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UTILITY ASH HANDLING & DISPOSAL PRACTICES SEPTEMBER 1991 FEMP

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UTILITY ASH HANDLING & DISPOSAL PRACTICES

SEPTEMBER 1991

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

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UTILITY ASH HANDLING & DISPOSAL PRACTICES

FERNALD OFFICE
Fernald, Ohio

SEPTEMBER 1991

U.S. DEPARTMENT OF ENERGY

2225

Report on Utility Ash Handling and Disposal Practices

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio

DOE Contract No. DE-AC05-90OR21951
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REPORT ON UTILITY ASH HANDLING AND DISPOSAL PRACTICES

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SECTION 1

INTRODUCTION

The Active Fly Ash Pile (along with the Inactive Fly Ash Pile) is one of four waste units included in Operable Unit 2 (the other waste units are Lime Sludge Ponds, the other Southfield disposal areas, and the Solid Waste Landfill). Also included are the berms, liners and soil within the operable unit boundary. Operable Unit 2 is part of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Program to identify and implement final remedial actions at the Fernald Environmental Management Project (FEMP) Site.

A removal action to mitigate potential wind and water erosion of the Active Fly Ash Pile at the FEMP Site is anticipated to be implemented in early 1992 while continuing to pursue final remediation under the CERCLA Program. As part of this work, a survey of current and past practices employed by U.S. utilities for handling fly ash, as well as fugitive dust control from coal piles, was undertaken to provide a sound basis for the evaluation of alternatives for resolving the potential erosion problems at the FEMP Active Fly Ash Pile. The review included visits to utility sites, telephone and personal communications, and a literature search.

This report describes the Active Fly Ash Pile and the current ash handling and disposal practices at the FEMP site, and current utility practices for handling ash, controlling dust at open stock piles, and closing ash ponds and landfills.

Utility solids wastes including "fly ash waste, bottom ash waste, slag waste, and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels" are excluded from being classified as hazardous wastes (40 CFR § 261.4(b)(2)). The vast majority of utility coal ash which has been tested by the Extraction Procedure (EP) Toxicity test and the more recent Toxicity Characteristic Leaching Procedure (TCLP) have been found to be non-toxic (OEPA 1988). The utility industry ash handling and disposal practices described in this report are thus based on the fact that coal ash is excluded from the Resource Conservation and Recovery Act (RCRA) and are non-toxic. Standard utility practices are only applicable to the FEMP Active Fly Ash Pile if this ash is also non-toxic. Determination of the toxicity of this ash is outside the scope of this document, however a TCLP is being run on the freshly generated ash at the FEMP to facilitate classification of the material.

Coal combustion wastes consist of bottom ash, boiler slag, and fly ash. Bottom ash consists of those combustion residues which are removed from the bottom of the furnace in a solid, granular form. Boiler slag is produced in the bottom of the furnace when the ash is in the molten state. A furnace

is designed to operate "dry", producing bottom ash, or "wet", producing boiler slag. Fly ash leaves the furnace with the exit gas stream and is removed by scrubbers, mechanical collectors, fabric filters, or electrostatic precipitators (GAI 1981, pp. 2-9 through 2-10). The boilers at FEMP operate "dry", producing bottom ash and collect fly ash from mechanical collectors and electrostatic precipitators. Approximately 70 percent of the ash collected is bottom ash and 30 percent is fly ash. Both the bottom ash and fly ash are collected together for disposal at the Active Fly Ash Pile.

SECTION 2

BACKGROUND

2.1 Site Description

The Active Fly Ash Pile is located approximately 3,000 feet south-southeast of the FEMP waste storage area and is identified in Figure 2-1. A mixture of bottom ash, fly ash generated from the mid level of the boiler, and fly ash collected from the electrostatic precipitator is disposed of in this waste facility.

This pile has been receiving coal ash from the boiler plant since the mid-1960's and is estimated to contain approximately 59,000 cubic yards of waste. The pile has a surface area of approximately 3.5 acres and depths ranging from 3 to 40 feet. The pile is uncovered with negligible vegetation. The exposed top working surface is gently sloped downward in a northerly direction while the eastern, western and southern sides are steeply sloped. Photographs of the pile taken on April 16, 1991, are shown in Figures 2-2 and 2-3. A topographic map of the active ash pile area based on aerial photography done in 1988 is shown in Figure 2-4. Two cross-sections, Section A-A looking east and Section B-B looking north, were taken through the center of the Active Ash Landfill. These are shown in Figures 2-5 and 2-6 respectively.

