FERMILAB

Report to the Director on the Fermilab Environment CY2000

1.0 Introduction

Monitoring and surveillance are critical elements of an effective environmental protection program. Fermilab has established and implemented comprehensive environmental monitoring and surveillance programs[1] to ensure compliance with legal and regulatory requirements imposed by Federal, State and local agencies and to provide for the measurement and interpretation of the impact of Fermilab operations on the public and the environment. The surveillance and monitoring activities are selected to be responsive to both routine and unplanned releases of penetrating radiation and liquid or airborne effluents. The location and frequency of sampling are based on established routines, operational considerations and historic levels of pollutants found in each location. Sampling points are selected based on 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. There were no abnormal occurrences that had an impact on the public, the environment, the facility or its operation in CY2000[2].

2.0 2000 Laboratory Highlights

The Fermilab community mourned the passing of its founding director, Robert Rathbun Wilson, on January 16, 2000. The 800 GeV fixed target program at Fermilab drew to a close in January 2000. The future fixed target program will use the high intensity Main Injector proton beam. Construction of the Neutrinos at the Main Injector (NuMI) tunnels and access shafts began in April 2000 with the official groundbreaking ceremonies held in May 2000. The Main Injector circulated antiprotons for the first time in August 2000. Construction of the MiniBooNE project continued. The Collider program at the Tevatron resumed operation in early 2001.

2.1 Significant Environmental Accomplishments

Fermilab's Environmental Protection Subcommittee and the ES&H Section continued to implement a program for peer review in the merit-based distribution of funds earmarked for highly effective waste

minimization efforts including the use of low-mercury lamps, the refurbishment of 10-foot magnets, various pollution prevention ideas and environmental cleanups.

An aerial survey of the Fermilab deer population was conducted in January 2000. Based on the results of that survey and on the low numbers of deer encountered, the U.S. Department of Agriculture Wildlife Service deer removal operations were curtailed until the spring of 2001. A vegetation study conducted by a consultant in May 2000 showed substantial recovery in the forest and fewer signs of deer browse damage, a significant rebounding after 2 years of the deer reduction program.

Continued construction activity resulted in heightened ES&H efforts to promote erosion control measures. The ES&H Section has continued to provide regular environmental oversight for the larger onsite construction projects and has assisted in task manager and contractor training on soil erosion control.

Fermilab's sitewide air pollution permit and open burning air pollution permits were renewed. The sitewide NPDES permit that covers discharges to surface water was reissued and the NPDES permit was revised to allow the construction of the NuMI tunnel. The NPDES permit for pretreatment of demineralizer regenerant waste at CUB was reissued. Plans to control soil erosion during the construction of NuMI and MiniBooNE were developed and are being implemented.

Significant improvements were made to the groundwater monitoring program in CY2000. A number of new monitoring wells and piezometers were installed based on findings of the shielding assessments and groundwater characterization studies. All of the old farm wells have now been removed and replaced by monitoring wells designed for providing representative samples of groundwater from designated portions of the regulated groundwater or modified to monitor only water levels. Piezometer installation has allowed for monitoring of water levels.

2.2 Other Environmental Issues

The Laboratory's long-range land management plan was updated in 2000. Existing prairie tracts were enriched with forbs and burned or mowed to discourage intrusion of brush, trees and exotic plants. About 9 acres of new prairie were planted.

Seven NERP research projects remain underway, while three additional projects have been proposed but have not yet started work in the field and one more is waiting funding.[3]

In July 2000, the Secretary of Energy issued a moratorium on the recycling of metals from posted radiological or radioactive materials areas at DOE facilities. Measures have been taken at Fermilab to separate materials subject to this moratorium. The result has been an accumulation of materials that are non-radioactive under our release criteria and which formerly could have been recycled.

3.0 Environmental Monitoring and Surveillance

The goal of the Fermilab Environmental Monitoring Program is to assist Laboratory management in decision-making by providing data relevant to impacts that Fermilab operations have on the surrounding environment. The Environmental Monitoring Program 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. We collect 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 and groundwater. Environmental surveillance consists of collecting and analyzing samples of various media and measuring penetrating radiation. Samples are collected and radiation is measured from areas within and outside 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 monitored 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.

