FERMILAB

Report to the Director on the Fermilab Environment CY2006

1.0 Introduction

Environmental stewardship continued to be a guiding principle at Fermilab in 2006. That principle was translated into a working reality through the effective deployment of the environmental protection program. The environmental protection program (EPP) establishes policies and procedures to ensure compliance with regulatory requirements imposed by Federal, State and local agencies and with Department of Energy (DOE) orders. In addition, the EPP provides for the measurement and interpretation of the impact of Fermilab operations on the public and the environment via its comprehensive environmental monitoring and surveillance program.[1]

Surveillance and monitoring tasks are conducted to confirm compliance with standards and permit limits as well as ensure early detection of an unplanned pollutant release. The location and frequency of sampling are based on established routines, operational considerations and process assessment as well as historic levels of pollutants found in each location. Sampling points are selected based on the potential for adverse impacts.

To evaluate the effects of Fermilab operations on the environment, samples of effluents and environmental media such as soil and groundwater are collected on the site and at the site boundary. These samples are analyzed and results are compared to applicable guidelines and standards. The status of environmental protection activities and the progress on environmental restoration, waste management and corrective action activities are discussed in this report.

During 2006, Fermilab responded to a Notice of Violation that was issued by the Illinois Environmental Protection Agency (IEPA), regarding the November 2005 detection of tritium in Indian Creek which discharges off site. After years of monitoring, this was the first time that tritium had been detected leaving the site. Although the levels found were far lower than the federal drinking water standards, Fermilab self-reported this situation to the IEPA. This tritium did not constitute a health risk to Fermilab employees or neighbors and the effect on the environment was nominal. However, the Lab wants to keep tritium levels as low as reasonably achievable (ALARA) both now and in the future.

Fermilab maintains that there was no *significant adverse* impact on the environment[2]; or on public safety during 2006.

In order to keep tritium levels ALARA, in 2006 Fermilab identified and isolated the major source of the tritium found in the Indian Creek discharge and Fermilab ponds, revised its water monitoring program, appointed a Surface Water Quality Task Force to monitor and evaluate the issue, consulted the Fermilab Community Task Force for Public Participation, and developed long-term strategies for minimizing tritium levels. This will address the planned increase in research activities that produce tritium as a by-product. Fermilab is committed to going beyond merely satisfying the regulatory limits and will reduce tritium discharges to ALARA; keep the public fully informed; and engage the public in the establishment of goals and formulation of plans (for further details concerning this issue, please see Section 2.0 *Significant Environmental Activities)*.

2.0 Significant Environmental Activities

Tritium in Surface Water
In November 2005, during routine surface water surveillance monitoring, Fermilab detected for the first time low levels of tritium in Indian Creek (the highest level was 3.4 pCi/ml). Upon the discovery of tritium, an investigation was begun to determine the cause and extent of this radionuclide in surface waters on site. Low levels of measurable concentrations of tritium were also found in the Main Injector cooling ponds and several other ponds associated with

the Industrial Cooling Water (ICW) pond system. The DOE notified the U.S. Environmental Protection Agency, IEPA and the Illinois Emergency Management Agency (IEMA) about the tritium found in Indian Creek. Fermilab also informed the immediate downstream neighbors of the situation. In early December Fermilab launched a website to help keep neighbors and the pubic informed of activities concerning this situation. Also in December, at Fermilab's invitation, IEMA took samples to confirm the presence of tritium in Indian Creek and the cooling ponds.

A preliminary investigation into the source of tritium in the creek led to the identification of leaks associated with a self leveling piping structure that connects two cooling ponds adjacent to the creek. To investigate and address the issues further, the Fermilab Director appointed a Surface Water Quality Task Force. The goal of the Task Force was to identify the potential sources of tritium and to apply all reasonable measures to keep releases of tritium below regulatory limits and ALARA. The Task Force is chaired by a Fermilab Associate Director and has membership that includes representation from all affected operational areas of the lab. The task force subsequently determined that the elevated levels of tritium in the cooling ponds could be primarily attributed to the higher beam intensity required to operate the NuMI beamline.

In February 2006, the IEPA performed a site inspection related to the tritium discharge. Fermilab was subsequently issued a Notice of Violation due to the discharge. In May, Fermilab addressed the violation notice by providing documented information to IEPA in the form of a Compliance Commitment Agreement (CCA). The four key elements addressed in the response were: 1) to provide assurance to IEPA that Fermilab was adequately protecting Class I ground water from tritium contamination, 2) demonstrate that modifications had been made to the ICW system to prevent future releases of tritium from non-permitted discharge points, 3) provide IEPA, through the lab's NPDES permit application process, additional information regarding the generation and release to surface waters of radiochemicals (primarily tritium), and 4) demonstrate to IEPA that discharges from non-permitted discharge points had ceased. In June 2006 the lab was informed by IEPA that they had accepted the terms of the CCA.

Element 3 of the CCA required Fermilab to submit additional, separate information to IEPA under the current site specific NPDES permit. This information was submitted in April 2006. IEPA has a pending permit renewal application from Fermilab dated June 2004. As of December 2006, IEPA has not acted on the additional information supplied for the NDPES permit.

In December 2005 the NuMI project began collecting condensate generated from the target chase closed air system for disposal. This condensate, produced at a rate of about 2 gallons per hour, accounted for half of the tritium being introduced to the sump water discharged from the Neutrinos at the Main Injector (NuMI) facility. During the 2006 maintenance shutdown, the Accelerator Division (AD) rerouted the discharges from sump pumps in the Booster and Antiproton enclosures so that they now discharge on the inside of the Tevatron berm instead of into drainage ditches that could eventually flow into Indian Creek. This was intended to reduce the possibility that tritium could be unintentionally released to *waters of the state*. Also in 2006, the AD External Beamlines Department installed a dehumidification system in the NuMI Target Hall in an effort to reduce tritium levels in the decay pipe walkway. This in turn reduced tritium levels in the NuMI/MINOS sump and holding tank. The dehumidification system is made up of five Munter dehumidification units located on the northeast side of the NuMI Target Hall. The Munter units draw air from the Target Hall and dry make-up air from the primary air supply duct to the Target Hall from supply units on the surface. The dehumidified air stream from the Munter units is sent into the decay pipe walkway and drawn approximately 1100 feet downstream of the Target Hall and vented upward in exhaust shaft EAV-2. The humid air stream from the Munter units is heated to approximately 140 degrees and vented via newly installed ductwork and an exhaust fan on survey sight riser #3 (SR-3).

Other measures undertaken in this effort include contracting personnel from the Lawrence Berkeley National Laboratory Earth Sciences Department to assist with hydrogeological modeling, modifying the piping connecting the NuMI holding tank to the ICW system to get more NuMI water evaporated at the Central Utilities Building, and developing a surface water management strategy.

The result of these actions was that no measurable tritium has been detected in off-site samples since February 2006.

