Health (the grant partner) and the project team investigated fire standards and flame retardant alternatives for the polyurethane foam cubes used in gymnastics facilities with the goal of reducing gymnast exposure to flame retardants. A recent study found that gymnasts can have high exposure to flame retardants as these chemicals are added to foam to meet fire safety standards. Flame retardants have been linked to thyroid disruption, memory and learning problems, early puberty, reduced fertility and cancer. Prototype testing took place at Worcester Polytechnic Institute's Fire Protection Engineering Laboratory. Results are being shared with gym owners, fire marshals, industry, gymnasts, coaches and parents.

YWCA of Lowell, *Girls Going Green: Naturally Beautiful Green Cosmetics and Personal Care Products*: Building upon the previous year's project, the Girls Going Green program at the YWCA of Lowell offered workshops and events for teenagers about safer beauty and personal care products. Elisabeth Phillips-Jones, Program Facilitator for youth programs at the YWCA, and the project team created a new team of core YWCA youth leaders to offer trainings that emphasize beauty by creating homemade cosmetics using safer ingredients and other healthy practices. The project team reached out to other community partners in Lowell and regionally to share information about cosmetics and recipes for making safer products.

Sector-Specific Projects

Aerospace and Defense Sector: TURI is now in the third phase of an ongoing collaborative project working with companies and government agencies in the aerospace and defense sector to research safer alternatives to the use of hexavalent chromium in selected applications. Core participants include Raytheon, Lockheed Martin, Northrop Grumman, Bombardier, Textron Aviation, Boeing, United Technologies, NASA, U.S. Navy, U.S. Army, and U.S. Air Force.

Phase I research was completed in FY13, providing positive results for the use of non-hexavalent chromium primers. Phase II research was completed in FY15 providing positive results for the use of non-hexavalent chromium sealant materials. Phase III research is under way and expected to be completed during FY17. The research participants have conducted wedge crack testing at U.S. Navy facilities and salt fog corrosion testing at NASA to evaluate the technical performance of non-hexavalent chromium structural adhesive bond primers.

Dry Cleaning: TURI continues to take an integrated approach to helping dry cleaners shift to safer alternatives. Largely as a result of encouragement, training and financial support provided by TURI, nearly 20 dry cleaners across Massachusetts are now dedicated professional wet cleaners.

Auto shops: With funding from an EPA Pollution Prevention grant, TURI completed outreach to auto shops, working with them to test safer products, like alternative brake cleaners and paint gun wash solutions. In September of 2015 TURI held an event to demonstrate these safer products for auto body shops.

Policy Analysis

The TURA program is recognized nationally and internationally as a leader in chemicals policy development. Upon request, TURI staff members occasionally provide input on national or international chemicals policy questions, particularly when these questions have the potential to affect Massachusetts businesses and communities directly.

During FY16, federal policy makers worked to complete updates to the Toxic Substance Control Act (TSCA). This work culminated in the June 22, 2016 signing of the Frank R. Lautenberg Chemical Safety for the 21st Century Act. Over the course of the year, TURI worked with other states in the Interstate Chemicals Clearinghouse (IC2) to provide analyses of the implications of the proposed updates to TSCA, with particular attention to implications for the TURA program and other state programs related to chemicals. Upon request, TURI provided presentations on these topics for the Northeast Waste Management Officials Association (NEWMOA) and the Environmental Commissioners' Organization of States (ECOS). After passage of the law, TURI produced a fact sheet on federal preemption of state authorities under TSCA. Going forward, TURI will provide updates for TUR Planners and others on TSCA implementation and its implications for Massachusetts businesses.

Laboratory Services

TURI's laboratory continues to provide free testing services to Massachusetts companies looking for safer cleaning alternatives. The TURI Laboratory tested the performance of safer cleaning solutions for 12 Massachusetts companies in the metalworking, military, furniture, microwave, medical supply, advanced ceramic components, footwear, components, adhesives, laboratory equipment manufacturing, and musical instruments sectors. The lab also tested products for 9 cleaning formulators. The lab continued to expand its services to industry and the Commonwealth in the area of janitorial cleaning. The lab worked with the MA Department of Conservation and Recreation, the MBTA, the MA Environmental Purchasing Toxics Reduction Task Force and the Environmentally Preferable Products (EPP) Procurement Program, helping both state agencies and schools move to greener janitorial cleaning chemicals and systems.

