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ENHANCING THE USE OF EASTERN AND MIDWESTERN COALS BY GAS REBURNING-SORBENT INJECTION

ENVIRONMENTAL MONITORING PLAN
for Illinois Power Hennepin Unit 1

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1.0 SUMMARY

Energy and Environmental Research Corporation (EER) is conducting a demonstration project to evaluate an SO_2 and NO_x control technology for coal-fired utility boilers. Funding for the project is being provided by the Department of Energy, the Gas Research Institute, and the Illinois Department of Energy and Natural Resources. The objective of this project is to demonstrate that 50 percent SO_2 control and 60 percent NO_x control can be realized through application of the Gas Reburning-Sorbent Injection (GR-SI) process. Bottom ash generation will be reduced and fly ash will be sluiced to a dedicated settling pond. Successful demonstration of the technology is a prerequisite to eventual commercial application of the GR-SI process.

This volume presents the Environmental Monitoring Plan (EMP) for Unit 1 at Illinois Power Company's (IP) Hennepin Station, one of three technology demonstration sites in the EER project. The EMP, which is required by EER's cooperative agreement with DOE, describes the environmental monitoring that will be conducted at Hennepin Station during the course of the GR-SI demonstration project. Environmental monitoring is a key aspect of this project, since monitoring will supplement the National Environmental Policy Act documentation to ensure that the demonstration project does not result in impacts which 1) violate applicable standards, or 2) are detrimental to human health or the environment. Environmental monitoring will also be used to develop a data base for mitigation of potential environmental problems related to the technology and for replication of the technology independent of site-specific parameters.

Monitoring will be conducted to characterize air emissions, water and solid waste discharges, and other safety and health concerns. Monitoring requirements for compliance with Federal, State, and local regulations are discussed, along with supplemental monitoring requirements which are designed to provide further information about the GR-SI system performance. IP and EER will utilize standard EPA measurement procedures whenever possible. Measurement methods for which no standard procedures are available are described in this volume.

Monitoring is required during all three phases of the demonstration: planning and design, construction, and operation. Table 1-1 summarizes the compliance and supplemental monitoring which was conducted during Phase I and

TABLE 1-1. PROJECT MONITORING IN PHASES I AND II

MEASUREMENT	SAMPLE TYPE	FREQUENCY	LOCATION
	COMPLIANCE		
WATER			
Flow Rate	single reading estimate	once/wk	existing ash pond discharge
pH	grab sample	twice/wk	existing ash pond discharge
Total Suspended Solids	24 hr composite	twice/wk	existing ash pond discharge
Oil and Grease	grab sample	twice/mo	existing ash pond discharge
GASEOUS EMISSIONS			
Coal Composition sulfur, ash, Btu, moisture	24 hr composite	daily	coal hopper
	SUPPLEMENTAL		
WATER			
General Use Water Quality Standards	composite	once	Illinois River - 100 ft upstream and downstream of proposed ash pond discharge
GASEOUS EMISSIONS			
NOx	continuous	(2)	economizer inlet
CO	continuous	(2)	economizer inlet
O2	continuous	(2)	economizer inlet
WORKER HEALTH			
Hearing		once (1)	TBD
Pulmonary Function		once (1)	TBD

1. Must occur prior to installation of Phase III.
2. Two-week period in Phase I.

will be conducted during Phase II of the demonstration project. Compliance measurements are expected to remain the same as current monitoring requirements. Supplemental measurements will provide baseline data against which GR-SI operation will be evaluated. The parameters listed in Table 1-2 will be monitored during Phase III, operation. Compliance monitoring requirements will remain the same as in Phases I and II. Supplemental monitoring requirements will be focused toward three major objectives:

- evaluate the project's success
- ensure that the project is safe for employees and the environment
- create a data base for GR-SI technology

The compliance measurements will be conducted by Illinois Power according to their quality assurance procedures, which satisfy the requirements of the Illinois Environmental Protection Agency (IEPA). A Quality Assurance plan for the supplemental measurements has been prepared according to U.S. EPA guidelines. Sample custody procedures will be followed in accordance with EPA's chain of custody procedures as recorded in Section 3 of the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III Stationary Source Specific Methods, EPA-600/4-77-027b, August 1977. Internal quality control checks for the supplemental data will be conducted by EER's Quality Assurance Officer with independent checks by the test supervisor. Corrective action will be taken if deficiencies are noted during audits or the quality assurance goals have not been achieved. This may involve recalculation of derived measurements or repetition of selected tests.

Once data quality has been verified, the data will be input to a computer system configured to store, process, and output the data in a variety of operator-selected formats. EER will submit quarterly and annual reports of environmental data to DOE with emphasis on data summaries and potential problem areas. These reports will also contain copies of all compliance reports submitted by IP to IEPA during the reporting period, and a description of the plant's permit status.

Data will be reviewed by EER and IP as it becomes available. Data showing significant results will be verified and appropriate action taken if required. This may include modification to monitoring frequency, the addition of a monitoring parameter, or change in monitoring location. EER and IP will review data continuously throughout all phases of the demonstration project.

TABLE 1-2. PROJECT MONITORING IN PHASE III
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MEASUREMENT	SAMPLE TYPE	FREQUENCY	LOCATION
		COMPLIANCE	
WATER			
Flow Rate	24 hr total	daily	new ash pond discharge
pH	grab sample	once/wk	new ash pond discharge
Total Suspended Solids	24 hr composite	once/wk	new ash pond discharge
Oil and Grease	grab sample	once/mo	new ash pond discharge
Groundwater (pH, DO, TDS, temperature, conductivity, elevation, S, B, Mn, Mg, Ca)	grab sample	(1)	groundwater monitoring wells
GASEOUS EMISSIONS			
Coal Composition (sulfur, ash, Btu, moisture)	24 hr composite	daily	coal hopper
		SUPPLEMENTAL	
WATER			
General Use Water Quality Standards (35 Ill. Adm. Code 302)	grab sample	quarterly	Illinois River - 100 ft downstream of ash pond discharge
Parameters Listed in Table 5-5	grab sample	monthly (2)	sluice line to new ash pond and new ash pond discharge
GASEOUS EMISSIONS			
NOx	in-situ chemiluminescent	continuous	stack breeching
SOx	in-situ NDUV	continuous	stack breeching
CO	in-situ NDIR	continuous	stack breeching
CO2	in-situ NDIR	continuous	stack breeching
O2	in-situ paramagnetic	continuous	stack breeching
HC	in-situ FID	continuous	stack breeching

TABLE 1-2. PROJECT MONITORING IN PHASE III, continued

MEASUREMENT	SAMPLE TYPE	FREQUENCY	LOCATION
GASEOUS EMISSIONS			
Particulate	Method 17	(3)	ESP inlet
	Method 5	(3)	ESP outlet
Particle Size Distribution	cascade impactors	(3)	ESP inlet and outlet
Resistivity	cyclonic flow probe	(3)	ESP inlet
Velocity	Method 2	(3)	ESP inlet
Opacity	in-situ optical	continuous	stack breeching
N2O	extractive	(4)	stack breeching
SOLID BY-PRODUCTS			
Ash (5)	grab sample	(6)	Ash hoppers
WORKER HEALTH			
Hearing	N/A	once/yr	TBD
Pulmonary Function	N/A	once/yr	TBD
Vital Signs	N/A	once/yr	TBD
AIR			
Noise	single reading	once (3)	near equipment installation
Coal Dust	single reading	once (3)	near coal pile

1. Monitoring will occur once prior to GR-SI operation, bi-monthly for the first six months, quarterly until the program is completed, and quarterly through closure and post-closure periods.
2. Sampling will be conducted when the pond first discharges, then monthly for the first six months.
3. Measurements will be taken once during each part of Phase III--baseline, parametric, and long term testing.
4. Samples will be collected once during baseline tests, several times during the parametric testing, and monthly for the first 3 months of long term testing.
5. Ash will be monitored for parameters listed in Table 5-2, PAH, and pH.
6. Sampling will be conducted daily during parametric testing and analyzed once. During long-term testing, sampling and analysis will be conducted monthly for the first 3 months.

A Monitoring Review Committee will be established to act in an advisory capacity for project monitoring. The Committee will comprise representatives from EER, DOE, the funding participants, and the demonstration host utilities. The Committee will meet at least once per year, and its functions will include data review and recommendations for modifications to monitoring tasks or reporting formats. Based on the Committee's ongoing review of monitoring information, members of the Committee can recommend that:

(1) Certain monitoring tasks be discontinued, modified or added;
(2) New analytical techniques or instrumentation be substituted; or
(3) The format of the quarterly and annual reports be changed.

If recommendations are made, project management at DOE and EER will consider modification to the EMP and authorize changes as appropriate.

2.0 INTRODUCTION

Energy and Environmental Research Corporation (EER) is conducting a demonstration project as part of the Department of Energy's Clean Coal Technology program. The project is designed to demonstrate an SO_2 and NO_x control technology for coal-fired utility boilers that does not require coal switching or other costly pollution control alternatives. This technology involves the combination of gas reburning with sorbent injection (GR-SI), and will be demonstrated on three full scale utility boilers representing the range of pre-NSPS coal-fired boilers. The project is being co-funded by the Department of Energy, the Gas Research Institute, and the Illinois Department of Energy and Natural Resources.

The remainder of this section presents a description of the GR-SI process, the background and history of the demonstration project, and the purpose and scope of this document.

2.1 Process Technology

Gas reburning involves introduction of natural gas above the main heat release zone to produce a homogeneous, slightly oxygen-deficient zone. Gas reburning is effective in the reduction of NO_x emissions by the reaction of hydrocarbon radical species with NO to form nitrogenous intermediates which react in the oxygen-deficient atmosphere to produce N_2. At the downstream end of this fuel-rich zone, burnout air and calcium-based sorbent are injected into the furnace. The sorbent injection process can be viewed as a sequential coupling of an activation step, in which the calcium-based sorbent calcines or dehydrates to produce CaO, and a heterogeneous sulfation step, where the CaO reacts with gas-phase SO_2/SO_3 and excess oxygen to form solid calcium sulfate. The calcium sulfate is subsequently removed along with the coal fly ash by the plant particulate control equipment.

2.2 Background and History of Project

The technical demonstration project conducted by EER will focus on three Illinois utility boilers representing the range of pre-NSPS boiler technology:

- Central Illinois Light Company, Edwards Station, Unit 1; 117 MWe (net), front wall fired.

- Illinois Power Company, Hennepin Station, Unit 1; 71 MWe (net), tangentially fired.
- City Water, Light and Power, Lakeside Station, Unit 7; 33 MWe (net), cyclone fired.

Hennepin Station comprises two coal-fired steam electric generating units with a total net generating capacity of 300 MWe. Unit 1, which will host the GR-SI demonstration, is a 71 MWe tangentially fired steam electric facility located near Hennepin in Putnam County, Illinois. This unit had a capacity factor of 67.6 percent in 1986. Hennepin Station is owned and operated by the Illinois Power Company (IP).

The project is being conducted in three phases. Phase I includes design and permitting. Preliminary tests were conducted during this phase to determine current emission and discharge levels. Phase II includes construction and startup of the GR-SI system. Phase III involves operation of the GR-SI system and demonstration of its NOx/SO2 emission control potential.

Phase I testing has been completed. Air emissions were monitored and boiler performance data were recorded. These data are being used in GR-SI system design and providing verification of physical isothermal flow models and thermal performance computer models. Phase II monitoring will provide information about worker safety during the construction process.

During Phase III, testing will occur in three stages: baseline, parametric, and long-term testing. First, tests will be conducted to establish baseline performance of the boiler (without GR-SI) under a range of selected operating conditions. The results of these tests will provide the baseline against which GR-SI performance will be evaluated. The objective of the parametric testing is to evaluate system performance over a wide operating range and to determine the conditions resulting in the best balance of emissions reductions, boiler performance, and cost. Alternate coals and sorbents will be evaluated as well. The long-term evaluation will provide information on the reliability of injection equipment and long-term impacts on boiler performance, including maintenance requirements and overall system performance in terms of emission control.

2.3 EMP Purpose and Scope

This document is the Environmental Monitoring Plan (EMP) for Unit 1 at IP's Hennepin Station, submitted in accordance with the cooperative agreement requirement for special reports. The EMP provides a detailed description of the monitoring of environmental and health related factors during construction and operation of the GR-SI system at the demonstration site, both compliance monitoring required by environmental permits and supplemental monitoring for research purposes.

Environmental monitoring will be one of the key methods used by EER and the funding participants to determine the success of this project. The goal is to effect control of SO_2 and NO_x emissions without adversely impacting other boiler performance parameters. Boiler emissions will be monitored to determine if project goals have been met. In addition, measurements will be made to monitor boiler performance and operating characteristics. Water and solid by-product discharge streams will also be monitored on a regular basis. Measurements will be made prior to and during GR-SI system operation.

The following section provides a more detailed description of the GR-SI process and its impacts on ancillary systems, including sorbent storage, process discharges, and by-product disposal. The project goals for atmospheric emission are given in Section 3.3. Section 4 describes the monitoring which is currently required at Hennepin Station and the anticipated compliance monitoring during all phases of the GR-SI demonstration project. Supplemental monitoring, described in Section 5, is monitoring that is not required by any permit or state regulation. This section also describes the methods EER will use to conduct the supplemental monitoring. Section 6 discusses the monitoring that will be conducted to ensure protection of worker health and safety. Section 7, the Quality Assurance Plan for the project, lists the sampling and analytical procedures which will be used to ensure sample integrity, including audits and QC checks. Section 8 describes the management procedures for monitoring data and the data reporting format.

3.0 PROJECT DESCRIPTION

3.1 Overall Description

Several technologies are available to reduce emissions of SO_2 and NO_x from pulverized coal-fired power plants. Gas Reburning-Sorbent Injection (GR-SI) is a retrofittable technology which is generally applicable to a wide range of cyclone-, wall-, and tangential-fired boilers that are characteristic of pre-NSPS design practices. GR-SI reduces the emissions of both suspected acid rain precursor species and, therefore, is expected to be an effective acid rain control strategy.

GR-SI combines two technologies: reburning for in-furnace NO_x control and the injection of a calcium-based sorbent in the furnace or convective pass of a pulverized coal-fired boiler for in-situ SO_2 removal. Figure 3-1 presents a simplified schematic of the GR-SI combined process when applied to a tangential-fired boiler. Since NO_x reduction by reburning and SO_2 reduction due to capture by calcium-based sorbents occur in different thermal and spatial zones within the boiler, it is convenient to consider the two processes separately.

3.1.1 Reburning

The concept of reburning for NO_x control has been recognized for over a decade. The overall process can be divided into three zones, namely:

- Main Heat Release Zone - In this zone, approximately 80 percent of the total heat input to the boiler is released. The coal burners operate under overall fuel-lean conditions and do not require modification.