Two inspections of the ash pile were made by PARSONS personnel during the time this report was being prepared. The first inspection of the ash pile was made on September 4, 1991. Rain showers had occurred on the morning of the site visit, so no fugitive dust generation or apparent runoff was observed. The top surface of the ash pile was firm enough to support trucks and personnel except along the south and west edge of the pile area where piles of ash had been dumped but not spread or compacted. The toe of the pile was observed. The slopes of the pile were stable with minimal signs of erosion. The slopes of the pile maintain an angle of 45 up to about 60 degrees or more. Only a small amount of ash (less than one inch depth) was observed in the grass within 20 feet of the foot of the pile. Only that vegetation that had actually been buried by dumped ash appeared to be affected.

The second site visit was made on September 18, 1991. Although light intermittent showers were occurring at the time of the visit, the ground was still dry. A light dusting of ash on the vegetation and fallen leaves along the toe of the pile on the south side was noted. As on the previous visit, no scouring of the sides of the pile by water runoff was noted. A small, dried, ash-filled puddle was noted near the gravel entrance roadway to the ash pile. Along the north side of the pile where the

slopes are oldest, vegetation was observed growing on the lower slopes of the pile. While standing on the surface of the ash pile, it was observed that the stronger gusts of wind were picking up visible fugitive dust, primarily from the uncompacted heaps of ash on the surface of the pile.

2.2 Current FEMP Ash Handling and Disposal Practices

The coal used at the FEMP is an eastern-Kentucky bituminous coal with an ash content of about 8 percent. The specifications for the coal are shown in Table 2-1.

Coal combustion at the plant generates approximately 3.2 and 7 tons of ash waste per day in the summer and in the winter respectively. The ash is composed primarily of bottom ash, on the order of 70 percent, which is collected on a grate below the boiler. The remaining 30 percent is fly ash collected from the mid-levels of the boiler and from the precipitator pollution control devices. The ash is vacuum-conveyed to a silo for temporary storage prior to being loaded into dump trucks. The loading is conducted via a rotary feeder and the ash is wetted at this stage to control dust. Tarp-covered trucks transport the ash to the Active Fly Ash Pile several times a week. The ash is dumped on the working surface of the ash pile in individual piles which resemble moguls on a hillside. The ash is spread and compacted every three months or when the working surface of the ash pile is covered with the individual piles dumped from the truck. A wheeled front-end loader is used to level and compact the ash pile surface. Water from a spray truck may be used for dust control during leveling and compacting operations. Since July of 1991, the FEMP fire pumper and tanker have been employed to mist the pile as needed for dust control.

