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

ENVIRONMENTAL INFORMATION VOLUME

for

CILCO Edwards Station, Boiler No. 1

Submitted by:

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1.0 INTRODUCTION

On December 19, 1985, President Reagan signed Public Law No. 99-190, which provides funds to conduct cost-shared clean coal technology projects between industry and government. To implement this law, the Department of Energy (DOE) has instituted a Clean Coal Technology Program. The goal of this program is to evaluate emerging technologies that are designed to displace oil and natural gas, or to utilize coal more cleanly, efficiently or economically than currently available technology. Individual clean coal projects are intended to demonstrate the feasibility of future commercial applications of emerging technologies. This volume is concerned with a clean coal project combining gas reburning with sorbent injection for the purpose of in-boiler control of oxides of nitrogen and sulfur.

The Energy and Environmental Research Corporation (EER) is currently making preparations to conduct a demonstration project involving cofiring pulverized coal with natural gas in combination with sorbent injection and/or coal cleaning to:

- Allow for cost effective control of NO_x and SO_2 emissions from coal-fired boilers constructed prior to requirements for New Source Performance Standards (NSPS) [40 CFR Part 60].

- Provide the utility industry with increased flexibility in coal purchasing.

The combination of technologies to be demonstrated, gas reburning with sorbent injection (GR-SI), involves introduction of natural gas above the main heat release zone to produce a homogeneous, slightly oxygen-deficient zone. At the downstream end of this rich zone, burnout air and calcium based sorbent are injected into the gas duct. 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. The sorbent injection process can be viewed as a sequential coupling of an activation step, in which the calcium based sorbent (limestone or hydrate) calcines to produce CaO, and a heterogeneous sulfation step, where the CaO reacts with gas phase SO_2/SO_3 to form calcium sulfate. The calcium sulfate is subsequently removed by the plant particulate control equipment. Upper furnace sorbent injection will be used in this project.

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

- Illinois Power Co., Hennepin Station, Unit 1; 80 MW_e tangentially fired.
- Central Illinois Light Co., Edwards Station, Unit 1; 117 MW_e front wall fired.
- Springfield CWLP, Lakeside Station, Unit 7; 40 MW_e cyclone fired.

This volume details the actions to be taken at Edwards Station and the environmental impacts of these actions.

The purpose of this Environmental Information Volume is to facilitate DOE's preparation of the environmental documents required for compliance with the National Environmental Policy Act of 1969 (NEPA). This report has been prepared in accordance with the guidelines provided by DOE in Appendix J of the Clean Coal Technology Program Opportunity Notice (PON) and contains all relevant information requested therein. The goal of this document is to provide a project description as well as an analysis of all applicable environmental, health, safety, and socioeconomic (EHSS) issues. Current air permits and National Pollutant Discharge Elimination System (NPDES) permits are also described, as well as anticipated permit modifications.

2.0 PROJECT DESCRIPTION

This section describes the existing facility at Edwards Station, presents a brief technical description of the GR-SI technology demonstration project, describes anticipated project activities, defines project resource requirements and discharges, and lists EHSS areas that could potentially be impacted by the project. All data requested in Appendix J of the DOE PON are addressed; however, only cursory treatment is afforded those factors for which this retrofit technology demonstration makes applicability tenuous.

2.1 Existing Facility

2.1.1 Site Description

Edwards Station is a 173 acre facility on the west bank of the Illinois River in Peoria County, approximately 2.5 miles south of Bartonville, Illinois, and about 130 miles southwest of Chicago, as indicated in Figures 2-1 and 2-2. The layout of the station is illustrated in the aerial view of Figure 2-3, and specific site features are identified on the station plot plan presented in Figure 2-4.

Edwards Station is accessible by rail, truck, and barge. The Chicago Northwestern Railway line runs adjacent to the site. A spur line to the site providing access to Burlington Northern and Santa Fe railways is in place and operational. Truck access is via Interstate Highway 74 to U.S. Highway 24 which runs adjacent to the plant site. Over 10,000 vehicles per day currently traverse Highway 24. The Illinois River, which forms the eastern boundary of Edwards Station, is a major navigation and commerce channel connecting with the Mississippi River. Process water supplies for the Edwards site are taken from the Illinois River. A 24 in. natural gas pipeline runs to within about 3/4 mile of the plant site and a feeder line will be connected to Unit 1 for the GR-SI project.

Edwards Station has three coal-fired steam electric generating units. The GR-SI technology demonstration will be conducted in Unit 1. Unit 1

★Edwards Power Station Location, Peoria County, Illinois

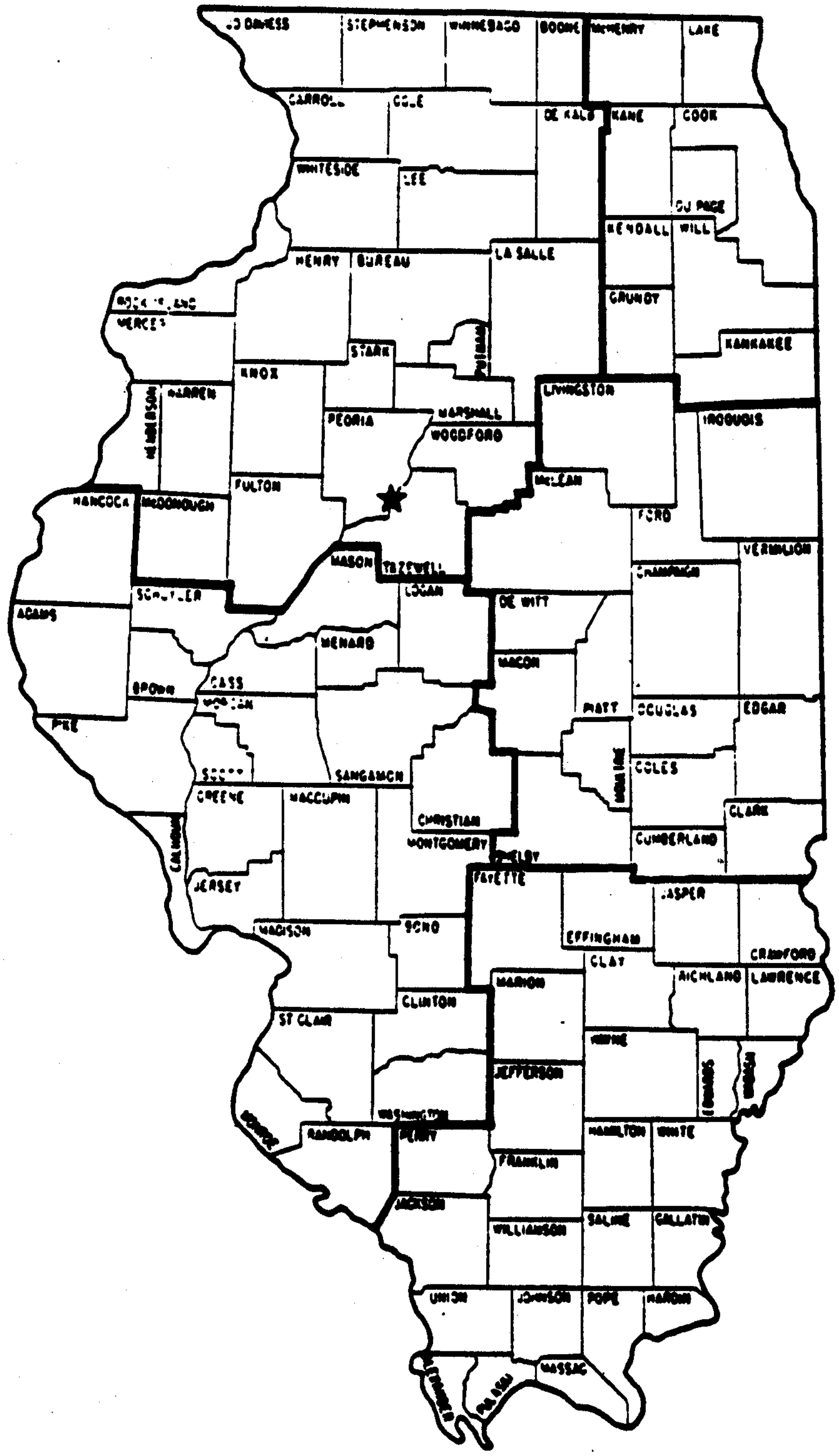


Figure 2-1. Location of CILCO Edwards Station.

COUNTY OF PEORIA, IL

☆ Edwards Station

FEDERAL EMERGENCY MANAGEMENT AGENCY

APPROXIMATE SCALE

5 0 5 10 15 MILES

Figure 2-2. Map of Peoria County.

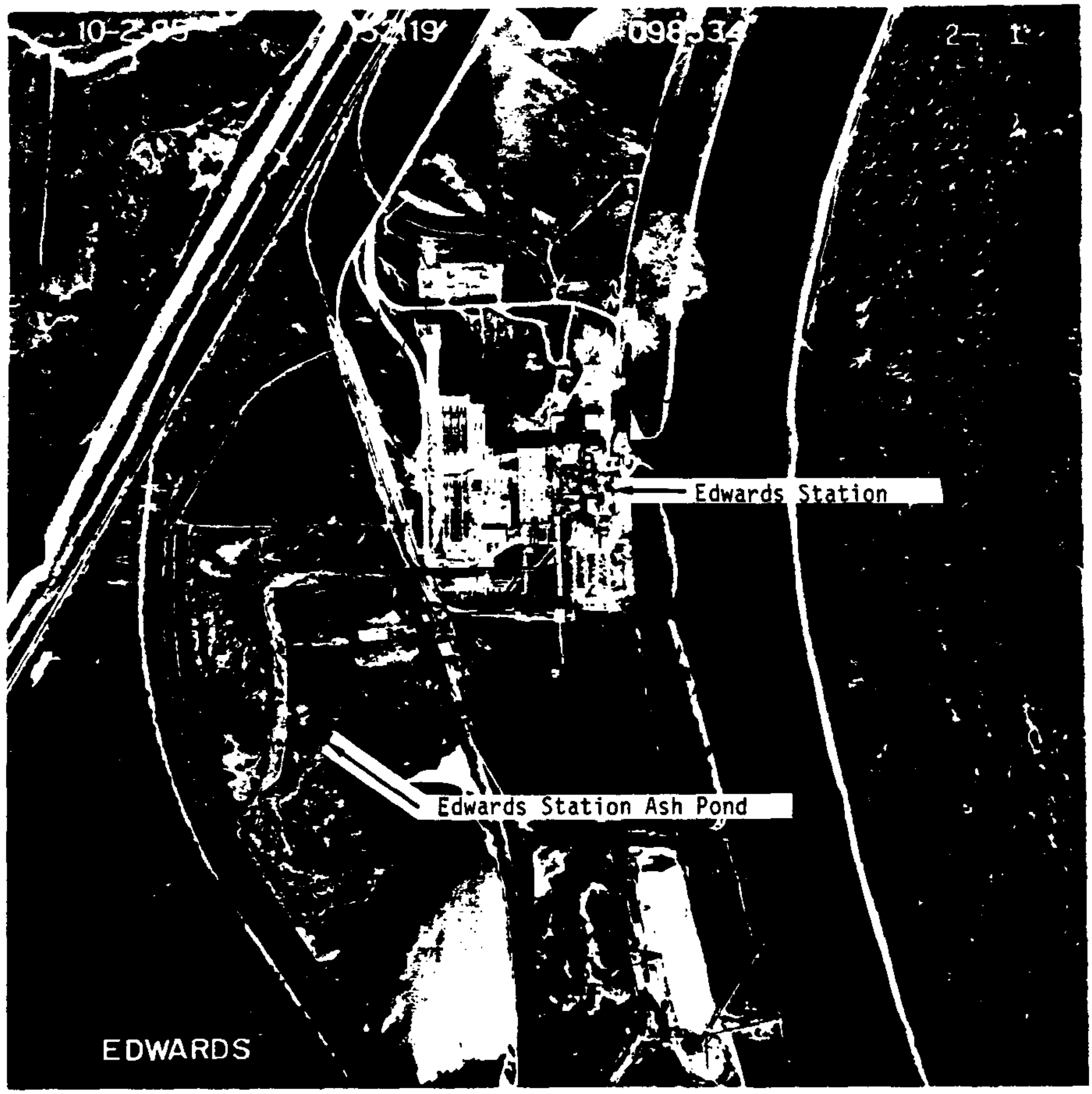


Figure 2-3. Aerial view of Edwards power station.

