

## 2006 Lab-XL Progress Report University of Vermont

This is the annual progress report required by the Final Project Agreement between EPA New England, the state of Vermont and the University of Vermont. As described in the 2005 Lab-XL Progress Report, the UVM Laboratory Waste Program has identified, going forward, four key indicators for its environmental performance and established goals for those indicators. This progress report provides information and data about progress towards these goals in 2005.

In summary, the amount of hazardous waste generated by UVM laboratories continues to decline significantly, enough to meet the goal set at the beginning of the XL project of a 10% decrease. We believe that this indicates that our strategy of developing an ongoing partnership with laboratory workers around safety and compliance issues, supported by laboratory training, active oversight processes and chemical redistribution programs, is the most effective way to support continuous improvement of this program. The implementation of this strategy has been enabled by the performance orientation of the XL standard. Based on this experience, we believe that the performance orientation of EPA's proposed academic laboratory waste rule is appropriate and will enable similar success at other academic institutions in the country.

### Indicator 1: Laboratory Worker Training

Our experience in the Lab-XL project has shown that worker training is the key to improving laboratory safety, environmental awareness, and compliance performance. For this reason, our program has continued to emphasize training as a key element in the laboratory safety and waste management program. Our indicator for this element of the program is the number of people who receive some form of laboratory safety training.

Measuring this indicator has become more complicated as we increase the number of ways in which we offer training. For example, in addition to our traditional classroom lab safety orientation training, we now offer introductory on-line training and advanced laboratory safety training. The numbers reported below are the number of people who took at least one on-line course added to the number of people who attend classroom training.

**Table 1: UVM Workers Attending Laboratory Safety Training**

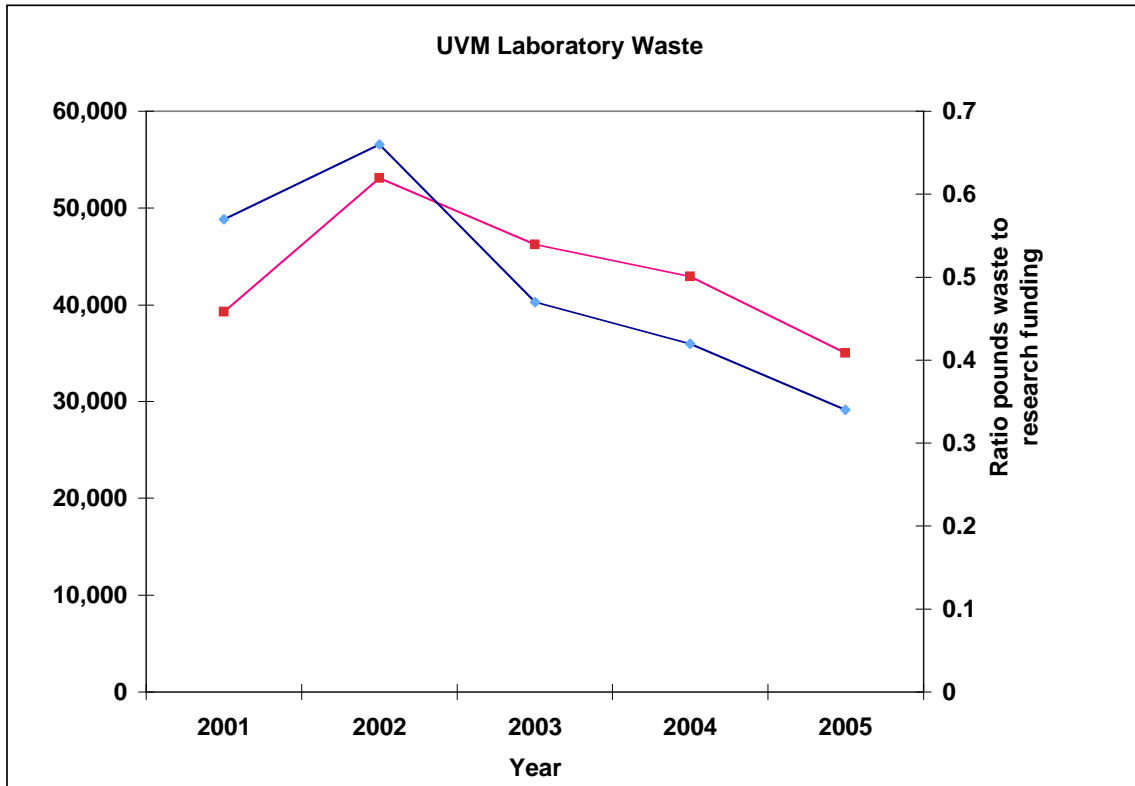
Year	2000	2001	2002	2003	2004	2005
Individuals trained	284	600	607	641	638	641