Environmental Management System (EMS) Implementation
During 2006, the EMS data questionnaire was developed by the DOE Office of Management and Budget (OMB) to monitor progress of federal agencies in EMS implementation. DOE chose the time frame for 2006 reporting to coincide with the fiscal year reporting that EPA will require by October 2008. EMS status information for Fermilab

was submitted by the December 2006 deadline and used to generate the OMB Environmental Stewardship Scorecard for DOE. In mid 2006, Fermilab decided that its mission would be improved by acquiring full ISO14001 third-party certification. The laboratory began the effort in late July by developing a request for proposal that was sent to prospective subcontractors for the purpose of conducting the necessary third-party certification registration. A contract was awarded to NSF in late September to perform those duties. NSF performed two audits of the Lab's EMS in 2006, a Desk Audit in late October and a Readiness Review Audit in December. Findings that resulted from the December Readiness Review were addressed in a Corrective Action Request Plan. The Lab anticipates completion of the certification process in 2007.

Oil Spill Associated with Heat Exchanger Failure
Fermilab continued through 2006 to implement corrective actions in response to an oil spill that occurred in August of 2004 resulting from the failure of a heat exchanger associated with a Central Helium Liquefier (CHL) Coldbox-2. Approximately 27 gallons of mineral oil were released into Bull Rush Pond where it was contained and cleaned-up. The details of the corrective actions can be found in Section 4.15, Oil Spill Prevention. Although not related directly to the 2004 spill, Accelerator Division upgraded all of its indoor spill response kits by updating their contents and improving their visibility and accessibility. Awareness of the kits was also enhanced through changes in the emergency warden training program.

2.1 Other Environmental Issues

Eleven National Environmental Research Park (NERP) projects were in differing stages of progress during 2006. The projects along with the name of the sponsoring institution are listed below:

- Assessment of the Impact of Biological Controls on Garlic Mustard (*Alliara petiolata*) and on Non-target Species in Forest Communities, Argonne National Laboratory
- Bird Surveys at Fermilab, Fermilab
- Feedbacks between Plants, Mycorrhizal Fungi, and Soil Nutrient Dynamics, Argonne Nationa Laboratory
- Effects of Tree Removal on Recovery of Ground Cover in Big Woods at Fermilab, Fermilab
- Bat House Project at Fermilab, National Speleological Society
- Translocation of Silver-bordered Fritillary, Bolaria selene at Fermilab, Peggy Notaebart Museum
- Assessing Carbon Cycling in Restored Grasslands using Stable Isotopes, Argonne National Laboratory
- Investigation of Carbon Dioxide and Nitrogen Fluxes in Terrestrial Ecosystems at Fermilab, Argonne National Laboratory
- Long term ecological studies at Fermilab, Argonne National Laboratory
- Hydrologic and Plant Community Controls on Soil Carbon Accreal after Cessation of Agriculture, Argonne National Laboratory
- Ascomycete Fungi in Bison Dung from the Fermilab Bison Herd, The Field Museum

The Laboratory's Ecological Land Management Plan[3] was updated in 2006. The plan can be viewed at www-esh.fnal.gov/ELM/ELM_Plan_2006.htm. Existing prairie tracts were enriched with forbs and burned or mowed to discourage intrusion of brush, trees and exotic plants.

The moratorium, issued by the Secretary of Energy in July 2000, on recycling of scrap metals from posted radiological or radioactive materials areas, remained in effect throughout 2006. Measures continued to be taken throughout the year at Fermilab to separate materials subject to this moratorium. Due to this, materials that were considered non-radioactive according to Fermilab's DOE-approved release criteria and which had been recycled prior to the moratorium continued to be amassed.

Fermilab carries out wildlife management to the extent necessary to protect the primary mission of the Laboratory and to preserve the Fermilab ecosystem. The Lab has a "nuisance animal" permit issued by the Illinois Department of Natural Resources (IDNR) that allows for the trapping and elimination of these nuisance animals. During 2006, five animals were destroyed. In addition, Fermilab intensively manages the population of whitetail deer on site to preserve the ecosystem. Fermilab contracts with the U.S. Department of Agriculture Wildlife Services Group to reduce the

herd to an optimum number annually. This activity requires approval and permitting from IDNR; during 2006, 46 whitetail deer were removed.

2.2 Environmental Management Systems (EMS)

Executive Order (EO) 13148, *Greening the Government through Leadership in Environmental Management*, required each Federal agency to implement an Environmental Management System (EMS) at its facilities by December 31, 2005. DOE issued Order 450.1 to ensure execution of EO 13148 at all DOE facilities. An EMS is a continuous cycle of planning, implementing, evaluating, and improving processes and actions undertaken to achieve compliance, pollution prevention, and continuous environmental improvement goals. In addition, a comprehensive EMS will assimilate the principles of the Integrated Safety Management System (ISMS) into an Integrated ES&H Management System (IES&HM), addressing facility operations hazards that have the potential to impact individuals and/or the environment.

In April and July of 2005, DOE Chicago Office (CH), Safety and Technical Services, reviewed the implementation status and progress of the EMS at Fermilab. In September of 2005, Fermilab's EMS was evaluated by a three member assessment team comprised of individuals from the DOE Chicago Operations Office (CH), the DOE Argonne Site Office, and Argonne National Laboratory, to provide the Fermilab Site Office (FSO) with a basis for formally declaring that Fermilab had implemented the EMS related requirements contained in EO 13148 and DOE Order 450.1. The review team issued a positive recommendation to the FSO Manager concerning the EMS Self-Declaration Process for Fermilab. In December of 2005, the FSO Manager stated, in a letter to Ray Orbach, DOE Office of Science Director, that "Fermilab fully conforms to the EMS requirements of DOE Order 450.1."

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3.0 Environmental Monitoring and Surveillance

The goal of the Fermilab Environmental Monitoring Program (EMP) is to assist Laboratory management in decision-making by providing data relevant to impacts that Fermilab operations have on the surrounding environment. The EMP consists of effluent monitoring to confirm compliance with permits, generally at a particular point. Environmental surveillance is conducted at various locations to intercept the pathway of potential pollutants to receptors such as plants, animals or members of the public. Fermilab collects environmental data for reporting purposes or whenever it is necessary or useful in conducting the business of the Laboratory. Line organizations have the responsibility to recognize and understand the environmental aspects of their operations and to conduct their work in an environmentally sound manner.

The pathways available for movement of radioactive materials and chemicals from Fermilab operations to the public are the atmosphere, surface water, groundwater, and via the roadways (transportation of materials to and from the site). Environmental surveillance consists of collecting and analyzing samples of various media and measuring penetrating radiation within and at the site boundaries.

Ground and surface waters are sampled at locations near operating areas, potential contamination sources and along potential transport pathways. In addition to air and water surveillance, samples of soil are collected and analyzed for

radioactivity to ascertain whether there is build-up of radioactive materials in the environment due to long-term operations.