Approximate Scale (miles)

0 1/8 1/4

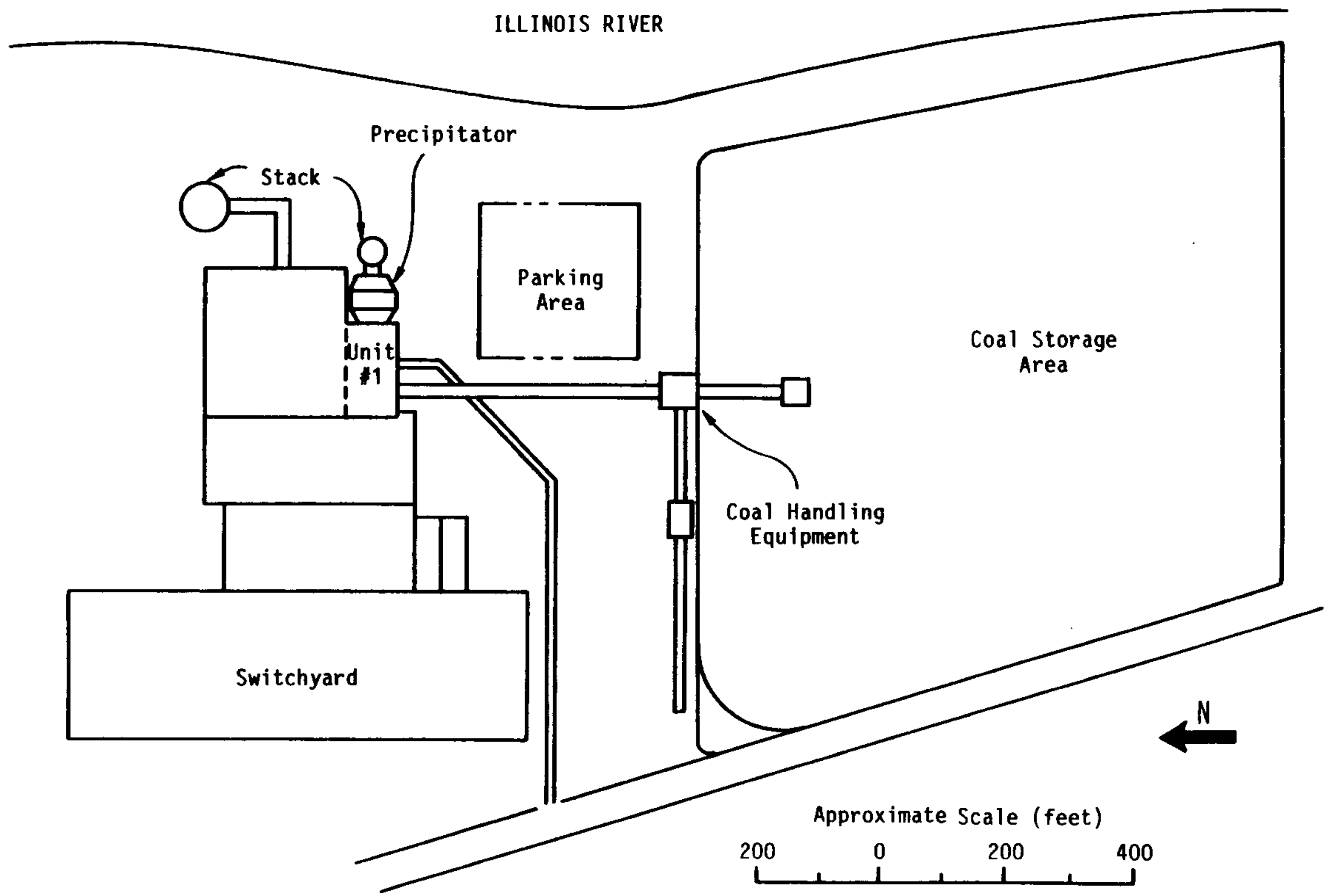


Figure 2-4. Plot plan of Edwards Station.

currently fires coals from central Illinois and from eastern Kentucky. The Illinois coal is delivered by truck. Approximately 75 percent of the Kentucky coal is delivered by rail directly to the site, and 25 percent is delivered by barge to a nearby dock and then trucked to the site. Coal delivered to the site is placed into a storage pile containing sufficient reserves for 56 days operation of all three units (approximately 250,000 tons of coal). Coal pile runoff is intermittent and has an average flow rate of 0.056 million gallons per day (MGD). Runoff is collected in an ash pond, and pond water is discharged into the Illinois River.

2.1.2 Description of Existing Process

Edwards Station has three coal-fired steam electric generating units with a total net generating capacity of 740 MW_e. The project will be conducted in Unit 1, a 117 MW_e front wall fired boiler, as shown in Figure 2-5. Unit 1 fires a blend consisting of nominally 15 weight percent high sulfur bituminous coal from Illinois and 85 percent low sulfur coal from eastern Kentucky. Coal and ash analyses are given in Table 2-1. These analyses were done for the plant by Commercial Testing and Engineering Company in 1987. Based on the Unit 1 design heat rate, during full load operation Unit 1 fires approximately 95,190 lb/hr of coal. Plant records indicate that in 1986 Unit 1 fired 208,676 tons of coal, and all three units at Edwards Station fired 1,308,339 tons of coal. Therefore, in 1986 Unit 1 accounted for about 16 percent of station coal usage. In 1986, the Unit 1 capacity factor was 49.9 percent.

An electrostatic precipitator (ESP) is used to control particulate emissions. The ESP is a cold side unit, which means that it operates downstream of the air preheater. The ESP has specific collection area of 137 $ft^2/(1000\ ft^3/min)$.

Solid waste streams from the boiler include the fly ash collected by the plant ESP and the furnace bottom ash. These waste streams are exempted from RCRA Subtitle C Hazardous Waste regulations and are sluiced to an on-site ash pond for disposal. Based on coal flow rate and ash percentage, calculations

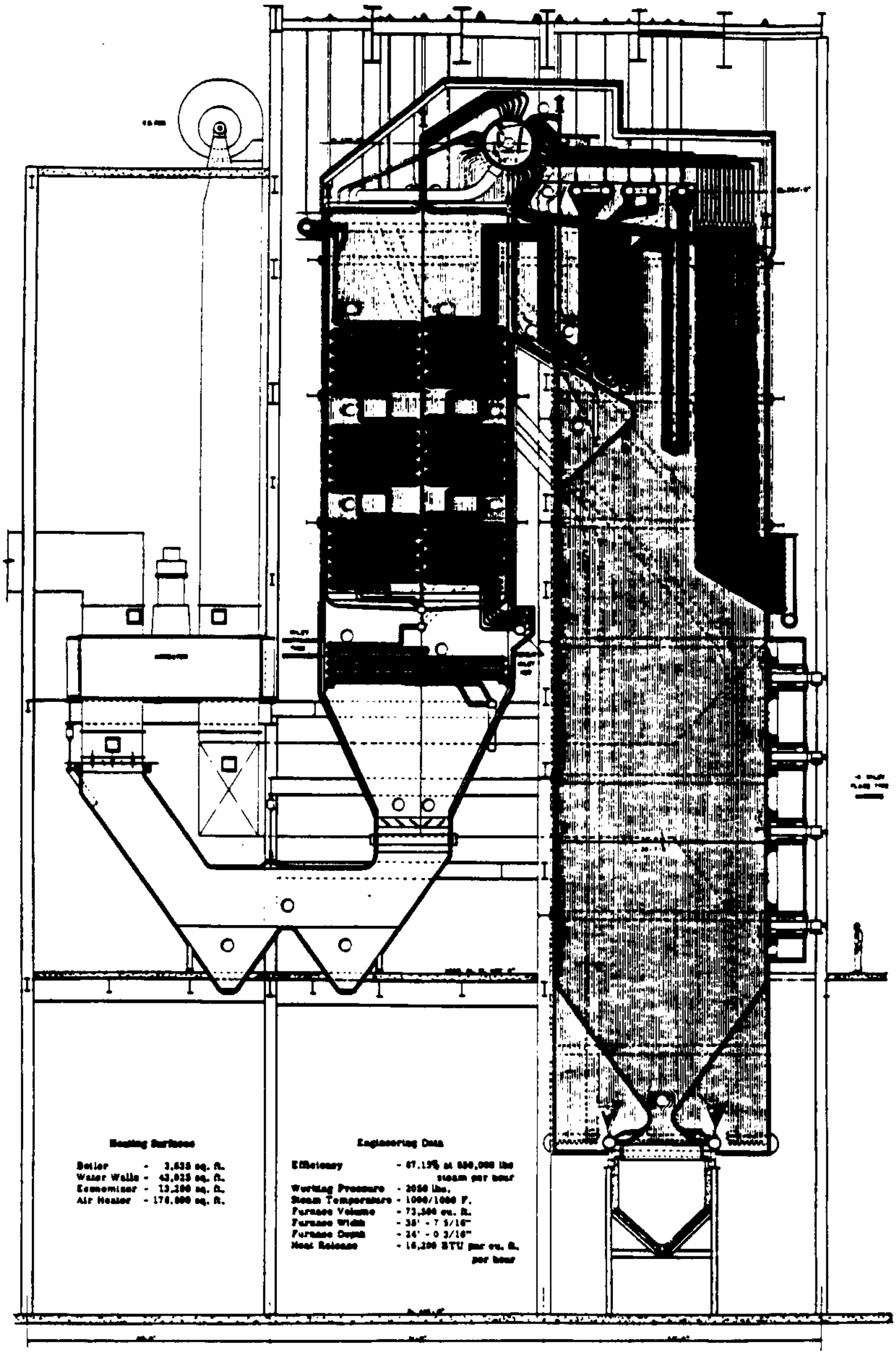


Figure 2-5. Schematic of Edwards Station Unit No. 1 Boiler.

TABLE 2-1. EDWARDS STATION UNIT 1
COAL PROPERTIES

Fuel Properties	Low-Sulfur Kentucky Coal	High-Sulfur Illinois Coal
Proximate Analysis (Dry)		
Fixed Carbon	57.40	49.52
Volatile Matter	36.65	39.28
Ash	5.95	11.20
Moisture (as received)	6.15	16.59
Heat Value (as fired) (Btu/lb)	13,438	10,635
Ultimate Analysis (Dry)		
Carbon	80.00	71.05
Hydrogen	5.08	4.99
Nitrogen	1.45	1.24
Chlorine	0.13	0.05
Sulfur	0.69	2.99
Ash	5.96	11.20
Oxygen	6.69	8.48
Ash Fusion Temp, Reducing (°F)		
Initial Deformation	2370-2700 +	1,975
Softening (H = W)	2540-2700 +	2,090
Softening (H = 1/2 W)	2630-2700 +	2,195
Fluid	2700 +	2,305

indicate that during full-load operation flow rate of fly ash from Unit 1 to the ash pond is 4724 lb/hr, and flow rate of bottom ash to the ash pond is 851 lb/hr. The process flow diagram in Figure 2-6, representing baseline conditions for Unit 1 at full load, shows these flow rates. Plant records indicate that in 1986 Unit 1 generated 12,208 tons of ash, and all three units at Edwards Station generated 76,014 tons of ash.

Process water from the adjacent Illinois River is used for once-through non-contact cooling applications and for transporting fly ash and bottom ash. Boiler make-up water is provided by demineralized Illinois River water. Process water flow rates are summarized in Table 2-2. Fly and bottom ash are sluiced to an ash pond. The average amount of sluice water required by Unit 1 is 1.17 MGD. Effluent water from the ash pond is discharged into the Illinois River. The plant's National Pollutant Discharge Elimination System (NPDES) permit requires the plant to monitor effluent water for flow rate, pH, total suspended solids, and oils and greases and to submit monthly monitoring reports. High, low, and average values of these parameters as taken from 12 successive monitoring reports from 1986 and 1987 are presented in Table 2-3.

Unit 1 currently requires air at a flow rate of 254,000 standard ft^3/min (scfm). Air emissions of concern include SO_2, NO_x and particulates. During full load operation, SO_2 is presently emitted at a rate of 1712 lb/hr [1.43 pounds per million Btu (lb/MBtu)], as calculated from coal feed rate and sulfur content. NO_x is emitted at a rate of 1269 lb/hr (1.06 lbs/MBtu). This value is calculated assuming NO_x emissions of 750 parts per million, which is a value typical of wall-fired boilers. Based on ESP performance tests conducted in 1986, particulates are emitted at a rate of 218 lb/hr (0.168 lb/MBtu).