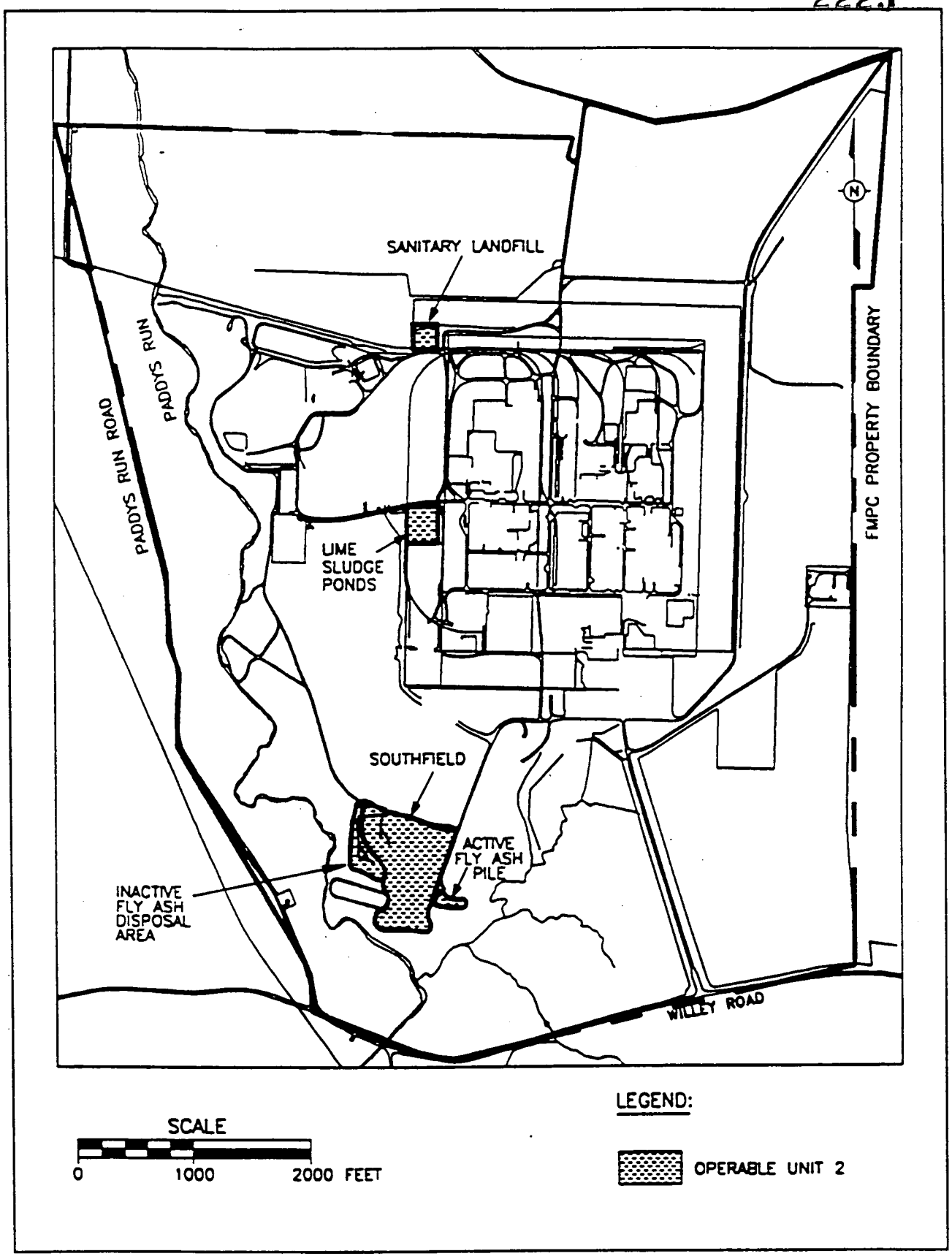

Figure 2-1 - Site Map

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Figure 2-2 - View of Active Ash Pile Looking North

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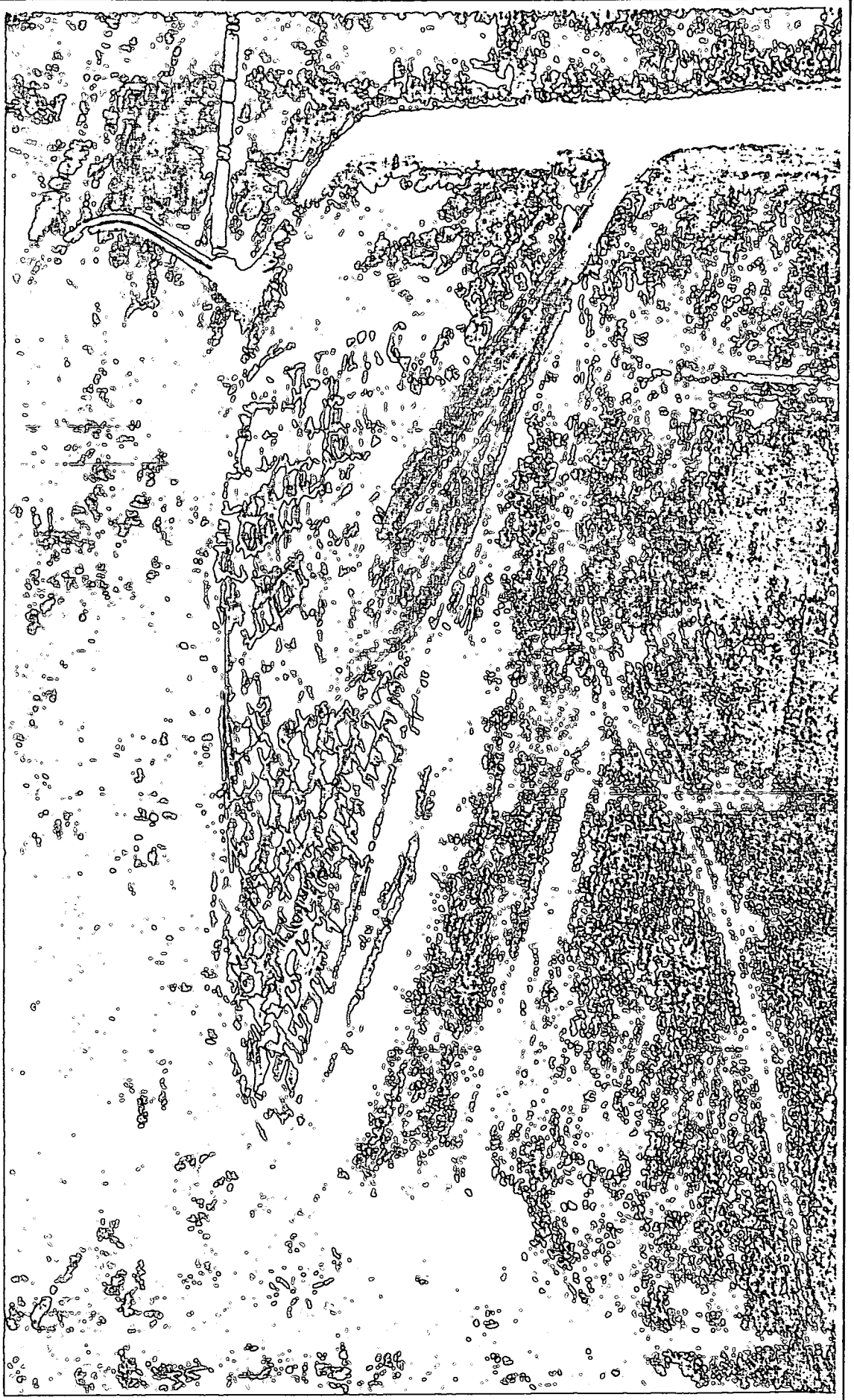