Library Services

The TURI Library continued to respond to information requests from businesses, citizens, students, faculty, nongovernmental organizations, and state and municipal agencies. Information requests have included queries about specific chemicals (e.g. formaldehyde, styrene), industrial processes (e.g. toluene use in cleaning; titanium etching with HF/nitric acid); alternatives assessment (e.g. alternatives to n-propyl bromide); and safer alternatives (e.g. for brake cleaning).

Publications, Presentations, and Educational Materials

TURI publishes educational materials for a variety of audiences, including TUR Planners, professionals in industry sectors that use toxic chemicals, and the general public. TURI's FY16 publications are shown in the Appendix.

TURI staff provided educational presentations in a variety of settings. Topics included TURA program resources, TSCA reform, chemical substitutions, alternatives assessments, green chemistry, engineered nanomaterials, alternatives to perchloroethylene in garment care, green cleaning, and sanitization and disinfection.

The TURI library's biweekly newsletter, Greenlist Bulletin, continued to provide information on recent news and publications. Greenlist circulates to over 700 opt-in recipients.

Press Coverage

Press coverage, both print and online, is another important route for public and business education about safer alternatives to toxic chemicals. In FY16, the work of the TURA program was featured in a variety of press outlets, with coverage of topics including the importance of chemical safety in the workplace and the implications of TSCA reform. FY16 press coverage is shown in the Appendix.

The Department of Environmental Protection (MassDEP)

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.

Toxics Use Reporting

Each July 1, large-quantity toxics users submit an annual report to MassDEP on each chemical listed by TURA used in above-threshold amounts during the previous calendar year. These reports supplement the Toxics Release Inventory (TRI) report that must be submitted to the U.S. Environmental Protection Agency and MassDEP on the same date. The TURA report documents the quantities of chemicals used, shipped in or as product, or generated as waste. The TRI reports document the quantities of chemical going to air, soil, water, or shipped to an offsite waste management facility or wastewater treatment plan. In FY16, MassDEP processed more than 1,500 individual chemical use reports from 480 facilities. Managing the reporting process involves assisting filers with the reporting process through phone or email; entering reporting and fee data into the data systems; 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; and processing fees.

In FY16 MassDEP replaced its reporting system, and improved the reporting forms to make it simpler to submit the required data.

Outreach

MassDEP updated the TURA Reporting Instructions, the TURA Reporting Appendices, and the TURA Chemical List in FY16. In addition, the agency updated the TURA Planning, Resource Conservation Planning and Environmental Management System Planning guidance documents in anticipation of the submission of biennial plans due on the first day of FY17.

MassDEP also participated in the development and delivery of the TURI sponsored Continuing Education conferences, and the TURA Planner Training Course. MassDEP worked with OTA and TURI to provide four TUR Reporting Training sessions in the spring of 2016.

Enforcement

During FY16, MassDEP:

- Inspected 55 TURA Filers.
- Screened another 222 facilities to determine if they were subject to TURA.
- Issued enforcement actions, including
 - 14 Notices of Noncompliance based on report reviews for either late filing or failure to file.
 - 2 Notices of Noncompliance based on inspections for failure to file.

Amnesty

In order to address a perceived problem of failure to comply with the TURA reporting and planning requirements, MassDEP offered an amnesty program between January 1, 2014 and July 1, 2016. Under the terms of the amnesty, facilities that voluntarily submitted previously owed reports received a warning letter and were required to pay one year of back fees and statutory late fees. The agency's normal enforcement response is to issue a Notice of Noncompliance to facilities that had failed to file and require them to pay three years of back fees and statutory late fees.

The program was a success. Over 120 facilities submitted one or more years of reports on 192 different chemicals. 26 of those facilities were new to the TURA program. 27 facilities had reported in prior years but had stopped reporting. 69 facilities were current reporters and submitted back reports of additional chemicals.