Surface water, air, groundwater, soil and sediment samples are analyzed for radionuclide concentrations. Surface waters are also monitored for potential chemical constituents. While levels of penetrating radiation are measurable near operational areas on the site, the levels decrease rapidly with distance from the sources. External penetrating radiation and airborne emissions are normally below instrument detection levels at the site boundary and must be estimated to provide information about the maximum potential radiation doses to offsite populations. The results of the environmental surveillance program are interpreted and compared with environmental standards where applicable. The Fermilab Environmental Monitoring Plan, which is maintained by the ES&H Section, provides more details.

The DOE advocates that sites address radiological protection of aquatic and terrestrial biota and has recommended that facilities review their monitoring programs for opportunities to improve and communicate their results. In response, Fermilab has used DOE's technical guidance (DOE-STD-1153-2002) and companion tool, the RAD-BCG Calculator, to evaluate the Laboratory's effect on both aquatic and terrestrial biota. On an annual basis soil and sediment samples are collected throughout the site in conjunction with water samples collected from sumps, ditches, and creeks according to routine sampling schedules. For the calendar year 2006, all locations analyzed passed the site screens. Thus, the radiological protection of biota is considered to be adequate.

3.1 Air Quality

Fermilab's Lifetime Operating Air Pollution permit issued by the Illinois Environmental Protection Agency (IEPA) under the Clean Air Act includes a *National Emissions Standards for Hazardous Air Pollutants* or NESHAPs element, which covers airborne radionuclides. In addition, the permit takes into account those criteria pollutants such as particulate matter, nitrogen oxides, carbon monoxide, volatile organic materials and sulfur oxides associated with the operation of various pieces of equipment.

Airborne radionuclides are normally released to the atmosphere from operating target stations. Measures, to keep these releases ALARA, are incorporated into the operating processes and procedures at these facilities. Monitoring is conducted at targeting areas where air emissions are considered a significant contributor to the overall transport of radioactive materials offsite. In addition, a small quantity of airborne radionuclides is contributed by the operation of the Magnet Debonding Oven. The air permit was revised in 1991 by the IEPA to include the Main Injector as a source of radioactivation at Fermilab. The air permit application stated that total activity released from the Lab would average no greater than 2000 Curies in a year with a maximum of 9000 Curies in a year.

The radiation doses potentially received by the offsite public due to Fermilab operations are calculated from data gathered through environmental surveillance of the onsite sources. Selected vent stacks are monitored directly with stack monitors and indirectly by taking soil samples in the vicinity of the stacks. The dose for the air pathway is calculated using a Gaussian plume computer simulation model called Clean Air Assessment Package-1988 (CAP-88PC2). This model was created by the USEPA to predict the movement of airborne radionuclides and its use is dictated by regulations governing hazardous air pollutants at 40 CFR 61. Maximum calculated concentrations off-site are predicted to be below the level that could be detected by direct monitoring.

Fermilab is not a significant source of chemical air pollution. The permits cover emissions caused by open burning conducted for prairie/land management and fire extinguisher and firefighter training, a magnet debonding oven, a fuel dispensing facility, a vapor degreaser, radionuclide emission stacks, a 2200 horsepower emergency standby diesel fuel fired generator, the Collider Detector at Fermilab (CDF) and the Main Injector Particle Production (MIPP) gas circulating systems, and the operation of several natural gas-fired boilers. Pollutant levels are estimated based on the knowledge of the processes that generate them and the characteristics of individual pollutants. The results are submitted to the Illinois Environmental Protection Agency in an annual air emissions report.

3.1.1 Radioactive Air Emissions

Operation of the debonding oven, while radioactive components are being burned, is a potential source of tritium. In 2006, the debonding oven did not burn any radioactive magnets (there were other magnets burned); therefore there was no release of tritium from this source. The Anti-Proton Area stack, used in Colliding Beam operations, and the MiniBooNE and NuMI stacks are estimated to have released a total of approximately 84.87 Curies in 2006. These radioactive air emissions were approximately 4.2% of the annual average (2000 Curies) expected from operations as acknowledged in the current air pollution permit application on file with the Illinois Environmental Protection Agency (IEPA). No detectable levels of radionuclides reached the site boundaries. Doses to the public from emissions in 2006 continued to be well below the Environmental Protection Agency (EPA) standard of 10 mrem/year and also much less than the EPA's continuous monitoring threshold of 0.1 mrem/year. Using the CAP-88PC2 gaussian dispersion model, the highest dose equivalent to any member of the public was estimated to be 0.0245 mrem.

Fermilab's 2006 Radionuclide Air Emissions Annual Report was submitted to the DOE FSO in May 2007. The report is distributed by the DOE FSO to the USEPA and IEPA.

3.1.2 Non-Radioactive Air Emissions

The IEPA decided in late 1996 that the level of air emissions at the Laboratory did not warrant the issuance of a Federally Enforceable State Operating Permit (FESOP) and therefore issued a Lifetime Operating Permit to Fermilab in 1999. In 2000, the permit was revised to add a vapor degreaser to the previously permitted air pollution sources and in 2004 to add a 2200 horsepower emergency standby diesel fuel fired generator located at the Feynman Computing Center, and again in 2006 to include both the CDF and MIPP gas circulating systems. The current permit covers the magnet debonding oven, three natural gas-fired boilers at the Central Utility Building (CUB), a 12,000-gallon gasoline storage tank with a stage 1 and stage 2 vapor balance system, accelerator tunnel ventilation stacks, a vapor degreaser at Industrial Building 3, the standby diesel generator, and the CDF and MIPP gas circulating systems. Permit conditions require the monthly logging of fuel consumption for covered fuel combustion sources and solvent usage at the degreaser. Source operations were reviewed by Fermilab personnel again this year to ensure that permitted equipment continued to operate and be maintained in accordance with permit conditions. The Annual Air Emission Report for 2006, an estimate of criteria pollutant emissions, was submitted to the Illinois Environmental Protection Agency (IEPA) in May 2007.

3.2 Penetrating Radiation

Operation of the Fermilab accelerator and associated beamlines produce ionizing radiation such as muons. Beamlines and experiments are designed so that most of the radiation has ranged out before reaching the ground surface. The remaining radiation that emerges above the surface presents a small potential for radiation dose. Small muon fields have been measured in conjunction with the operation of the Fixed Target beamlines in the past. These beamlines were not operated in 2006. Since the removal of the Main Ring from the Tevatron tunnel, the A0 beam absorber replaced the C0 beam absorber as the primary absorber. Unlike the C0 absorber, the Tevatron beam has to be bent down into the ground to be directed to the A0 absorber. Due to this beamline feature, the ground absorbs the muons emerging from the A0 absorber. Therefore, no muons are detected from its operation. Both the MiniBooNE and NuMI experiments have the potential to produce measurable muon flux; however, the 8 GeV energy protons used in MiniBooNE are too low in energy to produce muons that can escape the bulk shielding surrounding the experiment. The NuMI beamline bends the beam down so that the muons produced are absorbed deep underground.