Figure 2-3 - View of Active Ash Pile Looking South

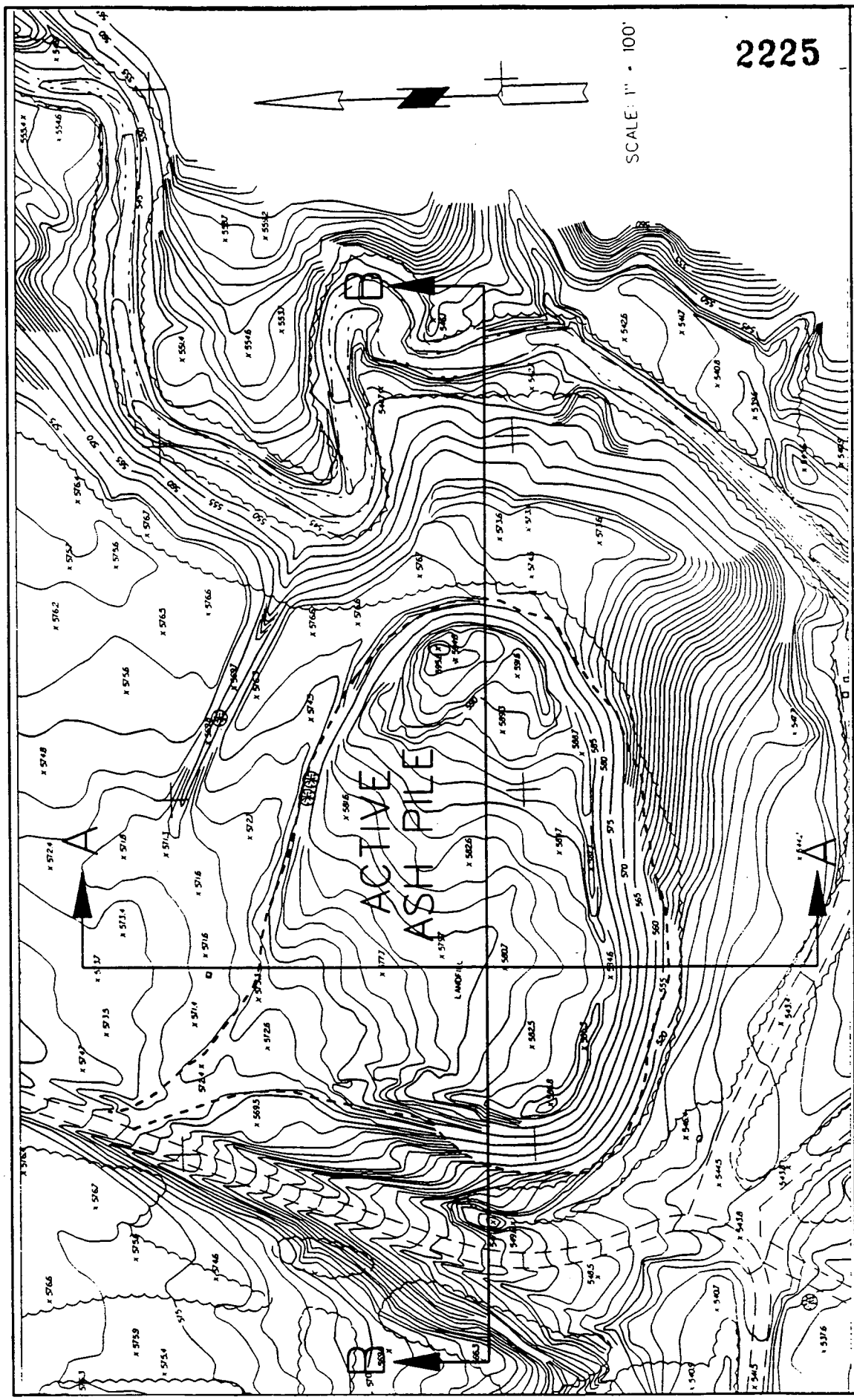

Figure 2-4 - Plan