3.1 Air

The potential for public exposure to air pollution from Fermilab is very low. Our 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. 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. Monitoring is conducted at targeting areas where air emissions are considered a significant contributor to the overall transport of radioactive materials offsite. The Magnet Debonding Oven at the Industrial Complex also contributes a small quantity of airborne radionuclides when operating. Our permit application states that total releases will average no greater than 100 Ci/year with a maximum of 900 Ci/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 CAP-88PC. This model was created by USEPA to predict the movement of airborne radionuclides and its use is required by regulations governing hazardous air pollutants at 40CFR61. Maximum calculated concentrations offsite are predicted to be below the level that could be detected by monitoring.

Fermilab is not a significant source of chemical air pollution. Our 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 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

The Debonding Oven, a potential source of tritium only while radioactive components are being burned, was operated for approximately 140 hours in CY2000. The releases from the FMI, Anti-Proton and Fixed Target Area stacks (MT, MC and KTeV) are estimated to have released a total of 9.59 Curies in CY2000. These radioactive air emissions were less than 10% of the limits of our 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 CY2000 continued to be well below the Environmental Protection Agency (EPA) standard of 10 mrem/year to a member of the public and also much less than the EPA's continuous monitoring threshold of 0.1mrem/year. Using the CAP-88 PC v2 gaussian disperstion code, the highest dose equivalent to any member of the public was estimated to be 0.00459 mrem.

Fermilab's CY2000 Radionuclide Air Emissions Annual Report was submitted to DOE in June 2001.

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). In CY2000, the Agency issued us a revised Lifetime Operating Permit adding a vapor degreaser to our previously permitted air pollution sources. The new permit covers the Magnet Debonding Oven, three boilers at CUB, a 12,000-gallon tank of gasohol, accelerator tunnel ventilation stacks and a vapor degreaser at IB3. 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 estimated concentrations of pollutants emitted were slightly increased as compared to last year due to increased fuel consumption by boilers. All source emissions were compliant in CY2000. The Annual Air Emission Report for CY2000, an estimate of criteria pollutant emissions, was submitted to the Illinois Environmental Protection Agency (IEPA) by May 1, 2001.

3.2 Penetrating Radiation

Operation of the Fermilab accelerator and associated beamlines produces ionizing radiation such as muons. Beamlines and experiments are designed so that most of the muons are stopped before reaching the ground surface. However, some emerge above the surface and present a small potential for radiation dose. Though small muon fields were measured in conjunction with the operation of the TeV Abort and the MT, MC, and KTeV beamlines, the effective dose equivalent to a member of the public due to Fermilab operations remained less than 0.1mrem/year and was small compared to doses due to natural causes (i.e., cosmic rays, terrestrial sources and indoor radon, etc.) which average approximately 300 mrem/year.

Storage of radioactive materials onsite results in another potential exposure to ionizing radiation. These sources of penetrating radiation are monitored throughout the site at locations based on criteria outlined in the Fermilab Monitoring Plan. Dose estimates are calculated under the extremely conservative assumption that a single individual is exposed for an entire year at the site boundary. Based on measurements made in CY1999 and CY2001, it is believed that radioactive material stored at the Railhead

contributed no measurable dose equivalent rate at the site boundary in CY2000. Through similar reasoning, it also appears that the maximum radiation dose to an individual at the nearest offsite house was significantly less than 1 mrem in CY2000.

3.3 Surface Waters

Fermilab discharges liquid effluent to surface water bodies and to publicly owned treatment works in Batavia and Warrenville. We hold National Pollutant Discharge Elimination System (NPDES) permits covering these discharges and those from various construction projects onsite.

In addition to the monitoring required by NPDES permits, samples of surface water are taken annually from selected bodies of water onsite and analyzed for radionuclides. We sample surface waters based on their potential for contamination. Chemical and physical parameters are not normally monitored in surface waters because Laboratory policies are designed to direct effluents into the sanitary sewers. Maximizing allowable discharges to the sanitary systems directs contaminants to the publicly owned treatment works (POTW) and minimizes environmental contamination. Chemical discharges are controlled by criteria set forth in Fermilab Environment, Safety, and Health Manual Chapter 8025.