Another potential source of exposure to ionizing radiation is the centralized radioactive materials storage area referred to as the Railhead. This source of penetrating radiation was monitored continuously in 2006 by a large ionization chamber located in the Railhead colloquially called a 'Hippo.' The Hippo measurements are supplemented by periodic onsite surveys. Based on measurements made in 2006, it is estimated that radioactive materials stored at the Railhead contributed a dose equivalent at the site boundary in 2006 of approximately 0.166 mrem. The maximum radiation dose equivalent to an individual at the nearest offsite house was similarly estimated to be approximately 0.029 mrem in 2006.

3.3 Surface Water Quality

Fermilab discharges liquid effluent to surface water bodies and to sanitary sewers. The Lab holds National Pollutant Discharge Elimination System (NPDES) permits that govern discharges to surface water from stormwater runoff, cooling water, and effluents from various onsite construction projects. In addition to monitoring for the physical and chemical parameters required by NPDES permits, samples of surface water are taken annually from selected water bodies and analyzed for radionuclides. These surface waters are sampled for radionuclides based upon their potential for contamination. Aqueous process wastewaters are directed to sanitary sewers and ultimately discharged to publicly owned treatment works (POTWs) in Batavia and Warrenville. Wastewater discharges are controlled by criteria set forth in the Fermilab Environment, Safety, and Health Manual Chapter 8025.

3.3.1 Radioactive Releases to Surface Water

In November 2005, during routine surface water surveillance monitoring, Fermilab detected for the first time low levels of tritium in Indian Creek (the highest level was 3.4 pCi/ml). Upon the discovery of tritium, an investigation was begun to determine the cause and extent of this radionuclide in surface waters on site. Low levels of measurable concentrations of tritium were also found in the Main Injector cooling ponds and several other ponds associated with the ICW pond system. DOE notified the U.S. Environmental Protection Agency, IEPA and the Illinois Emergency Management Agency (IEMA) about the tritium found in Indian Creek. Fermilab also informed the immediate downstream neighbors of the situation. In early December Fermilab launched a website to help keep neighbors and the pubic informed of activities concerning this situation. Also in December, at Fermilab's invitation, IEMA took samples to confirm the presence of tritium from Indian Creek and the cooling ponds.

A preliminary investigation into the source of tritium in the creek led to the identification of leaks associated with a self leveling piping structure that connects two cooling ponds adjacent to the creek. To investigate and address the issues further, the Fermilab Director appointed a Surface Water Quality Task Force. The goal of the Task Force was to identify the potential sources of tritium and to apply all reasonable measures to keep releases of tritium below regulatory limits and ALARA. The Task Force is chaired by a Fermilab Associate Director and has membership that includes representation from all affected operational areas of the lab. The task force subsequently determined that the elevated levels of tritium in the cooling ponds could be primarily attributed to the higher beam intensity required to operate the NuMI beamline.

In February 2006, the IEPA performed a site inspection related to the tritium discharge. Fermilab was subsequently issued a Notice of Violation due to the discharge. In May, Fermilab addressed the violation notice by providing documented information to IEPA in the form of a Compliance Commitment Agreement (CCA). The four key elements addressed in the response were: 1) to provide assurance to IEPA that Fermilab was adequately protecting Class I ground water from tritium contamination, 2) demonstrate that modifications had been made to the ICW system to prevent future releases of tritium from non-permitted discharge points, 3) provide IEPA, through the lab's NPDES permit application process, additional information regarding the generation and release to surface waters of radiochemicals (primarily tritium), and 4) demonstrate to IEPA that discharges from non-permitted discharge points had ceased. In June 2006 the lab was informed by IEPA that they had accepted the terms of the CCA.

Element 3 of the CCA required Fermilab to submit additional, separate information to IEPA under the current site specific NPDES permit. This information was submitted in April 2006. IEPA has a pending permit renewal application from Fermilab dated June 2004. As of December 2006, IEPA has not acted on the additional information supplied for the NDPES permit.

During the 2006 maintenance shutdown, the Accelerator Division rerouted the discharges from sump pumps in the Booster and Antiproton enclosures so that they now discharge on the inside of the Tevatron berm instead of into drainage ditches that could eventually flow into Indian Creek. This was intended to reduce the possibility that tritium could be unintentionally released to waters of the state. Also in 2006, the AD External Beamlines Department installed a dehumidification system in the NuMI Target Hall in an effort to reduce tritium levels in the decay pipe walkway. This in turn reduced tritium levels in the NuMI/MINOS sump and holding tank. The dehumidification system is made up of five Munter dehumidification units located on the northeast side of the NuMI Target Hall. The Munter units draw air from the Target Hall and dry make-up air from the primary air supply duct to the Target Hall from supply units on the surface. The dehumidified air stream from the Munter units is sent into the decay pipe walkway

and drawn approximately 1100 feet downstream of the Target Hall and vented upward in exhaust shaft EAV-2. The humid air stream from the Munter units is heated to approximately 140 degrees and vented via newly installed ductwork and an exhaust fan on survey sight riser #3 (SR-3).

3.3.2 Non-Radioactive Releases to Surface Water

Monitoring for non-radiological chemical constituents in surface water was limited to NPDES permit parameters (temperature, flow, TSS, TDS pH, chlorine, chloride and sulfate) this year. Discharge Monitoring Reports for six different outfalls were submitted monthly to the IEPA. In 2006 there were no exceedances of discharge limits to *waters of the state*.

3.3.2.1 Cooling Water System

An NPDES permit authorizes the discharge of commingled cooling water and stormwater runoff to surface waters through outfalls to Kress, Indian and Ferry Creeks. Due to the presence of the RCRA-permitted (Resource Conservation and Recovery Act) Hazardous Waste Storage Facility on-site, the NPDES permit also regulates stormwater discharges from designated solid waste management units (SWMUs). The Stormwater Pollution Prevention Plan required by this NPDES permit is periodically modified to reflect changes that occur as part of the RCRA Facility Investigation (RFI) of the SWMU sites. Fermilab's site-wide NPDES permit dictates that water temperature, pH, and flow be monitored at all three outfalls; chlorine concentration be monitored at the Kress and Indian Creek outfalls; and total dissolved solids, chlorides and sulfates be monitored at the Indian Creek outfall. The monitoring results are reported to the IEPA on a monthly basis.

Because of concerns about discharging low levels of tritium, the surface water bodies were managed very differently during 2006. Of the three potential discharge points from Fermilab surface water to *waters of the state*, only discharge to Kress Creek was allowed during 2006. Extensive changes to pumping and piping configuration were effected to move water from the Indian Creek and Ferry Creek watersheds to Casey's Pond. Main Ring Lake elevation was controlled so that there was no movement of process water to the eastern lakes (i.e., Lake Law and A.E. Sea). Swan Lake (headwaters of Indian Creek) was maintained at a low level to maintain all water on-site. Discharges from Casey's Pond to Kress Creek were permitted only when there was adequate flow in the creek to dilute tritium to a non-detectable level.