- Reburning Zone - The reburning zone is the region where the natural gas is injected, and accounts for a maximum of 20 percent of the total heat input. It is injected downstream of the main heat release zone to create a fuel-rich reburning zone. The NO produced in the main heat release zone reacts with hydrocarbon radicals formed by the partial oxidation of the reburning fuel. This produces reduced nitrogen-containing reaction intermediates,

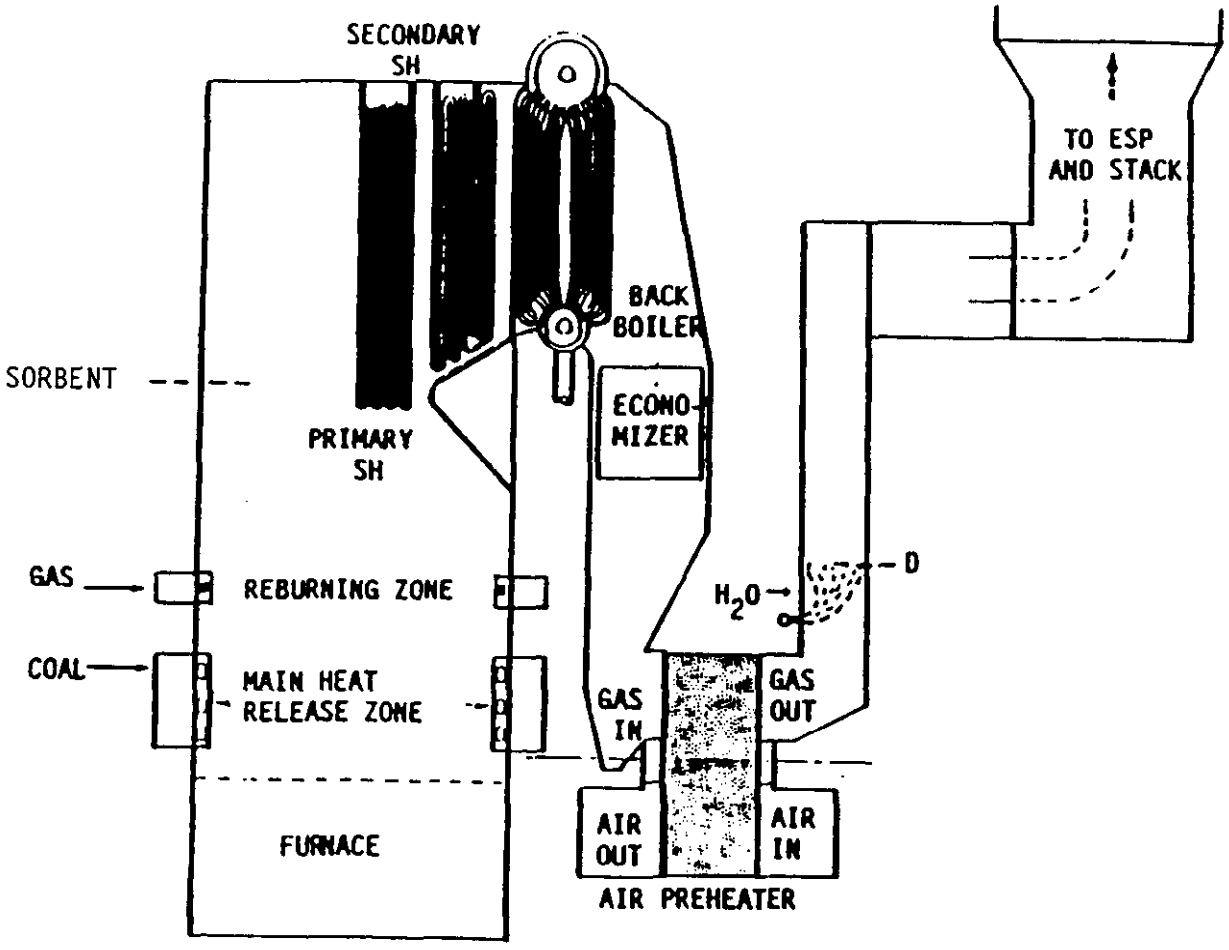

Figure 3-1. Application of Gas Reburning-Sorbent Injection For NO_x/SO_x Control

such as amines and cyano compounds, which may further react to form N_2 by a reaction path which can be summarized by:

$$CH + NO \rightarrow HCN + O$$
$$HCN + OH \rightarrow NHi + CO_2$$
$$NHi + OH \rightarrow N_2 + NO + H_2O$$
$$NHi + NO \rightarrow N_2 + H_2O$$

- Burnout Zone - The burnout zone is the region where air is added to create overall fuel-lean conditions and ensure complete oxidation of the reburning gas. Remaining reduced nitrogen species are converted either to NO or N_2. The fuel and air stoichiometries in the reburning zone and the burnout zone are so adjusted that N_2 formation is maximized.

3.1.2 Sorbent Injection

The use of calcium-based sorbents with furnace injection for SO_2 control has been studied extensively. The process involves calcination or dehydration of a calcium-based sorbent, which may be either a carbonate or a hydrated lime, producing calcium oxide. This calcium oxide reacts with SO_2 in the sulfation zone producing solid calcium sulfate. Two major parameters control the utilization of the calcium in the sorbent:

- The reactivity of the calcium oxide formed by calcination - This is strongly dependent upon the surface area of the calcine which is a function of the sorbent type and the thermal history of the calcine. Reactivity tends to decrease as the sorbent particle temperature is increased due to grain growth.

- The residence time of the calcine under conditions conducive to sulfation - Significant sulfation cannot occur above approximately 2250°F because of rate and equilibrium limitations, and the rate of sulfation becomes negligible below approximately 1600°F. Thus, the residence time of the active particle within this temperature window is important in the sulfur capture process.

The calcium sulfate, unreacted sorbent, and coal fly ash are removed from the gas stream prior to the stack by an electrostatic precipitator.

3.1.3 Gas Reburning for SO_2 Control

As was described in Section 3.1.2, sorbent injection is the primary means of SO_2 control. However, combining gas reburning with sorbent injection results in a lower SO_2 offgas level than applying sorbent injection alone. The combustion of natural gas in the reburning process replaces 20 percent of the heat input which would otherwise be supplied by the coal. This reduced coal use reduces the amount of sulfur in the fuel available for SO_2 formation. Thus, SO_2 control is enhanced by the reburning process since baseline SO_2 levels are reduced.

Gas reburning and sorbent injection are being combined for NO_x and SO_2 control in Unit 1 of IP's Hennepin Station. A flow diagram for the system is shown in Figure 3-2. The remaining discussion in this section describes material storage and discharge streams from the plant during GR-SI operation.

3.2 Material Storage

Materials that will be utilized during the GR-SI demonstration project are sorbent, natural gas, and coal. The sorbent used in the majority of the tests will be hydrated lime, with lime or limestone being tested for comparative purposes. The sorbent will be stored in a silo with appropriate provisions for loading and unloading. Hennepin Station currently has 100 percent natural gas firing capability. Natural gas is provided directly to the furnace by pipeline. There are no on-site storage requirements for gas. Coal for the plant is currently stored in an on-site coal pile.

3.3 Emissions and Discharges

A coal-fired boiler incorporating the GR-SI process contains many input and output streams. The main inputs to the system, as described above, include fuel (coal and natural gas), and sorbent for SO_2 capture. Major output streams include gaseous combustion products, fly ash which includes the spent sorbent, and bottom ash. These streams are shown with corresponding flow rates for Hennepin Unit 1 in Figure 3-2. When the GR-SI system is in operation, the bottom ash and fly ash will be sluiced to a new pond designed to handle these materials. When the GR-SI system is not in operation, the bottom ash and fly ash will be sluiced to the existing ash pond.

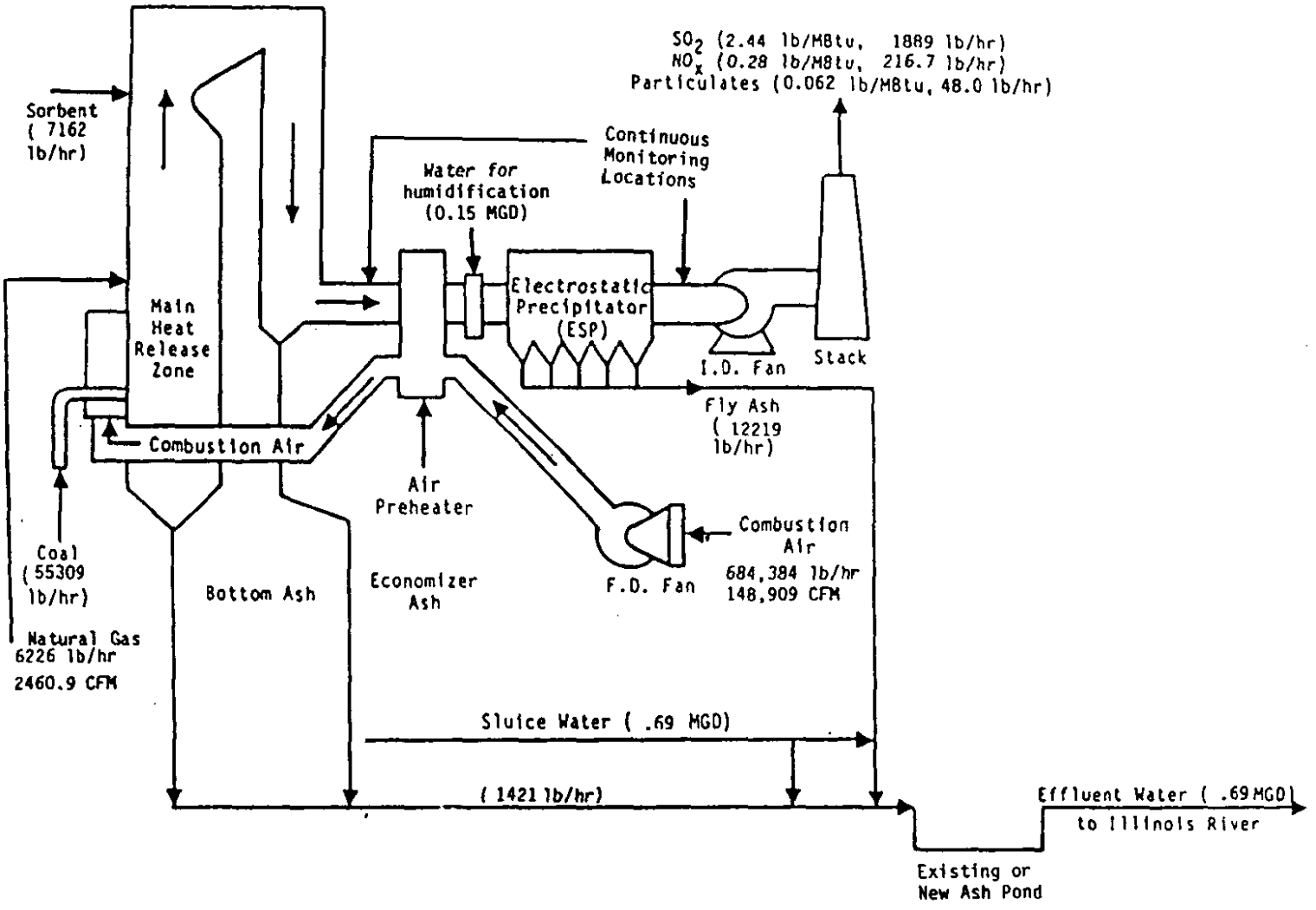

Figure 3-2. Process flow diagram for GR-SI operation during full load output

3.3.1 Atmospheric Emissions and Control

At Hennepin, the SO_2 emission control strategy for the GR-SI demonstration project is to reduce the existing SO_2 emission level by 50 percent. The current SO_2 emission rate from Hennepin Unit 1 is approximately 4.88 $lb/10^6$ Btu (3758 lb/hr at full load). The GR-SI system will provide 60 percent NO_x control. There is no NO_x emission constraint for this unit, thus NO_x emission reduction could be useful to the utility in response to acid rain regulations if and when they are promulgated. The current NO_x emission rate from Hennepin Unit 1 is approximately 0.69 $lb/10^6$ Btu (534 lb/hr at full load) and is expected to be reduced to 0.28 $lb/10^6$ Btu (217 lb/hr at full load) through GR-SI implementation. The baseline particulate emission rate of 0.062 $lb/10^6$ Btu (48 lb/hr at full load) is expected to increase due to the GR-SI process, but the increase is expected to be below any limit which might trigger requirements of the Clean Air Act.

3.3.2 Aqueous Discharges and Control

Fly ash from the GR-SI process will be disposed by sluicing the ash with water to a newly constructed on-site disposal pond. Effluent from the pond will be treated and then discharged to the Illinois River. Treatment will be required for pH and may be required for total suspended solids. Treatment for pH will be provided by injection of sulfuric acid into the discharge piping. Pipe turbulence and the residence time available will provide adequate conditions for the H_2SO_4 to be effective in lowering pH. Treatment for TSS, if required, will be accomplished by mixing a chemical polymer into the ash-laden water. The bottom ash will be sluiced with the fly ash to the new disposal pond. This will aid in preventing the build-up of cementitious material on the pipe walls.

4.0 COMPLIANCE MONITORING

4.1 Purpose and Scope

EER has evaluated the potential environmental risks associated with this project to aid DOE in preparing the necessary documentation to satisfy requirements of the National Environmental Policy Act. The results of this analysis, documented in the Environmental Information Volume for IP Hennepin Station, indicate that no adverse effects are expected on the environment as a result of this project. Nevertheless, both compliance and supplemental monitoring will be required to verify this conclusion.

Compliance monitoring is that environmental monitoring required by State regulatory obligations. Most of these obligations are specified in permits obtained by IP for operation of the facility, though some are requirements imposed by general regulations.

In general, new, modified or reconstructed sources of air emissions are required to meet the New Source Performance Standards (NSPS) developed as part of the Clean Air Act. Certain new or modified sources are also required to meet the Prevention of Significant Deterioration (PSD) requirements if they result in a significant net increase in emissions. However, EPA regulations specifically exempt addition of air pollution control equipment from the definition of a modification that may trigger NSPS [40 CFR 60.14 (e)(5)], and no significant increase in emissions is expected upon initiation of GR-SI operation, which would trigger PSD.

IP is currently required by the Illinois Environmental Protection Agency (IEPA) to monitor water discharges from Hennepin Unit 1. Modifications to the facility to implement GR-SI will be relatively minor. New permits for a new water discharge will be required as well as modifications to the existing air permit. The remainder of this section describes the existing monitoring requirements at Hennepin Station and the anticipated compliance monitoring requirements during all phases of the demonstration project.

4.2 Current Monitoring Requirements

IEPA has issued permits to IP for operating Hennepin Unit 1 as an air emission source and a water discharge source. Compliance monitoring

requirements for both permits are summarized in Table 4-1 for the discharges which will be affected by this project.

The air emission source operating permit establishes emission limits, monitoring requirements and reporting requirements. An emission limit has been established for SO_2. The monitoring requirement to verify that this emission limit is met is daily coal sampling. The reporting requirement is submittal of quarterly reports showing daily coal usage and composition. A copy of the permit is provided in Appendix A.

Water discharges are regulated by the National Pollution Discharge Elimination System (NPDES) permit, issued and enforced by IEPA's Water Pollution Division. The NPDES permit lists the monitoring requirements and allowable discharge levels for all water discharges from the plant. There are three discharge outfalls described in the permit with seven contributing discharge streams. These are listed in Table 4-2. It is anticipated that the discharge from the newly constructed pond will require modification of the existing NPDES permit, creating a new discharge. The only existing discharge which may be affected by the GR-SI project is the ash pond discharge, number 005. This discharge would experience a decrease in effluent flow rate. Monitoring required by the NPDES permit for discharge 005 includes weekly determinations of the discharge flow rate, pH, and total suspended solids, and monitoring of oil and grease twice per month. IP is required to submit monthly reports with the results of this monitoring to IEPA. The new discharge is expected to have similar requirements. Appendix A contains a copy of the current NPDES permit.

Illinois regulations concerning fugitive emissions are listed in Part 212, subpart K of the Air Pollution Rules and Regulations, and are enforced through IEPA's Air Pollution Division. These require that no visible emissions be observable at the property boundary. Further, operations within a particulate ambient standard non-attainment area must ensure that every source of possible fugitive particulate emission shall be operated under an emissions control program approved by IEPA. Hennepin Station is in an attainment area; thus, a fugitive emissions control program is not required.

TABLE 4-1. HENNEPIN UNIT 1 CURRENT PERMIT MONITORING REQUIREMENTS

MEASUREMENT	SAMPLE TYPE	FREQUENCY	LOCATION
AIR EMISSION SOURCE OPERATING PERMIT			
Coal composition sulfur, ash, Btu, moisture	24 hr composite	Daily	Coal hoppers
NPDES PERMIT			
Flow Rate	Single reading estimate	Once/wk	Existing ash pond discharge
pH	Grab sample	Once/wk	Existing ash pond discharge
Total Suspended Solids	24 hr composite	Once/wk	Existing ash pond discharge
Oil and Grease	Grab sample	Twice/mo	Existing ash pond discharge

TABLE 4-2. DISCHARGE STREAMS DESIGNATED IN HENNEPIN NPDES PERMIT

DISCHARGE NUMBER	DISCHARGE NAME
001	Condenser cooling water
001(a)	Boiler blowdown
001(b)	Intake screen backwash
001(c)	Roof drain discharge
003	Ash lagoon #2 and #4 discharge
005	Ash lagoon #3 discharge
005(a)	Chemical metal cleaning waste treatment sytem effluent

4.3 Pre-Construction

Hennepin Station Unit 1 continues to operate under existing permits during Phase I. In Phase I, EER conducted supplemental tests to assess the operating condition of the plant. These measurements were not taken for compliance purposes, although current monitoring required by the air and NPDES permits remain in effect during Phase I and are being conducted by IP as required. Records of all monitoring will be available for comparison with test results from later phases of the program.

4.4 Construction

The monitoring required by IEPA permits for air emissions and water discharges during Phase II will remain the same as the current monitoring requirements, described in Table 4-1.

4.5 Operation

Additional compliance monitoring will be imposed during the test program for the discharge from the new ash pond and for groundwater near the new pond. The current NPDES permit will require modification due to the addition of the discharge from the newly constructed pond. The monitoring which is anticipated to be required for the new discharge includes measurement of flowrate, pH, total suspended solids, and oil and grease levels. The frequency of measurement and sample type are expected to be the same as the monitoring requirements for the existing ash pond discharge, as listed in Table 4-1.