2.2 Technical Project Description

Laboratory-scale investigations of the reburning concept were originally conducted in the United States in the early 1970's (e.g. Wendt, J. O. L., Sternling, C. V., and Matovich, M. A., "Reduction of Sulfur Trioxide and

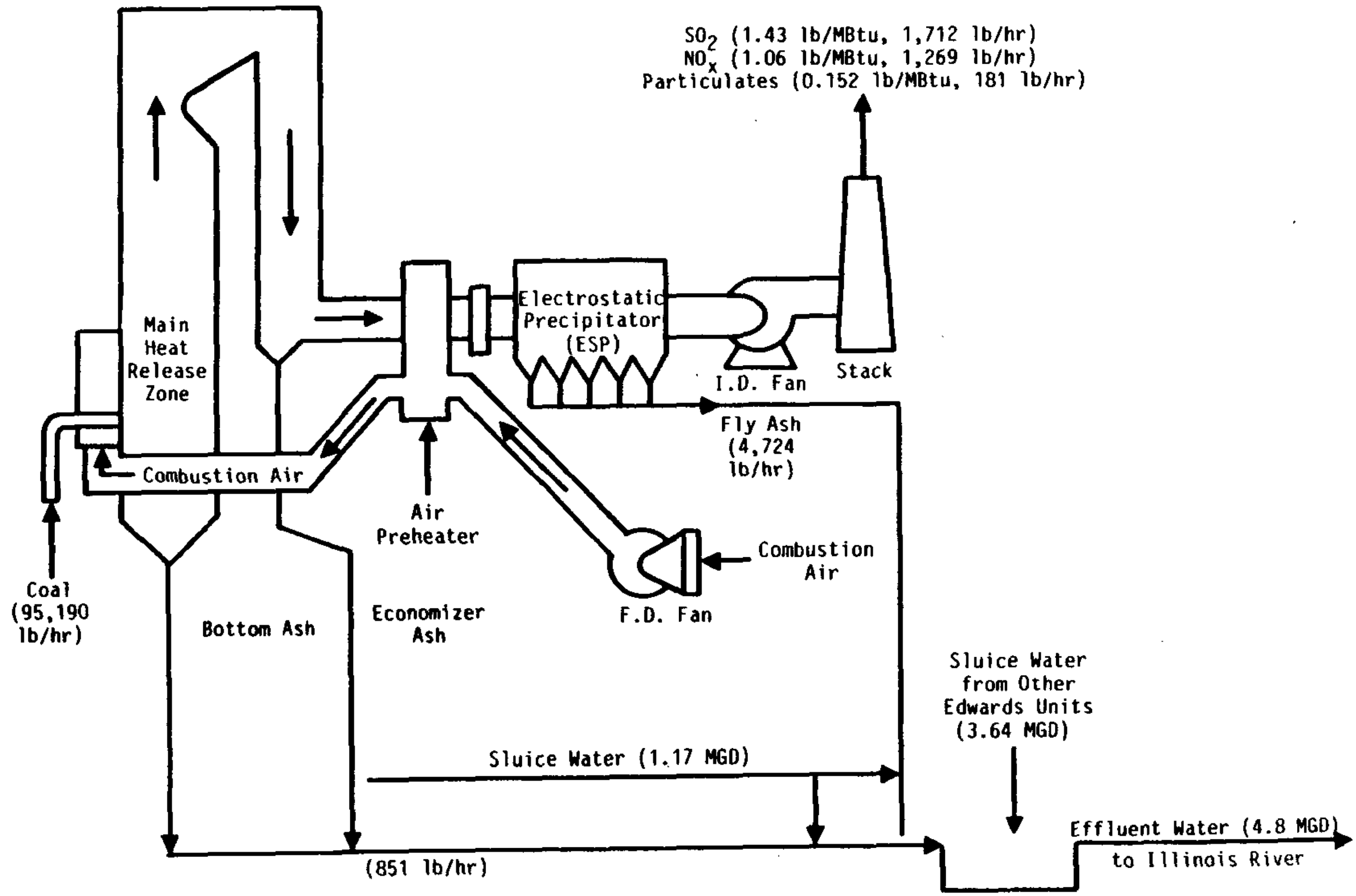


Figure 2-6. Process flow diagram for baseline operation during full-load output.

TABLE 2-2. PROCESS WATER FLOW RATES

Source	Flow Rate (MGD)
Circulating Boiler Water	2.6
Cooling Water	355
Sluice Water	1.17
Coal Pile Runoff	0.056

TABLE 2-3. ASH POND EFFLUENT WATER PARAMETERS

Parameter	High	Low	Average
Flow Rate (MGD)	5.8	3.0	4.8
pH	8.58	7.42	8.06
TSS (mg/l)	19	5	11
Oils/grease(mg/l)	11.0	1.4	4.0

Nitrogen Oxides by Secondary Fuel Injection." Fourteenth Symposium (International) on Combustion, The Combustion Institute, Pittsburgh, 1973, p. 897). More recently it has been demonstrated at full scale in Japan, but mainly with oil fired systems. Recent extensive research and pilot scale work at EER has demonstrated potential of the reburning concept, particularly when the reburning fuel is natural gas. Sorbent injection was also originally developed in circa 1960 and 1970 and was demonstrated at full scale in Tennessee Valley Authority's (TVA) Shawnee Power Plant in the early 1970's with rather poor results. Subsequently, TVA demonstrated that significantly higher capture levels could be achieved through use of proper injection locations and advanced sorbent materials. Large scale work at several U.S. and Canadian sites has begun to confirm the potential of this technology for SO_2 control.

EER's most recent pilot scale results indicate that 60 percent NO_x reductions can be achieved from typical pre-NSPS NO_x levels. Sulfur dioxide reductions of up to 70 percent can be achieved by combining reburning with sorbent injection if a hydrated sorbent is used. These data are typical of those obtained with optimized gas reburning-sorbent injection for a wide spectrum of primary fuels and they appear to be generally achievable in full scale systems.

The objectives of the current project are to provide a comprehensive data base demonstrating the performance of GR-SI in pre-NSPS utility boiler applications and to promote commercialization of this combination of technologies. Since the design and operating characteristics of pre-NSPS utility boilers vary widely, no single demonstration could adequately address the full population. Consequently, a total of three demonstrations will be conducted using three pre-NSPS utility boilers with widely varying characteristics. The GR-SI systems will be designed for optimum performance as applied to each specific host unit.

Figure 2-7 illustrates the application of GR-SI in a wall fired boiler. Natural gas is injected above the main heat release zone to reburn NO that is produced in that zone. NO is reduced by a hydrocarbon radical (CH) producing

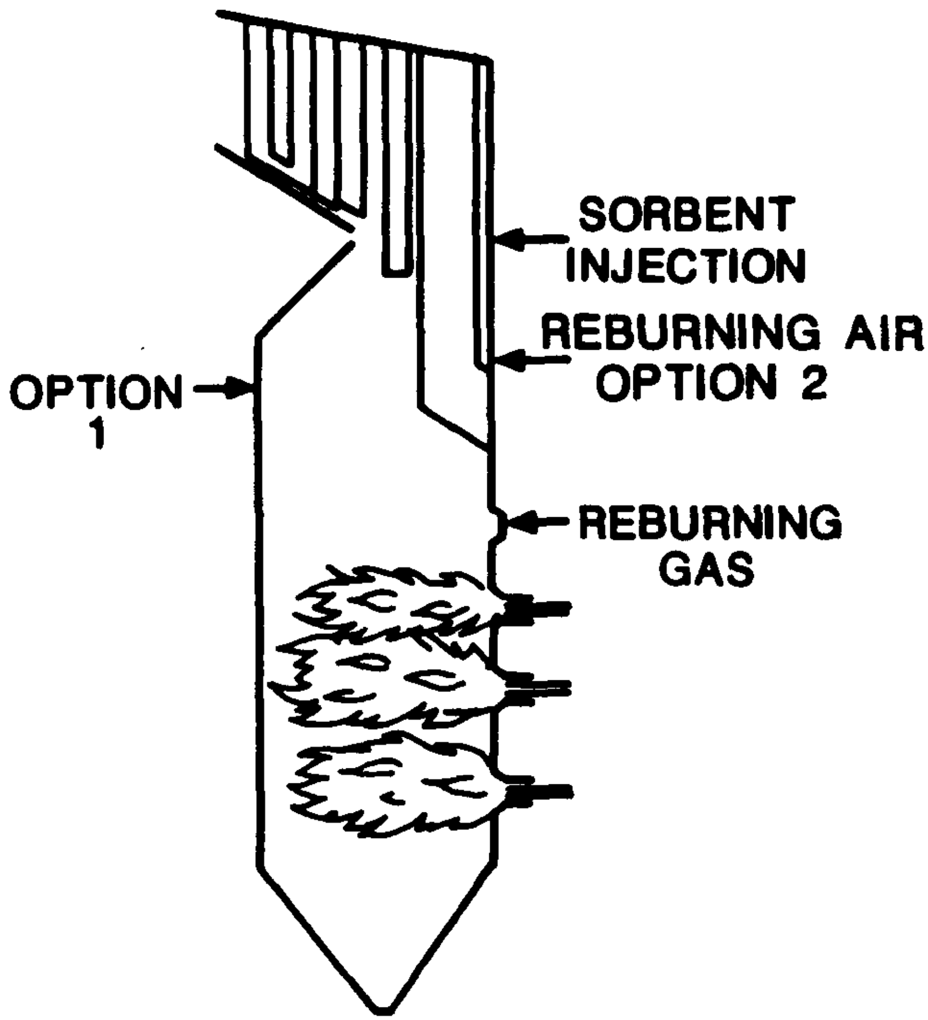


Figure 2-7. Application of gas reburning--sorbent injection for NO_x/SO_2 control.

HCN which allows the formation of NH via NCO. Molecular nitrogen is produced by the reaction of NO with N at high temperature and with NH_2 at lower temperatures (<2200°F). The goal of the GR-SI system is to provide 60 percent NO_x control. The pre-NSPS Edwards unit does not have an NO_x emission constraint. Thus, this NO_x emission reduction could be useful to the plant in response to future NO_x regulations.

In Figure 2-7 an upper furnace location is shown for sorbent injection. Upper furnace injection is necessary because an injection temperature of approximately 2250°F is required to maximize sulfur capture. For the wall-fired Unit 1 boiler, the SO_2 strategy will be to fire a higher percentage of high sulfur Illinois coal while maintaining SO_2 emissions at present levels. The preliminary plan is to inject the sorbent into the upper furnace on this unit. Sorbent injection will increase the amount of solid material in the flue gas. Therefore, several ESP modifications and performance upgrades will be assessed during the detailed design phase of the project and implemented during the construction and startup phase. Among these possible modifications are addition of plate area, flue gas humidification and SO_3 injection.

The solid waste from GR-SI is a blend of a calcium sorbent with fly ash which, due to the presence of unreacted lime, has similar characteristics to lime/fly ash/scrubber sludge prepared for sludge disposal or the solid product from lime-based spray dryer systems. This waste hardens after placement and produces stable landfills. Such a blend may also have commercial value for construction applications.

Two potential solid waste management options will be evaluated. One of these options is to use the plant's current wet handling system. The other option is dry disposal, which would involve trucking the solid waste to an off-site permitted landfill. One of these options will be chosen during the detailed design phase of the project.

2.3 Description of Activities

2.3.1 Description of Project Phases

The GR-SI project will take 53 months to complete. EER will conduct the technology demonstration project in three phases:

- Phase 1--Design and Permitting. This initial phase will culminate in the detailed design of gas reburning and sorbent injection systems for Edwards Station. Gas pipeline design, routing, and permitting activities will also be conducted during Phase 1. A program plan will be prepared for the equipment construction and demonstration testing. An industry panel will be established to initiate technology transfer. All necessary permits and permit modifications will be obtained.

- Phase 2--Construction and Startup. This phase will begin after Phase 1 is completed and will last 16 months. Following DOE approval, the gas reburning and sorbent injection equipment will be installed and checked out at Edwards Station. Gas pipeline construction will also be conducted during Phase 2. The process and engineering designs will be presented to the industry panel.