In 2006 Fermilab began, for the first time, treating the ICW system in order to eliminate zebra mussels. The infestation of mussels had been previously documented and it was determined that their presence threatened to hamper site operations. The treatment was approved by the IEPA and consisted of a chemical feed of EVAC, a Nalco product, to the ICW system at the Casey's Pond Pump house. In May, during a scheduled flush of the system, FESS Operations coordinated the treatment of more than twenty miles of piping that connects the ICW system. Subsequent flushing of the system, to remove dead mussels, occurred over the following 5-week period. An additional preventative treatment to the ICW system occurred the following September.

3.3.2.2 Releases to Sanitary Sewers

An Individual NPDES permit allows Fermilab to pre-treat and release effluent from the Central Utility Building (CUB) regeneration process to the City of Batavia sanitary sewer system. The pretreatment permit requires the collection and analysis of composite process effluent samples for specified metals on a quarterly basis. Samples are also collected and analyzed from each discharge for accelerator-produced radionuclides in order to confirm released radioactivity meet DOE guidelines. In 2006, 57,500 gallons of process wastewater were discharged to the Batavia sewer system. Two analyzed samples indicated levels of copper that were slightly above the permit allowed limit; this was reported to the state. All other levels were in compliance. Due to this situation, the entire process was assessed, and minor modifications to plumbing and procedures were instituted to ensure that every batch of treated water is in compliance. All effluent discharges were in compliance with the specified levels in the Department of Energy Derived Concentration Guide for radionuclides. A total of 0.268 mCi of tritium and 257 uCi of 7Be were released to the sanitary sewer from the CUB during 2006.

Monitoring stations, located at the site boundary, sample sewer discharges to the municipalities of Batavia and Warrenville. The discharge at these locations is a mixture of all effluents contributing to that sanitary sewer system. Analytical results are compared to municipal discharge limits to track compliance. In the past year, the Batavia sewer sampler revealed three exceedances of the iron discharge limit of 5.0 mg/l. The maximum level measured was 9.89 mg/l. These excursions were likely due to the aging pipe infrastructure and are of minimal impact to the Batavia treatment works. Beginning with the August sample of 2005, composited during the month of July, tritium was first detected at the Batavia monitoring station. Detections continued for the remainder of the year with a maximum activity of 4.1 pCi/ml measured from a grab sample collected in September. There were three months in 2006 where tritium was detected statistically above the detection limit, with the highest concentration of 2.0 pCi/ml in the January sample.

3.4 Groundwater Quality

The Illinois Environmental Protection Agency (IEPA) publishes groundwater quality standards[4] and defines Class I groundwater as a non-degradable resource, which is to be highly protected. The water that is located in or near the dolomite aquifer 50 to 70 feet below the ground surface of Fermilab is classified as Class I groundwater according to criteria published by the IEPA.[5] Water in the overlying Quaternary deposits has been demonstrated to be Class II water and therefore has less stringent standards.

Four background monitoring wells that are upgradient to Fermilab operations continued to be utilized in 2006 to obtain representative samples of the upper Class I groundwaters for chemical and radiochemical analysis. Ten wells at the Central Utility Building (CUB) Tile Field and seven at Meson Hill were sampled as part of ongoing RCRA Facility Investigation (RFI) corrective actions at these locations. During 2006, the Meson and Neutrino Experimental Area was removed from the RFI as a Solid Waste Management Unit; however, four wells in this region continue to be monitored under the lab's environmental surveillance program with the results reported to the IEPA annually for informational purposes. Over forty piezometers (pore-water pressure measuring instrument) were used to gather information on the direction of groundwater flow sitewide. The information collected is used in modeling the transport of potential contaminants from past and present operational areas of concern. Piezometers that had been installed as part of the NuMI site characterization were monitored to assist Fermilab in planning for groundwater protection at that facility. One location is used to monitor for NuMI operational impacts to the Class I aquifer. Fermilab continued in 2006 to analyze groundwater issues associated with this project that involved construction within the dolomite aquifer.

Thirty six of one hundred and two on-site groundwater monitoring locations were sampled during the year for radionuclide or chemical parameters. The remaining locations were available for water level monitoring.

3.4.1 Groundwater Characterizations

During 2006 the geology and hydrogeology of a region in the southwest portion of the Main Ring was characterized as part of the planning phase of a proposed construction project. The characterization included the installation of three nests of piezometers to monitor saturated conditions of the Quaternary deposits and the upper Silurian-aged bedrock.

In addition, a Southern Illinois University graduate student working at the Lab during 2006 completed a thesis titled, *Development of a Solute Transport Model to Characterize the Movement of Sodium Chloride through Glacial Sediments at Fermi National Accelerator Laboratory in Batavia, Illinois*. The thesis outlined the development of a two-dimensional numerical transport model to simulate the extent and rate of vertical migration of sodium chloride through the glacial units at the CUB Tile Field to the underlying Class I resource groundwater.

3.4.2 Monitoring Well Modification and Abandonment Activities

There were no monitoring well modifications or abandonment activities during 2006.

3.4.3 Radionuclides in Groundwater

The Department of Energy groundwater concentration guide and the Illinois Class I groundwater standard for tritium is 20 pCi/ml. 35 samples were taken from 16 locations for analysis. Radionuclides were not detected in any samples taken during 2006 in Class I groundwater.

3.4.4 Chemicals in Groundwater

Two rounds of groundwater samples were collected for chemical analysis in 2006 at two Solid Waste Management Units (SWMUs) as required by the Resource Conservation and Recovery Act Facility Investigation (RFI). (See Section 4.12.1 RFI Activities.)

Four samples were taken from four background monitoring wells for chemical analysis in 2006. These wells monitor groundwater coming onto Fermilab. Chemical analysis of groundwater from monitoring well BMW1 showed total and dissolved sulfate slightly above the Class I Groundwater standard.

4.0 Compliance with Specific Environmental Regulations

Below is a summary of Fermilab compliance with key environmental regulations.

4.1 Clean Air Act

Open burn permits to allow prairie/land management burning, maintenance of Meson Hill, and fire extinguisher training were renewed by the IEPA in 2006. The annual air emissions report for 2006 was submitted to the IEPA in April 2007 and the annual radionuclide emissions report was submitted to the USEPA in June 2007.