Compliance monitoring for groundwater will include grab sampling of water from the monitoring wells placed upgradient and downgradient from the new ash pond. The parameters to be measured are pH, dissolved oxygen (DO), temperature, conductivity, elevation, sulfate, boron, manganese, magnesium, calcium, and total dissolved solids (TDS). The frequency for compliance groundwater monitoring should be one round prior to operation to obtain baseline results, bi-monthly for the first six months of operation, and quarterly until completion of the GR-SI demonstration.

4.6 Post-Operation

When the GR-SI demonstration is complete, IP has the choice of keeping the equipment which was installed for the GR-SI system or having it removed. If the system equipment remains intact, IP may operate the unit with or without the GR-SI system in operation. If IP chooses to operate with GR-SI and continue to use the new ash pond, quarterly monitoring of monitoring wells and weekly monitoring of the pond discharge will continue to be requirements. If the GR-SI system is not operated, quarterly monitoring of groundwater wells will continue for the closure and post-closure GR-SI period, which is approximately one year.

4.7 Permits

The only permits governing plant operation currently are the NPDES and air emission source operating permits, both issued by IEPA. The GR-SI demonstration project will necessitate modification of these permits as well as the addition of others, including a construction permit for modifications to the boiler and a construction permit for an ash disposal pond. Requirements for new and modified permits are discussed below.

A permit is required by IEPA for construction of any new emission source. In this case the silo, constructed for sorbent storage, will have a vent, which is considered a new emission source, requiring a construction permit. The modifications to the boiler for the GR-SI system will also require a construction permit. Each permit application must contain information about the proposed equipment, including type, size, efficiency, and specifications. In addition, information on the nature of the emission source must be provided, including description of raw materials, expected quantities of controlled and uncontrolled emissions, operating procedures, and other data to quantify the entire process.

The existing operating permit must be reviewed and revised by IEPA when modifications are made to any emission source. Since the GR-SI system will cause changes in boiler operation, a modification to the boiler operating permit will be required. The application for this permit modification must contain details of the startup procedures and expected operating characteristics. In some cases, the construction and operating permits are

issued jointly if IEPA perceives no complications or unexpected problems in the construction phase.

IEPA requires a permit for construction of any new wastewater treatment facility. The permit application must contain:

1) site assessment and selection criteria
2) hydrogeological study
3) engineering construction plans and specifications
4) characterization of new discharge
5) impacts of effluent on receiving waters
6) updated water flow diagram

IEPA also requires an NPDES permit for operation of any new facility or modification to an existing facility or process which affects the discharge. IP currently has an NPDES permit which would require modification for a new discharge. The information required for this permit is essentially the same as that for the new facility construction permit. The NPDES permit is expected to require that the new discharge be monitored for pH, total suspended solids, oil and grease, and the groundwater monitoring wells for various water quality related parameters.

A joint permit application to the U.S. Army Corps of Engineers, Illinois Department of Transportation (Division of Water Resources), and the Illinois Environmental Protection Agency (Division of Water Pollution Control) is required for any construction which will take place in a 100-year floodplain or impact a wetland, river, lake, or stream. The application must contain details of the construction and expected impacts. No monitoring requirements are anticipated as part of the Corps of Engineers permit. The Illinois Department of Transportation (IDOT) may classify the new ash pond as a Class III dam, which could require a maintenance plan. Periodic inspection to assure structural integrity would be required as a part of such an IDOT permit. The joint permit application would also be subject to the review authority of the Illinois Department of Conservation and other state and federal agencies.

4.8 Schedules

The timetable for various phases of the GR-SI demonstration project is provided below. Preliminary monitoring took place early during Phase I, and continued for approximately two weeks. The construction period is scheduled to be completed about 16 months after the initiation of Phase II. The entire demonstration program (Phase III) is scheduled to last approximately 18 months. The exact schedule will depend on final design, outage schedule, load schedule, and other details. At the end of the demonstration program, IP may choose either to keep the equipment installed on Hennepin Unit 1 or have it removed, at no cost to them.

Phase I - 18 months
- Preliminary Monitoring
- System Design
- Permitting (applications)

Phase II - 16 months
- Permitting (secure permits)
- Construction

Phase III - 18 months
- Baseline Testing
- Parametric Testing
- Long-Term Operation
- Optional Equipment Removal

5.0 SUPPLEMENTAL MONITORING

5.1 Purpose and Scope

EER will conduct monitoring during the three phases of the test program which is not required for compliance with any federal or state regulations. This type of monitoring is termed supplemental monitoring, and will be focused upon three major goals:

1. Provide a basis for evaluating the success of the demonstration project.
2. Ensure that the demonstration will not be detrimental to the environment or to worker health and safety.
3. Create a data base from which others may draw for replication of this technology in the future.

This section describes the supplemental measurements which have been and will be made during each phase of the demonstration project, the corresponding measurement methods, and the monitoring schedule.

5.2 Phase I: Pre-Construction

Monitoring will be conducted to document baseline values for environmental parameters which may be affected by the project. Some of this monitoring took place prior to installation of GR-SI equipment in Phase I, and other monitoring will be conducted in Phase II or Phase III. Areas of concern include ash pond water quality, Illinois River water quality, gaseous emissions, and worker health. All worker safety and health issues are addressed in Section 6. Baseline water quality data will be collected at the beginning of Phase III, prior to GR-SI initiation; the associated measurements are discussed in Section 5.4.

Supplemental emissions of NO_x, O_2 and CO were measured early in Phase I. These data are being utilized as system design inputs and to verify computer and physical modeling studies. Additional baseline gaseous emission measurements will be made at the beginning of Phase III. Table 5-1 shows the supplemental gaseous monitoring program for Phase I, as well as Phases II and III.

TABLE 5-1. SUPPLEMENTAL EMISSIONS MONITORING PLAN
page 1 of 2

MEASUREMENT		SAMPLE TYPE* AND FREQUENCY	LOCATION
PHASE I			
Preliminary	NOx	Continuous (7E)	Economizer inlet
	O2	Continuous (3A)	Economizer inlet
	CO	Coninuous (10)	Economizer inlet
PHASE II			
No measurements			
Phase III			
Baseline	NOx	Continuous (7E)	Economizer outlet or stack breeching
	SO2	Continuous (6C), Method 6	Economizer outlet or stack breeching
	CO	Continuous (10)	Economizer outlet or stack breeching
	CO2	Continuous (3A), Method 3	Economizer outlet or stack breeching
	O2	Continuous (3A), Method 3	Economizer outlet or stack breeching
	Particulate	Method 17	ESP inlet
		Method 5	ESP outlet
	Particle Size Distribution	Cascade impactors	ESP inlet and outlet
	Resistivity	Cyclonic flow probe	ESP inlet
	Velocity	Method 2	ESP inlet
	Opacity	In-situ optical	Stack breeching
	N2O	Extractive	Stack breeching

*All sample types are EPA reference methods from 40 CFR 60 Appendix A (1987).

TABLE 5-1. SUPPLEMENTAL EMISSIONS MONITORING PLAN, continued

	MEASUREMENT	SAMPLE TYPE* AND FREQUENCY	LOCATION
Parametric	NOx	Continuous (7E)	Economizer inlet or ESP outlet
	SO2	Continuous (6C)	Economizer nilet or ESP outlet
	CO	Continuous (10)	Economizer inlet or ESP outlet
	CO2	Continuous (3A)	Economizer inlet or ESP outlet
	O2	Continuous (3A)	Economizer inlet or ESP outlet
	HC	Continuous (25A)	Economizer inlet or ESP outlet
	Particulate	Method 17	ESP inlet
		Method 5	ESP outlet
	Particle Size Distribution	Cascade impactors	ESP inlet and outlet
	Resistivity	Cyclonic flow probe	ESP inlet
	Velocity	Method 2	ESP inlet
	Opacity	In-situ optical	Stack breeching
	N2O	Extractive	Stack breeching
Long Term Operation	NOx	Continuous (7E)	Stack breeching
	SO2	Continuous (6C), Method 6	Stack breeching
	CO	Continuous (10)	Stack breeching
	CO2	Continuous (3A), Method 3	Stack breeching
	O2	Continuous (3A), Method 3	Stack breeching
	HC	Continuous (25A)	Stack breeching
	Particulate	Method 17	ESP inlet
		Method 5	ESP outlet
	Particle Size Distribution	Cascade impactors	ESP inlet and outlet
	Resistivity	Cyclonic flow probe	ESP inlet
	Velocity	Method 2	ESP inlet
	Opacity	In-situ optical	Stack breeching
	N2O	Extractive	Stack breeching

*All sample types are EPA reference methods from 40 CFR 60 Appendix A (1987).

Other data were also obtained during Phase I for design and permitting purposes. A major by-product of the GR-SI process is the solid waste stream containing a mixture of unreacted and spent sorbent with fly ash. This material will be disposed in a new on-site pond. During Phase I, ash was generated in a pilot-scale test furnace under simulated GR-SI conditions. The ash was tested to characterize its disposal properties. The solid waste characterization conducted on the simulated ash include pH level, concentration levels of various inorganic elements, and toxicity leaching characteristics. Specific characterization tests performed on the ash are listed in Table 5-2. The test results indicate that wet disposal should pose no serious problems. Leachate concentrations of all eight metals specified under RCRA were well below values that would classify the ash as hazardous. The GR-SI ash settling time is similar to that for the conventional Hennepin fly ash. The temperature increase observed when water was added to the GR-SI ash indicates that caution will be required to ensure that the temperature remains within acceptable limits; however, the temperature rise observed in the tests occurred at a water to ash mass ratio of 4:1, while the actual ratio expected during wet ash disposal is approximately 17.6:1. Finally, the preliminary tests indicate that the GR-SI ash may satisfy the standard specification for use as a concrete admixture. Further evaluation of this and other beneficial uses of GR-SI ash will be undertaken during Phase III of this project.

5.3 Phase II: Construction

The only supplemental monitoring performed during the construction phase of this program will be sampling of the Illinois River to document baseline levels for various parameters. One composite sample will be taken from the river at points 100 feet upstream and downstream of the new pond discharge. More details of this monitoring are provided in Section 5.4.2.

5.4 Phase III: Operation

The supplemental monitoring of environmental parameters during Phase III will include gaseous emissions, solid by-product discharges, water discharges, ambient monitoring in the Illinois River, and groundwater. These measurements are described in more detail below.

TABLE 5-2. SOLID BY-PRODUCT CHARACTERIZATION

CHEMICAL CHARACTERISTICS

Mineral Analysis
EP Toxicity
Free CaO
Total Organic Carbon
Sulfate
Chemical Oxygen Demand
Phenol
Cyanide
Chloride
Sulfide
Paint Filter Test

PHYSICAL CHARACTERISTICS

Specific Gravity
Fineness
Pozzolanic Activity
Soundness

5.4.1 Air Emissions

The objective of this project is to verify that GR-SI can effectively control SO_2 and NO_x emissions without adversely impacting particulate emissions. In addition, boiler performance will be evaluated during system operation. The focus of all environmental measurements is the output streams, particularly air emissions of SO_2, NO_x, and particulates. Other parameters will be monitored to aid in the understanding of the processes occurring within the furnace during GR-SI operation. Table 5-1 summarizes the gaseous emissions monitoring plan for all three phases of the demonstration project.

Gaseous emissions to be monitored during the test program include SO_2, NO_x, CO, CO_2, O_2 and hydrocarbons. EER will use a special continuous monitoring system designed to overcome problems such as gaseous stratification and in-probe SO_2 capture. Figure 5-1 shows a schematic diagram of the continuous monitoring system developed by EER for the evaluation of sorbent injection on utility boilers. Key features of the system include:

- Multiple probes
- Rotameters to allow accurate flow rate balancing
- Phase discrimination probes
- All components heated upstream of moisture removal
- Zero and span gases for instrument calibration

For gaseous measurements, six to 16 probes are plumbed to a mixing manifold to provide an average sample. Glass rotameters are used to provide an on-line indication of each probe flow rate. Phase discrimination probes are used to provide inertial separation of particulate while minimizing the contacting of the gas with the particulate. Figure 5-2 shows the design of a phase discrimination probe. This probe has been developed by EER to separate particulate from sample gas via inertial effects prior to SO_2 measurement. Under typical probe operating conditions, in excess of 90 percent of the particulate matter is separated from the gas stream which is to be monitored. This greatly reduces the potential for interaction between the gas sample and the particulate in the sampling system. All components are heated to 250°F or above and insulated to eliminate the possibility of condensation in the sample system. Calibration of each of the gas monitors is accomplished with zero and span gases on a regular basis. Hydrocarbon (HC) will be measured at the economizer inlet using a Beckman 402 heated flame ionization detector. A

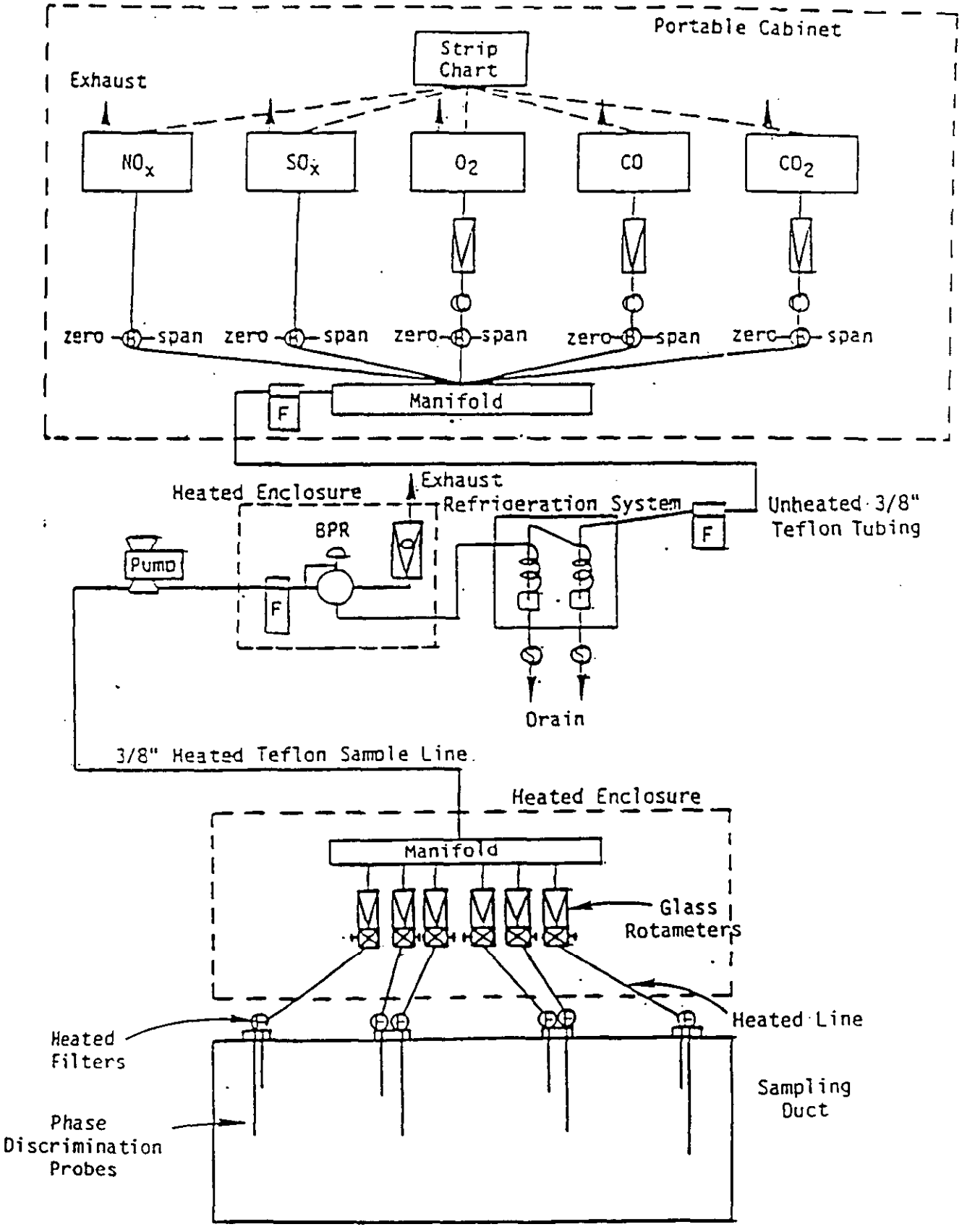

Figure 5-1. Continuous Monitor Sampling Train

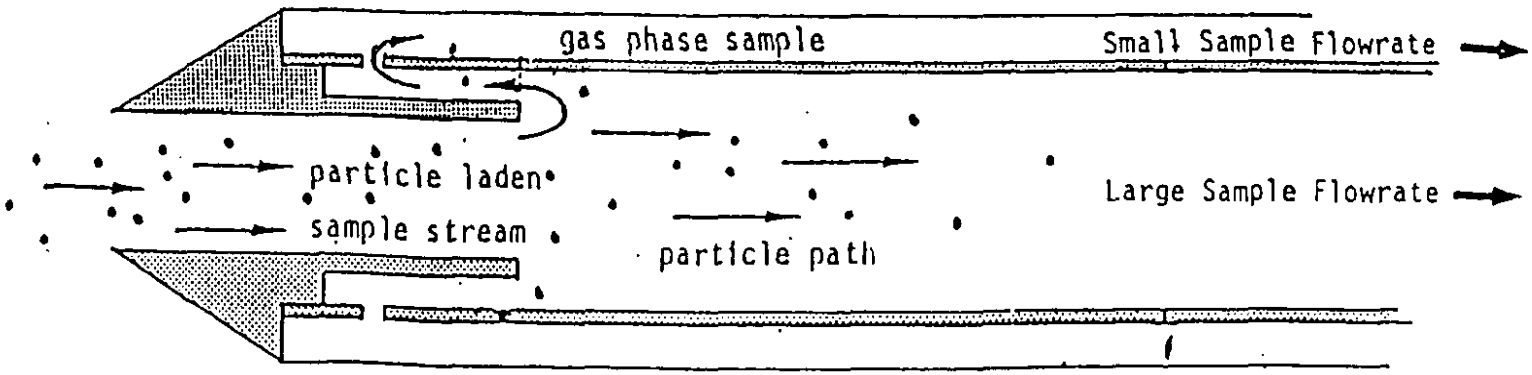

FIGURE 5-2. PHASE DISCRIMINATION PROBE

separate single point sampling system heated to 350°F will be used to minimize the potential loss or hang-up of hydrocarbons in the sampling system. Table 5-3 lists the instrumentation to be used for each of the gases monitored.