of Active Ash Pile

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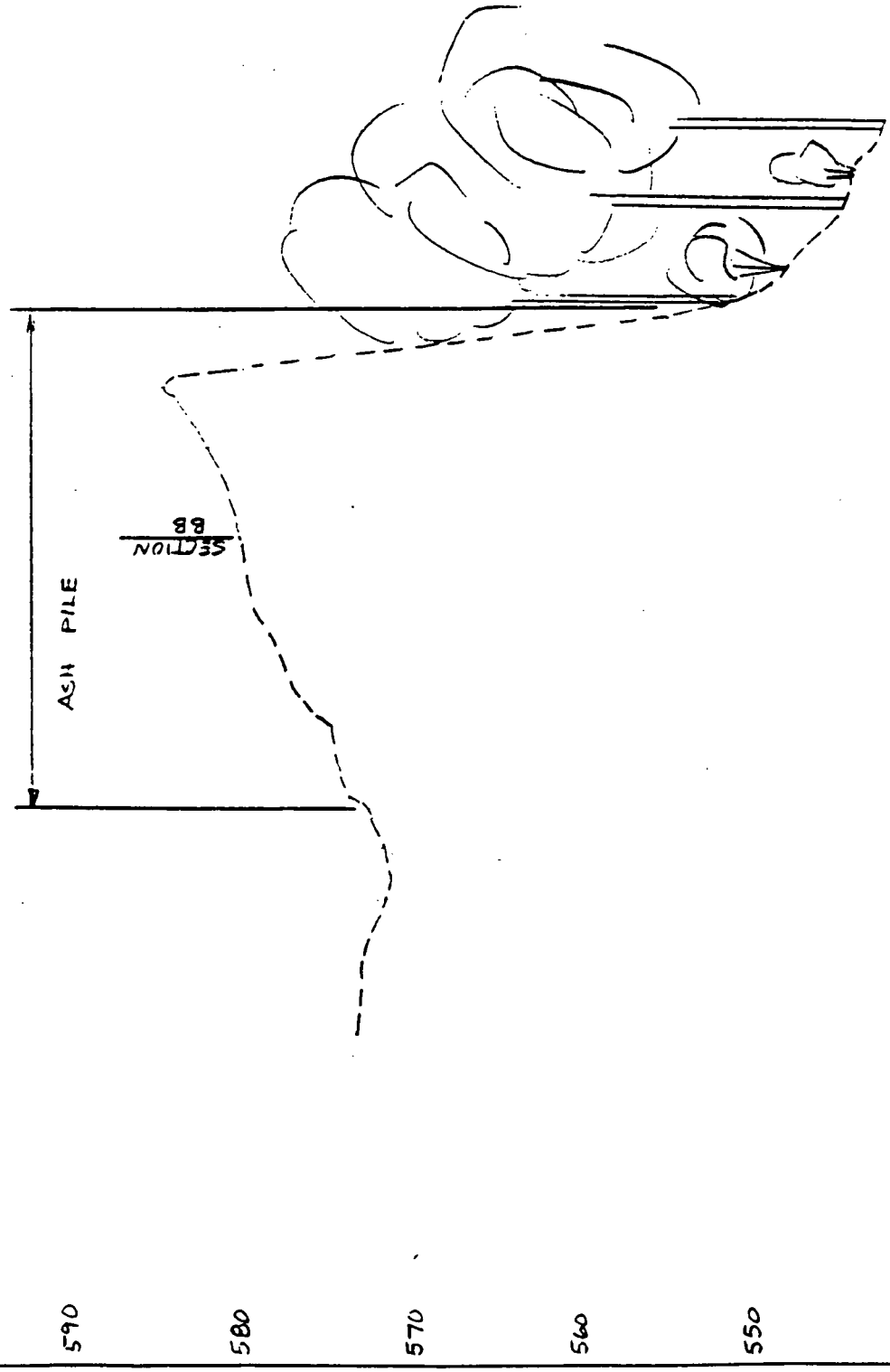