In 2006 an estimated 84.87 Curies were released in conjunction with the operation of the Fermilab Anti-Proton Areas stack (used in Colliding Beam operations) and the MiniBooNE and NuMI Project stacks. The magnet debonding oven, a potential source of tritium, did not burn any radioactive magnets in 2006. The CAP-88PC2 dispersion model calculated the maximum dose equivalent delivered to a member of the public (at the boundary of the lab) to be 0.0245 mrem/year due to 2006 Fermilab operations. This approximate 13% increase from the 2005 maximum dose equivalent of 0.0216 mrem/year was due to the inclusion of more conservative estimates of tritium released from both NuMI and MiniBooNE exhaust stacks in the calculations and also due to a 70% increase in total Curies released. The collective effective dose equivalent for 2006 was estimated to be 0.135 person-rem.

Fermilab is registered with the Clean Fuel Fleet Program (CFFP); one of several programs the IEPA has implemented to help improve air quality in the Chicago ozone non-attainment area.

4.2 Underground Storage Tanks

No compliance issues were identified in 2006. The three Underground storage tanks (USTs) in use at the Fermilab Site 38 Fuel Dispensing Facility were operated and maintained per current UST standards prescribed by the USEPA (40 CFR 280.80) and the Illinois State Fire Marshall.

4.3 The Endangered Species Act of 1973

No compliance issues were identified in 2006.

4.4 Executive Order 11988, “Floodplain Management”

No compliance issues were identified in 2006.

4.5 Clean Water Act Section 404 (and Executive Order 11990, "Protection of Wetlands")

Pre-evaluation of Fermilab activities in wetlands continued to be accomplished through the NEPA and construction design review processes. The Lab continued to use task manager/construction coordinator training to instruct participants in how to ensure that potential work areas are screened for the presence of wetlands and to be aware of all aspects of environmental compliance management.

During 2006, Fermilab maintained a permit for the NuMI project that was issued as a requirement of Section 404 of the Clean Water Act although all activities associated with this permit are finished. Fermilab has requested closure of this permit from the Illinois EPA; however, this has not yet been granted. An additional Section 404 permit, that covered construction of the access road from the Lederman Center west to the MiniBooNE parking lot, remains active in case further construction on this access road is deemed necessary.

4.6 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

In 2006, the use of pesticides and herbicides at Fermilab was handled in accordance with FIFRA.

4.7 Illinois Department of Natural Resources "Rules for Construction and Maintenance of Dams"

Fermilab holds an Illinois Department of Natural Resources (IDNR) issued permit that classifies the Main Injector berm as a small *Class III* dam. The dam provides limited flood control to areas downstream from the Lab in the Indian Creek watershed. On a five-year cycle Fermilab is required to perform a comprehensive inspection and file a detailed report on the condition of this structure. The last comprehensive inspection was conducted in April of 2003. Only minor maintenance issues were discovered then and all of those were addressed at that time. In addition, a visual examination of the Class III dam is conducted annually by the Lab. No action items were identified during the 2006 examination.

4.8 The Migratory Bird Treaty Act

Fermilab possesses a permit (Class C Nuisance Wildlife Control Permit) issued by the IDNR (acting for U.S. Fish and Wildlife Service) that allows for the destruction of Canada geese nests in the vicinity of the Children's Center, if they become a safety hazard. The permit allows the Lab to destroy up to ten nests each year. During 2006, three nests containing a total of five eggs were destroyed.

4.9 National Environmental Policy Act (NEPA)

Fermilab met the requirements of this Act by continuing to implement a program of reviewing all activities for compliance as set forth in the Fermilab Environment, Safety and Health Manual (FESHM) Chapter 8060. FESHM Chapter 8060 – NEPA Review Procedure – was revised in 2003 to clarify when NEPA review was required and specifically what the review should entail; the approach to determining NEPA applicability was refined and several definitions were improved upon. DOE approved three projects for Fermilab as being categorically excluded (CXs) from further review in 2006 and an Environmental Assessment was initiated for the proposed NuMI Off-Axis v Appearance Experiment.

Categorical exclusions are categories of actions that do not individually or cumulatively have a significant effect on the human environment and for which, therefore, neither an environmental assessment nor an environmental impact statement is required; DOE's CXs are listed in Appendices A and B to Subpart D of its NEPA regulations found at 10

CFR Part 1021. In applying one of these CXs to a specific proposed action, DOE must determine that: (1) the proposed action fits within a class of actions listed in the regulations, (2) there are no extraordinary circumstances related to the proposal that may affect the significance of its environmental effects, and (3) the proposal is not connected to other actions with potentially significant impacts, related to other proposals with cumulatively significant actions, or an improper interim action. An Environmental Assessment is a concise public document for which a Federal agency is responsible that includes brief discussions of the need for the proposal, possible alternatives, environmental impacts of the proposal and alternatives, and a listing of agencies and persons consulted that serves to: (1) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; (2) aid an agency's compliance with the Act when no environmental impact statement is necessary; and (3) facilitate preparation of a statement when one is necessary.

4.10 National Historic Preservation Act (NHPA), Archaeological Resources Protection Act, Native American Graves Protection and Repatriation Act (NAGPRA) of 1990

Compliance with these Acts was accomplished through the NEPA review process that included an evaluation of all proposed land-disturbing projects in 2006 to assess any potential impacts on historic resources. No compliance issues were identified in 2006.

A DOE requested Cultural Resources Management Plan (CRMP) following guidelines outlined in DOE Publication DOE/EH-0501, was prepared and completed for Fermilab in 2002. The CRMP assures continued compliance with the above listed Acts by providing a comprehensive overview for the locations and status of all archaeological resources within the Fermilab site boundaries thereby facilitating future NEPA reviews.

Fermilab submitted its annual questionnaire on 2006 Federal archaeological activities to the Department of the Interior in March of 2007.

4.11 National Pollutant Discharge Elimination System (NPDES)

The following four IEPA issued National Pollutant Discharge Elimination System (NPDES) permits were active for Fermilab in 2006. The four permits are the following:

1. General (covers several facilities that have the same type of discharge and are located in a specific geographic area) NPDES permit covering non-coal mine discharges associated with the NuMI tunnel construction project. Fermilab has petitioned the IEPA for closure of this permit and incorporation of the associated outfall into its Individual NPDES permit (see item #3).

2. General NPDES permit covering discharges associated with stormwater management at construction sites greater that one acre. This permit covers stormwater management and erosion control for the construction of a domestic water supply connection to the City of Warrenville. The permit was terminated in June 2006 upon completion of the project.

3. Individual (specifically tailored to an individual facility) NPDES permit for combined stormwater and non-contact cooling water discharges associated with industrial activities; there are three outfalls linked with this permit (Outfall 001 to Ferry Creek, Outfall 002 to Kress Creek, and Outfall 003 to Indian Creek).

4. Individual NPDES pre-treatment permit that allows Fermilab to discharge wastewater effluent from operations occurring at the Central Utilities Building (CUB) to the city of Batavia sanitary sewer treatment works.

4.12 Resource Conservation and Recovery Act of 1976 (RCRA)

The Annual Hazardous Waste and Illinois Generator Non-Hazardous Special Waste Reports for 2006 were transmitted to the DOE Fermi Site Office in January and February 2007 respectively. DOE subsequently submitted these reports to IEPA.