3.3.1 Radioactive Releases to Surface Water

Numerous sumps collect and drain water from building footings and from under beamline tunnels in the Tevatron, Main Injector and the Experimental Areas. Water collected by these sumps often contains detectable concentrations of radionuclides (primarily tritium, ^{3}H) that have been leached by rainwater from radioactive soil near beam targets and absorbers or released accidentally to sumps from beamline cooling water systems. These sumps discharge to ditches and ponds onsite. Surface water monitoring conducted during CY2000 showed tritium concentrations to be well within the Department of Energy Derived Concentration Guides for allowable radionuclide releases to surface waters (2000 pCi/ml). Eight of the sixty-nine samples taken from onsite ditches, ponds and creeks in CY2000 showed a detectable level of tritium[4], the highest of which was 51.8 pCi/ml. No radionuclides were detected in samples taken at the site boundary.

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, total suspended solids (TSS), pH and chlorine) this year. Discharge Monitoring Reports for six different outfalls were submitted monthly to the IEPA. We reported excursions above the permitted discharge limits for pH in June and for TSS in April, October, November and December 2000 at an outfall associated with the NuMI tunneling project.

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 onsite, the permit also regulates stormwater discharges from designated solid waste management units (SWMUs). The Stormwater Pollution Prevention Plan required by this permit is periodically modified to reflect changes that occur as part of the RCRA Facility Investigation (RFI) of the SWMU sites. In August 1999, when this permit was renewed, the Indian Creek outfall was permanently moved downstream to a location where the creek leaves the site in order to allow for monitoring of potential contaminants from the Main Injector complex and from the construction and operation of NuMI. Our NPDES permit

requires that water temperature, pH and flow be monitored at all three outfalls. The results are reported to the IEPA on a monthly basis. Chlorine concentration[5] is reported for the Kress and Indian Creek outfalls. In April 2000 we exceeded our pH limit at the Ferry Creek outfall perhaps due to natural fluctuations in the water system.

3.3.2.2 Releases to Sanitary Sewers

Another NPDES permit allows us to pretreat and release effluent from the Central Utility Building (CUB) regeneration process to the City of Batavia sanitary sewer system. Quarterly monitoring reports are submitted to the IEPA as a condition of this permit. The pretreatment permit for the Central Utility Building regeneration effluent requires the collection and analysis of composite process effluent samples for specified metals. Samples are also analyzed for radionuclides in order to confirm that amounts of radioactivity released are minimal. In order to provide information on the process, these samples are taken quarterly at the process release point rather than at the site boundary where Fermilab actually discharges to the Batavia municipal sewers. Concentrations in the process effluent would actually be greatly diluted by other wastewaters before reaching the site boundary where the Batavia City ordinance on sewer discharges is applicable. Analytical results are submitted quarterly to the IEPA. Analyzed samples from the process effluent have never been in exceedance of the Batavia Sanitary Sewage Ordinance or the Department of Energy Derived Concentration Guide, which specify discharge limits. Effluent from the Central Utility Building regeneration process was sampled before each discharge and analyzed for accelerator-produced radionuclides. Approximately 1.17 mCi of tritium was released to the sanitary sewer from the CUB during 2000.

Monitoring stations located at the site boundary sample sewer discharges to each municipality. 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. This year, the Batavia sewer sampler showed an exceedance of the iron discharge limit (5.0 mg/l). The sample yielded an iron concentration of 180 mg/l. This excursion is thought to be due to the aging of the pipes and ongoing work to upgrade that infrastructure.

3.3.2.2 Stormwater Discharges Related to Construction Activities

A Notice of Intent (NOI) to discharge storm water associated with 8GeV Fixed Target and Booster Neutrino Detectors (BooNE) construction site activities was submitted in July 1999. The IEPA determined that the stormwater discharges associated with these sites are covered by a General NPDES permit. A project-specific SWPPP continues to be maintained to ensure compliance with this permit.