TUR Planner Certification

On even calendar years large-quantity toxic users must also complete a Toxics Use Reduction Plan – an evaluation of the costs of using each reported toxic chemical, possible changes to their production processes that would reduce the use and waste of each chemical, and whether it would be cost-effective for the company to implement those changes. If a company has completed two such analyses, it may choose to do a similar analysis on its use of water or electricity, generation of solid waste, or use of non-reportable toxic substances for every other subsequent planning year. Alternatively they may incorporate toxics use reduction planning into their existing Environmental Management System. These “Toxics Use Reduction,” “Resource Conservation,” or “Environmental Management System” plans must be reviewed and approved by a Toxics Use Reduction Planner (TUR Planner) who has been certified by MassDEP as having the expertise and training needed to approve the type of plan the company prepared. MassDEP certifies two types of planners:

- General Practice TUR Planners are allowed to review and approve plans developed by any company. In order to receive a General Practice certification, the TUR Planner must have taken

the TUR Planners Course offered by TURI, and must pass an examination offered by MassDEP with the assistance of TURI. In addition, they must demonstrate adequate education and experience. In order to renew their certification they must take continuing education courses in Toxics Use Reduction.

- Limited Practice TUR Planners are allowed to review and approve plans at their place of employment only. In order to receive a Limited Practice Certification, the TUR Planner must demonstrate adequate education and experience, and show that they have expertise in each aspect of Toxic Use Reduction Planning. Limited Practice TUR Planners must also take continuing education courses in Toxics Use Reduction to renew their certification.

In FY16, MassDEP:

- Offered the TUR Planner exam to nine individuals who had completed the TURI TUR Planner course (eight individuals passed the exam).
- Certified 16 new TUR Planners:
 - 4 General Practice TUR Planners
 - 9 Limited Practice TUR Planners who have demonstrated sufficient experience in TUR Planning to be licensed to approve TUR Plans at their place of employment
- Recertified 129 TUR Planners whose two-year certification was due to expire.

Out of these 145 certifications and re-certifications:

- 55 certifications were for Limited Practice TUR Planners, who are only authorized to sign plans for their own company. Of these:
 - 50 were approved for TUR plans only.
 - 3 were approved for TUR and Resource Conservation plans.
 - 3 were approved for TUR and Environmental Management System plans.
- 90 were for General Practice TUR Planners, who are allowed to sign the plans for any toxic user. Of these:
 - 44 were approved for TUR plans only.
 - 10 were approved for TUR and Resource Conservation plans.
 - 16 were approved for TUR, Resource Conservation and Environmental Management System plans.
 - 20 were approved for TUR and Environmental Management System plans.

As of December 2016, there are a total of 182 Certified TUR Planners in Massachusetts. 107 are General Practice and 75 are Limited Practice TUR Planners.

- 120 are approved for TUR Plans Only
 - 54 General Practice
 - 66 Limited Practice
- 14 approved for TUR and Resource Conservation plans
 - 11 General Practice
 - 3 Limited Practice
- 26 approved for TUR and Environmental Management System plans

- 22 General Practice
- 4 Limited Practice
- 1 Limited Practice TUR Planner approved just for Environmental Management System plans
- 21 approved for TUR, Resource Conservation and EMS plans
 - 20 General Practice
 - 1 Limited practice

Data Analysis

In FY16, MassDEP worked to significantly update and expand the analysis of the reported TURA data, with a particular focus on evaluating the implementation of toxics use reduction. The most recent data available derives from the 2014 calendar use reports that were due on July 1, 2015. These facilities:

- Used a total of 901 million pounds of 145 different chemicals;
- Generated 73 million pounds of chemical as byproduct (chemical waste);
- Released 3 million pounds of chemical waste as pollution; and
- 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.

Fee Revenue

TURA-regulated facilities must pay annual fees, unless they have obtained a financial hardship waiver. In FY16 there were no fee-waiver requests. MassDEP collected:

- \$2,906,525 in annual fees and statutory late fees, and
- \$26,040 in fees from TUR Planners who applied for the DEP's certification or recertification.

Appendix

Selected Events

TURA organized a variety of events in FY16. This list does not include events organized by TURI grantees.

