

**TABLE 2-5
BROOKHAVEN NATIONAL LABORATORY
POLLUTION PREVENTION, WASTE REDUCTION AND RECYCLING PROJECTS (CY 2001) TRACKING SYSTEM**

WASTE DESCRIPTION	TYPE OF PROJECT	POUNDS REDUCED, REUSED, RECYCLED OR CONSERVED IN 2001	WASTE TYPE	POTENTIAL COSTS FOR TREATMENT & DISPOSAL	COST OF RECYCLE, PREVENTION	ESTIMATED COST SAVINGS	PROJECT DESCRIPTION DETAILS
Photographic Waste	Segregation	2,320	Hazardous Waste	\$4,640	\$0	\$4,640	Photography and Graphic Arts Division implemented a pollution prevention project that segregates hazardous fixer from non-hazardous developer. This reduced the hazardous waste stream by approximately 2,320 lbs., avoiding hazardous waste disposal costs of approximately \$4,640.
Photographic waste from X-ray film processor	Source Reduction	765	Hazardous Waste	\$8,415	\$5,200	\$4,800	The X-ray film processor at the clinic was replaced with a more efficient processor, reducing hazardous waste generation by 90 gallons/year. This avoids the cost of disposal of \$8,415 (765 lbs at 11.00/lbs) and saves \$1,585 from reduce labor. The project cost was \$5,200.
Photoresist waste	Source Reduction	500	Hazardous Waste	\$5,500	\$0	\$5,500	A fully aqueous developer solution was installed in the printed circuit laboratory for processing dry film photoresist. The system replaced a solvent-based process that formerly generated approximately 500 lbs of hazardous waste annually. Waste avoidance costs are estimated at \$5,500 (500 lbs at \$11.00/lbs.).
Heavy metal solutions from Crystallography experiments	Source Reduction	10,200	Hazardous Waste	\$112,200	\$3,500	\$114,700	This project, funded by the pollution prevention council, installed a xenon pressure cell to allow preparation of samples for protein crystallography without the use of toxic heavy metal solutions. The project is estimated to eliminate 1200 gallons of heavy metal hazardous waste (10,200 lbs) and avoid disposal costs of \$112,200 (\$11.00/lbs). Additionally, approximate \$6,000 savings is estimated from reduced labor and handling. The project cost was \$3,500.
Lead	Recycled	550	Hazardous Waste	\$6,050	\$0	\$6,050	Approximately 550 lbs of lead bricks were collected by the Instrumentation Division for recycling. Waste disposal cost avoided is estimated at \$6,050 (550 lbs at \$11.00/lbs).
Lead Acid Batteries	Recycled	9,600	Hazardous Waste	\$105,600	\$0	\$105,600	Estimate 40 lbs./battery and avoided disposal costs as hazardous waste at \$11.00/lbs.
Ion Exchange wastewater	Source Reduction	1250	Hazardous and Sanitary Wastewater	\$2,000	\$100	\$1,900	Prefilters were added to the deionization system to polish make up water entering the ion exchange system. This extended the useful life of the ion exchange resins, requiring less frequent regeneration. The regeneration process generates hazardous and sanitary wastewaters. The project is estimated to have eliminated 40 gallons of hazardous waste and 200 gallons of sanitary wastewater. Approximately \$2,000 in disposal costs are avoided annually.
Tritium Exit Signs	Source Reduction	800	Mixed Waste	\$99,750	\$20,000	\$79,750	Removed 190 tritium exit signs from service and returned to the manufacturer. Replaced with energy efficient light emitting diode (LED) signs. Project reduced risk of tritium gas release and avoided disposal as mixed waste. Savings from avoided disposal costs estimated at \$99,750 (475 cuft at \$210/cuft), less \$20,000 implementation cost for total savings of \$79,750
Chromotography waste	Source Reduction	782	Mixed Waste	\$164,220	\$30,000	\$134,220	This project, funded by the pollution prevention council, constructed a preparative-scale supercritical fluid chromatograph suitable for Positron Emission Tomography radiotracer purification. This system utilizes an alternate solvent (supercritical CO2) system that allows radiotracer purification to be carried out in an organic-free environment. The primary benefit to using supercritical CO2 as a solvent for tracer purification is that it can eliminate a huge organic waste stream. Total organic waste generated from a single synthesis and purification is less than 200 mL as compared with about 200 mL using conventional HPLC purification. This project has been an enormous success in minimizing organic waste. Waste disposal cost avoidance is estimated at \$164,220 (782 lbs. mixed waste at \$210/lbs.). The project cost was \$30,000.
Shield Block (concrete)	Reuse	100,000	Radioactive Waste	\$27,833	\$0	\$27,833	In excess of 100,000 lbs. of shield block was reused on site by the Collider Accelerator Department as shielding for beamlines. This avoided disposal costs of approximately \$27,833 (estimate 1,113 cubic feet at \$25/cubic foot).
Cooling Water	Reuse	153,000	Radioactive Waste	\$144,000	\$0	\$144,000	Approximately 18,000 gallons (153,000 lbs) of cooling water was reused in the main magnet cooling water system, avoiding disposal as radioactive waste water at a cost of \$8.00/gallon.
Short Half-life waste	Decay in Storage	3950	Radioactive Waste	\$1,575	\$0	\$1,575	Short half-life isotopes, particularly phosphorus-32 and phosphorus-33, are frequently used in life sciences experiments. Wastes generated from these operations were managed in accordance with BNL decay-in-storage requirements, rendering the wastes eligible for volumetric release. Waste disposal cost avoided is estimated at \$1575 (63 cubic feet at \$25.00/cubic foot).
Filters	Decay in Storage	1,920	Radioactive Waste	\$9,312	\$0	\$9,312	Filters from the air handlers in the Linear Accelerator facility become contaminated with beryllium-7, a short-lived isotope eligible for decay. The filters were allowed to decay for over ten half-lives in accordance with the decay in storage requirements. They were surveyed and released as undetectable for disposal as industrial waste. This avoided disposal costs estimated at \$9,312.
Antifreeze	Recycled	1,700	Industrial Waste	\$3,400	\$0	\$5,600	Estimate avoided disposal cost of \$3,400 (1700 lbs at \$2.00/lbs for bulk waste), plus material savings of \$2200.
Oily Waste Water	Source Reduction	6,240	Industrial Waste	\$12,480	\$17,300	\$2,980	This project, funded by the pollution prevention council, installed automatic oil-water separators on compressor blowdown stations. These units capture the oily discharge and save significant labor hours compared to the previous system. Waste disposal cost avoidance is estimated at \$12,480 (6240 lbs at \$2.00/lbs.) and labor savings is estimated at \$7800/yr. The project cost was \$17,300.
Lubricating Oil	Energy Recovery	54,400	Industrial Waste	\$108,800	\$500	\$108,300	Approximately 6,800 gallons of lubricating oils were collected, tested for suitable for use as waste oil fuel, and used for energy production at the Central Steam Facility. This avoided waste disposal costs estimated at \$108,800. Cost of analysis is estimated at \$500.
Cooling Tower Chemicals	Source Reduction	6,375	Industrial Waste	\$0	\$0	\$15,000	Ozone water treatment units were installed on cooling towers at two RHIC experiments to provide biological control of cooling water. These systems eliminate the need for water treatment chemicals (typically toxic biocides), save labor, and reduce analytical costs for monitoring cooling tower blowdown. Savings are estimated at \$15,000/yr.
Measuring and Test Instrumentation	Reuse	2,000	Industrial Waste	\$22,000	\$0	\$82,000	As part of the HFBR facility stabilization project, staff transferred approximately \$60,000 worth of measuring and test equipment to five other departments at BNL. Avoided disposal costs are estimated at \$22,000 (2000 lbs at \$11.00/lb)