Measurement of SO_2 in the presence of active particulate is difficult due to the reaction of the SO_2 with unreacted calcium in the presence of moisture. This can cause higher SO_2 capture levels to be reported than actually exist at the probe inlet. Due to the importance of the SO_2 measurement system, and the possibility of interactions between SO_2 and sorbent in the sampling system, EER will perform the primary SO_2 measurements at the precipitator outlet. Because the precipitator removes nearly all of the particulate, SO_2 measurements at the outlet will not be subject to interference from the reactive particulate. Measurements at the economizer outlet will also be taken and will be used primarily for diagnostic purposes.

Concentrations of O_2, CO, HC, and CO_2, will be measured to confirm boiler operating conditions. The O_2 concentration in the flue gas provides an indication of the boiler excess air and is used to convert the other emissions concentrations to a standard condition. The CO_2 provides a means of checking the O_2 measurements based on the fuel composition and a carbon mass balance. CO and hydrocarbon (HC) concentrations provide a relative indication of combustion efficiency. The concentration of CO is typically less than 200 ppm in coal-fired boilers. CO and HC will be monitored to determine if the process causes a change in emissions or combustion completeness. Also, CO and O_2 stratification across the economizer outlet can be used as an indication of burner fuel-air balance.

EER will utilize EPA Reference Methods to verify the emissions measurements obtained with the continuous monitors. EPA Method 3 will be used to verify CO_2 and O_2 measurements in Phase III once during baseline testing and once during long-term operation. Method 7 will be used for verification of the NO_x measurement. SO_2 measurements will be verified using EPA Method 6. Both methods 6 and 7 will be used once during baseline testing and once during long-term operation. EER utilizes a modified Method 6 to measure SO_2 to minimize the interaction of active particulate and sample gas. A Method 5 sample train with a 4-inch heated out-of-stack filter is used rather than the standard Method 6 sample train. The large heated filter reduces the build-up of a filter cake, minimizing the potential loss of SO_2 in the sample system. The Method 6 sampling will be conducted at the precipitator outlet to further

TABLE 5-3. CONTINUOUS ANALYZERS

GAS MEASURED	DETECTION PRINCIPAL	MANUFACTURER	MODEL NO.	RANGE
SO2	NDUV	Western Research	721AT	0-5000 ppm
NOx	Chemiluminescent	TECO	10AR	0-2.5 ppm to 0-10,000 ppm
O2	Paramagnetic	Taylor	OA570	0-10%, 0-25%
CO	Nondispersive Infrared	ANARAD	AR500R	0-500 ppm to 0-2,000 ppm
CO2	Nondispersive	ANARAD	AR500R	0-25%
HC	Flame Ionization	Beckman	402	

minimize the potential for SO_2/particulate interactions. Additional details regarding data quality assurance can be found in Section 7.

Nitrous oxide (N_2O) will be measured during baseline, parametric and long term testing of Phase III. Measurements will be extracted, dried, scrubbed for SO_2, then kept in sampling flasks until analyzed. N_2O analysis will be conducted by gas chromatography. Sampling will occur once during baseline tests, several times during parametric testing and monthly for the first three months during the long term tests. At the end of this time, results will be analyzed to determine the need for additional monitoring.

Opacity will be measured with an opacity monitor placed in the stack breeching. This instrument measures light transmittance through the flue gas. Opacity will be measured continuously during Phase III parametric and long term testing.

Total particulate emissions will be measured at the precipitator inlet using EPA Reference Method 17 and at the ESP outlet using Method 5. Particle size distribution will also be measured at the ESP inlet and outlet using in-stack cascade impactors. A Brinks impactor will be used at the inlet because the low sample flow rate of this impactor will allow a longer sample time with a high inlet grain loading. An Andersen impactor will be used at the outlet because the relatively high sample flow rate of this sampler is more appropriate for the low grain loading. Resistivity of the gases entering the ESP will be measured using a Wahlco cyclonic flow probe. Velocity will be measured using EPA Reference Method 2. Measurements of particulate, particle size distribution, resistivity, and velocity will be taken once during baseline operation, once during the parametric testing, and once during the long term operation, and additionally as required for diagnostic purposes.

5.4.2 Aqueous Discharge

During normal operation of the GR-SI system, the modified fly ash from Unit 1 will be sluiced to a newly constructed ash pond. The bottom ash will also be sluiced to the new ash disposal pond. The new pond will require modifications to the NPDES permit, as described in Section 4.7, including monitoring of some discharge parameters. In addition to the compliance measurements, some supplemental monitoring will be conducted.

Supplemental monitoring will be conducted at the sluice line discharge point, at the ash pond discharge point and in the Illinois River. Monitoring results will be used to gauge the effectiveness of gravity sedimentation as a treatment for the GR-SI ash, and also to verify that the project implementation will have no detrimental effect on the Illinois River water quality. Table 5-4 lists the various aqueous discharges to be monitored during the demonstration.

Monitoring of the ash sluice water and the ash pond discharge will be conducted for a number of constituents, which are listed in Table 5-5. Water samples will be collected from each location as soon as the pond is in operation, and monthly thereafter for the first six months of the parametric and long-term testing period. Analysis of the samples from both the influent and effluent streams will indicate the amount of solids and other pollutants being collected in the pond. In the unlikely event that the concentration level of any pollutant exceeds the NPDES permit limitations or the Illinois Effluent Standards (35 Ill. Adm. Code 304), available treatment measures will be implemented for that pollutant in the ash pond or the discharge pipe.

General Use Water Quality Standards (35 Ill. Adm. Code 302) listed in Table 5-6 are applicable for waters of the state for which there is no specific designation, which includes the Illinois River. Monitoring for these pollutants will take place at the beginning of Phase III during baseline operation. Measurements will be taken 100 feet upstream and downstream of the ash pond discharge location. Samples will be collected from a boat at eight evenly spaced intervals across the river with a composite sampler. The samples will be analyzed separately to determine the effects of the GR-SI system on the river cross-section. During the GR-SI parametric testing of Phase III, additional samples will be collected to evaluate the impact of GR-SI on the General Use Water Quality parameters. If significant increases in any pollutant are detected during screening tests, appropriate mitigating measures will be identified and implemented, and a routine monitoring program will be instituted. The procedures outlined above are designed to ensure that no adverse impact to the Illinois River and the nearby heron rookery/hatchery occurs as a result of GR-SI implementation.

TABLE 5-4. SUPPLEMENTAL MONITORING PLAN FOR AQUEOUS DISCHARGES AND SOLID BY-PRODUCTS

	MEASUREMENT	SAMPLE TYPE	FREQUENCY	LOCATION
PHASE I				
No measurements				
PHASE II				
	General Use Water Quality Standards	composite	once	100' upstream and downstream of ash pond discharge
PHASE III				
Baseline	No measurements			
Parametric	Ash--parameters in Table 5-2, PAH, pH	grab sample	sample daily analysis once	Ash hoppers
	Water--parameters in Table 5-5	grab sample	monthly	sluice line discharge and ash pond discharge
	Water--General Use Water Quality Standards (35 Ill. Adm. Code 302)	grab sample	quarterly	100' upstream and downstream of ash pond discharge
Long Term	Ash--parameters in Table 5-2, PAH, pH	grab sample	sample and analysis monthly for 3 months	Ash hoppers

TABLE 5-5. AQUEOUS MONITORING FOR ASH POND INFLUENT AND EFFLUENT STREAMS

Arsenic, Total
Barium, Total
Boron, Total
Cadmium, Total
Chromium, Total
Iron, Total
Lead, Total
Mercury, Total
Oil and Grease
pH
Selenium, Total
Silver, Total
Sulfates
Total Dissolved Solids
Total Suspended Solids
Zinc

TABLE 5-6. ILLINOIS GENERAL USE WATER QUALITY STANDARDS

CONSTITUENT	CONCENTRATION (mg/l)
Arsenic (total)	1.0
Barium (total)	5.0
Boron (total)	1.0
Cadmium (total)	0.05
Chloride	500.0
Chromium (total hexavalent)	0.05
Chromium (total trivalent)	1.0
Copper (total)	0.02
Cyanide	0.025
Flouride	1.4
Iron (total)	1.0
Lead (total)	0.1
Manganese (total)	1.0
Mercury (total)	0.005
Nickel (total)	1.0
Phenols	0.1
Selenium (total)	1.0
Silver (total)	0.005
Sulfate	500.0
Total Dissolved Solids	1000.0
Zinc	1.0

5.4.3 Solid By-Products

A major by-product of the GR-SI process is the solid waste stream containing a mixture of unreacted and spent sorbent with fly ash. When the GR-SI system is operating, the mixture will be disposed in a dedicated on-site ash pond. In order to characterize the ash, samples must be obtained and analyzed for chemical constituents and physical properties. Table 5-4 lists the solid waste sampling plan for the demonstration project.

During the second stage of Phase III, parametric testing, the GR-SI ash will be sampled on a daily basis by EER personnel. Samples will be obtained with a scoop from the openings in the ESP hoppers and placed in four-ounce sample containers with screw lids. Sample containers will be labeled and stored in a clean, dry environment.

Ash samples will be analyzed for screening purposes at the beginning of the parametric testing when the waste is first generated. Analysis will then be conducted for screening purposes on a monthly basis for the first three-month period in the third stage of Phase III, long-term testing. At the end of the three-month period, results will be evaluated to define trends and to determine appropriate follow-up analyses.

Tests will be performed for physical and chemical characteristics which were listed previously in Table 5-2. In addition, screening tests for polynuclear aromatic hydrocarbons which may be adsorbed on fly ash or unburned carbon particles will be conducted.

The data analyses will be used to fully characterize the by-product from the GR-SI process, and to add to the limited existing data base of ash composition and characterization from processes similar to GR-SI. Results from the analyses will be compared with literature data for consistency. If any unexpected constituents are present in the ash, or if constituents are present at unexpected levels, the constituent will be identified as a future monitoring need. After the first three-month period in the long-term testing, analyses for certain constituents will be conducted on an as-needed basis, to be determined when results from the screening tests have been evaluated. Screening test results will also aid EER in determining if handling or disposal procedures require modification.

5.5 Post-Operation

The supplemental monitoring conducted during the construction and operation stages is designed to identify effects on the environment resulting from the operation of the GR-SI system. If IP elects to operate Unit 1 with the GR-SI system after the field demonstration period, the environmental effects will already be known. If IP does not operate the GR-SI equipment when this project is complete, there will be no environmental effects of concern. All by-products generated during Phase III of this program will be disposed in an on-site ash pond. EER shall indemnify Illinois Power against all claims, damages, losses and expenses arising from future liability associated with disposal by-products. Groundwater monitoring requirements beyond the Phase III end date are considered part of compliance monitoring. Therefore, no supplemental monitoring is anticipated when the demonstration program is complete.

5.6 Schedules

Supplemental monitoring will be required only during the pre-construction and operating phases of the demonstration program. Preliminary tests for gaseous emissions occurred during the middle of Phase I and lasted for approximately two weeks. No supplemental monitoring will occur during Phase II. Phase III is defined as the operating phase and will have a duration of approximately 18 months, including baseline testing, parametric testing, and long term testing. Table 5-1 describes the schedule which will be used for the supplemental monitoring of gaseous emissions, and Table 5-4 provides a schedule for supplemental monitoring of aqueous and solid by-product discharges.

6.0 HEALTH AND SAFETY MONITORING

6.1 Purpose and Scope

To protect the safety and health of plant employees, some general safety practices must be followed. This section describes the current safety program at Hennepin Station, as well as the additional safety and health monitoring which will be conducted during the GR-SI project.

6.2 Current Safety Program at IP Hennepin Station

The Department of Labor's Occupational Safety and Health Administration (OSHA) has produced a set of standards which can be applied nationwide to a variety of industries. These are specified in Title 29, Part 1910 of the Code of Federal Regulations. These guidelines are not specific to each particular industry, but cover most industries in general, including public utilities. Sub-parts include topics such as General Safety and Health, Walking-Working Surfaces, Means of Egress, Occupational Health and Environmental Control, and Hazardous Materials.

All utilities are required to follow OSHA's standards listed in 29 CFR 1910, but IP maintains an additional safety program which ensures safe working conditions at all IP facilities, including Hennepin Station. Several different approaches are used for employee protection. An extensive education program is in progress continually, and all potential hazards are identified and discussed at weekly, monthly, and quarterly meetings. Mandatory training sessions are conducted to familiarize personnel with new equipment and procedures. Employees are provided with Material Safety Data Sheets (MSDS) which indicate the hazards and properties of all the substances to which workers may be exposed. In addition, there is a Safety Manual which is available to all employees describing the safety regulations of the utility. The rules in this manual incorporate most of the OSHA standards, and also provide safety rules developed by IP safety personnel which were brought about by past accidents as well as suggestions of employees.

IP has a program to provide physical examinations for all employees. Physicals are required for all new employees and those returning to work after an extended absence, and IP recommends that all other employees have a physical on a yearly basis.

6.3 GR-SI Health and Safety Monitoring

Maintaining the health and safety of all employees during the course of the GR-SI project is a top priority to the EER project management team as well as to Illinois Power management. In general, the safety practices which are currently in effect, as described in the Safety Manual, will remain in effect during the GR-SI project and will be the primary source of guidelines for safety practices at Hennepin Station.

Any construction which may occur at the plant due to the addition of the GR-SI process will be governed by OSHA standards for construction, listed in 19 CFR 1926. All personnel required for the construction phase will be informed of these standards and required to abide by them. No additional health and safety monitoring is anticipated to be required during this phase, except asbestos abatement activities.

Boiler tubes are insulated with asbestos to minimize heat loss, and some asbestos handling will be required to perform necessary modifications during construction activities. All asbestos removal will be conducted by a contractor qualified to work with the asbestos containing material. The contractor's specifications will include a requirement that all applicable OSHA and EPA regulations be satisfied, including asbestos removal guidelines, air monitoring requirements, and proper disposal considerations. When the contractor is on site, EER will verify that proper measures are being implemented.

Prior to the initiation of Phase III, a safety survey will be conducted by EER personnel. The purpose of this survey is to ensure that:

1) All OSHA regulations have been and will be met, specifically related to noise, dust and asbestos removal; and
2) All testing facilities and safety equipment are available before test personnel arrive.

In addition, monitoring of worker health will be conducted, both prior to GR-SI operation and annually thereafter until project completion. Monitoring will be conducted for hearing and pulmonary function. Records of all employees' test results will be maintained confidentially throughout the

demonstration project. Monitoring will be required for all EER employees and optional for IP employees expected to be associated with plant operations.

Noise monitoring is required by OSHA regulations (29 CFR 1910.95) to determine which areas of the plant require hearing protection. Once these areas are established, area monitoring is not required unless a change in process or equipment increases or decreases noise level. EER anticipates that four additional fans will be required for the GR-SI system. Vendor information indicates that three fans have noise levels below 85 decibels at the fan casing. These fans will be installed in areas which do not currently exceed the OSHA noise 'action level' of 85 dB. Sound level information for the fourth fan is not yet available. Noise monitoring will be conducted to determine installed equipment noise level and worker exposure. Monitoring of the areas where these fans are installed will be conducted once at the beginning of Phase III.