September 2015

- TUR Planner Certification Course, September 8 – November 12 (13 students)
- Beyond the MSDS Training, September 17 (6 attendees)
- Auto Body and Repair Shop Alternatives to Solvents Demonstration, September 19 (6 attendees)
- Reducing Gymnast Exposures to Flame Retardants Webinar: September 30 (37 attendees)

October 2015

- Franklin Paint Demonstration of Effective TUR in Product Formulation, October 15 (19 attendees)

November 2015

- Analog Devices Demonstration of Process Water Conservation, November 16 (26 attendees)
- TUR Planners' Continuing Education Conference, November 19 (93 attendees)

January 2016

- MassCAR Training, Fitchburg, January 6 (42 attendees)
- Resource Conservation Training, January 13 and 27 (10 attendees)
- MassCAR Training, Fitchburg, January 13 (9 attendees)
- Quality Cleaners Wet Cleaning Demonstration, January 14 (12 attendees)
- MassCAR Training, Worcester, January 20 (4 attendees)
- MassCAR Training, Bourne, January 26 (7 attendees)

February 2016

- MassCAR Training, Boston, February 4 (7 attendees)
- Beyond the (M)SDS Training, February 9 (15 attendees)
- MassCAR Training, Bourne, February 10 (26 attendees)

April 2016

- TUR Planners' Continuing Education Conference, April 14 (90 attendees)

May 2016

- Green Your Bottom Line in Food Processing - An Energy and Environmental Workshop, May 5 (organized in collaboration with EPA and other Massachusetts entities)
- Late Lessons from Early Warnings about Hazards to Health and Environment, May 18 (co-sponsored)

June 2016

- Honoring Champions of Toxics Use Reduction in Massachusetts: June 8 (150 attendees)

Publications

The TURA program and staff continued to make work accessible through a variety of publications and presentations. Note that some of the publications and presentations listed below are the result of non-TURA sponsored work.

Reports, Book Chapters, and Journal Articles

Becker, M., Morose G., “Program identifies safer chemicals for use as plasticizers”, November 2015, *The Wire Journal*. Available at

http://www.turi.org/TURI_Publications/TURI_Staff_Publications/Program_identifies_safer_chemicals_f_or_use_as_plasticizers.2015

Coughlin, S., Jacobs, M., Thind, H., Champagne, N., Liu, B., Golden, M., Osimo, C., Tracy, N., Massey, R., “On the Need for Research-Tested Smartphone Applications for Reducing Exposures to Known or Suspected Breast Carcinogens in Work and Home Environments”, October 2015, *Journal of Environment and Health Sciences*. Available at

http://www.turi.org/TURI_Publications/TURI_Staff_Publications/On_the_Need_for_Research-Tested_Smartphone_Applications_for_Reducing_Exposures_to_Known_or_Suspected_Breast_Carcinogens_in_Work_and_Home_Environments_2015

Coughlin, Steven, Herpreet Thind, Benyuan Liu, Nicole Champagne, Molly Jacobs, Rachel Massey. 2016. “Mobile Phone Apps for Preventing Cancer Through Educational and Behavioral Interventions: State of the Art and Remaining Challenges.” *JMIR MHealth and UHealth* 4:2.

Goodyear, N., Brouillette, N., Tanaglia, K., Gore, R., Marshall, J., “The Effectiveness of Three Home Products in Cleaning and Disinfection of *S. aureus* and *E. coli* on Home Environmental Surfaces”, September 2015, *Journal of Applied Microbiology*. Available at http://www.turi.org/TURI_Publications/TURI_Staff_Publications/The_Effectiveness_of_Three_Home_Products_in_Cleaning_and_Disinfection_of_S._aureus_and_E._coli_on_Home_Environmental_Surfaces.2015

Hjorth, R., Hansen, S., Jacobs, M., Tickner, J., Ellenbecker, M., Bauny, A., “The Applicability of Chemical Alternatives Assessment for Engineered Nanomaterials” Integrated Environmental Assessment and Management. Available at http://www.turi.org/TURI_Publications/TURI_Staff_Publications/The_Applicability_of_Chemical_Alternatives_Assessment_for_Engineered_Nanomaterials.2016

Marshall, J. Wilcox, H., *In Search of the Silver Bullet: Assessment of Alternatives for Trichloroethylene in Cleaning Operations*, Nova Publishers, New York, 2015.