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Heavy Machinery	Reuse	12,000	Industrial Waste	\$24,000	\$0	\$174,000	As part of the HFBR facility stabilization project, staff transferred approximately \$150,000 worth of heavy equipment (lathes, milling machines, etc) to the Magnet Division at BNL. Avoided disposal costs are estimated at \$24,000 (12000 lbs at \$2.00/lb)
Pressure equipment	Reuse	1,000	Industrial Waste	\$11,000	\$0	\$51,000	As part of the HFBR facility stabilization project, staff transferred approximately \$40,000 worth of pressure guages, pressure regulators, thermometers, and o-rings to the Collider Accelerator Department at BNL. Avoided disposal costs are estimated at \$11,000 (1000 lbs at \$11.00/lb).
Hydraulic Oil	Source Reduction	6,000	Industrial Waste	\$12,000	\$15,000	\$30,000	This project, funded by the pollution prevention council, replaced hydraulic lines on heavy equipment with steel braided lines and replaced the petroleum based hydraulic oils with bio-based vegetable oils. Hydraulic line breaks were responsible for a significant number of reportable spills and costly response and clean-up. This project reduced the frequency of spills and resulting response and clean-up costs. The vegetable based oil is biodegradable and subject to fewer reporting requirements. Avoided disposal costs are estimated at \$12,000 (6000 lbs at \$2.00/lbs) and savings from reduced response and clean-up costs are estimated at \$33,000. The cost of implementation was \$15,000.
Blasocut Machining Coolant	Recycled/Reused	85,280	Industrial Waste	\$170,560	\$0	\$187,610	Central Shops Division operates a recycling system that reclaims Blasocut machining coolant and supplies it labwide. 10,660 gallons (85,280 lbs.) of Blasocut lubricant were recycled in 2001. Recycling involves aeration, centrifuge, and filtration. Avoids cost of disposal as industrial waste (\$2.00/lbs for bulk waste), plus an avoided cost of procurement of 8 drums of concentrate (\$800/drum) and 213 drums for waste (\$50/drum) for a total savings of \$187,610. Cost of recycle is estimated to be the same as cost of procurement and preparation of proper dilution for use.
Used Motor Oil	Recycled	23,345	Industrial Waste	\$46,690	\$0	\$46,690	Estimate avoided disposal cost of \$46,690 (23,345 lbs. at \$2.00/lbs bulk waste).
Office Paper	Recycled	492,000	Sanitary Waste	\$19,680	\$0	\$19,680	Estimate \$80/ton for disposal as trash.
Cardboard	Recycled	254,000	Sanitary Waste	\$10,160	\$0	\$10,160	Estimate \$80/ton for disposal as trash.
Scrap Metal	Recycled	88,000	Sanitary Waste	\$3,520	\$0	\$3,520	Estimate \$80/ton for disposal as trash.
Bottles/Cans	Recycled	58,600	Sanitary Waste	\$2,344	\$0	\$2,344	Estimate \$80/ton for disposal as trash.
Construction Debris	Recycled	578,000	Sanitary Waste	\$7,225	\$0	\$7,225	Estimate \$25/ton for disposal as trash.
TOTALS		1,954,577		\$1,144,954	\$91,600	\$1,385,989	