- Phase 3--Operation, Data Collection, Reporting, and Disposition. Phase 3 will begin concurrent with the final stages of Phase 2 and will last 29 months. Following DOE approval, the host unit will be tested for one year over a range of conditions. All data and test results will be compiled into a guideline manual which will be made available to industry. The project results will be presented to the industry panel.

The demonstration of GR-SI is not intended as a first generation of specific technology but rather it will build upon the results of several individual technology demonstrations now being conducted by the EPA and others.

2.3.2 Description of Installation Activities

The following section describes the specific installation tasks that will be undertaken as part of the GR-SI technology demonstration by EER personnel, plant personnel and local labor. Worker safety is a primary concern in any industrial project, since an employer has not only a financial liability, but an ethical responsibility to ensure that workers are not subjected to unreasonable risks. All appropriate occupational health and safety rules will be fully enforced throughout this program to minimize the risk of injury to workers.

Major activities involved in the construction phase of the project include installation of the gas reburning and sorbent injection equipment, construction of the natural gas pipeline, and implementation of ESP upgrades. The GR-SI equipment installation work at Edwards Station will be conducted in a series of five steps:

1. Procurement
2. Initial installation (normal unit operation)
3. Final installation (outage)
4. Checkout
5. Correction of deficiencies

Step three, final installation, must correspond to a normally scheduled outage and this is the key element determining the installation schedule. The specific outage schedule will depend on the utility's load requirements at the time and the condition of the unit. For example, if a fall outage is scheduled but the power demand is greater than anticipated in the fall and there are no major problems, the utility may elect to delay the outage until the low load period in the spring. The program must be flexible in this regard. To maximize schedule flexibility, EER will request authorization to procure long lead time items as soon as possible following the completion of the final design specifications.

Most of the equipment will be standard items such as piping, valves, silos, etc., and will be obtained directly from vendors. A limited number of items will need to be custom-fabricated to meet site specific requirements. These include the gas and sorbent injectors, windbox modifications, etc. The general approach to the equipment procurement and installation will be to conduct the fabrication/assembly work off site to the maximum extent possible. This will limit the amount of time-consuming custom installation and fitting required during the short outage periods.

The on-site installation work will be divided into two steps: an initial installation step where all work is conducted during normal unit operation and the final installation step which requires a unit outage. The following equipment will be installed during normal unit operation:

1. Sorbent unloading and storage equipment.
2. Sorbent feeding and transport equipment.
3. Sorbent piping and injection equipment assembly.
4. Sorbent injection control assembly.
5. Gas piping and control assembly.
6. Gas injector assembly.
7. Instrumentation installation except for final connections.

A plot plan of Edwards Station showing a proposed location of the sorbent storage silo is shown in Figure 2-8. The intent is to complete the initial installation in time to provide flexibility on completing the final installation during a scheduled outage.

The following equipment must be installed during an outage:

1. Windbox modifications.
2. Furnace or duct penetrations for gas injectors, overfire air ports or sorbent injectors.
3. Final connections for control equipment.
4. Final gas plumbing.
5. Final instrumentation connections.
6. ESP upgrades.

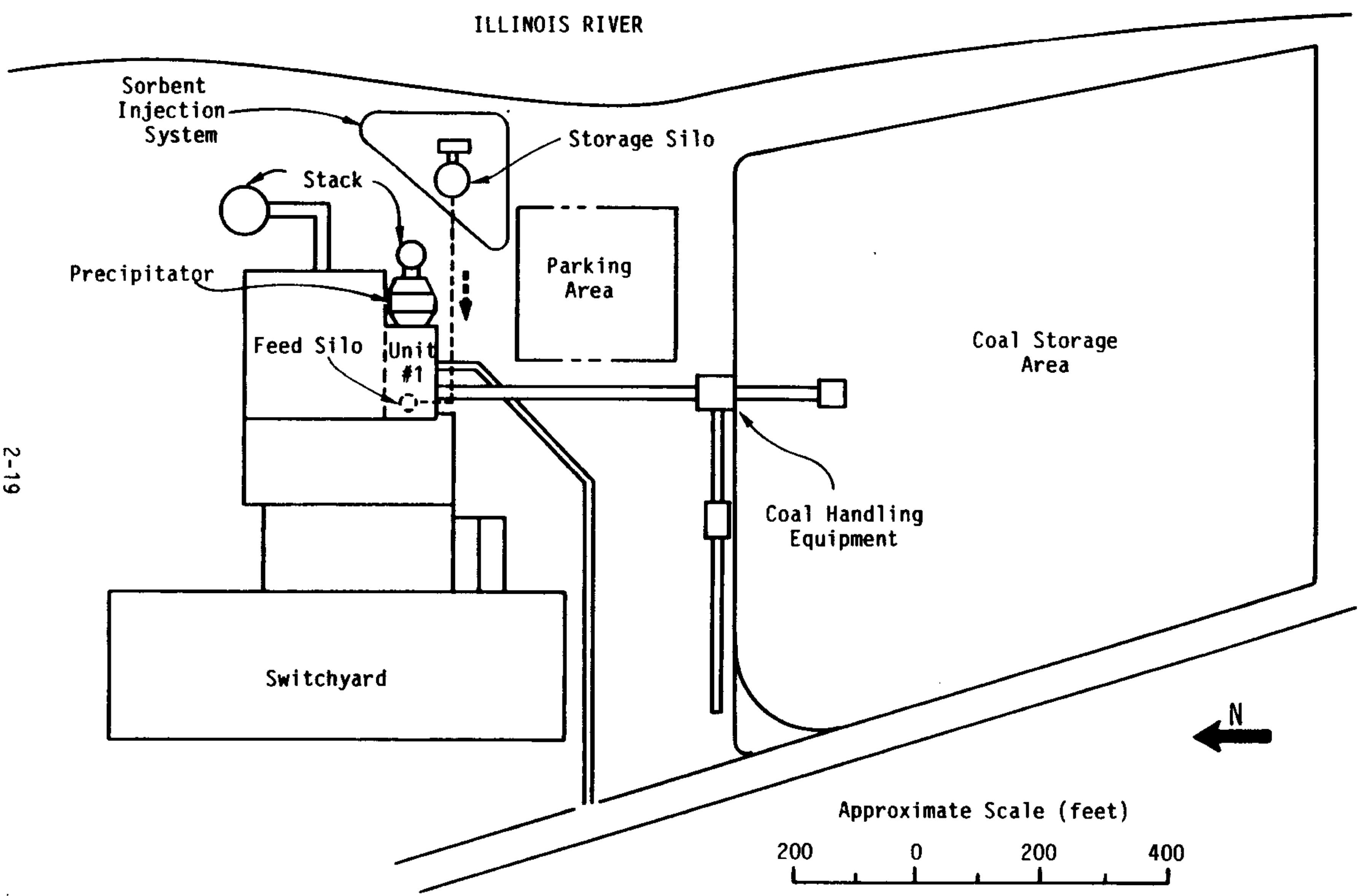


Figure 2-8. Plot plan of Edwards Station.

Boiler tubes are insulated with asbestos to minimize heat loss, and some asbestos handling will be required. All boiler modification work will be conducted by a contractor qualified to work with asbestos materials. EER will include in the contractor's specifications a requirement that all applicable OSHA and EPA regulations be satisfied, including asbestos removal guidelines, air monitoring requirements, and proper disposal considerations.

It is not necessary that all final installation work be completed at a single scheduled outage following the initial installation. Consideration will be given to installing the furnace/duct penetrations, windbox modifications and ESP upgrades prior to the completion of the initial installation items if a scheduled outage becomes available. This would reduce the intensity of effort required during the final outage.

Installation of the natural gas pipeline at Edwards Station will be conducted by the Gas Division of CILCO. The tentative route selected for the pipeline is shown in Figure 2-9. The pipeline will be approximately 1 mile long, of which 3/4 mile will be on privately owned property. Since the project involves federal funding, the Historic Preservation Agency, which includes the State Historic Preservation Officer (SHPO), must evaluate the potential impact of pipeline construction. An archaeological survey may be required by the SHPO to demonstrate that the pipeline will not disturb any sites of archaeological cultural, or historic significance.

Construction of the natural gas pipeline will include the following steps:

- Preliminary engineering and route selection
- Land ownership title search
- Final engineering and route selection
- Right of way negotiation/procurement
- Archaeological survey
- Materials and equipment procurement
- Excavation and pipefitting
- Right of way cleanup

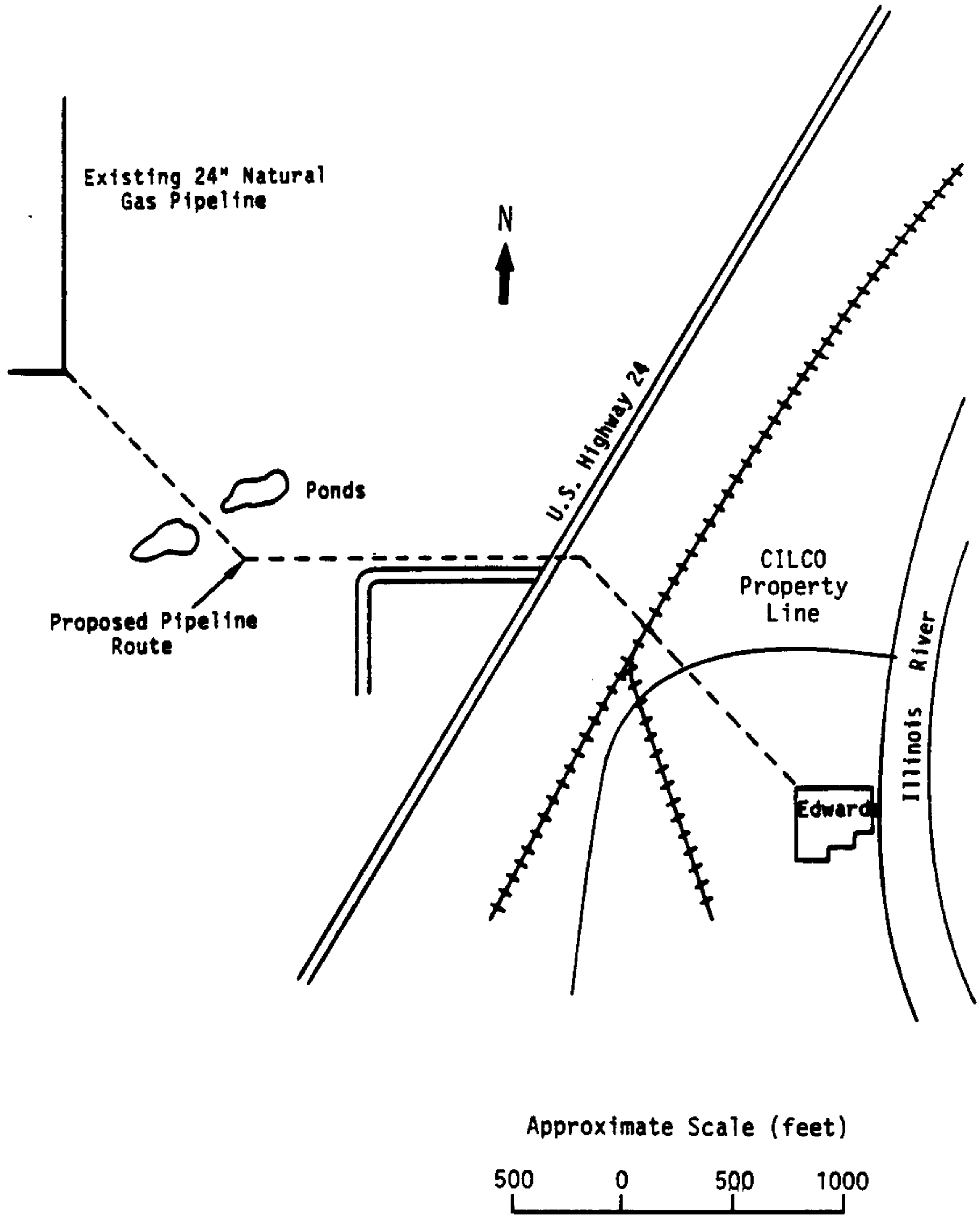


Figure 2-9. Tentative route for natural gas pipeline to Edwards Station.

These tasks will be coordinated by CILCO. If the archaeological survey reveals that the pipeline route is unsuitable, then an alternate route will be chosen. No final route will be selected that will damage any artifacts or land of archaeological significance.