A hearing conservation program must be instituted if employee exposure will exceed an eight hour time weighted average of 85 decibels or an equivalent exposure level (higher noise level over a shorter time period). The hearing conservation program requires monitoring of employee hearing within the first six months of exposure, to establish a baseline level, and annually thereafter, to check for a change in hearing level. All employees who have a possibility of excessive noise exposure will be included in the hearing conservation program.

OSHA regulations governing dust exposure (29 CFR 1910.1000) require that employees not be exposed to a total dust level of greater than 15 mg/m^3 or a coal dust level of 2.4 mg/m^3 on an eight-hour time weighted average. It is anticipated that dust could be generated during GR-SI system operation from the sorbent, the coal, or the fly ash. During system startup, areas with visible dust will be monitored, and workers task areas will be evaluated to determine employee exposure. If levels are observed to exceed allowable exposure limits, administrative and engineering controls will be identified and implemented. When such controls are not feasible to achieve full compliance, protective measures shall be used. No additional monitoring for dust is anticipated.

The only particular safety issues which are unique to the GR-SI project include handling of natural gas, sorbent, and the solid by-product. Safety

procedures for transporting and utilizing natural gas in boiler furnaces are well established. All hardware and controls installed will be consistent with good industry practice. Gas firing poses no unusual problems for this application.

The baseline sorbent used in the GR-SI demonstration at Hennepin Station will be hydrated lime [Ca(OH)2] in a fine (micron-sized) powder form that is a caustic irritant and is sufficiently fine to be suspendable and inhalable. According to the National Lime Association, studies performed on workers in lime plants show that dust from hydrated lime can be irritating if inhaled, but is not injurious to the respiratory system.[1] IP personnel at Hennepin Station currently handle lime for use in another plant process, and are familiar with safe handling procedures. Material Safety Data Sheets are available for all those working with hydrated lime and will be posted. Handling procedures and dust suppression systems are available which will minimize the human contact with the powder. In addition, all workers who will be directly exposed to the lime powder will be provided with a lightweight filter mask and tight fitting safety glasses with side shields. Minimal safety problems are expected from dry sorbent utilization, and no additional health monitoring is considered necessary.

The only waste product generated in the process is the fly ash/sorbent mixture caught in the particulate collection equipment. This mixture contains sorbent particles which have been sulfated as well as some unreacted calcium oxide. The calcium oxide material will hydrate when exposed to moisture with significant heat release. However, controlled hydration of the product will be performed to hydrate the material completely and neutralize the material before it is disposed. There are no specific monitoring requirements for the spent sorbent other than those described in Section 5.4.2, monitoring of aqueous discharge.

Table 6-1 shows the worker health and safety monitoring which will be conducting during Phases II and III of the demonstration project. No monitoring was conducted during Phase I.

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[1] National Lime Association, "Lime Handling, Application, and Storage." Bulletin 213, National Lime Association, Arlington, VA, 1982.

TABLE 6-1. WORKER HEALTH AND SAFETY MONITORING PLAN

MONITORING PARAMETER	FREQUENCY	LOCATION
PHASE I		
No monitoring		
PHASE II		
Safety Survey	once	All applicable areas of plant
PHASE III		
Dust	as required	Areas with visible dust
Worker Health	annually (1)	N/A
Hearing		
Pulmonary Function		
Noise Level	once	Near fans

1. Initial screening must be conducted prior to operation of the GR-SI system. Annual exams will continue until the demonstration is complete.

7.0 QUALITY ASSURANCE AND QUALITY CONTROL

7.1 Purpose and Scope

This section contains the Quality Assurance (QA) plan for the GR-SI project concerning the supplemental measurements described in this document; the QA procedures for compliance monitoring will continue as they are currently practiced at the plant. This QA plan has been prepared according to the EPA guidelines for quality assurance plans.

7.2 Sampling Procedures

Sampling procedures for each measurement to be employed during the GR-SI demonstration are described in Sections 4 and 5. The description includes sampling location, sampling procedures, and sampling frequency for each measurement. EPA procedures are used where appropriate, and procedures which are not standard protocol have been described in more detail in Section 5.

Reagents to be used in the measurements conform to the specifications of the reference methods. Reagent grade chemicals are used exclusively. Clean sample containers are used to collect samples, with each container prepared by rinsing in appropriate solutions. For example, particulate probe wash samples are acetone-rinsed, and all containers are air-dried after rinsing. Samples are analyzed as rapidly as is practical; however, no special preservation or holding times are required for these measurements.

7.3 Sample Custody

Many of the measurements to be employed during the GR-SI demonstration involve the use of continuous monitors or other measurement methods which do not require custody procedures. All compliance monitoring requires stringent sample custody procedures. EER will work closely with IP's quality assurance groups on any compliance related sampling. The supplemental measurements generating samples that will require physical custody are the particle loading and particle size measurements, the EPA reference method test to verify the accuracy of the continuous SO_2 and NO_x measurements, solid by-product sampling, and water sampling. Samples collected for particulate characterization include particulate matter on glass fiber filters, in probe washes and on cascade impactor substrates. Samples for SO_2 and NO_x

verification are liquid samples containing SO_2 and NO_x collected in aqueous solutions. Pond effluent and Illinois River samples are aqueous samples. EER will utilize the "chain of custody" procedures for all samples as defined by EPA for legal sample custody. These procedures are listed in Section 3 of Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III - Stationary Source Specific Methods, EPA-600/4-77-027b, August 1977.

7.4 Calibration Procedures and Frequency

Calibration procedures and frequency for each measurement system are listed in Table 7-1. Opacity is not included in Table 7-1 since calibration is conducted internally to the instrument. Standard calibration procedures will be used for each system. Each system will be calibrated at a frequency to ensure that the accuracy of the measurement is traceable to the calibration standards.

7.5 Analytical Procedures

Continuous monitoring instrumentation to be used to analyze NO_x, opacity, HC, CO, CO_2, O_2, and SO_2 concentrations is described in Table 7-2. These instruments were specifically selected to provide the highest sensitivity and minimum interferences possible. Test data from the instruments will be continuously recorded with a strip chart recorder to provide permanent documentation of test results.

The EPA standard procedures given in Table 7-1 are used with the monitoring instruments listed in Table 7-2. Where possible, the remaining measurements use other standard procedures. Some measurements such as water and solids analysis will be conducted by an outside laboratory utilizing their own instruments and calibration procedures.

7.6 Data Reduction and Validation

Figure 7-1 shows the general reporting scheme for each measurement from collection of raw data to validation and reporting of results. Following the sampling and analysis portion of each measurement, results are calculated for each measurement. The preliminary results are then subjected to an independent check by the test supervisor to verify the following:

TABLE 7-1. CALIBRATION PROCEDURES

MEASUREMENT PARAMETER	CALIBRATION PROCEDURE	CALIBRATION FREQUENCY	CALIBRATION STANDARD	REFERENCE
EXHAUST GAS COMPOSITION				
NO, NO2	Compare to Calibration Gases	Daily	Certified gases	40 CFR 60 App. A, Method 7E
O2	Compare to Calibration Gases	Daily	Certified gases	40 CFR 60 App. A, Method 3A
CO	Compare to Calibration Gases	Daily	Certified gases	40 CFR 60 App. A, Method 10
CO2	Compare to Calibration Gases	Daily	Certified gases	40 CFR 60 App. A, Method 3A
HC	Compare to Calibration Gases	Daily	Certified gases	40 CFR 60 App. A, Method 25A
SO2	Compare to Calibration Gases	Daily	Certified gases	40 CFR 60 App. A, Method 6C
SO3	Compare to Std Acid	Monthly or with new titrant	Gravimetrically prepared std. solution	40 CFR 60 App. A, Method 6
PARTICULATE				
Gas Meter	Compare to std	Before use	Std test meter	40 CFR 60 App. A, Method 5
Orifice Meter	Compare to gas meter	Before, after use	Field test meter	40 CFR 60 App. A, Method 5
Pitot Probe	Compare to std	Before use	Standard pitot	40 CFR 60 App. A, Method 2
Nozzle	Direct measure	Before use	Micrometer	40 CFR 60 App. A, Method 5
Thermocouple	Compare to std	Before, after use	ASTM Thermometer	40 CFR 60 App. A, Method 2
Balance	Compare to std weights	As needed	Class S weights	--

TABLE 7-2. CONTINUOUS ANALYSIS INSTRUMENTS

GAS MEASURED	DETECTION PRINCIPAL	MANUFACTURER	MODEL NO.	RANGE
CO	Nondispersive Infrared	ANARAD	AR500R	0-500 ppm to 0-2,000 ppm
CO2	Nondispersive	ANARAD	AR500R	0-25%
O2	Paramagnetic	Taylor Servomex	OA570	0-10% 0-25%
SO2	NDUV	Western Research	721AT	0-5000 ppm
NOx	Chemiluminescent	TECO	10AR	0-2.5 ppm to 0-10,000 ppm
HC	Flame Ionization Detector (FID)	Beckman	402	
Opacity	Light Transmittance	To Be Determined		

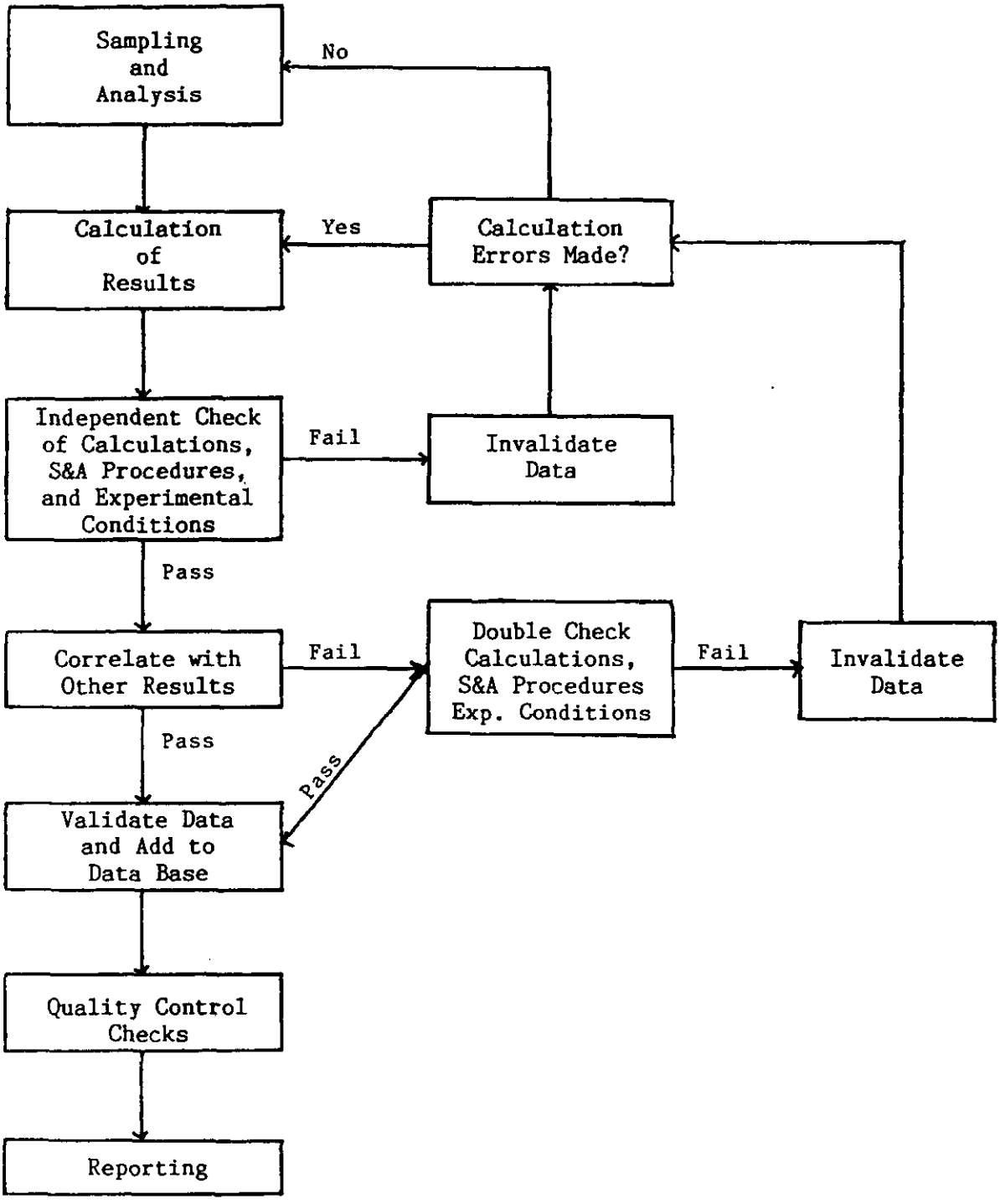

FIGURE 7-1. DATA REDUCTION AND VALIDATION

- Accuracy of calculations
- Proper sampling and analytical procedures
- Representative experimental conditions

Data obtained with improper sampling or analytical procedures, or under non-representative conditions, are then invalidated. Results passing the checks are then correlated with other results to identify potential outliers. Results not correlating with existing data are subjected to a double check of calculations and measurement procedures.

Measurements passing the above checks are then validated and added to the data base. Specific criteria used to validate data are the following:

1. Measurement performed under representative experimental conditions.
2. Proper sampling and analytical procedures utilized.
3. Calculations independently checked.

The on-site Test Engineer will be responsible for the collection, reduction, and validation of data. The on-site Test Supervisor will be responsible for ensuring that the measurements fulfill the program objectives. The Quality Assurance Officer will be responsible for verifying that the specified data handling procedures are followed and that the results meet the validation criteria.

7.7 Internal Quality Control Checks

EER will conduct an internal quality control program which will include the following items:

- Routine calibrations and maintenance
- Internal audits
- Periodic quality control checks

The engineers/technicians responsible for data collection will also be responsible for routine calibration and maintenance of all instruments and measurement systems. Specific calibration procedures and frequency are discussed in Section 7.4.

The EER Quality Assurance Officer (QAO) will conduct internal audits of measurement systems and procedures to ensure that all quality assurance requirements are met. These audits are discussed in Section 7.8.

The EER QAO will also administer a program of quality control checks. The quality control checks to be used are listed below.

1. Calibration Standards and Devices
   - equipment checks
   - reagents
   - zero and span gases
2. Quality Control Samples
   - blanks
   - spiked samples
   - surrogate samples
3. Replicates
4. Control charts

7.8 Performance and System Audits

EER will participate in and conduct system and performance audits. A system audit is an on-site inspection and review of the quality assurance system used for the total measurement system (sample collection, sample analysis, data processing, etc.) for each monitoring sensor or sample collected. System audits are normally a qualitative appraisal and include assessment of the following:

1. Organization and Responsibility - Is the quality assurance organization operational?
2. Sample Collection - Are written sample-collection procedures available and are these followed as written?
3. Sample Analysis - Are written analysis procedures available and are these followed as written?
4. Data Validation - Is a list of criteria for data validation available and is it used?
5. Calibration - Are written calibration procedures available and are these followed as written? In addition, a review should be made of procedures used to establish traceability of calibration schedule and data by measurement sensor.

6. Audits - Are control charts for performance audits reviewed?
7. Interlaboratory Tests - Are results from interlaboratory testing reviewed?
8. Preventive Maintenance - Is the preventive maintenance schedule being followed as recommended in the QA plan?

Performance audits refer to independent checks made by the supervisor or auditor to evaluate the quality of data produced by the total sampling and analysis system. Performance audits generally are categorized as follows:

1. Sampling audits
2. Analysis audits
3. Data processing audits

These audits are performed independently of and in addition to normal quality control checks by the operator/analyst. Independence can be achieved by having the audit made by a different operator/analyst from the one conducting the routine measurements or, in the case of sampling or analysis, by the introduction of external reference standards into the sampling or analysis system or interlaboratory comparison and the subsequent plotting of results on control charts by the supervisor. The use of external reference standards should be applied without the knowledge of the operator/analyst, if possible, to ensure that recorded results reflect normal operating conditions.

Performance audits made by a different operator/analyst from the one conducting the routine measurement may be conducted in several ways. The following are examples of the most common type of audits.

1. Sampling Audit - The auditor uses a separate set of calibrated flow meters and reference standards to check the sample collection system:
    a. flow rate devices
    b. instrument calibration
    c. instrument calibration gases, when applicable

2. Analysis Audits - The auditor is commonly provided a portion or aliquot of several routine samples for analysis.

3. Data Processing Audits - Data processing commonly involves a spot-check on calculations, and data validation may be checked by inserting in the data processing system a dummy set of raw data followed by review of these validated data.