The NuMI construction project-was issued a General NPDES permit by the IEPA covering construction related to mining activities. This permit is primarily concerned with ensuring the safe discharge of effluents from the mining of dolomite in digging the new tunnel and providing erosion controls for construction areas and associated stockpiles. In association with this project, several new outfalls to onsite waterways have been identified for monitoring. Monitoring for Total Suspended Solids (TSS) will be performed at NuMI-specific outfalls.

3.4 Groundwater

Groundwater quality standards are published by the State[6]. Class I groundwater is considered to be a non-degradable resource and is highly protected. The water that is located in or near the dolomite aquifer 50 to 70 feet below ground surface of Fermilab is Class I groundwater according to criteria published by

the State[7]. Water in the overlying till has been demonstrated to be Class II water and therefore has less stringent standards.

Four background monitoring wells in locations upgradient to Fermilab operations continued to be utilized to obtain representative samples of the upper Class I groundwaters for either chemical and/or radiochemical analysis. Ten wells at the Central Utility Building (CUB) Tile Field were sampled as part of an ongoing RCRA Facility Investigation (RFI) at that site. Over forty piezometers were used to gather information on the direction of groundwater flow sitewide. The information collected will be used in modeling the transport of potential contaminants. Piezometers that had been installed as part of the NuMI (Neutrinos at Main Injector) site characterization were monitored to assist the Lab in planning for groundwater protection at that facility. Fermilab continues to analyze groundwater issues associated with this proposed construction project that involves construction within the dolomite aquifer.

Thirty-three of one-hundred-four onsite groundwater monitoring locations were sampled during the year for radionuclide or chemical parameters, the remainder were available for water level monitoring.

3.4.1 Groundwater Characterizations

The upgrading of the Fermilab sitewide groundwater monitoring network has been completed. In 1994, a plan was conceived for the replacement of an existing network of old single family farm supply wells with monitoring wells constructed to for the purpose of monitoring groundwater at source-specific areas of vulnerability. From late 1996 through 2000 the monitoring network was slowly and methodically replaced with a state of the art network located specifically to monitor the resource groundwater as close as possible to those areas determined to be the most vulnerable from past or present operations. In addition, improved characterization methods were used and state-of- the-art monitoring wells were installed in the underlying glacial deposits to better understand how groundwater moves through these deposits to the resource groundwater that lies below. A total of 25 old supply wells and 9 abandoned cased boreholes have been removed. An additional 10 old farm supply wells have been modified to serve as points to supplement data on groundwater flow below the site.

Committees convened by the Director identified a number of historical areas of concern and analyzed future experimental designs. A total of 82 new locations have been added (28 monitoring, 54 piezometers) for obtaining data on groundwater quality or quantity.

The final three piezometers for the NuMI groundwater network were constructed in August 2000.

Geologic characterization was completed adjacent to the Meson Detector Building in August for a shielding analysis study associated with a proposed new experiment in the Meson Fixed Target Beamline.

In August 2000, an area in the Proton Fixed Target Beamline (PE3), which had been identified as requiring investigation, was characterized. Three piezometers were installed into the upper bedrock aquifer. The general groundwater flow direction in the area will be monitored and one of the piezometers will be fitted with sampling equipment to convert it to a monitoring well.

3.4.2 Monitoring Well Modification and Abandonment Activities

In March 2000, the final four angled monitoring wells at the Neutrino/Meson Fixed Target Beamline were properly abandoned. These wells had been replaced in 1998 by a network of monitoring wells and

piezometers installed in upper bedrock. This new network provides a more effective means of monitoring potential operational effects to the environment in this area.

The last open borehole used for the initial NuMI subsurface characterization was properly abandoned.

3.4.3 Radionuclides

The Department of Energy groundwater concentration guide and the Illinois Class I groundwater standard for tritium is 20 pCi/ml. Monitoring of all Central Utility Building Tile Field monitoring wells in CY2000 showed tritium levels in those wells to be less than the detection limit of 0.1 pCi/ml.