Morose, G., Marshall, J., Eliason, P., Butow, M., Uzor, C., *Chemical Alternatives Assessment: Cleaning Solutions Formulations*. TURI Technical Report No. 79. Available at

http://www.turi.org/TURI_Publications/TURI-Technical-Reports/Chemical_Alternatives_Assessment_Cleaning_Solutions_Formulations.2015

Fact Sheets

- “Athletic Playing Fields and Artificial Turf: Considerations for Municipalities and Institutions” Available at:
http://www.turi.org/TURI_Publications/TURI_Chemical_Fact_Sheets/Artificial_Turf2
- Auto Body Factsheets from the MassCAR Guide available at www.mass.gov/eea/ota/masscar
 - “Federal and State Auto Body Air Regulations”
 - “Less Toxic Alternatives”
 - “Paint Mixing Room Guidelines and Best Practices”
 - “Safe Welding Practices”
 - “Solvent Recycling Systems”
 - “Vacuum Sanding”
 - “Water-Based Gun Washing”
 - “Water-Based Paint”
- Auto Repair Factsheets from the MassCAR Guide available at www.mass.gov/eea/ota/masscar
 - “Adhesive & Lead-Free Wheel Weights”
 - “Antifreeze Recycling”
 - “High Voltage Safety with Hybrids and Electric Vehicles”
 - “Oil Filter Crushers”
 - “Refrigerant Recycling Systems”
 - “Water-Based Brake Cleaning”
 - “Water-Based Parts Cleaning”
- General Auto Body and Repair Factsheets from the MassCAR Guide available at www.mass.gov/eea/ota/masscar
 - “Common Hazardous Wastes”
 - “Hazardous Waste Management”
 - “Permits and Inspection Readiness”
 - “Spill Prevention”
 - “Understanding OSHA Requirements for Auto Shops”
 - “Vehicle Fluid Evacuation Caddies”
 - “Waste Oil Management”
 - “Wastewater Regulations and Best Practices”
- “TSCA Preemption Provisions” Available at:
http://www.turi.org/TURI_Publications/TURI_Chemical_Fact_Sheets/TSCA_Preemption_Provisions

Case Studies

- “ChemGenes Corporation Toxics Use Reduction Case Study” Available at
<http://www.mass.gov/eea/docs/eea/ota/case-studies/chemgenes-corp.pdf>

- “Merrimack Ales Tests Less Hazardous Cleaning and Sanitizing Technology” Available at http://www.turi.org/TURI_Publications/Case_Studies/Microbreweries/Merrimack_Ales_Tests_Less_Hazardous_Cleaning_and_Sanitizing_Technology

Invited and Sponsored Conference Presentations, Workshops, and Training Presentations (Selected)

Butow, M., “Beyond the [M]SDS” Poster Presentation, BIZngo Annual Conference, Boston, December 2015.

Butow, M., “Beyond the [M]SDS” Workshop, Simmons College, February 3, 2016, Approximately 25 people in attendance.

Eliason, P., “Toxics Use Reduction for Enhanced Pollution Prevention” – Day-long workshop for the Michigan Department of Environmental Quality and the Retired Engineers Technical Assistance Program, Lansing, MI, August 20, 2015. Approximately 20 people in attendance.

Eliason, P., “Strategic Collaboration to Accelerate Informed Chemical Substitution and Alternatives Assessment”, Global Business Summit, Brussels, Belgium, March 29, 2016. Approximately 50 people in attendance.

Eliason, P., “Safer and Better: High Performing Green Chemistry Solutions”, Moderator, GC3 Annual Conference, Burlington, VT, May 24-26, 2016.

Ellenbecker, M., “The Challenge of Setting Occupational Exposure Limits for Engineered Nanomaterials,” the Henry F. Smyth, Jr., Award Lecture, American Industrial Hygiene Conference & Expo (AIHCE), Baltimore, MD, May 2016.

Harriman, E., STEM Careers Panel, Lynn, MA, April 7, 2016, Approximately 25 people in attendance.

Massey, R., “Toxics Use Reduction Institute Programs and Services.” MassDEP Commissioner’s Summer Speaker Series, August 18, 2015. Approximately 12 people in attendance.