The goal for the training indicator is that we maintain the current number of workers being trained at about 600 people per year. This goal is based on laboratory worker surveys which consistently show that about 40% of UVM

laboratory workers have less than 2 years experience in UVM laboratories. With a laboratory population of about 1200 people, 600 people per year represents a reasonable approximation of the turnover in UVM laboratories.

**Indicator 2: Laboratory Hazards Waste Shipped from Campus**

Research and teaching laboratories at UVM generated 35,032 pounds of RCRA hazardous waste in 2005. This is a decrease of 18% in total pounds over the previous year, as well as a 18% decrease in the pounds of waste per research dollar received (see Table 2).



The goal established for the laboratory hazardous waste program for 2005 is that the three year rolling average of the amount of hazardous waste generated normalized per research dollar received would decrease. This goal was achieved, because this ratio decreased 19%. This has met the “bottom line” goal of the XL project of reducing the amount of laboratory hazardous waste by 10% (10.8%, to be more precise).

**Table 2: UVM Laboratory Hazard Waste Generation Trends**

Calendar Year	2005	2004	2003	2002	2001
Pounds waste generated	35,032	42,921	46,246	53,112	39,284

One year % change in generation	-18%	-7%	-13%	35%	Not applicable
Research dollars received	\$101,653,612	\$101,587,152	\$98,013,963	\$80,043,495	\$69,411,224
Pounds waste / \$1000 research	0.34	0.42	0.47	0.66	0.57
Three year ratio average	0.41	0.51	0.56	Not applicable	Not applicable
% change in three year average of ratio	-19%	-9%		Not applicable	Not applicable

Reasons for this success can be attributed to a variety of factors. These include a decrease in the amount of unused chemicals disposed of, a decrease in the unknown chemicals generated by campus laboratories, the ChemSource chemical redistribution program (see indicator #4 below) and the success of the laboratory oversight process in identifying materials which should be disposed of in a timely manner (see indicator #3 below).

**Unused Chemicals:** In 2005, 8,717 pounds of waste input into our waste management tracking system were identified as unused material. This accounts for 25% of the 35,032 pounds of hazardous waste generated from research and teaching. This percentage is the same as in 2004 and down from the estimate of 40% described in the literature (see “*Less is Better*” by the American Chemical Society) that we believe applied to UVM prior to 2003.

**Unknowns:** In 2005, UVM laboratories disposed of 49 containers of unknown chemical waste through the ESF. Unknown waste is an important waste stream because of the potential hazard and expense associated with its disposal. It is also an indicator of the maturity of laboratory chemical storage and disposal practices. Environmental Safety programs in place are designed to raise the awareness of laboratory personnel regarding proper chemical storage practices. The following data suggests continued improvement resulting from increased awareness in the laboratories.

**Table 3: Trends in Unknown Chemical Wastes Generated by UVM Labs**

Calendar Year	2001	2002	2003	2004	2005
# of unknown containers	165	42	91	82	49

### Indicator 3: Laboratory Oversight Program

The UVM Laboratory Safety and Compliance Oversight program has continued to evolve rapidly. We now understand that an effective oversight program consists of a dynamic balance of efforts between improving communication with laboratory workers by integrating training efforts into the overall laboratory oversight system with ongoing laboratory visits to identify compliance problems.