3.4.4 Chemicals

Four rounds of groundwater samples were collected in 2000 at several Solid Waste Management Units (SWMUs) under our RCRA RFI. (See Section *4.12.1 RFI Activities)*

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 issued to Fermilab by the IEPA in 2000. A permit was also obtained to burn old portakamps as part of a firefighting training exercise and to operate a vapor degreaser at IB3. Annual air emissions reports for CY2000 were submitted to the IEPA and will be submitted to the USEPA by the end of June 2001.

An estimated 9.59 Curies were released in conjunction with the operation of the Fermilab Anti-Proton, and the Fixed Target Areas stack in CY2000. The Magnet Debonding Oven released 59.2 microcuries this year. The CAP-88PC dispersion model calculated the maximum dose equivalent delivered to a member of the public (at the boundary of the lab) to be 0.00459 mrem due to CY2000 Fermilab operations. The collective effective dose equivalent for CY2000 was estimated to be 6.1 person-mrem.

Fermilab has 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

Fermilab met the December 22, 1998 deadline for compliance with the EPA underground storage tank (UST) regulations 40 CFR 280.80. All pre-existing USTs installed prior to 1988 have been properly closed. The only two remaining underground storage tanks (USTs) were installed in 1994 and are currently in use at the Fermilab Fuel Dispensing Facility. They comply with the new UST standards. Two enforcement individuals from the USEPA RCRA Office of USTs/LUSTs visited Fermilab on January 22, 1999 to confirm that the two remaining USTs on site met the required codes. No concerns have been identified since.

4.3 The Endangered Species Act of 1973

No compliance issues were identified in CY2000.

4.4 Executive Order 11988, "Floodplain Management"

No compliance issues were identified in CY2000.

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

Evaluation of Fermilab activities in wetlands continues to be accomplished through the NEPA review process. A permit was received from the Corp of Engineers to realign a portion of Indian Creek and to fill wetlands for the MiniBoone/8 GeV Target Beamline. In addition, the Lab currently has a site preparation permit associated with the NuMI project.

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

In CY2000, 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 personnel inspected the permitted Fermilab Main Injector Class III Dam (the FMI berm) in March 2000 to ascertain that the dam was being maintained in accordance with the maintenance plan associated with the permit. The Main Injector berm is permitted by the Illinois Department of Natural Resources as a small Class III dam. The need for some minor remedial actions and routine maintenance was discovered and actions were taken. There were no compliance issues identified. The annual report was submitted to the State on time.

4.8 The Migratory Bird Treaty Act

There were no compliance issues identified in CY2000.

4.9 National Environmental Policy Act (NEPA)

Fermilab met these requirements by continuing to implement a program of reviewing all of its activities for compliance as set forth in the Fermilab Environment, Safety and Health Manual Chapter 8060. DOE approved twenty-two projects for Fermilab as being categorically excluded (CXs) from further review in CY2000.

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 CY2000 to assess any potential impacts on historic resources. The Illinois Historic Preservation Agency (IHPA) was consulted regarding the MiniBooNE Target Hall/8 GeV Beamline project. The consultation included an IHPA review of existing documentation. No compliance issues were identified in CY2000.

4.11 National Pollutant Discharge Elimination System (NPDES)

Our NPDES permit to pretreat demineralizer regenerant waste at the CUB was reissued in August 2000. BooNE construction activities continued to be covered under an NPDES permit. See *Section 3.3.2.2* for

further discussion. An NPDES General Permit for Non-Coal Mines, regulates discharges from the NuMI construction project.

4.12 Resource Conservation and Recovery Act of 1976 (RCRA)

On 9/7/00, the USEPA conducted their annual RCRA inspection of Fermilab's Hazardous Waste program. This included a review of waste manifests, annual reports, training records, the contingency plan, the closure plans, and the Part B permit and operating records. Satellite waste accumulation areas and the Hazardous Waste Storage Facility were visited. No deficiencies were cited.