The materials and equipment required for the pipeline construction include pipe, fittings, valves, metering equipment, welding supplies, excavation equipment, and material handling equipment. All materials will meet applicable codes and will match common industrial practices. The natural gas pipeline will be routed to convenient termination adjacent to Unit 1. From this terminal point, the remaining construction activities will be conducted as described previously under equipment installation.

2.4 Project Source Terms

This section characterizes all of the areas that could be impacted by the GR-SI technology demonstration project. Potential areas of impact can be divided into the categories of resource requirements and project discharges.

2.4.1 Project Resource Requirements

Project resource requirements include energy, land, water, labor, materials, and other resources. Figure 2-10 is a diagram detailing important process flow rates. The resource requirements associated with the GR-SI technology demonstration project are identified below.

Energy Requirements

Additional energy requirements associated with the GR-SI technology demonstration include electrical power to run sorbent injection and ESP equipment, and natural gas required as reburning fuel. The estimated increase in electrical power consumption for the site is about 1400 kW. It is estimated that the natural gas consumption rate for the host site at full operating capacity will be 3908 scfm. This value is calculated by assuming that 18 percent of the heat input currently provided by coal will be provided

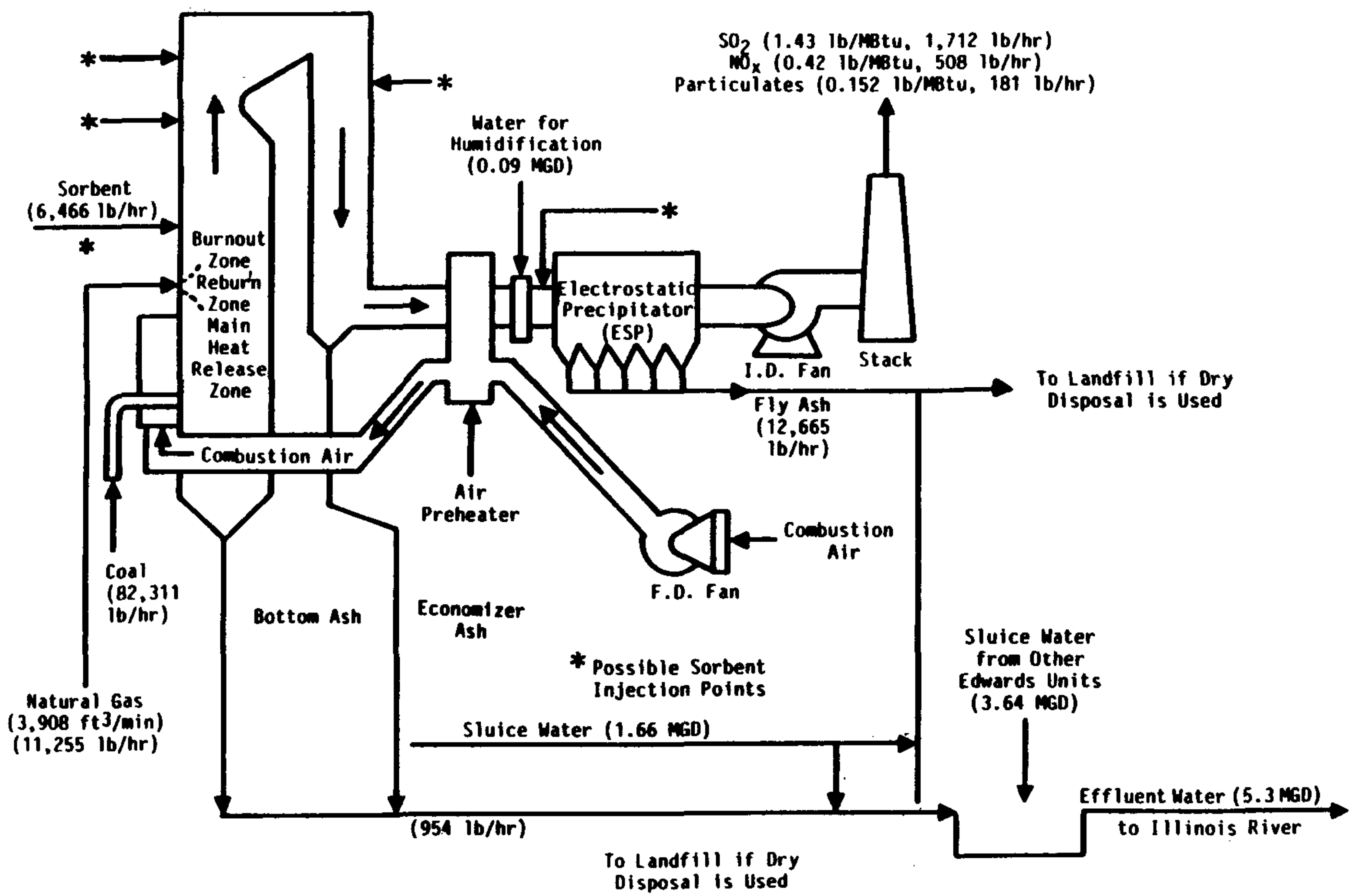


Figure 2-10. Process flow diagram for GR-SI during full-load output.

by natural gas during GR-SI operation. Coal usage will decrease due to the added natural gas flow. Full-load coal feed rate is expected to decrease by approximately 11 percent to 82,311 lb/hr. To maintain SO_2 emissions at present levels, calculations indicate that the new blend of coal fired by Unit 1 will be about 57 percent high-sulfur Illinois coal and 43 percent low-sulfur Kentucky coal.

Land Requirements

The GR-SI project involves the retrofit of two emission control procedures on an existing utility boiler. The host site has been examined to ensure that adequate space is available on site for installation of the sorbent storage and feeding equipment. Sufficient space is available for convenient location of all required hardware.

If the option of wet solid waste disposal to the existing ash pond is used, then no additional land will be required for waste disposal. If the dry solid waste disposal option is used then the waste will be transported to an existing landfill. In this case, the only land requirement will be for land that has already been allocated for waste disposal. The solid waste will be disposed of in an appropriately permitted landfill, as defined by Illinois solid waste regulations.

The only significant land requirement of the project will be for the natural gas pipeline. A stretch of land approximately 1 mile long will be required for pipeline construction. However, the pipeline will be underground and topsoil will be removed, stockpiled, and replaced after installation. Thus after pipeline installation is completed, the land will be available for agricultural and other uses.

Water Requirements

The GR-SI process does not require the utilization of water, per se. However, humidification water will be needed to enhance ESP performance. Calculations assuming saturation indicate that the humidification water requirement will be 0.09 MGD. If the wet solid waste disposal option is used, more sluice water will be required because the sorbent injection process will generate an increased amount of fly ash. Calculations based on the sluice pump capacity rating indicate that the Unit 1 sluice water requirement will increase from its present value of 1.17 MGD to about 1.66 MGD if the wet disposal option is used. This represents an increase of 0.49 MGD. If the dry solid waste disposal option is used, then no sluice water will be required by Unit 1.

Labor Requirements

Labor will be required for installation of the GR/SI equipment, operation and maintenance of the hardware, and verification of system performance. Although the equipment installation represents the largest labor requirement, it is still a relatively small effort which can be managed by EER using locally available labor to provide both general and specialized skills. A breakdown of labor requirements is presented in Table 2-4. Labor required for pipeline construction will be supplied by CILCO or its agent and is not included in Table 2-4.

Operation and maintenance of the GR-SI systems requires very little additional labor; it is anticipated that these tasks may be conducted by the existing plant operations staff upon completion of a brief training program. During test periods, EER test crew personnel will also be available to oversee operation and maintenance procedures.

Performance verification tasks will be conducted by EER test crews. No additional labor will be required for these tests.

Materials Requirements

The primary material requirement for the GR-SI technology demonstration is a calcium based sorbent. During operation 6470 lb/hr of $Ca(OH)_2$ will be required. During the course of the program, 15,000 tons of sorbent are expected to be used at the site. Approximately 150 tons of sorbent will be

TABLE 2-4. PROJECT LABOR REQUIREMENTS

Task	Duration (months)	Community Supplied Labor (hrs)
Phase 1: Baseline Testing	1	240
Phase 2: Construction	16	5,520
Phase 3: GR-SI Testing	12	2,000
Total	29	7,760

stored in the site's sorbent silo. The raw material for sorbent is limestone for which the state of Illinois is a major producer. The sorbent to be tested will be selected as part of the demonstration process.

Construction materials will be purchased from local distributors. *Construction materials include sorbent silo and handling equipment, piping* and small hardware items. Sulfuric acid and/or CO_2 required for ash pond pH adjustment will also be purchased locally if the wet disposal option is used.

Transportation Requirements

Of the low-sulfur Kentucky coal, 75 percent is delivered by rail directly to the site, and 25 percent is delivered by barge to a loading dock and then trucked a short distance to the site. The high-sulfur Illinois coal is all delivered by truck, and requires approximately nine 20-ton trucks per day during full-load operation. Because the GR-SI process will utilize an increased amount of high-sulfur Illinois coal, the truck requirement will increase to approximately 26 trucks per day for coal delivery. The sorbent will also be trucked in and will require approximately five trucks per day for delivery. Therefore, approximately 31 trucks per day will be required for deliveries during full-load operation.

If the dry disposal option is used, then about 9 trucks per day will be required to haul the solid waste to a landfill, assuming full-load conditions. The delivery trucks could potentially be used to backhaul the solid waste to the landfill. This option will be assessed after the landfill is chosen. Based on the scheduled duration of the test period, the sorbent flow rate, and the coal feed rate, it is estimated that about 1580 truck loads of solid waste will be generated during the 12-month GR-SI test period.

2.4.2 Project Discharges

Significant waste discharge streams from the boilers employing the GR-SI technology include stack emissions and a solid waste consisting of fly ash and spent sorbent. At the technology demonstration site an emission control target of 60 percent for NO_x has been established. NO_x emissions are expected to decrease to 508 lb/hr (0.42 lb/MBtu). Emissions of SO_2 are expected to remain at 1712 lb/hr (1.43 lb/MBtu). No changes in CO, unburned hydrocarbons, or particulate emissions are anticipated. Electrostatic precipitator modifications may be required to maintain particulate emissions at present levels. Modifications may include humidification, SO_3 injection or addition of plate area.

Solid waste is expected to change in both flow rate and composition due to the addition of sorbent. Flow rate of fly ash collected by the ESP during full-load operation is expected to increase to about 12,665 lb/hr. The new composition of the fly ash will be 42 percent coal ash, 18 percent $CaSO_4$, and 40 percent $Ca(OH)_2$. Bottom ash flow rate, which GR-SI will not affect per se, is expected to increase to 954 lb/hr during full load because more coal with high ash content will be used.

Solid waste will be managed either by using the current wet disposal system or by using dry disposal in a permitted landfill. Choice of a solid waste management option will be made during Phase 1 of the project, when detailed design work will be done. Factors influencing the decision include technical requirements for maintaining ash pond pH and total suspended solids within permit limits, and regulatory and economic requirements for dry disposal.

If the dry disposal option is used, then Unit 1 will require no sluice water, and the pond effluent flow rate will decrease to 3.6 MGD. If the wet disposal option is used, then based on the expected amount of sluice water increase, the effluent water flow rate will increase to 5.3 MGD. Flow rate will increase because the increased amount of solid waste will require more sluice water. The addition of unreacted and spent sorbent to the fly ash will cause the waste stream to become more alkaline. The pH of the ash pond will be adjusted to meet the permit limit of 9. Monitoring will be done during the testing, and corrective action will be taken as needed to ensure compliance with permit limits for pH. Possible neutralization measures to lower the pH level in the ash pond include injection with sulfuric acid or bubbling of carbon dioxide through the alkaline water. In both of these processes, the acid addition (CO_2 reacts in water to form carbonic acid) will lower the pH to within the permit limit of 9.

Oil and grease loadings are not anticipated to change. Total suspended solids will be maintained below the regulatory limit of 15 mg/l by increasing the residence time of the water in the pond or using chemical means such as polymerizing agents. Sulfate concentration is expected to increase because the sorbent reacts with SO_2 to form calcium sulfate.