Onasch, J., “Alternatives to Perchloroethylene in Garment Care: Making the Business Case for Wet Cleaning”, AIHce, Baltimore, MD, May 25, 2016.

Skogstrom, Tiffany. “Community Resilience and Chemical Safety.” Presented at a Massachusetts Department of Public Health Earth Day event called Building Resilience to Climate Impacts in Massachusetts: A Public Health Symposium.

Wilcox, H., Seattle Clean School Seminar, July 29-31, 2015, Approximately 100 people in attendance.

Wilcox, H. New York State Environmental Summit, Saratoga Springs, NY, October 12-13, 2015 Approximately 120 people in attendance.

Wilcox, H., "Green Cleaning, Sanitizing and Disinfection", New York Pupil Transportation Association, Albany, NY, February 17-19, 2016.

Wilcox, H., "Update on DCR Work and Projects", DCR Supervisors Meeting, April 12, 2016.

Press Coverage

Benson, Brian. "Grant helps Natick start organic land care program" Metro Daily News 9/24/2015. Available at: <http://www.metrowestdailynews.com/article/20150924/NEWS/>

Benson, Brian. "Growing interest in organic", Milford Daily News, 10/25/15. Available at [http://www.milforddailynews.com/article/20151025/NEWS/151027006/.](http://www.milforddailynews.com/article/20151025/NEWS/151027006/)

Benson, Brian. "Natick officials looking to showcase organic gardens in tour", MetroWest Daily News, 12/13/15. Available at <http://www.metrowestdailynews.com/article/20151213/NEWS/151218347>

Fitzgerald, Cole. "10 QUESTIONS WITH Ken Geiser, authority on the dangers of toxic chemicals, authors new book" Lowell Sun, 9/28/2015. Available at http://www.lowellsun.com/news/ci_28889196/chemicals-without-harm#ixzz4H1t157ya

Gausten, Joel. "Controversies & Compliance: Inside AASP/MA's First Meeting of 2016", New England Automotive Report, February 2016. Available at <http://www.grecopublishing.com/new-england-automotive-report-february-2016/>

Howarth, Joanna. "Bentley Professor Leads Effort to Detoxify Local Child Care Centers" PreparedU View, 10/16/2015. Available at <http://www.bentley.edu/prepared/bentley-professor-leads-effort-detoxify-local-child-care-centers>

Lefferts, Jennifer. "Natick receives grant to pilot organic land care practices," The Boston Globe, 10/6/15. Available at <https://www.bostonglobe.com/metro/regionals/west/2015/10/06/natick-receives-grant-pilot-organic-land-care-practices/oZSHpX5zQq715YE09l7nbL/story.html>

Rae Sisk, Chasidy. "MassCAR Training Helps Meet EPA Compliance" 3/16/16. Available at https://issuu.com/autobodynews/docs/ne_0316_issue_web

Swanson, Cassidy. "Lowell brewery to receive UMass Lowell grant" Lowell Sun, 12/10/15 Available at: http://www.lowellsun.com/business/ci_29229297/lowell-brewery-receive-uml-grant

NECN. Money Saving Mondays. DIY Cleaning Products. 3/21/2016. Available at: http://www.necn.com/news/business/NECN_032116_msm_8a_NECN-372926221.html

Connecticut DEEP "Wastebusters Green Cleaning in Schools" video, Connecticut DEEP. Available at http://www.turi.org/Our_Work/Cleaning_Laboratory/Institutions_Janitorial_Products_and_Equipment

Collaborations & Partnerships

TURA program staff work in collaboration with a wide variety of partners in local, state, and national government, with industry and non-governmental organizations; and with researchers. In addition to the partners mentioned elsewhere in this report, sample partners include the National Pollution Prevention Roundtable (NPPR), the Interstate Chemicals Clearinghouse (IC2), the New England Waste Management Officials' Association (NEWMOA), the Lowell Center for Sustainable Production (LCSP), and the Green Chemistry in Commerce Council (GC3).

OTA also collaborated in FY16 with researchers at Brandeis University:

“Black Hair Salon Study: Assessing Occupational Exposure in Black Hair Salons” Available at <http://www.brandeis.edu/programs/environmental/news/blackhairstudy.html>