The following volumes of non-radioactive waste were generated by Fermilab and managed for disposal by the Hazard Control Technology (HCT) Team of the Environmental Protection in Fiscal Year 2000:

563.2 m^3	Non-Routine Hazardous Waste (RCRA + TSCA)
3.4 m^3	Routine Hazardous Waste (RCRA + TSCA)
11.9 m^3	Non-Routine Non-Hazardous (Special) Waste
37.0 m^3	Routine Non-Hazardous (Special) Waste
11,582.2 m^3	Dumpster/Landfill Waste

The Annual Hazardous Waste and Illinois Generator Non-Hazardous Special Waste Reports for CY2000 were submitted to the DOE Fermi Area Office in January and February 2001 respectively. DOE subsequently submitted these reports to IEPA.

4.12.1 RFI Activities

As a condition of our RCRA Part B permit, the IEPA has required Fermilab to undertake a RCRA Facility Investigation (RFI). The purpose of the RFI is to investigate whether hazardous constituents have 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 requires that IEPA be notified of any changes to a previously identified SWMU. A total of three SWMUs are still being addressed in accordance with the corrective action requirements of Fermilab's RCRA permit: the CUB Pipe and Clay Tile Field, the Meson and Neutrino Experimental Areas, and the Meson Hill Landfill. Further investigation is not required at the Village Machine Shop and the Railhead Storage Yard,

Village Machine Shop (SWMU# 5)
The final report on sampling at the Village Machine Shop has been completed and submitted to the IEPA. Conditions required by the IEPA have been met and documentation was submitted in March 1999. No further remediation is required.

CUB Tile Field (SWMU# 12)
The CUB Tile Field has been removed along with all contaminated soil and gravel. The soil was properly disposed and the surrounding soil sampled and analyzed. Soil samples were taken from the floor and walls of the trenches after the excavation of the backfill and clay tile pipe in the CUB Tile Field. At the request of the IEPA, these samples were analyzed for gross alpha, gross beta and tritium. The results indicated radioactivity levels comparable to those found locally in soil due to naturally occurring radionuclides. At these concentrations they present no significant threat to public health.

In July 2000, a Directive was issued by the IEPA in response to our soil investigation report. It was determined that no further soil investigation or remediation was necessary at this SWMU relative to barium, cadmium, chromium, or lead. Groundwater sampling is scheduled to continue until 2013. An

item-by-item response to the Directive was sent to the IEPA in September 2000. The response contained a demonstration that the levels of gross alpha, gross beta and tritium remaining in the soil would not pose a threat to human health or to the environment.

Fermilab continues quarterly monitoring of all the CUB Tile Field wells. Wells MWS1-3-3 and MWD1 indicated chloride levels above the Class II standard in CY2000

Meson Hill (SWMU# 13)

Closure activities for Meson Hill were completed in 1998. This included moving concrete, grading, installing a clay cap and placing topsoil on the clay cap and hydroseeding of the top of the hill and a site inspection. Quarterly groundwater monitoring continues. Meson Hill well GL101 contained total dissolved solids and dissolved sulfate at a level about the Class II standard. Well G107 contained dissolved chloride at a level above the Class II standard. Statistical evaluations of data are performed quarterly and the results are submitted to IEPA. In July 2000, the IEPA review of the closure report resulted in a determination that the certification of closure of this SWMU was approved and postclosure care of the landfill could be carried out as previously directed. The agency specified groundwater monitoring until 2013.
In December 2000, Fermilab submitted a request to the IEPA for reduction in the sampling frequency and/or number of parameters monitored at this site.

Railhead Storage Yard (SWMU #14)

It was determined that the low levels of lead remaining at the Railhead Storage Yard do not pose a threat to human health. Conditions required by the IEPA have been met and documentation was submitted in March 1999. No further remediation is required at this time.

Neutrino (SWMU #15)

Additional information acquired through studies at NS1 and NS2 was sent to the IEPA in March 1999. In July 2000, the IEPA issued a directive in response to several submittals regarding SWMU #15. The Directive approved the overall corrective action plan for the SWMU subject to several conditions and modifications. We are required to monitor groundwater until 2013.