As part of EER's internal quality control program discussed in Section 7.7, the EER QAO will conduct independent system and performance audits. These audits will provide a comprehensive evaluation of conformance with the requirements specified in the QA plan. Where applicable, the audits will be conducted according to the procedures specified in Quality Assurance Handbook for Air Pollution Measurement Systems, Volumes I and II, EPA-600/9-76-005, March 1976 and EPA-600/4-77-027b, August 1977. For measurements where no EPA audit procedures have been developed, the audits will be conducted by following the EPA guidelines and substituting the types of audit samples, etc., appropriate for the specific measurement systems.

Following each audit, the EER QAO will evaluate the results and report them to the Test Supervisor. If the audits identify QA problems, corrective action will be initiated as discussed in Section 7.11. The results of all audits and any corrective action will be discussed in the quarterly monitoring reports.

7.9 Preventive Maintenance

Proper equipment operation is essential to obtaining quality measurements. During this project, EER will utilize standard procedures for routine preventive maintenance and maintain an inventory of critical spare parts to ensure that quality data are collected and to minimize data loss due to equipment malfunctions. Tables 7-3 and 7-4 list standard maintenance procedures and critical spare parts for the measurement systems. In addition to these routine procedures, EER personnel continually monitor equipment performance to detect and allow correction of equipment problems.

7.10 Calculation of Data Quality Indicators

The precision, accuracy, and completeness of each of the data quality indicator measurements will be monitored over the duration of this project to ensure that the quality assurance goals are achieved. Project goals for precision, accuracy, and completeness of these critical measurement data are

TABLE 7-3. PREVENTIVE MAINTENANCE PROCEDURES

EQUIPMENT	PROCEDURE	FREQUENCY
CONTINUOUS MONITORING INSTRUMENTATION		
Calibration Gases	Verify pressure > 100 psig	Daily
Instrument Operating Conditions	Verify to manufacturer's specifications	Daily
Leak Check Sample System	Vacuum and pressure component check	Daily
Clean Probe Filter Tips	Reverse gas purge with compressed air	Daily
Sample Probes	Balance sample flow in each probe	Daily
Filters	Change	Weekly, or as required
Sample Flow Rate	Verify constant	Daily
System Vacuum/ Pressure	Verify constant	Daily
Heater and Chiller Temperatures	Verify within specifications	Daily
NOx Vacuum Pump Oil	Change	Monthly
LABORATORY EQUIPMENT		
Balances	Calibration check Service and calibration by manufacturer	Daily Semiannually
Instrumentation	Routine service	As specified by manufacturer

TABLE 7-4. CRITICAL SPARE PARTS

CONTINUOUS MONITORING INSTRUMENTATION	MANUAL SAMPLING EQUIPMENT	LABORATORY EQUIPMENT
Filters	Sample Pump	Reagents
Probe Filter Frits	Nozzles	GC Columns
Sample Pump	Pump Oil	Glassware
Pump Valves, Diaphragm	Manometer Oil	Instrument Spare Parts:
Back Pressure Regulator	Fuses	Combustion Tubes
NOx Sample Capillary	Glass Probe Liners	Filters
Infrared Sample Cells	Nozzle "O" Rings	Scrubbers
Valves, Flowmeters	Sample Filters	
Misc. Tubing and Fittings	Thermocouples and Lead Wire	
	Glassware	
	Reagents	
	Ash Sampling Containers	

listed in Table 7-5 for supplemental monitoring parameters. The confidence interval will also be determined for each measurement to allow the significance of the results to be evaluated.

Quality control charts will be maintained on a daily basis for precision and accuracy to identify immediately a loss of control in any measurement and to show any trends in improvement or deterioration in quality control. Quality control charts will be constructed and maintained as described in EPA-600/9-76-005. Control charts will be utilized to monitor data quality and to indicate a loss of control for any measurements. The precision and accuracy of each measurement will be plotted as the relative standard deviation, s, of each measurement and the mean of the accuracy determinations. Control lines will be established at $\pm 2s$ for the warning limit and $\pm 3s$ for the quality control limit. Initially, these limits will be established based on results of previous measurement programs and will be modified as necessary after a data base of 15 to 20 determinations is obtained for this project. Measurements exceeding the warning limit will be subjected to review to determine the cause of the loss of control before being validated.

7.11 Corrective Action

The following occurrences will require corrective action:

1. QA Goals Not Achieved - This includes the failure to achieve the precision, accuracy and completeness criteria specified in Section 7.1.
2. Audit Deficiencies - Deficiencies may be identified during systems and/or performance audits.
3. Interlaboratory Comparison Problems - This includes discrepancies between similar samples analyzed by separate laboratories.
4. Significant Concentrations of Regulated or Unregulated Substance - This involves a determination by the advisory group that significant environmental and health concerns exist.

The corrective action procedure is shown schematically in Figure 7-2. It is the responsibility of the EER QAO to bring to the attention of the EER Test Supervisor (TS) any of the problems listed above. The TS and QAO will then review, determine what data are suspect, and compare the QA and project goals to determine if the specific QA problem will actually cause a problem in

TABLE 7-5. PROGRAM OBJECTIVES FOR CRITICAL MEASUREMENT DATA

MEASUREMENT PARAMETER (METHOD)	REFERENCE	EXPERIMENTAL CONDITIONS	PRECISION RELATIVE STANDARD DEVIATION	ACCURACY	COMPLETENESS
SO_2 (NDUV)	40 CFR 60, App B Per Spec 2	Flue Gas	2%	20%	90%
NO_x (Chemiluminescent)	40 CFR 60, App B Per Spec 2	Flue Gas	2%	20%	90%
O_2 (Paramagnetic)	40 CFR 60, App B Per Spec 3	Flue Gas	2%	20%	90%
CO (NDIR)	Instruc Manual	Flue Gas	2%	10%	90%
CO_2 (NDIR)	40 CFR 60, App B Per Spec 3	Flue Gas	2%	20%	90%
Opacity	40 CFR 60, App B Per Spec 1	Flue Gas	2%		90%
Total Particulate	40 CFR 60, App A	Flue Gas	10%		90%
Particle Size Distribution (Cascade Impactor)	Guidelines for Using Equipment EPA-600/2-77-04	Flue Gas	10%		90%

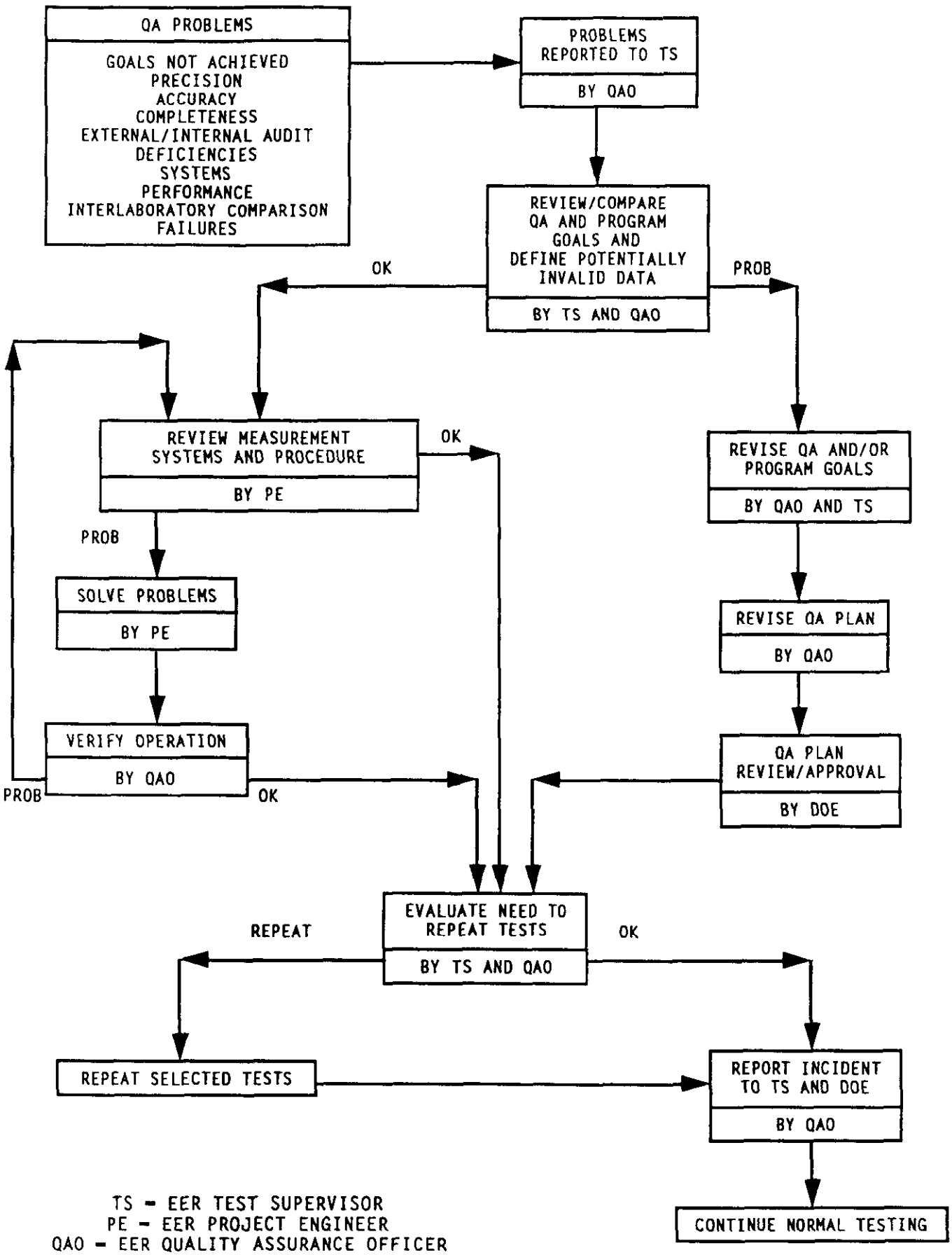

Figure 7-2. Corrective action procedure.

achieving project goals. If it is determined that the QA goals are too stringent, they will be modified to reflect the current project objectives. The QA plan will then be revised by the QAO accordingly.

If the QA and project goals are determined to be satisfactory, the TS will delegate review of the subject measurement systems and procedures to an EER project engineer (PE). The PE will proceed to solve the measurement system problems, etc., as required. When the PE has determined that the problems have been solved, the EER QAO will verify the results. This may include specific calibration, systems and/or performance audits, etc. Any remaining problems will be handled by the PE.

Following revision of the QA plan, solution of measurement problems and other related actions, the TS will review the questionable data in accordance with the data reduction and validation process (Figure 7-1) and determine if specific tests must be repeated.

Although unlikely, it is possible that suspect data are found to be valid and values are actually much higher (or lower) than anticipated. Significant concentrations of some substances could indicate unforeseen situations during GR-SI operations. In these situations, EER will make every effort to determine the nature of the problem and correct it as soon as possible. In some cases, the high concentrations may simply represent the characteristics of GR-SI application to this boiler. If it is found that any concentrations of substances exist at levels which generate environmental or health concerns, action will be taken to correct the problem, either with process modification or treatment technologies. The details of each incident requiring corrective action will be reported in the quarterly monitoring reports.

7.12 Quality Assurance of Outside Organizations

In some instances, samples will be obtained and analyses performed for this program by non-EER personnel, including both utility laboratories and contract laboratories. In order to verify data quality from these measurements/analysis, the quality assurance plans of these organizations will be incorporated into the EER quality assurance plan with regard to data supplied by those laboratories.

8.0 DATA MANAGEMENT AND REPORTING

8.1 Purpose and Scope

The management of data which have been generated is an integral part of any test program. They must be recorded faithfully with backups and checks to ensure data quality. They must be stored in a system which has sufficient information storage capacity for a period of months or years. The system must be flexible enough for the user to have access to any data which may be required, and capable of performing data processing functions as well. Finally, the system must have the capability of reproducing the data in a format which the user requires.

The specific data management procedures applied to environmental data will depend upon the manner in which the data are acquired and upon the type of data. Environmental data acquisition may be accomplished via any of the following means:

1. Direct in-situ acquisition of data (e.g. pH meter reading recorded in field logbook).
2. Laboratory analysis of discrete samples with manual recording of results on laboratory data sheets.
3. Continuous data recording on strip chart recorders.
4. Continuous data acquisition by on-line computer, with data recording on disk.

Figure 8-1 illustrates the logic behind the data management system. Once data are generated they will be recorded either manually for subsequent entry to a computer system or directly to the computer, as noted above. After the data have been entered, a hard copy will be produced and the validity of the data checked. Printouts will be compared with manual documentation for validation of data recording procedures and hardware.

Once the data quality is verified and corrected as necessary, the data will be stored within the computer system. Any additional information which may be pertinent to the testing will also be stored for data identification purposes. As data reporting is required, reports can be generated by the system in a user-specified format. Some of the information may require processing to produce the data in an applicable and relevant manner. The

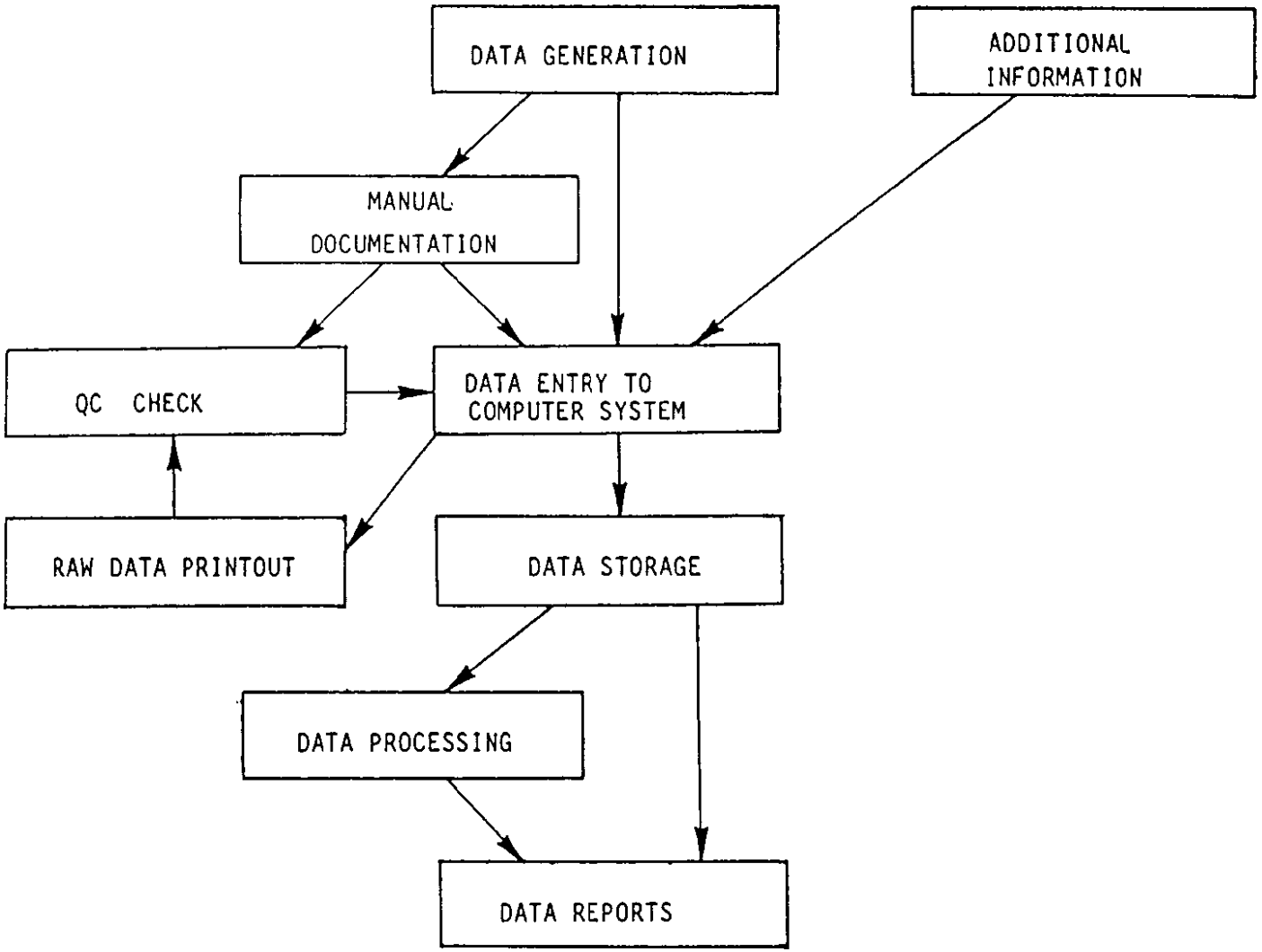

FIGURE 8-1. DATA MANAGEMENT SYSTEM FLOW DIAGRAM

computer system has the capability for any data processing necessary for the test program.