The following volumes of non-radioactive waste were generated by Fermilab and managed for disposal by the Hazard Control Technology (HCT) Team of the Safety and Environmental Protection Group in 2006.

16.0 m^3	Non-Routine Hazardous Waste (RCRA + TSCA)
5.6 m^3	Routine Hazardous Waste (RCRA + TSCA)
9.0 m^3	Non-Routine Non-Hazardous (Special) Waste
29.1 m^3	Routine Non-Hazardous (Special) Waste
8,703.0 m^3	Dumpster/Landfill Waste

4.12.1 RFI Activities

As a condition of the Lab's RCRA Part B permit, the IEPA required Fermilab to undertake a RCRA Facility Investigation (RFI). The purpose of the RFI was to investigate whether hazardous constituents had been released to the environment from identified solid waste management units (SWMUs) located onsite. In addition to requiring the reporting of newly identified SWMUs, RCRA also required that IEPA be notified of any changes to previously identified SWMUs. A total of two SWMUs are still being addressed in accordance with the corrective action requirements of Fermilab's RCRA permit: the CUB Pipe and Clay Tile Field and Meson Hill. The Meson and Neutrino Experimental Area was removed from the RFI as a SWMU as part of the RCRA Part B permit renewal process. Further investigation is not required at the Village Machine Shop, the Railhead Storage Yard, and the IB2 Industrial Building so long as institutional controls remain in place.

IB2 Industrial Building

No new information was requested or generated at this unit during 2006.

Village Machine Shop (SWMU# 5)

No new information was requested or generated at this unit during 2006.

CUB Tile Field (SWMU# 12)

The CUB Tile Field has previously been removed along with all chromate-contaminated soil and gravel. The soil was properly disposed of and the surrounding soil sampled and analyzed. Fermilab continues to monitor all of the CUB Tile Field wells semi-annually. Monitoring wells at SWMU 12 were sampled during the 2nd, and 4th quarters of the calendar year. Well MW7B was dry during the 2nd quarter round of sampling and Wells MWS1, MWS2, MWS3, MWS4, and MW7B were dry during both the 4th quarter round of sampling.

Meson Hill (SWMU# 13)

Closure activities for Meson Hill were completed in 1998. This included moving concrete, grading, installing a clay cap, placing topsoil on the clay cap, hydroseeding the top of the hill, and a site inspection. Fermilab continues sampling of all monitoring wells installed at this unit on a semi-annual frequency. Analysis of groundwater from the monitoring wells screened within the upper Quaternary deposits has shown elevated concentrations of total dissolved sulfate and associated total dissolved solids above the 99% confidence level and Class II groundwater standards.

An Assessment Monitoring Plan was developed, reviewed and accepted by the IEPA in 2001 as a result of the continued monitoring results of elevated concentrations of total dissolved sulfates and associated total dissolved solids, and implemented and reported to the IEPA during 2002. The plan was developed to determine the source of the increase, concentrations and extent of sulfate migration, and assess any potential threat to human health and the environment. Results from the study indicated natural conditions were the source of the detected sulfate concentrations and that there was no potential threat to human health and the environment.

A directive was received from IEPA in August 2002 requiring the replacement of the background monitoring well at the RCRA unit. A post closure modification request was developed and forwarded to IEPA detailing the investigation, installation and sample process for the proposed background-monitoring well. IEPA responded in January 2003 approving the post closure modification request with conditions and modifications. The new background monitoring well was installed on May 22, 2003. Sampling of this monitoring point began with the second quarter 2003 semi-annual monitoring and continued through the fourth quarter 2004. New 99% confidence levels were proposed in a modification request for Fermilab's post-closure care plan during 2005. New 99% confidence levels were received from IEPA in a directive to Fermilab during 2006.

Monitoring wells at SWMU 13 were sampled during the 2nd and 4th quarters of 2006. Statistical analyses confirmed that the concentrations of total dissolved sulfates in samples from monitoring well G105 has continued to exceed the 99% confidence level. Concentrations of total dissolved sulfate in monitoring wells G101 and G105 also exceeded the Class II groundwater standard during both quarters. During the 2nd quarter sampling, monitoring well G104 and G105 showed concentrations of ammonia above the 99% confidence level and monitoring well G103 showed concentrations of chloride above the class II groundwater standard. During the 4th quarter sampling, monitoring well G105 showed concentrations of manganese above the 99% confidence level. Due to the elevated concentrations of sulfates and associated total dissolved solids as well as other parameters (ammonia, chloride and manganese), updated notifications of a 'significant change in groundwater quality' were sent to the IEPA in conjunction with both 2006 semi-annual analytical reports.

Railhead Storage Yard (SWMU #14)

No information was requested or generated at this unit during 2006.

Meson/Neutrino Soil Activation Areas

This region was removed from the RFI as a SWMU during 2006 as part of the RFI Part B permit renewal. Fermilab continues to sample four monitoring wells in this region on a quarterly schedule for accelerator-produced radionuclides. The results of samples from the Class I groundwater along with flow directions in the upper dolomite are reported annually to IEPA for informational purposes. No radionuclides were reported in these monitoring wells above detection levels during 2006.

4.13 Safe Drinking Water Act

During September 2005, Fermilab discontinued the use of onsite wells for domestic drinking water and secured a connection to the City of Warrenville public water supply. Fermilab retains no water treatment responsibilities, however, one drinking water well remains in place at Site 29. This is considered a private well, and therefore no treatment, sampling, or reporting are required on this source.

4.14 SARA TITLE III or Emergency Planning and Community Right-To-Know Act of 1986 (EPCRA)

Under these regulations Fermilab is required to provide the EPA, State, and local officials with an annual accounting of hazardous, toxic, and extremely hazardous chemicals used or stored onsite in quantities greater than a given threshold. Fermilab filed a Toxic Chemical Release Inventory Report (TRI) for 2006 with the USEPA and IEPA in June 2007. Copper was the only toxic chemical processed or used at Fermilab at threshold activity levels defined by SARA Title III Section 313. As required by Section 312 of SARA Title III, Fermilab also submitted a Tier II Emergency

and Hazardous Chemical Inventory (2006) to state and local emergency services and disaster agencies in February 2007.

4.15 Oil Spill Prevention

There are no above-ground fuel storage tanks at Fermilab. Above-ground oil inventory at Fermilab consists primarily of a number of oil-filled electrical transformers ranging in volume from 4 to 17,300 gallons. Transformers are considered to be "oil-filled operational equipment" and are subject to regulation by U.S. EPA under Spill Prevention, Control and Countermeasures (SPCC) rules at 40 CFR Part 112. Potential on-site oil spill sources are located such that surface water discharge spillways can be effectively used to prevent the oil from leaving the site and reaching *waters of the state* as defined in the regulations. The only exception is the transformer at Giese Road (1695 gallons) near Indian Creek. This transformer is located adjacent to Indian Creek, which is classified as *waters of the U.S.,* and therefore has reasonable potential to spill into regulated waters. The Giese Road transformer and others on site utilize secondary containment to protect all surface water on the site. In accordance with 40 CFR 110-112, Fermilab maintains an SPCC plan (SPCC) for the Giese Road transformer. This plan is periodically reviewed and revised as necessary. Some organizations also maintain local spill control plans to cover specific sources.