Coal usage will decrease as a result of the GR-SI project, and as a result coal-based metals loading will decrease. In general, metals contributions from sorbent are expected to be smaller than those from coal. In addition, pH is expected to remain at current levels or to increase slightly. Studies have shown that leachability of metals decreases with increasing pH (e.g. Cote, P. L. and Constable, T. W., "Development of Canadian Data Base on Waste Leachability, Special Technical Publication 805, ASTM, Philadelphia, 1984, p. 53). Since coal-based metals loading and leachability are both expected to decrease, there is expected to be no increase in metals levels in either effluent or groundwater as a result of the GR-SI project.

2.5 Potential EHSS Receptors

A number of environmental features could potentially be impacted by the proposed action. These include air quality, surface water quality, groundwater quality, land use, labor force, and energy resources. Section 3 focuses on characterizing the existing environment with respect to these probable impact receptors. Section 4 evaluates the probable impact of GR-SI on these receptors.

3.0 EXISTING ENVIRONMENT

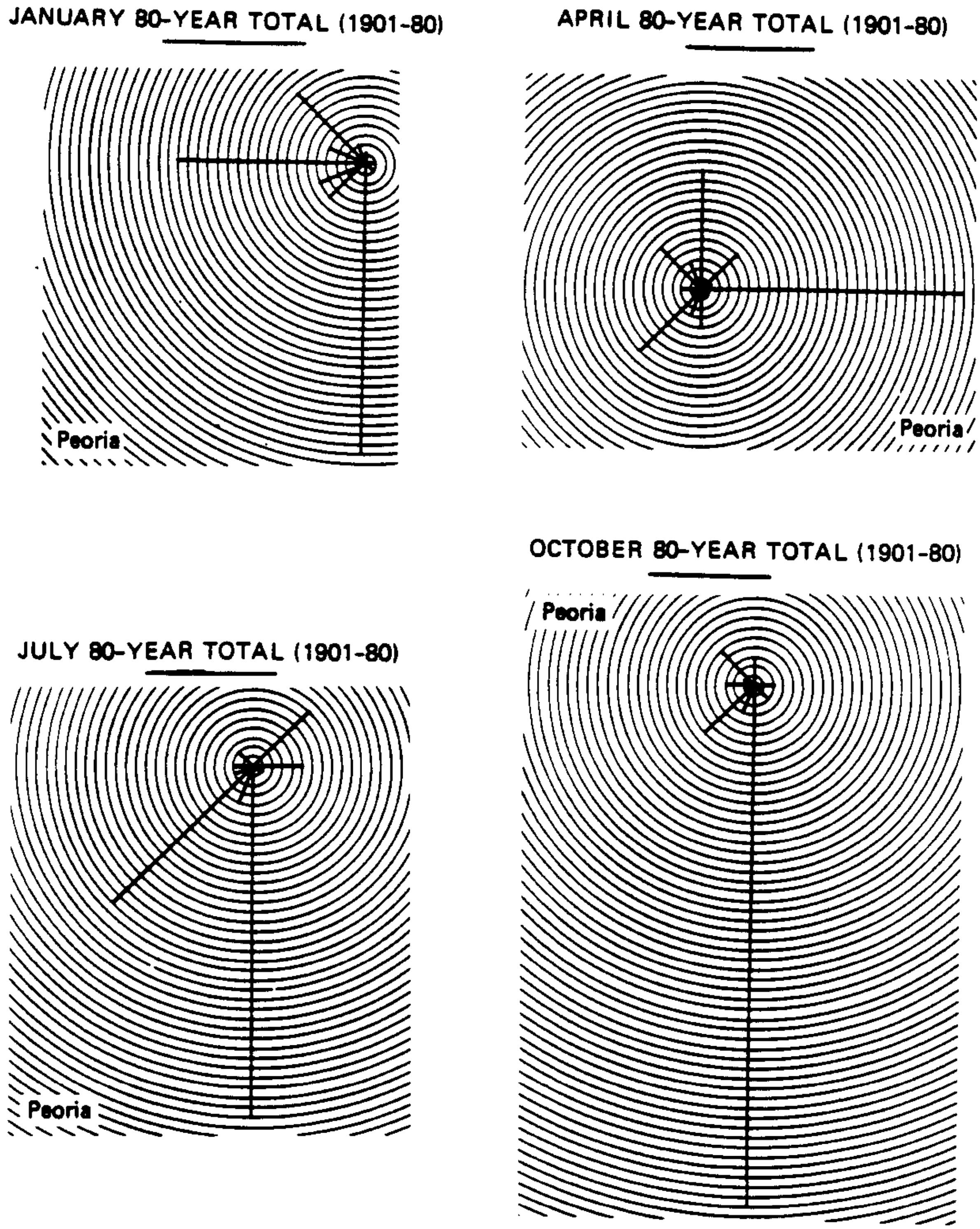
This section provides a description of the environmental setting at Edwards Station, focusing on environmental features that might be affected by the proposed action. The environment is divided into the six categories that were mentioned in Section 2.5. Each of these categories is characterized individually in this section.

3.1 Atmospheric Resources

The area of central Illinois in which the demonstration site is located provides a typical continental climate with warm summers and fairly cold winters. Figure 3-1 shows 80-year average wind roses for Peoria for 4 months throughout the year. According to the Illinois State Climatologist, who is an agent of the Illinois State Water Survey, average annual precipitation in Peoria is 34.9 inches. The climate is typical of the entire midwestern states area and not represesentative of a local specialized environment.

Peoria County is in federal air quality control region 65 (Burlington-Keokuk Interstate). The plant is in Hollis Township which is a non-attainment area for SO_2 primary standards and both TSP and SO_2 secondary standards, according to the Geographic Designations of Attainment Status of Criteria Pollutants published in February 1985 by the Illinois EPA. A survey of Illinois EPA's Air Emissions Inventory revealed that in Peoria and Tazewell counties there are 283 businesses and industrial plants that emit air pollutants, of which 156 emit particulates, 60 emit SO_2, and 77 emit NO_x.

The area immediately surrounding the Edwards Station is not highly industrialized, but there are other industrial plants along the Illinois River. Current noise levels at the Edwards plant are attributable to ongoing construction activities and normal plant operation (e.g. coal pile shaping and coal feeding).



Key: For each concentric circle, the wind blows 1 percent of the time from the direction of the line. Thus, a line directed vertically downward from the city that passed through 10 circles would indicate that the wind blew from the south 10 percent of the time.

Figure 3-1. Wind roses for Peoria, Illinois.

3.2 Land Resources

Edwards Power Station is located in Peoria County, Illinois. The power plant is situated along the lower Illinois River at the edge of the Springfield Plain of the Central Lowland physiographic Province. The plain is characterized by broad upland divides and shallow, wide valleys. The power plant lies in the Illinois River floodplain composed of thick loess, alluvium and glacial outwash underlain by Pennsylvania age bedrock. A flood zone map of the Edwards Station area from the National Insurance Agency is given in Figure 3-2. Unit 1 is in a Zone C region, which is an area of minimal flooding. Part of the natural gas pipeline will be in a Zone A13 region, which is within the 100-year flood plain. According to the Illinois Department of Conservation, wetlands maps have not been published for the area around CILCO Edwards Station.

There is a great deal of agricultural activity near Edwards Station. According to the Peoria County Soil and Water District, the soil on which the plant rests is classified as Fayette silt loam. The pipeline will traverse soils that are classified as Fayette silt loam and Sylvan silt loam. These soils are considered to have good potential for cultivated crops, hay, pasture, and woodland use. Areas of these soils having small degrees of slope are considered to be prime for farming.

The natural gas pipeline route was shown in Figure 2-8. The pipeline will require a right of way approximately 1 mile long. Of this land, approximately half is currently used for farming. The remaining land is comprised of CILCO-owned land, railroad-owned land, and publicly owned land around four-lane U.S. Highway 24.

3.3 Water Resources

Edwards plant intakes water from and discharges to the Illinois River. Ambient water quality data for the Illinois River at Pekin, which is about one mile south of Edwards Station, are summarized in Table 3-1, including

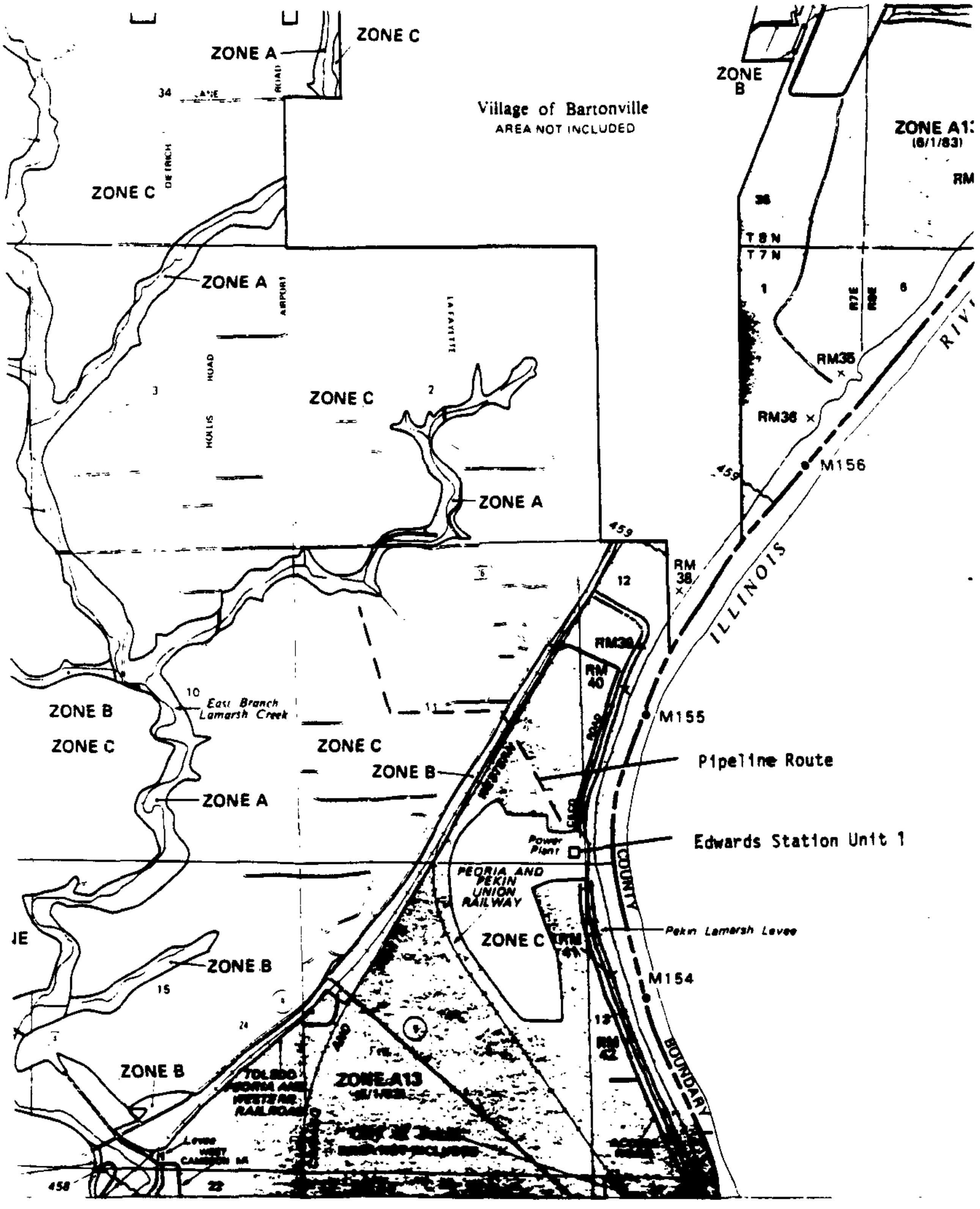


Figure 3-2. Edwards Station flood zone map.

TABLE 3-1. WATER QUALITY DATA FOR ILLINOIS RIVER AT PEKIN (1985)

Parameter	High	Low	Average	Illinois General Use Water Quality Standard
pH	8.2	7.4	7.8	6-9
*Flow Rate (ft^3/s)	70,200	6620	20,300	-
Dissolved Oxygen	13.0	6.1	9.4	>6
Barium (mg/l)	0.08	0.05	0.064	<5
Boron (mg/l)	0.18	0.05	0.15	<1
Cadmium (mg/l)	0.003	<0.003	<0.003	<.05
Chromium (mg/l)	0.009	<0.005	<0.005	<1.0
Copper (mg/l)	0.009	<0.005	0.007	<0.02
Iron (mg/l)	4.4**	1.4**	2.3**	<1.0
Lead (mg/l)	<0.05	-	<0.05	<0.1
Manganese (mg/l)	0.19	0.069	0.11	<1.0
Mercury (mg/l)	0.0001	<0.0001	<0.0001	<.0005
Nickel (mg/l)	0.019	<0.005	0.009	<1.0
Phosphorous (mg/l)	0.58**	0.19**	0.34**	<0.05
Zinc (mg/l)	0.18	<0.05	0.09	<1.0

*7-day, 10-year low flow rate = 3181 ft^3/s.