4.13 Safe Drinking Water Act

Fermilab provides drinking water to its employees through two Fermilab-operated public water supplies and a satellite supply connected to the City of Warrenville public water supply. Full jurisdiction for Fermilab's public water supplies was transferred from the Illinois Environmental Protection Agency (IEPA) to the Illinois Department of Public Health (IDPH) in 1996. Initially, this involved an IDPH review of our existing monitoring program, which determined that our program was compliant with their regulations.

During CY2000, the action level for lead (Pb) in drinking water was exceeded in samples from the distribution system for the Main Site public water supply. While not a compliance issue, this required additional sampling; distribution of educational materials describing the hazards of lead in drinking water and the development and revision of corrosion control plans to decrease levels of Pb in the distribution systems. In February and July 2000 public education was delivered for lead action level exceedances that occurred in samples taken from the Main Site. Verification of the distribution of public education was sent to the IDPH in December 2000. A Main Site supply corrosion control plan that utilizes an orthophosphate treatment system at the Main Site supply well (W-1) has been installed. Since October 1998, the D-Zero supply has had successive sampling periods where it has not exceeded the Pb action levels. As a result, the IDPH has reduced the frequency of Pb/Cu monitoring for the D-Zero.

In addition to routine bacteriological analysis and Pb/Cu sampling, Fermilab completed the required testing for VOCs at D-Zero and for nitrate and pesticide/herbicides in both water supplies this year. Onsite semi-private wells were also sampled for nitrates as well and coliform. Results were acceptable.

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 chemicals 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 CY1999 with the USEPA and IEPA in June 2000. The chemicals at Fermilab used or stored at Fermilab in reportable quantities under SARA Title III Section 313 were 1,2,4-trimethylbenzene, friable asbestos, and ethylene glycol. The Toxic Release Inventory (TRI) for CY1999 was submitted to the EPA in June 2000. As required by Section 312 of SARA Title III, Fermilab also submitted a Tier II Emergency and Hazardous Chemical Inventory (CY2000) to state and local emergency services and disaster agencies in February 2001.

4.15 Oil Spill Prevention

Oil inventory at Fermilab consists of numerous oil-filled electrical transformers ranging in volume from 4 gallons to 17,300 gallons. There are no aboveground oil storage tanks at Fermilab. The total volume of oil in transformers onsite is estimated to be about 250,000 gallons. Potential onsite oil spill sources are located such that surface water discharge spillways can be effectively used to prevent any oil spills from leaving site and entering State Waters. The only exception is the transformer at Giese Road (1695 gallons) near Indian Creek. This transformer was previously located downstream of the Indian Creek outfall to State Waters. Even though the outfall has been moved to a location further downstream in Indian Creek, this transformer still has the potential to spill into regulated waters because there is no in-stream mechanism to prevent a discharge from making it to Waters of the State. The Giese Road transformer and others onsite employ secondary containment as an added precaution. A Spill Prevention Control and Countermeasures plan (SPCC) for the Giese Rd. transformer has been completed in accordance with 40 CFR 110-112.

4.16 Toxic Substance Control Act (TSCA)

The application of TSCA requirements to Fermilab involves the regulation of polychlorinated biphenyls (PCBs) and asbestos. Significant strides in PCB management have been made at Fermilab in the last several years.

An EPA-approved plan to remediate PCB-contaminated soil at twenty-four transformer sites located at service buildings around the Main Ring continued with many accomplishments in CY2000. The contamination had occurred primarily because of past (pre-TSCA) practices in which transformer oil containing 2-5% PCBs was drained onto the ground as part of sampling to assess the status of the oil's dielectric properties.

Cleanup work conducted in February-May included complete remediation at B2, C3, D2 and D3 service buildings as well as removal of the remaining contaminated soil at the C1, C4, D1, and D4 service buildings. The latter four sites had been partially remediated in 1999. Also during this period, new

transformer and switchgear pads, complete with secondary oil containments were constructed at B2, C3, D2 and D3. Locations C1, C4, D1, and D4 only required backfilling and restoration of the hardstands.