8.2 Reporting Requirements

The communication of process and measurement information must be performed on a regular basis with complete reporting of all relevant data. EER will submit quarterly and annual reports of the environmental data to DOE, with emphasis on data summaries and potential problem areas. Quarterly reports will include:

1. Summaries of environmental monitoring data collected during the prior quarter.

2. Copies of all compliance reports and analyses submitted to regulatory authorities by IP during previous quarter. This includes a one time submission of compliance test results, plus monthly NPDES monitoring reports, and coal composition data.

3. Identification and characterization of regulated and unregulated substances present at concentrations of significant environmental and health concern, as determined by an advisory group comprising representatives from EER and the utilities.

4. Description of the plant's permit status, including a description of any significant changes to the terms of permits or notices of violations issued by the regulatory authorities.

5. Identification of problem areas encountered during the prior quarter and indication of actual, anticipated, or possible solutions.

6. Recommendation of modifications to or deletion of specific tasks defined in the Monitoring Plan which are not yielding useful information, including a basis for the recommendation.

Annual reports will include:

1. The fourth quarterly report.

2. Summary of monitoring information from all prior annual reports and the four previous quarterly reports, including trends and patterns in the data and summary of data.

3. Indication of any trends of environmental or health concern, based on previous reports which have been submitted.

4. Indication whether any of the problem areas identified in previous quarterly or annual reports have been resolved and, if not, what mitigation measures should be taken.

8.3 Monitoring Data Review

Data will be reviewed by EER and IP as it becomes available. Data showing significant results will be reviewed, verified, and appropriate action taken if required. This may include modification to monitoring frequency, the addition of a monitoring parameter, or change in monitoring location. EER will review data continuously throughout all phases of the demonstration project.

Data will be reviewed on an annual basis by a Monitoring Review Committee. The Committee will be composed of representatives from all project participants, including EER, the funding participants, and the utilities providing host sites for the demonstration projects. The main purpose of this review is to determine if there are any significant findings among the data provided in the quarterly and annual reports. Based on the Committee's ongoing review of monitoring information, members of the Committee can recommend that:

1) Certain monitoring tasks be discontinued, modified or added;
2) New analytical techniques or instrumentation be substituted; or
3) The format of the quarterly and annual reports be changed.

If recommendations are made, project management at DOE and EER will consider modification to the EMP and authorize changes as appropriate.

APPENDIX A

Illinois Environmental Protection Agency · P. O. Box 19276, Springfield, IL 62794-9276

217/782-2113

OPERATING PERMIT

PERMITTEE

Illinois Power Company
Attn: Aric D. Dierick, Supervisor
- Environmental Administration
500 South 27th Street
Decatur, Illinois 62525

Application No.: 73010752
Applicant's Designation:
Subject: Hennepin Boiler #1
Date Issued: February 22, 1989
Location: P.O. Box 188, Hennepin

I.D. No.: 155010AAA
Date Received: December 23, 1988

Expiration Date: March 31, 1991

Permit is hereby granted to the above-designated Permittee to OPERATE emission source(s) and/or air pollution control equipment consisting of boiler #1 with associated electrostatic precipitator as described in the above-referenced application. This Permit is subject to standard conditions attached hereto and the following special condition(s):

1. Emissions of sulfur dioxide from boilers 1 and 2 (combined) shall be limited to 17,050 lbs in any one hour period.

2a. Emissions in excess of applicable emission standards is allowed during startup, malfunction and breakdown.

b. Combustion of the chemical metal cleaning waste sludge and waste oils may not be initiated during startup, malfunction or breakdown. If a malfunction or breakdown should occur while the sludge or waste oil is being combusted, the loading of the sludge/coal/waste oil mixture to the bunker shall be discontinued until the malfunction or breakdown is corrected. Records shall be maintained of the hours that the sludge/coal/waste oil mixture was combusted during malfunction or breakdown conditions.

3. The Permittee shall notify the Agency's regional office by telephone as soon as possible during normal working hours upon the occurrence of excess emissions due to malfunctions, or breakdowns. The Permittee shall comply with all reasonable and safe directives of the regional office regarding such malfunctions and breakdowns. Within five (5) working days of such occurrence the Permittee shall give a written follow-up notice to the Agency's regional office providing an explanation of the occurrence, the length of time during which operation continued under such conditions, measures taken by the Permittee to minimize excess emissions and correct deficiencies, and when normal operation resumed.

4a. The permittee shall maintain records of excess emissions during malfunctions and breakdowns. As a minimum, these records shall include:

(i) date and duration of malfunction or breakdown;

(ii) a full and detailed explanation of the cause for such emissions;

(iii) the contaminants emitted and an estimate of the quantity of emissions;

(iv) the measures used to reduce the quantity of emissions and the duration of the occurrence; and

(v) the steps taken to prevent similar malfunctions or breakdowns or reduce their frequency and severity.

b. These records shall be retained for at least two years following an event, maintained at a readily accessible location at the plant, and be available to representatives of the Agency during normal working and/or operating hours.

5a. Organic liquid by-products or waste oils other than that permitted by Condition #5b shall not be burned in these fuel combustion emission sources without written approval from this Agency.

b. Waste oils fitting the following description may be burned in quantities not to exceed approximately 10,000 gallons per year in Hennepin boilers 1 and 2 (combined).

(i) lubricating oil from coal mills, fan motors, pumps, turbines, and IC engines,

(ii) hydraulic fluids.

c. The waste oil shall be blended with coal on the conveyor belt leading to the breaker building.

6. The Agency shall be allowed to sample all fuels stored at the above location.

7. This permit allows the burning of chemical metal cleaning waste sludge of the same general composition as outlined in your letter dated February 10, 1986. The plantwide quantity of sludge to be generated and burned is estimated to be 45,500 gallons every 3 years.

8. The Permittee shall analyze one time individual waste oil streams prior to mixing together for arsenic, cadmium, chromium, lead, flash point, and total halogens. The analysis report shall be submitted to the Agency by August 1, 1989.

9. The Permittee shall also analyze one time a representative sample of waste oil to be burned for sulfur, ash, BTU, and bottom sediments and water. The representative sample shall be prepared by mixing individual waste oil streams in the ratio normally expected to be produced. The analysis report shall be submitted to the Agency by August 1, 1989.

10. The Permittee shall analyze a representative sample of waste oil to be burned for arsenic, cadmium, chromium, lead, flash point, total halogens, sulfur, and BTU values. The analysis report shall be submitted to the Agency with the next permit renewal application. The frequency of sampling may be reduced depending upon the outcome of analytical results.

11. The Permittee shall keep records of the quantity and analyses of waste oil fuel burned for energy recovery and the estimated quantity of chemical metal cleaning waste sludge burned for a period of three (3) years. These records shall be kept on site and shall be made available to Agency personnel on request during normal working and/or operating hours. The Permittee shall report to the Agency the annual quantity of waste oil fuel and chemical metal cleaning waste sludge burned by February 15 of each year.

12. The Permittee shall submit quarterly reports of the daily tonnage and daily analyses of the coal burned in the above-referenced equipment. For any day in which the SO_2 emission rate exceeded 5.8 lbs. per million btu, the maximum hourly heat input to the coal fired boilers shall also be reported. Coal samples shall reflect daily averages of the fuel as burned in each fuel combustion emission source for percent moisture, percent ash, percent sulfur and heat content. ASTM procedures shall be used in sampling and analysis of the coal. This report shall be due within 30 days after the end of each calendar quarter.

Terry A. Sweitzer, P.E.
Manager, Permit Section
Division of Air Pollution Control

TAS:VVG:jmm/0067K/50-62

cc: Region 2
R. Watson - DLPC

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

STANDARD CONDITIONS FOR OPERATING PERMITS

July 1, 1985

The Illinois Environmental Protection Act (Illinois Revised Statutes, Chapter 111-1/2, Section 1039) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

The following conditions are applicable unless superseded by special permit condition(s).

1. The issuance of this permit does not release the permittee from compliance with state and federal regulations which are part of the Illinois State Implementation Plan, as well as with other applicable statutes and regulations of the United States or the State of Illinois or with applicable local laws, ordinances and regulations.

2. The Agency has issued this permit based upon the information submitted by the permittee in the permit application. Any misinformation, false statement or mispresentation in the application shall be grounds for revocation under 35 Ill. Adm. Code 201.207.

3. a. The permittee shall not authorize, cause, direct or allow any modification, as defined in 35 Ill. Adm. Code 201.102, of equipment, operations or practices which are reflected in the permit application as submitted unless a new application or request for revision of the existing permit is filed with the Agency and unless a new permit or revision of the existing permit(s) is issued for such modification.

   b. This permit only covers emission sources and control equipment while physically present at the indicated plant location(s). Unless the permit specifically provides for equipment relocation, this permit is void for an item of equipment on the day it is removed from the permitted location(s) or if all equipment is removed. notwithstanding the expiration date specified on the permit.

4. The permittee shall allow any duly authorized agent of the Agency, upon the presentation of credentials, at reasonable times:

   a. to enter the permittee's property where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit,

   b. to have access to and to copy any records required to be kept under the terms and conditions of this permit,

   c. to inspect, including during any hours of operation of equipment constructed or operated under this permit, such equipment and any equipment required to be kept, used, operated, calibrated and maintained under this permit,

   d. to obtain and remove samples of any discharge or emission of pollutants, and

   e. to enter and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring or recording any activity, discharge or emission authorized by this permit.

5. The issuance of this permit:

   a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are located,

   b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the facilities.

c. does not take into consideration or attest to the structural stability of any unit or part of the project, and

d. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liabilit directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. The facilities covered by this permit shall be operated in such a manner that the disposal of air contaminants collected by the equipment shall not cause a violation of the Environmental Protection Act or regulations promulgated thereunder.

7. The permittee shall maintain all equipment covered under this permit in such a manner that the performance of such equipment shall not cause a violation of the Environmental Protection Act or regulations promulgated thereunder.

8. The permittee shall maintain a maintenance record on the premises for each item of air pollution control equipment. This record shall be made available to any agent of the Environmental Protection Agency at any time during normal working hours and/or operating hours. As a minimum, this record shall show the dates of performance and nature of preventative maintenance activities.

9. No person shall cause or allow continued operation during malfunction, breakdown or startup of any emission source or related air pollution control equipment if such operation would cause a violation of an applicable emission standard or permit limitation. Should a malfunction, breakdown or startup occur which results in emissions in excess of any applicable standard or permit limitation, the permittee shall:

   a. immediately report the incident to the Agency's Regional Field Operations Section Office by telephone, telegraph, or other method as constitutes the fastest available alternative, and shall comply with all reasonable directives of the Agency with respect to the incident;

   b. maintain the following records for a period of no less than two (2) years:

      i. date and duration of malfunction, breakdown or startup,

      ii. full and detailed explanation of the cause,

      iii. contaminants emitted and an estimate of quantity of emissions,

      iv. measures taken to minimize the amount of emissions during the malfunction, breakdown or startup, and

      v. measures taken to reduce future occurrences and frequency of incidents.

10. If the permit application contains a compliance program and project completion schedule, the permittee shall submit a project completion status report within thirty (30) days of any date specified in the compliance program and project completion schedule or at six month intervals, whichever is more frequent.

11. Beginning one year from the date of this permit the permittee shall submit an "Annual Emission Report," form APC-208, as required by 35 Ill. Adm. Code 201.302. (Note: If the permittee has other operating permits for this facility, the "Annual Emission Report" for all such permits may be included in a single annual submission.)

NPDES Permit No. IL0001554

Illinois Environmental Protection Agency

Division of Water Pollution Control

2200 Churchill Road

P.O. Box 19276

Springfield, Illinois 62794-9276

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

Modified (NPDES) Permit

Expiration Date: April 1, 1990

Issue Date: July 15, 1985
Effective Date: August 14, 1985
Modification Issue Date: June 2, 1989
Modification Effective Date: July 2, 1989

Name and Address of Permittee:

Illinois Power Company
500 South 27th Street
Decatur, Illinois 62525

Facility Name and Address:

Illinois Power Company
Hennepin Power Plant
Hennepin, Illinois 61327
Putnam County

Discharge Number and Name:

No. 001 Condenser Cooling Water
No. 001(a) Boiler Blowdown
No. 001(b) Intake Screen Backwash
No. 001(c) Roof Drain Discharge
No. 003 Ash Lagoon #2 and #4 Discharge
No. 005 Ash Lagoon #1 and #3 Discharge
No. 005(a) Chemical Metal Cleaning Waste Treatment System Effluent

Receiving Waters

Illinois River

In compliance with the provisions of the Illinois Environmental Protection Act, Subtitle C Rules and Regulations of the Illinois Pollution Control Board, and the FWPCA, the above-named permittee is hereby authorized to discharge at the above location to the above-named receiving stream in accordance with the standard conditions and attachments herein.

Permittee is not authorized to discharge after the above expiration date. In order to receive authorization to discharge beyond the expiration date, the permittee shall submit the proper application as required by the Illinois Environmental Protection Agency (IEPA) not later than 180 days prior to the expiration date.

Thomas G. McSwiggin, P.E.
Manager, Permit Section
Division of Water Pollution Control

TGM:GC:jd/0495E/3

Modification Date: June 2, 1989

NPDES Permit No. IL0001554

Effluent Limitations and Monitoring

PARAMETER	LOAD LIMITS lbs/day 30 DAY AVG.	LOAD LIMITS lbs/day DAILY MAX.	CONCENTRATION LIMITS mg/l 30 DAY AVG.	CONCENTRATION LIMITS mg/l DAILY MAX.	SAMPLE FREQUENCY	SAMPLE TYPE

1. From the effective date of this permit until April 1, 1990, the effluent of the following discharge(s) shall be monitored and limited at all times as follows:

Outfall(s): 001 Condenser Cooling Water

This discharge consists of: — Approximate Flow

1. Condenser Cooling Water — 153.26 MGD
2. House Service Water — 7.0 MGD
3. Boiler Blowdown — 0.027 MGD
4. Intake Screen Backwash — 0.258 MGD
5. Roof Drain Discharge — Intermittent

Flow				Daily	24-Hour Total
Total Residual Chlorine			0.2	1/Week	*
Temperature	See Special Condition No. 4			Daily	Continuous

*See Special Condition No. 3

Outfall(s): 001(a) Boiler Blowdown — Approximate Flow 0.027 MGD

Flow				1/Week	Single Reading-Estimate
Total Suspended Solids		15.0	30.0	1/Week	24-Hour Composite

Modification Date: June 2, 1989

NPDES Permit No. IL0001554

Effluent Limitations and Monitoring

PARAMETER	LOAD LIMITS lbs/day 30 DAY AVG.	LOAD LIMITS lbs/day DAILY MAX.	CONCENTRATION LIMITS mg/l 30 DAY AVG.	CONCENTRATION LIMITS mg/l DAILY MAX.	SAMPLE FREQUENCY	SAMPLE TYPE

1. From the effective date of this permit until April 1, 1990, the effluent of the following discharge(s) shall be monitored and limited at all times as follows:

Outfall(s): 001(b) Intake Screen Backwash

Approximate Flow
0.26 MGD

Flow			1/Week	Single Reading Estimate

So as to minimize adverse impacts, for purposes of this permit, the intake structure operation and maintenance shall include, but not be limited to, the following:

1. Outer bar racks shall be routinely cleaned and collected debris properly disposed.
2. The traveling screens shall commence operating whenever the head loss across the screens exceeds four (4) inches.
3. The traveling screens shall be operated at least once per 8 hour shift, provided, however, that this requirement shall be inapplicable when the generating units are not operating.