**Value exceeds Illinois general use water quality standard.

flow rates and concentrations of contaminants. Also included is The Illinois General Use Water Quality Standards for various parameters, which are standards which must be met in waters of the state for which there is no specific designation. From Table 3-1 it can be seen that iron and phosphorous levels exceed the Illinois general use water quality standards. A survey of the Illinois EPA Waste Treatment Discharge Indices revealed that there are currently 61 plants discharging industrial effluent streams into the Illinois River in Peoria and Tazewell Counties.

3.4 Ecological Resources

A variety of terrestrial and aquatic plant and animal species exist in the local/regional environment of Edwards Station. Approximately 1480 species of flora have been identified by the Illinois Natural History Survey within 25 miles of the plant. A survey of the Illinois Plant Information Network revealed that no species of flora in Peoria or Tazewell counties are federally listed as endangered or threatened. There are 458 bird, fish, mollusk, amphibian, and reptile species within 25 miles of Edwards Station. According to the Illinois Fish and Wildlife Information System, none of these species are federally listed as endangered or threatened. Distribution of flora and fauna is relatively homogeneous throughout the environment, and there have been no sensitive ecological communities identified.

A search of the Illinois Natural Areas Inventory database yielded 29 sites within a 25 mile radius of Edwards Station. Table 3-2 lists these natural areas and their locations are indicated on the regional map of Figure 3-4. The Midwestern Regional Endangered Species Department, which is an Illinois state agency, has indicated that there are no federally designated critical habitats near Edwards Station.

3.5 Socioeconomic Resources

Edwards site is located within six miles of the cities of Peoria and Pekin. These and other cities in the area provide a population base of over 200,000 people within 15 miles of the plant. These cities also provide an

TABLE 3-2. NATURAL AREAS IN THE EDWARDS STATION REGIONAL ENVIRONMENT

Reference Number	Area Name	Acreage
553	Copperas Creek Geological Area	11.0
776	Trivoli Northwest Geological Area	7.0
-117	Jubilee State Park	42.0
142	Dickison Run Hill Prairie	14.0
212	Wokanda Camp	35.0
143	Mossville Road Hill Prairie	5.5
233	Peoria Park Hill Prairie	19.0
234	Gentiana Hill Prairies	31.0
209	Boyds Hollow Woods	68.0
211	North Detweiller Woods	65.0
208	Detweiller Park	153.0
207 *	Forest Park Nature Preserve	495.0
929	Partridge Creek Marsh	4.3
928 *	Spring Bay Fen	47.0
134	Caterpillar Hill Prairie	19.0
205	Grandview Woods	58.0
210	Springdale Cemetery	5.5
204	Rocky Glen	125.0
206	St. Mary's Cemetery	3.2
800	Illinois Central College Nature Area	80.0
851	Fondulac Seep	11.0
283	Meadow Valley Park	90.0
852	Farm Creek Geological Area	2.0
133 *	Fort Creve Coeur Hill Prairie	4.0
129	Log Cabin Hill Prairie	6.0
999	Klemm Memorial Woods	70.0
130	Indian Creek Woods	30.0
132	Mackinaw River Forest	47.0
131 *	Tazewell Gravel Terrace Prairie	11.0
492	Spring Lake	1520.0
850	Spring Lake Seeps	180.0
735	Sand Ridge State Forest Geological Area	223.0
123	Sand Ridge Prairie	6.0
1064	Clear Lake Rookery	1483.0
733	Sand Ridge State Forest Illinois Mud Turtle Site	40.0
364	Sand Ridge Savanna	55.0
109 *	H. A. Gleason Nature Preserve	96.0
110	Rountree Nature Preserve	27.0
736	Chicago & Illinois Midland Railroad Prairie	1.1

* Dedicated Nature Preserve

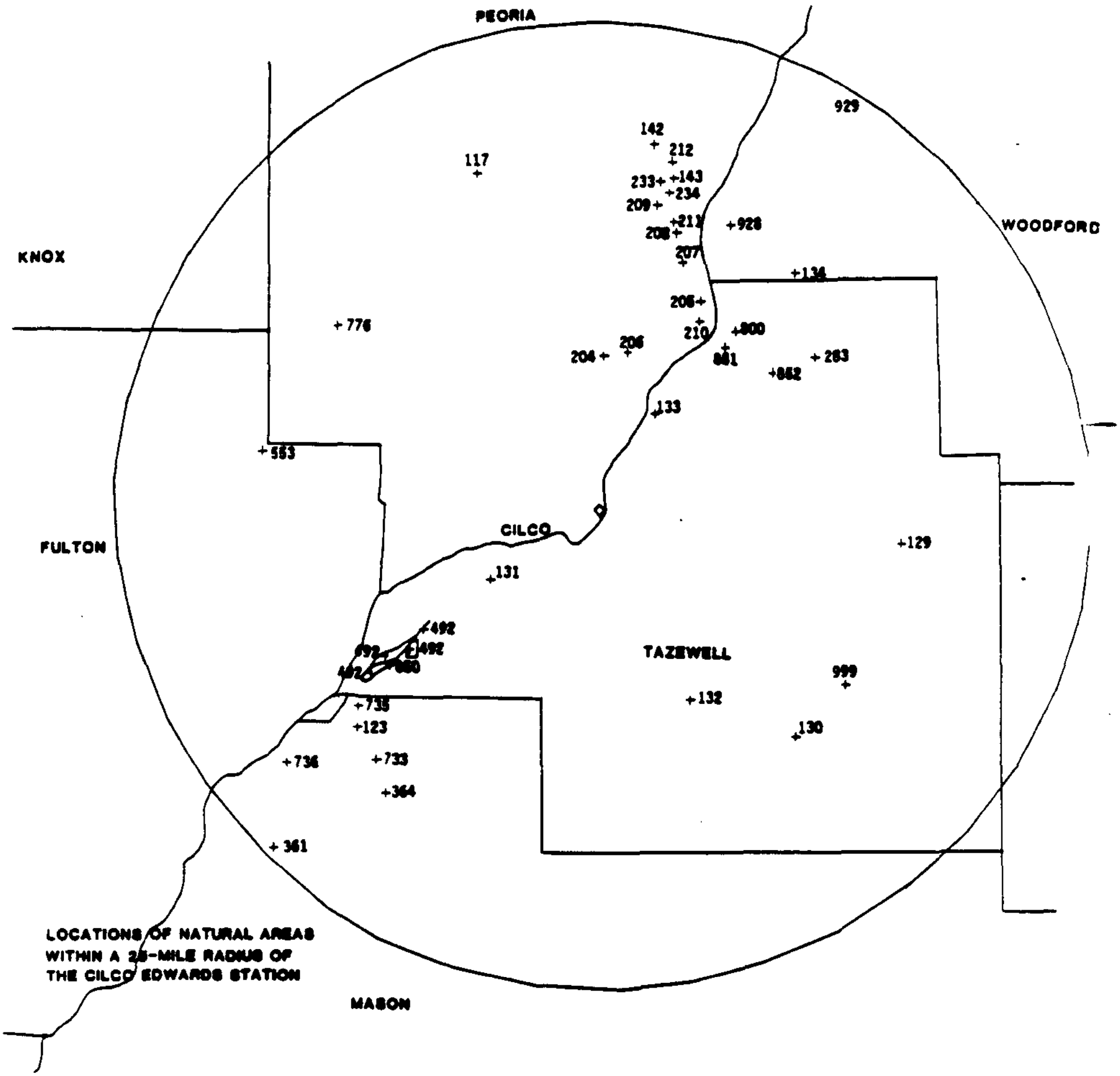


Figure 3-4. Natural areas in the Edwards Station regional environment.

economic base of labor and materials to the Edwards plant. Means of transportation of materials and manpower to the plant are provided by the Illinois River, U.S. Highway 24, Highway 9, and several nearby railroads.

3.6 Energy and Materials Resources

The main material resources of interest for this project are limestone, coal, and natural gas. Limestone is in abundant supply, with capacity existing to deliver over 17 million tons per year to the United States market (Gutschick, K. A., Lime for Environmental Uses, ASTM, Philadelphia, 1987, p. 2). There are over 160 limestone quarries in Illinois and Missouri (Boynton, R. S., Chemistry and Technology of Lime and Limestone, Wiley, New York, 1980, p. 14). Coals are brought in from Kentucky and Illinois. Edwards Station has contracts running through 1995 with its coal suppliers, and thus no problem is expected with coal availability. A natural gas pipeline will be installed at the site. Natural gas is also in abundant supply, with capacity existing to deliver an additional 6.5×10^6 scfm beyond current consumption to the U.S. market (Natural Gas Production Capability--1986, American Gas Association, Arlington, VA, December 6, 1985).

4.0 CONSEQUENCES OF THE PROJECT

Demonstration of GR-SI technology in a pre-NSPS utility boiler has the potential to impact the environment in several ways. The discussion that follows considers the consequences of both construction and operation. Plans for mitigating possible detrimental impacts are also discussed. In this way it will be shown that this project will have no significant EHSS impacts.

4.1 Atmospheric Impacts

The GR-SI technology project is of insufficient scale to have an impact upon meteorology in the Edwards Station area. During construction, the only air emissions are expected to be fugitive emissions from pipeline installation, equipment installation, and minor landscaping. These fugitive emissions will be of a short-term nature and should have a negligible impact upon air quality. During GR-SI operation, limestone delivery trucks will be enclosed to minimize fugitive emissions. Trucks delivering coal to Edwards Station are currently covered; this practice will be continued during GR-SI operation.

Emissions of NO_x are expected to decrease by 60 percent. In addition to the obvious public health benefits of these emission reductions, the utility plant could also benefit if stricter air pollution laws were passed. Particulate emissions are expected to remain the same. This may require adjustments in the plant's electrostatic precipitation process, possibly including flue gas humidification, addition of plate area, or SO_3 injection. These options will be evaluated during Phase 1 of the project.

The handling and use of dry, calcium-based sorbents presents several unique problems. Sorbent handling requires special care to prevent breathing of the dust or contact with the eyes, since the sorbent is not only abrasive, but somewhat alkaline. Also, the potential exists for fugitive dust emissions during the transportation and storage of sorbents. To minimize fugitive emissions, a dustless pneumatic handling system will be used. The only exposure of the sorbent to the atmosphere will be through vents in the storage silo, and these vents will be equipped with bag filters. If a need arises for workers to handle sorbent, mitigating measures to minimize risks to workers will include mandatory use of protective apparatus such as enclosed safety goggles and inhalation dust filters. These protective measures have proven very effective in operations with sorbents conducted at the EER test site in El Toro, California.

Noise from the addition of the GR-SI process will be generated by construction activities and truck traffic. Rule 208 of the Illinois Noise Pollution Control Regulations states that Rule 205, which regulates noise that is emitted from equipment, does not apply to equipment being used for construction. Therefore, construction activities will not violate Illinois noise regulations. Construction will be short-term and will not have a lasting effect on noise levels. Construction will also occur against a background of the ambient operational noise from other power plant activities. Incremental operational noise from the GR-SI project will be negligible in comparison to current plant noise. Noise due to increased traffic is expected; however, the traffic will increase along transportation routes and not near residences, as can be seen on a roadmap, or near natural areas. Therefore, no significant impact of noise is expected.

4.2 Land Impacts

Installation of the gas reburning and sorbent injection equipment itself will take place on-site and is not expected to have any land impact. If the dry solid waste disposal option is used, then the land required for this option will consist of a landfill that has already been allocated for waste disposal. If the wet disposal option is used, then the only area of potential on-site land impact will be the ash pond. The pond will fill more rapidly due to the GR-SI process. Therefore, the wet disposal option will only be used if the ash pond is determined to have enough capacity to span beyond the scope of the project. The rate of solids from Unit 1 entering the pond is expected to increase. The amount of increase will depend on the amount of sorbent injected, the amount of coal displaced by natural gas and the amount of SO_2 removed from the flue gas stream. Studies have shown that coal fly-ash/spent-sorbent mixtures have good landfilling characteristics due to their pozzolanic properties, which allow the solid waste to harden into a cement-like substance after drying. Therefore, the solid waste generated in this project should make a satisfactory landfill if it is decided at a future date to use it for this purpose.