In November-December, all contaminated concrete, soil, and gravel was removed from the transformer yards at the A1, A2, E2, and E4 service buildings. New transformer yards with secondary containments were constructed at A2 and E2. Excavations at A1 and E4 were backfilled to match the surrounding hardstand. Also in November, the pads at the four buildings where cleanup is still pending were cleared of equipment in preparation for the remaining work.

Twenty out of the twenty-four sites originally identified as needing attention have been addressed.

Fermilab no longer has any PCB-containing equipment whose *use* is regulated by TSCA. However, there is still a sizeable inventory of equipment containing small PCB (greater than or equal to 500 ppm) capacitors and large PCB-contaminated (greater than or equal to 50 ppm but less than 500 ppm) capacitors. Disposal of this equipment is regulated. There is a plan to gradually phase out this equipment as funding and the accelerator operating schedule allow.

4.17 Waste Minimization and Pollution Prevention

As part of PCB transformer remediation, 46.3 metric tons of uncontaminated concrete was recycled.

A study was begun to investigate potential sewer infiltration within the lab's main site sanitary sewer system. Reduction of our discharge volume to the City of Batavia is anticipated if improvements can be made to fix leaks.

Two helium tanks no longer needed in the Fixed Target Area were salvaged for reuse at CDF.

A 94% waste reduction volume was achieved when 12 electrical discharge resistors made of transite (containing asbestos) were removed from six steel electrical enclosures. If left intact the enclosures would have been TSCA-regulated but now the steel enclosures can now be recycled as scrap.

The MINOS construction project was able to reuse high voltage cables and connectors from the Wide Band Lab.

During a major cleanup and reorganization of material in the Railhead storage areas, a significant volume of various sizes of plate steel were declared to be low-level radioactive waste. Due to the size and condition of the steel, transportation and disposal packaging was required. Following normal practices, the steel would have been packaged in steel boxes with only about 50% of the container being utilized due to weight limitations. By choosing a new shorter disposal box design we were able to reduce the volume and disposal costs.

Beginning with FY 2001, we have included rehabilitation of space in our ES&H Management Plan budget, thereby using this source of funds (waste management funds) to allow for the rehabilitation and reuse of laboratory facilities. Highest priority is given to projects for which a cleanup would remove a significant ES&H concern.

Fermilab has initiated an Excess Chemical Database, to facilitate the exchange of information about chemicals that could be reused or redistributed onsite.

Recycling efforts included 87.9 metric tons of office and mixed paper; 11.10 metric tons of corrugated cardboard; 14.08 metric tons of stainless steel; 66.61 metric tons of copper; 555.18 metric tons of iron:

8.91 metric tons of aluminum; 0.3 metric tons of toner cartridges; 10.8 metric tons of shipping pallets; 1.36 metric tons of engine oils; 6.0 metric tons of batteries; and 7.84 metric tons of tires.

Fermilab continues a program of recycling our spent mercury containing lamps with 2.8 metric tons of fluorescent bulbs being recycled in CY2000. Also recycled were 52.63 metric tons of miscellaneous electronics, 15.86 metric tons of wooden pallets and 10.75 metric tons of computer monitors.

The volumes of non-routine radioactive waste generated this year (164.8 cubic meters) were double that of last fiscal year. The volume of routine radioactive waste generated (34.2 cubic meters) was also up this fiscal year despite continued efforts to use process reduction techniques to further reduce the volume of radioactive waste shipped for disposal. These increases in waste generated were due to the major cleanup of the Railhead.

5.0 Conclusion

The operations at Fermilab during CY2000 had no significant adverse impact on the environment or on public safety.

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[1] Details of the Fermilab environmental program can be found in the Fermilab Environmental Monitoring Plan (FEMP).
[2] Supporting data are available upon request from the Fermilab ES&H Section in electronic or paper form.
[3] Fermilab Annual Ecological Land Management Plan for Calendar Year 2001, Fermilab ELM Committee, 3/01/01
[4] Lower limit of detection for tritium in surface waters is 1.0 pCi/ml.
[5] Total halogen is measured as chlorine.
[6] 35 IAC 620
[7] 35 IAC 620.210

[JR1] Message of memo starts here.