

# 2007 Lab-XL Progress Report

## University of Vermont

The Final Project Agreement between EPA New England, the state of Vermont, and the University of Vermont requires an annual progress report on UVM's laboratory waste management system. As described in the 2005 Lab-XL Progress Report, the UVM Laboratory Waste Program has identified four key environmental performance indicators we use to assess the strength of this program. This report describes the results of these indicators in 2006.

### Executive Summary

In summary, the amount of hazardous waste generated in 2006 by UVM laboratories continues to decline compared to the previous year (7% from 2005 to 2006). This decrease is enabled by ongoing environmental health and safety training efforts, an active laboratory oversight program, and ongoing use of the UVM ChemSource program by campus laboratories. We believe that the trends in these indicators demonstrate that our strategy of developing an ongoing partnership with laboratory workers around safety and compliance issues is the most effective way to support continuous improvement of the laboratory waste management program. The implementation of this strategy has been enabled by the performance orientation of the XL standard rather than strict application of the RCRA regulations in the laboratory setting.

### 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	2006
Individuals trained	284	600	607	641	638	641	689

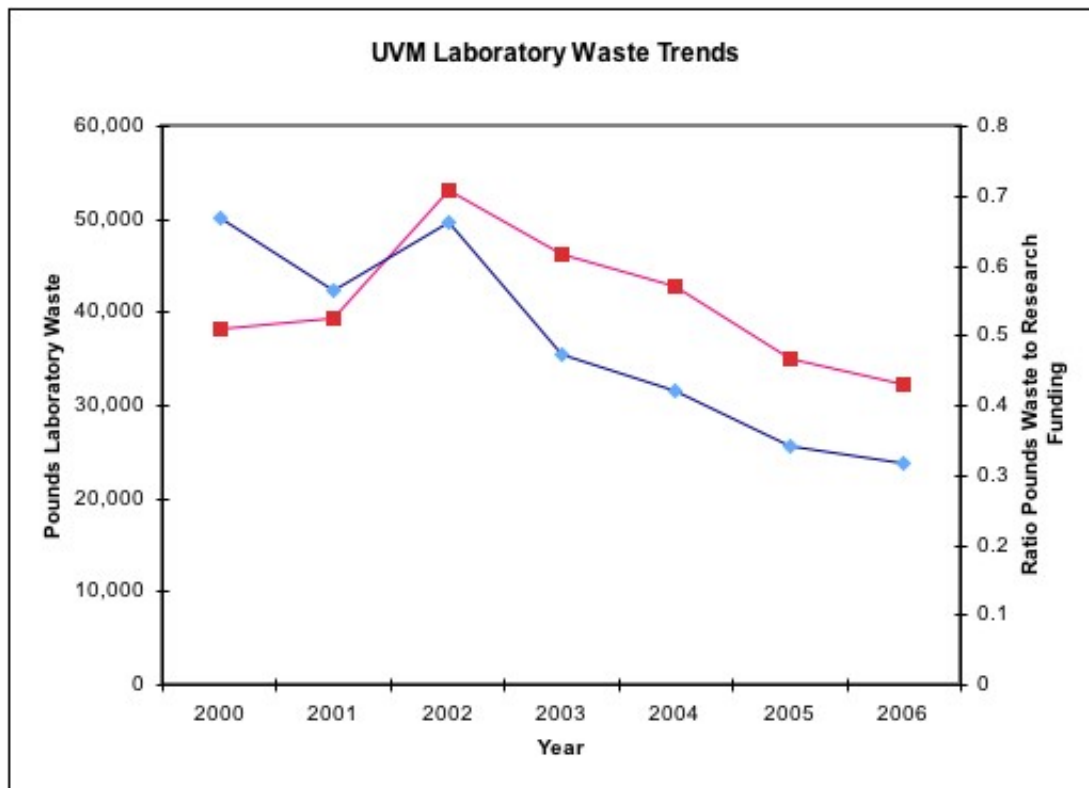
The goal for the training indicator is that we maintain the current number of workers being trained at about 600 people per year. This goal is based on laboratory worker surveys which consistently show that about 40% of UVM laboratory workers have less

than 2 years experience in UVM laboratories. With a laboratory population of about 1300 people, 600 people per year represents a reasonable approximation of the turnover in UVM laboratories. In 2006, we increased the variety of classroom trainings we offered (see discussion in oversight section below). This resulted in an increase in the number of people who participated in the training. In 2007, we are increasing the variety of on-line courses available in order to take advantage of the increased interest and support for this form of training.