Fermilab also has various indoor oil-containing systems that have the potential to release oil to the site's network of ICW ponds in the event of a failure. One such incident occurred in August 2004, when a heat exchanger associated with a Central Helium Liquefier (CHL) Coldbox-2 failed and released oil to a drainage ditch and, eventually, Bull Rush Pond. The oil was confined in the pond and clean-up efforts were subsequently carried out in the pond and the ditch. Subsequently, a similar failure occurred in a heat exchanger at EØ service building in the Main Ring in May 2006. The oil was very light and dispersed so quickly that no cleanup was required, but the vulnerability of these systems was again apparent. Fermilab continued to implement corrective actions in response to the 2004 incident. The following actions were taken in 2006:

1. A database was created for use in developing a comprehensive inventory of oil and glycol-containing devices with potential to release into the ICW system. Once the inventory is completed, each system will be analyzed for vulnerabilities and steps will be taken to reduce risk.
2. CHL personnel continued to evaluate candidate off-the-shelf instrumentation for better monitoring of oil levels in their equipment. During the shutdown in 2006, they installed a new sensor in the Rotoflow skid serving the nitrogen reliquefier. Its performance has been satisfactory and additional sensors will be installed during a future shutdown.

4.16 Toxic Substance Control Act (TSCA)

Over the course of several years (1993 – 2002), Fermilab conducted a cleanup of Polychlorinated Biphenyl (PCB) contaminated soil resulting from past management practices at the transformer yards associated with various Tevatron service buildings. Groundwater that had seeped into the excavations after the 2002 remedial activities at B1 and B4 service buildings was found to be above the standard for unrestricted release. This water was properly disposed of prior to closing the excavations and very little water reentered the pits before they were backfilled. Consequently, although these locations met the standard for soil cleanup, they could not be declared "clean" at that time. Further groundwater sampling activities were conducted in July 2003. No remaining groundwater was detected at B1, so remediation there was declared complete. Conversely, groundwater samples collected at B4 again indicated contamination at levels slightly above the standards.

When PCB-contaminated groundwater is encountered, EPA regulations dictate that the owner consult with the Agency and the Agency decide, based upon risk, what further remediation, if any, is necessary. To obtain such a decision, Fermilab prepared a report on the results of its groundwater investigation and DOE transmitted it to the EPA on September 22, 2003. In the report, Fermilab concluded that the remaining contamination was very low-level and sufficiently localized that it did not pose any significant environmental threat. The Lab therefore, requested that the Agency classify the residual PCBs as "disposed in place." Discussions among EPA, Fermilab and the DOE Fermi Site Office staff have been held intermittently by phone; the most recent of which produced an EPA request for

additional hydrogeological information. This was provided in October 2005 and Fermilab continues to await a response.

4.17 Pollution Prevention and Waste Minimization

Fermilab continued to make progress minimizing waste prior to generation and reducing pollution and in 2006 received several awards for efforts in managing excess electronic equipment. Specifically, the Lab won DOE's *Pollution Prevention Star Award* and DOE's *Best-in-Class Award* for its efforts toward electronics management. Upon receiving the *Best-in-Class Award,* the Lab was notified of also being in the running for the *White House Closing of the Circle Award*. Additionally, the DOE participated in and won the *Federal Electronics Reuse and Recycling Challenge* sponsored by the USEPA and Fermilab was recognized as being a major contributor to DOE receiving that distinction. Other notable pollution prevention activities include the following:

Municipal Leaf Litter
Over the past three years, several nearby local communities brought their autumn collection of residential leaf litter to the Lab. The leaf litter was then hauled to Fermilab's agricultural tracts where it was incorporated into the farm fields as a soil amendment. The benefits of this program for the Lab include soil enrichment that minimizes field preparation measures as well as the enhancement of community relations. In addition, the participating communities benefit from being able to reduce their transportation and disposal costs (i.e. fuel costs, labor, and tipping fees). This program has been so successful that Fermilab has had to limit the amount of leaf litter that is accepted from the municipalities. Currently, the Lab accepts up to 30,000 cubic yards of leaf litter per year.

Fermi Green Guy – Seymour Green
Fermilab created an icon, *Seymour Green*, in 2006 to serve as a mascot in the promotion of environmental sustainability. The icon originated from the Engineering Services Department as a way to emphasize green engineering and the Labs commitment to following U.S Green Building Council practices. *The Green Guy*, as the icon was originally called, was dubbed *Seymour Green* as a result of a laboratory-wide renaming campaign in which over 600 people participated. Seymour's associated slogan, 'It Matters,' communicates Fermilabs interest in particle physics while using resources wisely. Seymour was initially used in 2006 for a pilot project to promote the use of high efficiency hand dryers in washrooms at Fermilabs central building, Wilson Hall.

Less Toxic Paint
In 2006, greater scrutiny was given to painting activities occurring in Fermilab's Accelerator Division. When proposed projects undergo an environmental review, paints are now selected with a goal to minimize hazardous components that could become a disposal issue in the future. For example, every effort is made by AD to obtain an alternative to a paint containing toxic metals such as lead or barium and preference is given to low volatile organic material (VOM) formulated paints.

Glycol Conversion
To minimize the impact of a possible glycol leak or spill, several older, large-scale cooling systems associated with Fermilab's Central Helium Liquefier (CHL) facility were converted from ethylene glycol to more environmentally friendly propylene glycol. The secondary cooling for these systems comes from once through cooling water that is discharged to Fermilab's cooling pond system. In addition to providing cooling, these ponds are home to a wide variety of native flora and fauna that the Lab wants to keep healthy. A system total of 3,100 gallons (50/50 mix) was converted from ethylene to propylene glycol at the CHL facility in 2006.

Training and Awareness
To enhance employee awareness of recycling opportunities that abound to consumers, the Particle Physics Division (PPD) ES&H group gave a special training session during an open house held in August of 2006. The training provided both general and specific information concerning the benefits of recycling and provided information about the various available recycling outlets. The training was well attended by members of PPD and it was considered a success by the division.

5.0 Conclusion

The operations at Fermilab during 2006 had no significant adverse impact on the environment or on public safety.

[1] Details of the Fermilab Environmental Monitoring Program (FEMP) can be found on the ES&H home page.

[2] Supporting data are available upon request from the Fermilab ES&H Section.

[3] Fermilab Annual Ecological Land Management Plan for calendar year 2006.

[4] 35 IAC 620

[5] 35 IAC 620.210