The results of the laboratory audit program from 2001 – 04 included not only a significant increase in the compliance rates observed in laboratories, but also led to a better appreciation by Environmental Safety staff of the practical and compliance health and safety challenges faced by laboratory workers who use hazardous chemicals. After the 2004 audits were completed, Environmental Safety staff reviewed the results of the audits and the laboratory challenges we observed and decided that the most effective way to move forward with regards to laboratory oversight was through revamping the training program and the audit checklist, along with our web site.

The biggest concern we heard from the laboratory population was that the audit checklist we used was overly complicated and did not provide guidance for a path forward for correcting issues it identified. Based on this feedback, Environmental Safety staff carefully reviewed legal requirements, prudent practices for the use of laboratory chemicals identified by the National Research Council, and state of the art practices from other laboratory institutions. The items we collected from this review were organized into a new laboratory safety “compliance scorecard” that is specifically designed to explicitly identify for laboratories which issues are highest priority (legal requirements) and which are associated with routine (prudent practices) or model lab (state of the art) practices. The resulting checklist can be viewed at [http://esf.uvm.edu/uvmemp/lab\\_inspection\\_cards.pdf](http://esf.uvm.edu/uvmemp/lab_inspection_cards.pdf)

While this work proceeded, laboratory oversight continued both through ongoing laboratory safety training (see discussion in Indicator 4 below) and laboratory visits. Laboratory visits included pick-ups of hazardous waste and Environmental Safety consultations. Waste pick-ups entailed visits to 317 laboratory rooms on campus in 2005 and provide the basic level of oversight for the management of laboratory hazardous waste on campus. Waste technicians making pick-ups are able to observe waste management practices, including storage and labeling and to answer questions about proper procedure. Concerns about issues that go beyond these items are referred to Environmental Safety Specialists for follow-up.

Environmental Safety consultations occur in about 50 laboratories per year. About three quarters of the Environmental Safety consultations occur at the request of the laboratory supervisor, usually when a laboratory is being started up or moving. The remaining consultations are in follow-up to concerns noted when picking up laboratory wastes or in follow up to specific laboratory incidents. Both of these focus on issues specific to the laboratory, using the new compliance checklist to assure that all appropriate issues are covered.

Neither of these types of visits resulted in a compliance audit score similar to those produced in earlier years, so we cannot evaluate whether the program has reached the goal of achieving an average lab status of being a “UVM model lab”. Starting in 2007, we will institute a new form of laboratory visit called a “scenario assessment”, which will allow the assessment of scores for laboratories on the

high priority items in a way that allows for better use of Environmental Safety resources.

#### **Indicator 4: Chemical Redistribution (The ChemSource Program)**

The UVM Environmental Safety Facility staff continues to provide a chemical redistribution program, UVM ChemSource, as its primary centralized pollution prevention program for laboratory chemical wastes. This program realizes the price advantage of “economy of scale” purchases while reducing the amount of hazardous chemicals purchased by and stored in laboratories. The goal for this program is that the use of the program be maintained at a consistent level of about 850 deliveries per year. Our goal is not to increase the amount of hazardous materials used on campus, so we don’t feel that increasing the use of the program is an appropriate goal. It should also be noted that this is an approximate goal because this number is based on the number of delivery tickets filled out each year and many delivery tickets represent multiple items.

Use of this program has remained consistent over the past four years. We believe that this program is the primary reason for the decrease in the amount of unused chemicals found in the laboratory waste streams, as noted in the discussion of Indicator #2 above. To maintain the value of the program for both laboratory and pollution prevention purposes, ESF staff are continuously reviewing campus purchasing practices to meet changing needs for chemicals.

**Table 4: Trends in Chemsorce Deliveries**

<b>Calendar Year</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>
Chemical orders delivered	854	863	888	897
Chemical exchange orders delivered	17	25	17	22

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