OutFall(s) 001(c) Roof Drain Discharge

This discharge consists of:
1. Power Block Building Roof Drains

Approximate Flow
Intermittent

See Standard Condition No. 17

NPDES Permit No. IL0001554

Effluent Limitations and Monitoring

PARAMETER	LOAD LIMITS lbs/day 30 DAY AVG.	LOAD LIMITS lbs/day DAILY MAX.	CONCENTRATION LIMITS mg/l 30 DAY AVG.	CONCENTRATION LIMITS mg/l DAILY MAX.	SAMPLE FREQUENCY	SAMPLE TYPE

1. From the effective date of this permit until April 1, 1990, the effluent of the following discharge(s) shall be monitored and limited at all times as follows:

Outfall(s): 003 Ash Lagoon #2 and #4 Discharge

This discharge consists of:

		Approximate Flow
1.	Unit 2 Bottom Ash and Fly Ash	2.9 MGD
2.	Demineralizer Regenerate Wastes	0.035 MGD
3.	Unit 2 Non-chemical Metal Cleaning Washwater	Intermittent
4.	Unit #1 and Unit #2 Ash Hopper Overflow**	0.20 MGD
5.	Fly Ash Air Separator Overflow	Intermittent
6.	Ash Hopper Tank Emergency Overflow	Intermittent
7.	Boiler Drum Chemical Tank Drainage	Intermittent
8.	Demineralizer Room Floor Drainage	Intermittent

Flow					1/Week	Single Reading Estimate
pH	*See Special Condition No. 1*				1/Week	*Grab*
Total Suspended Solids			15.0	30.0	1/Week	24 Hour*** Composite
Oil and Grease			15.0	20.0	2/Month	Grab

**This wastestream may be discharged to the East (Outfall 003) or West (Outfall 005) Ash Pond System.

***See Special Condition No. 6

Modification Date: June 2, 1989
NPDES Permit No. IL0001554

Effluent Limitations and Monitoring

PARAMETER	LOAD LIMITS lbs/day 30 DAY AVG.	LOAD LIMITS lbs/day DAILY MAX.	CONCENTRATION LIMITS mg/l 30 DAY AVG.	CONCENTRATION LIMITS mg/l DAILY MAX.	SAMPLE FREQUENCY	SAMPLE TYPE

1. From the effective date of this permit until April 1, 1990, the effluent of the following discharge(s) shall be monitored and limited at all times as follows:

Outfall(s): 005 Ash Lagoon #1 and #3 Discharge

This discharge consists of:	Approximate Flow
1. Unit #1 Bottom Ash and Fly Ash Transport Water	0.21 MGD
2. Unit #1 and #2 Ash Hopper Overflow****	0.2 MGD
3. Power Block Building Floor Drains and Sump Discharges	0.1 MGD
4. Coal Breaker Building Drain Sump	Intermittent
5. Illinois River Dredge Spoils	Intermittent
6. Unit #1 Non-chemical Metal Cleaning Washwater	Intermittent
7. Chemical Metal Cleaning Waste Treatment System Effluent	Intermittent
8. Coal Pile Runoff	Intermittent
9. Unit #1 and Unit #2 Ash Line Low Point Drain	Intermittent
10. Crib House Sump	Intermittent
11. Well Water Drain Line	Intermittent
12. Water Treatment Plant Sump	Intermittent

PARAMETER					SAMPLE FREQUENCY	SAMPLE TYPE
Flow					1/Week	Single Reading Estimate
pH	See Special Condition No. 1				1/Week	Grab
Total Suspended Solids		15.0	30.0		1/Week	24 Hr***** Composite
Oil and Grease		15.0	20.0		2/Month	Grab

****This wastestream may be directed to the East Ash Pond System (Outfall 003).
***** See Special Condition No. 6

NPDES Permit No. IL0001554

Effluent Limitations and Monitoring

PARAMETER	LOAD LIMITS lbs/day 30 DAY AVG.	LOAD LIMITS lbs/day DAILY MAX.	CONCENTRATION LIMITS mg/l 30 DAY AVG.	CONCENTRATION LIMITS mg/l DAILY MAX.	SAMPLE FREQUENCY	SAMPLE TYPE
1. From the effective date of this permit until April 1, 1990, the effluent of the following discharge(s) shall be monitored and limited at all times as follows:						
Outfall(s): 005(a) Chemical Metal Cleaning Waste Treatment System Effluent						
Flow					Approximate Flow Intermittent Daily When Discharging	24 Hour Total
Iron (Total)				1.0	Daily When Discharging	24 Hour Composite
Copper (Total)				1.0	Daily When Discharging	24 Hour Composite

Special Conditions

1. The pH shall be in the range 6.0 to 9.0.

2. Samples taken in compliance with the effluent monitoring requirements shall be taken at a point representative of the discharge, but prior to entry into the receiving stream.

3. Total residual chlorine (TRC) may not be discharged from any single generating units main cooling condensers for more than two hours per day.

   A. Weekly sampling for TRC in the discharge flume shall be conducted at a minimum between five and twenty minutes following the initiation of a chlorination event of one condenser half using grab samples collected at three minute intervals. A different condenser half shall be monitored each week. A weekly TRC concentration curve shall be prepared and reported with monthly discharge monitoring reports. Relevant weekly chlorination practice data shall also be reported.

   B. If the permittee can demonstrate to the Agency the time to peak TRC concentration can be reliably predicted, upon written concurrence by the Agency, monitoring shall be reduced to the collection of a single grab sample at the predicted maximum TRC concentration time.

4. Discharge of wastewater from this facility must not alone or in combination with other sources cause the receiving stream to violate the following thermal limitations at the edge of the mixing zone which is defined by Section 302.211, Illinois Administrative Code, Title 35, Chapter I, Subtitle C, as amended:

   A. Maximum temperature rise above natural temperature must not exceed 5°F (2.78°C).

   B. Water temperature at representative locations in the main river shall not exceed the maximum limits in the following table during more than one (1) percent of the hours in the 12-month period ending with any month. Moreover, at no time shall the water temperature at such locations exceed the maximum limits in the following table by more than 3°F (1.67°C). (Main river temperatures are temperatures of those portions of the river essentially similar to and following the same thermal regime as the temperatures of the main flow of the river.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
°F	60	60	60	90	90	90	90	90	90	90	90	60
°C	15.6	15.6	15.6	32.2	32.2	32.2	32.2	32.2	32.2	32.2	32.2	15.6

5. There shall be no discharge of polychlorinated biphenyl compounds.

6. If inclement weather prohibits the collection of a 24-hour composite sample for five consecutive days, sampling shall consist of a grab sample.

NPDES Permit No. IL0001554

Special Conditions

7. Illinois Power Company has complied with Section 302.211(f) of Title 35, Chapter 1, Subtitle C: Water Pollution Regulations and Section 316(a) of the CWA by demonstrating that thermal discharge from Hennepin Power Plant has not caused and cannot reasonably be expected to cause significant ecological damage to the Illinois River as approved by the IPCB in PCB 78-8 on October 19, 1978. Pursuant to 35 Ill. Adm. Code 302.211(g) no additional monitoring or modification is being required for reissuance of this NPDES permit.

8. Illinois Power Company's demonstration for the Hennepin Power Plant in accordance with Section 316(b) of the CWA has been approved by this Agency by letter dated December 29, 1978. It is determined that no additional intake monitoring or modification is being required for reissuance of this NPDES permit.

9. Standard Condition No. 9 shall not constitute a waiver of any constitutional rights of the permittee.

10. The provisions contained in Standard Condition No. 17 shall not prejudice permittee's right to obtain or be granted a reasonable time in which to comply, but in no event shall such time be later than any applicable Federal or State of Illinois statutory or regulatory compliance date, in connection with any modification made pursuant thereto.

11. The permittee shall record monitoring results on Discharge Monitoring Report Forms using one such form for each discharge each month.

    The completed Discharge Monitoring Report forms shall be submitted to IEPA no later than the 15th day of the following month, unless otherwise specified by the permitting authority.

    Discharge Monitoring Reports shall be mailed to the IEPA at the following address:

    Illinois Environmental Protection Agency
    Division of Water Pollution Control
    2200 Churchill Road
    Springfield, Illinois 62706

    Attention: Compliance Assurance Section

    Additionally, Discharge Monitoring Report forms shall be mailed to United States Environmental Protection Agency in Chicago on a quarterly basis. The permittee shall submit the reports as follows, unless otherwise specified by the permitting authority.

Period	Report Due At U.S. Environmental Protection Agency
Jan, Feb, Mar	April 28th
April, May, June	July 28th
July, Aug, Sept	October 28th
Oct, Nov, Dec	January 28th

    Reports shall be addressed to United States Environmental Protection Agency as follows:

    NPDES Water Division - Compliance Section
    United States Environmental Protection Agency
    Region V
    230 South Dearborn Street
    Chicago, Illinois 60604

Special Conditions

12. Standard Condition 11(a) of Attachment H is rewritten as follows:

An application submitted by a corporation shall be signed by a principal executive officer of at least the level of vice president, or his duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge described in the application form originates. In the case of a partnership or a sole proprietorship, the application shall be signed by a general partner or the proprietor, respectively. In the case of a publicly owned facility, the application shall be signed by either the principal executive officer, ranking elected official, or other duly authorized employee.

13. Standard Condition 11(b) of Attachment H is rewritten as follows:

Pursuant to 40 CFR 122.22(b) all reports required by permits, other information requested by the Director, and all permit applications submitted for Group II storm water discharges under 122.26(b)(3) shall be signed by a person described in 40 CFR 122.22(a), or by a duly authorized representative of that person. A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described in paragraph (a) of this section;

(2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) and

(3) The written authorization is submitted to the Director.

ATTACHMENT H

Standard Conditions

Definitions

Act means the Illinois Environmental Protection Act, Ch. 111 1/2 Ill. Rev. Stat., Sec. 1001-1051 as Amended.

Agency means the Illinois Environmental Protection Agency.

Board means the Illinois Pollution Control Board.

Clean Water Act (formerly referred to as the Federal Water Pollution Control Act) means Pub. L. 92-500, as amended, 33 U.S.C. 1251 et seq.

NPDES (National Pollutant Discharge Elimination System) means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318 and 405 of the Clean Water Act.

USEPA means the United States Environmental Protection Agency.

Daily Discharge means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

Maximum Daily Discharge Limitation (daily maximum) means the highest allowable daily discharge.

Average Monthly Discharge Limitation (30 day average) means the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

Average Weekly Discharge Limitation (7 day average) means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Aliquot means a sample of specified volume used to make up a total composite sample.

Grab Sample means an individual sample of at least 100 milliliters collected at a randomly-selected time over a period not exceeding 15 minutes.

24 Hour Composite Sample means a combination of at least 8 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over a 24-hour period.

8 Hour Composite Sample means a combination of at least 3 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over an 8-hour period.

Flow Proportional Composite Sample means a combination of sample aliquots of at least 100 milliliters collected at periodic intervals such that either the time interval between each aliquot or the volume of each aliquot is proportional to either the stream flow at the time of sampling or the total stream flow since the collection of the previous aliquot.

(1) Duty to comply. The permittee must comply with all conditions of the permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or for denial of a permit renewal application. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

(2) Duty to reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. If the permittee submits a proper application as required by the Agency no later than 180 days prior to the expiration date, this permit shall continue in full force and effect until the final Agency decision on the application has been made.

(3) Need to halt or reduce activity not a defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity, as under to maintain compliance with the conditions of this permit.

(4) Duty to mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

(5) Proper operation and maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up, or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

(6) Permit actions. This permit may be modified, revoked and reissued, or terminated for cause by the Agency pursuant to 40 CFR 122.62. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

(7) Property rights. This permit does not convey any property rights of any sort, or any exclusive privilege.

(8) Duty to provide information. The permittee shall furnish to the Agency within a reasonable time, any information which the Agency may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with the permit. The permittee shall also furnish to the Agency, upon request, copies of records required to be kept by this permit.

(9) Inspection and entry. The permittee shall allow an authorized representative of the Agency, upon the presentation of credentials and other documents as may be required by law, to:

(a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;

(b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit;

(c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

(d) Sample or monitor at reasonable times, for the purpose of assuring permit compliance, or as otherwise authorized by the Act, any substances or parameters at any location.

(10) Monitoring and records.

(a) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

(b) The permittee shall retain records of all monitoring information, including all calibration and maintenance records, and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Agency at any time.

(c) Records of monitoring information shall include:

(1) The date, exact place, and time of sampling or measurements;

(2) The individual(s) who performed the sampling or measurements;

(3) The date(s) analyses were performed;

(4) The individual(s) who performed the analyses;

(5) The analytical techniques or methods used; and

(6) The results of such analyses.

(d) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit. Where no test procedure under 40 CFR Part 136 has been approved, the permittee must submit to the Agency a test method for approval. The permittee shall calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals to ensure accuracy of measurements.

(11) Signatory requirement. All applications, reports or information submitted to the Agency shall be signed and certified.

(a) Application. All permit applications shall be signed as follows:

(1) For a corporation: by a principal executive officer of at least the level of vice president or a person or position having overall responsibility for environmental matters for the corporation;

(2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

(3) For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.

(b) Reports. All reports required by permits, or other information requested by the Agency shall be signed by a person described in paragraph (a) or by a duly authorized representative of that person. A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described in paragraph (a); and

(2) The authorization specifies either an individual or a position responsible for the overall operation of the facility, from which the discharge originates, such as a plant manager, superintendent or person of equivalent responsibility; and

(3) The written authorization is submitted to the Agency.

(c) Changes of Authorization. If an authorization under (b) is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of (b) must be submitted to the Agency prior to or together with any reports, information, or applications to be signed by an authorized representative.

(12) Reporting requirements.

(a) Planned Changes. The permittee shall give notice to the Agency as soon as possible of any planned physical alterations or additions to the permitted facility.

(b) Anticipated noncompliance. The permittee shall give advance notice to the Agency of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

(c) Compliance schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of the permit shall be submitted no later than 14 days following each schedule date.

(d) Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in the permit.

(1) Monitoring results must be reported on a Discharge Monitoring Report (DMR).

(2) If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40 CFR 136 or as specified in the permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.

(3) Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Agency in the permit.

(e) Twenty-four hour reporting. The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. The following shall be included as information which must be reported within 24 hours:

(1) Any unanticipated bypass which exceeds any effluent limitation in the permit;

(2) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Agency in the permit to be reported within 24 hours;

The Agency may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

(f) Other noncompliance. The permittee shall report all instances of noncompliance not reported under paragraphs (12)(c), (d), or (e), at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph (12)(e).

(g) Other information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to the Agency, it shall promptly submit such facts or information.

(13) Transfer of permits. A permit may be automatically transferred to a new permittee if:

(a) The current permittee notifies the Agency at least 30 days in advance of the proposed transfer date;

(b) The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage and liability between the current and new permittees; and

(c) The Agency does not notify the existing permittee and the proposed new permittee of its intent to modify or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement.

(14) All manufacturing, commercial, mining, and silvicultural dischargers must notify the Agency as soon as they know or have reason to believe:

(a) That any activity has occurred or will occur which would result in the discharge of any toxic pollutant identified under Section 307 of the Clean Water Act which is not limited in the permit, if that discharge will exceed the highest of the following notification levels:

(1) One hundred micrograms per liter (100 ug/l);

(2) Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

(3) Five (5) times the maximum concentration value reported for that pollutant in the NPDES permit application; or

(4) The level established by the Agency in the permit.

(b) That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the NPDES permit application.

(15) All Publicly Owned Treatment Works (POTWs) must provide adequate notice to the Agency of the following:

(a) Any new introduction of pollutants into that POTW from an indirect discharger which would be subject to Sections 301 or 306 of the Clean Water Act if it were directly discharging those pollutants; and

(b) Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

(c) For purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

(16) If the permit is issued to a publicly owned or publicly regulated treatment works, the permittee shall require any industrial user of such treatment works to comply with federal requirements concerning:

(1) User charges pursuant to Section 204(b) of the Clean Water Act, and applicable regulations appearing in 40 CFR 35;

(2) Toxic pollutant effluent standards and pretreatment standards pursuant to Section 307 of the Clean Water Act; and

(3) Inspection, monitoring and entry pursuant to Section 308 of the Clean Water Act.

(17) If an applicable standard or limitation is promulgated under Section 301(b)(2)(C) and (D), 304(b)(2), or 307(a)(2) and that effluent standard or limitation is more stringent than any effluent limitation in the permit, or controls a pollutant not limited in the permit, the permit shall be promptly modified or revoked, and reissued to conform to that effluent standard or limitation.

(18) Any authorization to construct issued to the permittee pursuant to 35 Ill. Adm. Code 309.154 is hereby incorporated by reference as a condition of this permit.

(19) The permittee shall not make any false statement, representation or certification in any application, record, report, plan or other document submitted to the Agency or the USEPA, or required to be maintained under this permit.

(20) The Clean Water Act provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Clean Water Act is subject to a civil penalty not to exceed $10,000 per day of such violation. Any person who willfully or negligently violates permit conditions implementing Sections 301, 302, 306, 307, or 308 of the Clean Water Act is subject to a fine of not less than $2,500, nor more than $25,000 per day of violation, or by imprisonment for not more than one year, or both.

(21) The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

(22) The Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit shall, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

(23) Collected screening, slurries, sludges, and other solids shall be disposed of in such a manner as to prevent entry of those wastes (or runoff from the wastes) into waters of the State. The proper authorization for such disposal shall be obtained from the Agency and is incorporated as part hereof by reference.

(24) In case of conflict between these standard conditions and any other conditions included in this permit, the other conditions shall govern.

(25) The permittee shall comply with, in addition to the requirements of the permit, all applicable provisions of 35 Ill. Adm. Code, Subtitle C, Subtitle D, Subtitle E, and all applicable orders of the Board.

(26) The provisions of the permit are severable, and if any provision of the permit, or the application of any provision of the permit is held invalid, the remaining provisions of the permit shall continue in full force and effect.