The major area of potential off-site land impact is installation of the natural gas pipeline. The land on which the pipeline will be installed consists of railroad land, highway land, and farmland. Easements and rights of way will be negotiated with railroad and highway representatives. Pipeline construction may have a minor short-term impact on the railroad and highway, but will have no long-term impacts. Rights of way will also be negotiated with farmland owners in the area. Topsoil will be replaced after pipeline installation, and thus the underground pipeline is not expected to have any lasting impact upon farmlands.

Part of the pipeline will lie within a 100-year flood plain. Since pipeline installation will be of a short-term nature and land features above the pipeline will be unchanged after installation, the pipeline is expected to have no impact upon the flood plain itself or upon any natural or man-made structures within the floodplain.

4.3 Water Quality Impacts

A negligible change in water usage is anticipated. If the dry solid waste disposal option is used, then no fly ash sluice water will be required by Unit 1, and the total water requirement of the plant will actually decrease. If the wet disposal option is used, then the increase in water usage due to flue gas humidification and increased sluice water requirement will be about 0.58 MGD. The main source of water usage at Edwards Station are the condensers and cooling water flow, which has an average value of 355 MGD. Therefore, the increase in water usage will be insignificant in comparison to total station water usage, which includes the cooling water and other plant flows.

If the dry solid waste disposal option is used, then Unit 1 will require no fly ash sluice water, and the flow rate of effluent water discharged to the Illinois River will decrease. Thus the dry disposal option will incur a negligible effluent water quality impact.

If the wet disposal option is used, then average effluent flow rate is expected to increase from its present value of 4.8 MGD to about 5.3 MGD. The plant's current NPDES permit requires that pH be below 9.0. The lime sorbent will tend to increase the pH of the pond, and thus some pH adjustment will be needed. This will be assessed during Phase 1 of the project, when detailed design work will be done. Suitable mitigation measures such as addition of sulfuric acid or CO_2 will be used as needed to control pH. The process will also generate an increased amount of total suspended solids (TSS) in the pond water. To remain below the current requirement of 15 mg/l of TSS, possible modifications to the pond system include routing the water through channels to increase residence time and chemical treatment with polymerizing agents. These options will be assessed during Phase 1 of the project. Oils and greases are currently well below the limit of 15 mg/l, and are expected to remain unchanged.

Concentrations of heavy metals in the effluent water are not expected to increase, as was discussed in Section 2.4.2. Coal-based metals loadings will decrease, and pH will remain at current levels or increase due to the GR-SI project. Studies have shown that increasing pH decreases the leachability of metals. Therefore, the project is not expected to have a negative impact upon metals levels in either effluent or groundwater.

Sulfate concentration in the pond water is expected to increase. There are no effluent water standards for sulfates. Sulfates are not considered toxic for either plants or animals and thus the impact of increased sulfate concentration should be negligible.

4.4 Ecological Impacts

Construction activities will contribute some noise and fugitive emissions to the environment. However, noise and emissions from these activities will have a negligible impact upon the biota in the area because construction will be of a short-term nature and will be in addition to other ongoing minor construction activities.

Pipeline installation will not disrupt any natural areas. Noise and fugitive emissions from trench digging and minor landscaping activities are expected to have a minimal impact upon the area's biota. No sensitive ecological species or communities will be displaced as a result of pipeline installation.

The GR-SI project is expected to improve air quality by reducing NO_x emissions, which should have a minor beneficial impact upon the area's biota. No significant changes in effluent water are expected. Since air quality and water quality are the only foreseeable areas of impact beyond the boundaries of the plant, the GR-SI demonstration project is not expected to have any detrimental impacts upon the ecology in the Edwards Station area.

4.5 Socioeconomic Impacts

The labor requirements for the GR-SI project were detailed in Section 2.4.1. The total amount of labor required from the local community is expected to be about 7760 man-hours for construction and testing, which will be spread over a 29-month period. Operational manpower requirements should remain at current levels. Since there are over 200,000 residents within 15 miles of Edwards Station, the GR-SI project should have a small positive impact upon the local labor pool. Even though the construction supervisors will be non-local EER personnel, no adverse impact on housing and support facilities is anticipated since the host site is within commuting distance of metropolitan areas.

Miscellaneous small pieces of equipment and pH adjustment materials may be purchased locally. The project will also increase the station's utilization of high-sulfur Illinois coal. Thus, the GR-SI project should have a small positive impact upon the region's economy.

The GR-SI project will require 31 trucks per day for delivery of sorbent and coal. If the dry disposal option is used, 9 trucks per day will be required for solid wste disposal. These transportation requirements are not significant in comparison to the current traffic level of over 10,000 vehicles per day on Highway 24.

Installation of the natural gas pipeline is the only activity that will be conducted off-site and therefore is the only task with the potential for archaeological, cultural, or historical (ACH) impacts. All required archaeological surveys will be performed prior to pipeline installation and the pipeline will not be installed in any sensitive area. Therefore the project is not expected to have any ACH impact.

4.6 Energy and Materials Impacts

The estimated increase in electrical power consumption due to GR-SI is about 1400 kW. Although this level of electrical consumption is not negligible, it represents only 1.12 percent of the total net generating capacity of the host unit. This additional energy requirement, then, will have minimal impact on the availability of electrical power beyond the plant boundaries. Also, the project will pay for the additional energy requirement, which will minimize the fiscal impact to the operating utility.

The possible areas of materials impacts are coal usage, natural gas usage, and sorbent usage. Implementation of GR-SI technology will result in direct replacement of approximately 11 percent of the baseline coal input with natural gas. Full-load coal usage will decrease from 92,185 lb/hr to 82,311 lb/hr. Since Unit 1 accounts for only 16 percent of total station coal usage, an 11 percent reduction in Unit 1 coal usage will have a minimal impact upon station coal usage.

During operation, the project will require 3908 scfm of natural gas. General availability of natural gas resources is not expected to present any problem; capacity exists to deliver an additional 6.5×10^6 scfm beyond current consumption to the U.S. market. This surplus represents 20 percent of the current U.S. consumption, and the increased consumption for the three GR-SI demonstrations amounts to less than 0.1 percent of the current excess capacity.

The GR-SI project will require the use of limestone-based sorbent. The year-long test will require about 15,000 tons of sorbent. Capacity exists to deliver 17 million tons per year of limestone to the U.S. market. Therefore, the project will require only 0.09 percent of the U.S. limestone supply. Local limestone availability is not a problem because there are over 160 quarries in Illinois and Missouri.

4.7 Impact Summary

In summary, no significant EHSS impacts are anticipated during the construction and operation phases of the GR-SI technology demonstration, other than the beneficial impact of the reduction in NO_x emissions, and the increased usage of high-sulfur Illinois coal. Disposition of the GR-SI system at the end of the demonstrations (if required by the host utilities) would incur the same types of impacts and levels of risk associated with the on-site construction activities; i.e., minimal to negligible EHSS impacts are anticipated for the disposition activities.

5.0 REGULATORY COMPLIANCE

This section describes current permit requirements and regulations governing plant operation, and then outlines the anticipated permit modifications and the process by which they will be obtained.

5.1 Regulations and Permit Requirements

Demonstration of the GR-SI technology will be on a retrofit basis for the Edwards boiler; therefore, the host site currently has all necessary permits for air emissions, land use, water use, and water discharges.

The Division of Air Pollution Control of the Illinois Environmental Protection Agency (IEPA) has issued a permit to CILCO for operation of Unit 1 at Edwards Station. Unit 1 has emissions limits of 1.8 lb/MBtu of SO_2 and 0.20 lb/MBtu of particulates. The heat input to the Unit 1 boiler is limited to 1218 MBtu/hr. There are reporting requirements to verify that these limits are being met. The permittee is required to submit quarterly reports showing daily coal usage, and sulfur, ash, Btu, and moisture contents. They must also maintain records of any excess opacity emissions and report these excess emissions to IEPA.

Fly ash and bottom ash wastes from the boiler are handled by wet transport to a settling pond. The ash pond discharges to surface waters are regulated under the National Pollutant Discharge Elimination System (NPDES). The Illinois EPA Division of Water Pollution Control has issued an NPDES permit to CILCO to regulate the ash pond discharge to the Illinois River. The existing permit contains concentration limits of various species, as well as monitoring requirements. The monitoring requirements and the limits imposed on the ash pond are described in Table 5-1.

TABLE 5-1. EFFLUENT FROM ASH POND AT EDWARDS--MEASUREMENT PLAN AND PERMIT LIMITS

Parameter	Measurement Method	Measurement Frequency	Permit Limit	
			30-Day Avg.	Daily max.
Flow Rate	24-Hour Total	Once/Week	-	-
pH	Grab Sample	Once/Week	6-9	6-9
Total Suspended Solids	8-Hour Composite	Once/Week	15.0 mg/l	30.0 mg/l
Oil and Grease	Grab Sample	Once/Month	15.0 mg/l	20.0 mg/l

5.2 Anticipated Permit Modifications

5.2.1 Air Permit Modifications

The Edwards plant is located in Peoria County which is designated as a non-attainment area for SO_2 and total suspended particulates. After reviewing the nature of the GR-SI technology demonstration, the Illinois EPA indicated that modifications to existing air permits, rather than new permits, will be required (personal communication, Pat Dennis, September 1987). In applying for these permit modifications, it will be necessary to describe to EPA all design and operating changes, as well as emissions changes. Specifically, required information will include descriptions of boiler modifications, sorbent storage and injection equipment, projected coal input, ESP modifications and estimated efficiency, trucking changes, and fugitive dust control measures.

It may also be necessary to obtain approval for emissions resulting from initial startup and testing of the GR-SI process. Since startup and testing will be relatively short-term, IEPA has indicated that there should be no difficulty in obtaining such a variance. In applying for a variance, it will be necessary to submit a schedule of construction and testing activities.

All preparation, including engineering calculations and design work, will be done so that permit modification applications will be ready for submittal at the end of Phase 1 of the project. Permit applications will then be submitted early in Phase 2. EPA is required to respond to permit applications within 90 days. In the experience of the utility, 60 to 90 days is usually required for permit approval. Sufficient lead time will be allocated for permit applications to allow Phase 2 construction and startup activities to begin as scheduled.

5.2.2 Solid Waste/Water Permit Modifications

Management of the fly ash/sorbent waste generated during this program will be conducted in accordance with all applicable federal, state, and local regulatory requirements. The specific waste management processes to be utilized will be defined during Phase I of the evaluation. Solid waste streams from coal firing and flue gas emission control procedures are exempt from classification as hazardous wastes under both federal (40 CFR 261.4) and Illinois (35 Ill. Adm. Code 721.104) regulations.

If the current method of ash disposal by wet transport to a settling pond is used for disposal of the GR-SI system waste, then the NPDES limits on ash pond discharge will be applicable to the generated waste. The Illinois EPA Division of Water Pollution Control has indicated that a new NPDES permit will not be required, and that modifications to the existing permit will be sufficient (personal communication, Gary Cima, September 1987).

In applying for NPDES permit modifications, it will be necessary to describe to IEPA all projected changes in the water and solid waste entering the ash pond, and in the effluent water leaving the ash pond. Permit modification applications will be prepared at the end of Phase 1 and then submitted early in Phase 2. In the experience of the utility, 60 to 90 days is usually required for permit approval.

If the dry disposal option is used, then the solid waste will be transported to a landfill. The landfill selected will have all required permits for disposal of the coal fly ash/sorbent waste. It will also comply with all appropriate landfill design and operating regulations.

5.2.3 Other Required Permits

All of the GR-SI equipment itself will be installed within the boundaries of the plant. All required surveys, easements, and permits will be obtained for pipeline installation. Construction permits for installation of the equipment will be obtained from the state and local authorities. All necessary agreements with railroad and highway authorities will be procured prior to commencement of pipeline construction activities. In general, it is anticipated that demonstration of GR-SI technology can be conducted in an environmentally sound manner in complete compliance with all applicable environmental regulations without the imposition of extraordinary control measures.