To maintain awareness and training in the laboratory population, we use an e-mail list to communicate with the laboratory workers on an ongoing basis. Everyone who participates in the on line training is automatically added to this list. At this point, mailings on this list are distributed to 1350 people, which we believe is close to the total laboratory population at UVM.

### Indicator 2: Laboratory Hazardous Waste Shipped from Campus

Research and teaching laboratories at UVM generated 32,322 pounds of RCRA hazardous waste in 2006. This is a decrease of 7% in total pounds over the previous year, as well as a continued decrease in the pounds of waste per research dollar received (see Table 2).



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

<b>Calendar Year</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
Pounds waste generated	39,284	53,112	46,246	42,921	35,032	32,322
One year % change in generation	Not Applicable	+35%	-13%	-7%	-18%	-7%

Key reasons for this ongoing success in hazardous waste minimization are improved laboratory housekeeping and compliance. These reasons are demonstrated by the trends associated with two key waste streams: unused chemicals and unknown chemicals.

**Unused Chemicals:** In 2006, 4,492 pounds of waste input into the TAGS waste management tracking system were identified as unused material. This accounts for 14% of the 32,322 pounds of hazardous waste generated from research and teaching. This percentage is down from the previous two years (2004 and 2005 were estimated to be 25%) and well below 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. We attribute this low number to the ongoing presence of Environmental Safety personnel in UVM laboratories leading to increased awareness in our laboratory community of the importance of careful chemical purchasing.

**Unknowns:** In 2006, UVM laboratories disposed of 58 containers of unknown chemical waste through the ESF. This number is slightly up from the year before (2005 was 49), but below the five year average of 81 unknowns/year. Unknown waste is an important waste stream because of the potential hazard and expense of its disposal. It is also a key indicator of the state of laboratory chemical storage and disposal practices on campus. On this basis, we believe that ESF programs are in place to raise the awareness of laboratory personnel regarding proper practices are working well.

### **Indicator 3: Laboratory Oversight Program**

The UVM Laboratory Safety and Compliance Oversight program has continued its dual strategy of improving communication with laboratory workers and conducting periodic laboratory visits to verify conformance and identify and address outstanding waste management and safety issues.

The first prong of this strategy led us to diversify the laboratory training we offered in 2006. The attendance numbers reported in the Indicator 1 discussion above reflect 10 different types of classroom training, as compared to 4 different kinds in 2005. Included in this classroom training was one class specific to laboratory waste management issues. This course combined information about chemical waste management

procedures with information about biowaste and hazardous waste minimization opportunities. Feedback about this diversity of courses was positive.

While development of the training program proceeded, laboratory oversight occurred during laboratory waste pick-ups and Environmental Safety consultations. Waste pick-ups entailed visits to 354 laboratory rooms on campus in 2006 and provide the basic level of oversight for the management of laboratory hazardous waste on campus. Waste technicians making pick-ups observe waste management practices, including storage and labeling practices and answer questions about proper waste management procedure. Issues that go beyond these items are referred to Environmental Safety Specialists for follow-up.

An example of how this system works involves the Chemistry Department teaching laboratories. Teaching laboratories present special challenges for managing chemical waste because there are many people generating small amounts of waste using the same equipment simultaneously. This creates the opportunity for significant confusion as to proper chemical waste management. UVM waste technicians noticed ongoing lapses and labeling and housekeeping of class wastes (about 20% of the containers collected had a problem). They reported this observation to the Laboratory Safety Coordinator responsible for oversight of the Chemistry Department, who worked closely with the class supervisors and teaching assistants to adjust the waste handling procedures to improve compliance. When these adjustments were made for the summer semester, the number of problems dropped to near zero.

Environmental Safety consultations occurred in 35 laboratories in 2006. About 75% of the consultations occurred at the request of the laboratory supervisor, usually when a laboratory was being started up or moved. The remaining consultations were in response to concerns noted when picking up laboratory wastes or as follow up to specific laboratory incidents. In both of these cases, the consultation visits focus on issues specific to the laboratory, using the compliance checklist updated in 2007 to assure that all appropriate issues are covered.

#### **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 continuously review campus chemical use to adjust the chemicals ChemSource stocks in order to meet changing needs for chemicals.

**Table 4: Trends in Chemsources Deliveries**

<b>Calendar Year</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
Chemical orders delivered	854	863	888	897	735
Chemical exchange orders delivered	17	25	17	22	6