Figure 2-5 - Active Ash Pile Section A-A Looking East
Scale: Horizontal 1" = 100'; Vertical 1" = 10'

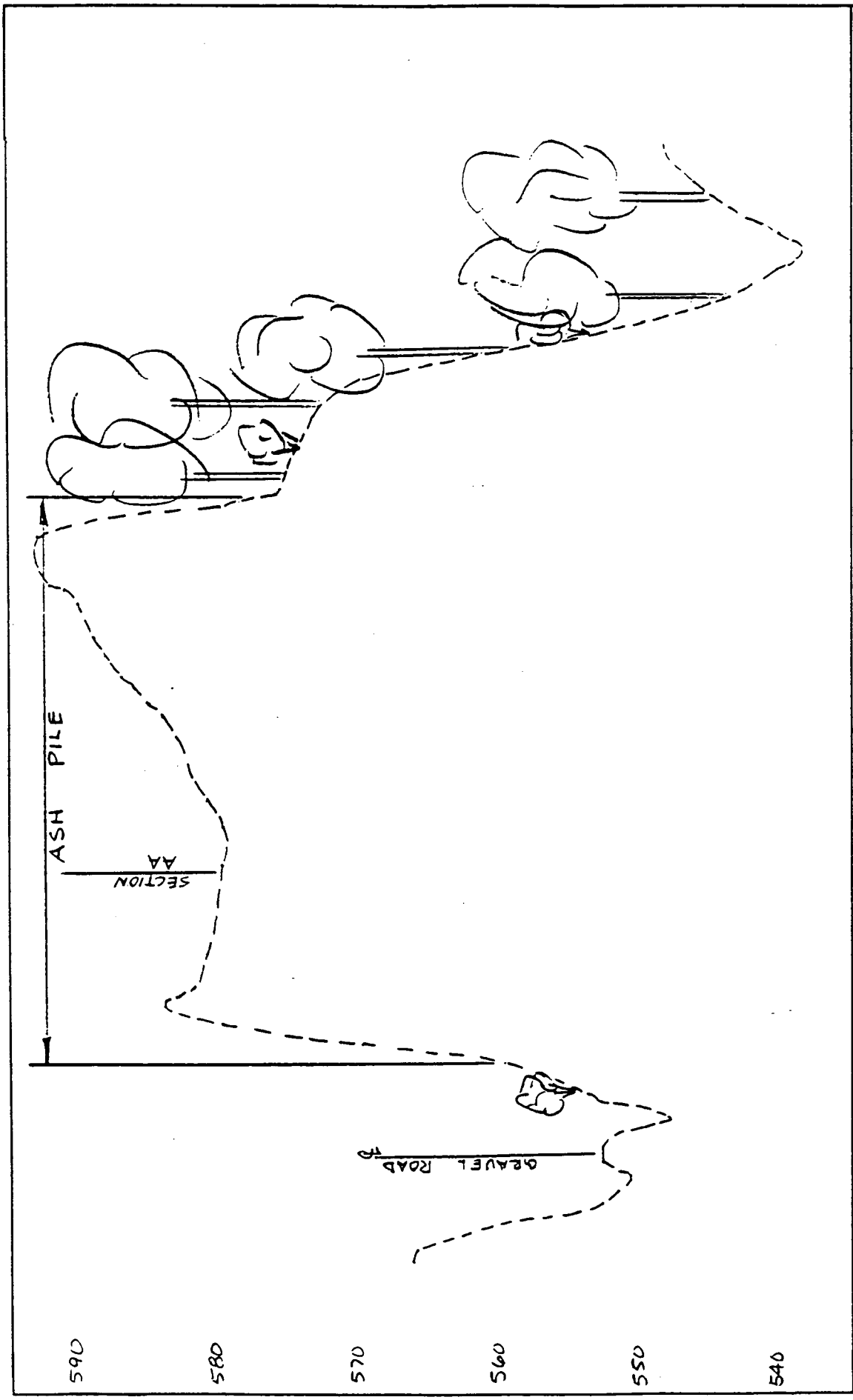

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Figure 2-6 - Active Ash Pile Section B-B Looking North
Scale: Horizontal 1" = 100'; Vertical 1" = 10'

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Table 2-1 - Coal Specifications at the FEMP

Parameter	Specifications As Received	Contractors' Guaranteed Specifications
Moisture	8% maximum	8.0%
Ash	8% maximum	8.0%
Volatile Matter	32% to 42% range	34%
Fixed Carbon	47% to 55% range	52%
BTU	12,500 minimum (as received)	12,500
Fusion Temp. of Ash	2,300 F. min.	2,300° F
Sulphur	1%	1.0%
Size	2" x 0" with not more than 20% below 1/4" size	

The following are the required specifications of the coal and the specification that will be rejected:

Parameter	Specifications As Received	Rejection Specifications (As Received)
BTU	12,500 minimum	Less than 11,000
Ash	8% maximum	More than 10%
Moisture	8% maximum	More than 10%
Sulphur	1% maximum	More than 1.3%
COAL SHALL NOT BE OIL TREATED		

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SECTION 3

UTILITY ASH HANDLING PRACTICES

3.1 Historical Practices

Prior to the mid 1970s, the most common ash disposal method used by utilities was wet sluicing of ash to disposal ponds. Approximately half of the ash produced was sluiced to ash disposal ponds. About one quarter of the ash was handled dry and landfilled. The remaining quarter was recovered and utilized (GAI 1979, pp. 3-1 and 3-2).

Ash produced by coal-fired power plants consists of bottom ash which is collected from the boiler bottom, either wet, as a slurry, or mechanically, in a dry form, and fly ash which is collected from the economizer hoppers and precipitators, either hydraulically or pneumatically. The bottom ash and fly ash may be kept separate or combined for disposal.

Case studies were prepared and included in the 1979 Coal Ash Disposal Manual prepared for EPRI (GAI 1979). Twenty coal-fired generating plants were visited during the preparation of the manual. These plants covered the range of ash handling and disposal practices which were in use at that time. Some of the features of the ash disposal methods used at those plants are summarized and presented in Appendix A.

Review of these case studies shows that there was a trend away from the wet disposal of ash in ponds, even in the mid 1970s. The driving force behind the shift from wet disposal in ponds includes:

1) The Clean Water Act and restrictions on the discharges from ash sluicing systems.

2) Concerns about the RCRA regulations and how they would apply to ash.

3) The move to more recovery and reuse of bottom ash and fly ash.

4) Water conservation issues and the lack of sufficient water, particularly in dry areas.

5) The larger land areas required for ash ponds, compared to landfills.

3.2 Present Ash Disposal Practices

3.2.1 Existing Sites

The present trend in ash disposal is moving away from wet disposal in ash ponds and toward landfill disposal. Existing power plants which utilize wet sluicing of ash to ponds are now generally dredging either fly ash or bottom ash for reuse or for landfill disposal. While most existing plants use wet sluicing for bottom ash removal, many have added or are adding bottom ash dewatering bins that permit the ash sluice water to be recirculated after treatment and that allow the dewatered ash to be trucked away to a landfill for disposal.

3.2.2 New Sites

Power plants built or upgraded in the past 10 years generally handle ash in a "dry" manner. In newer units, bottom ash may be removed from the boiler bottom using a drag bar chain conveyor. The water-filled boiler bottom provides the boiler seal and quenches the hot ash. The drag bar conveyor pulls the ash up an inclined plane allowing it to dewater. The ash is then conveyed to an elevated storage bin from which trucks can be loaded to haul the ash away for reuse or landfill disposal. Wet sluicing of bottom ash to dewatering bins may still be required in upgraded units if physical space limitations preclude the installation of a dry removal system. The sluice water is recycled since effluent limitations require that prior to discharge it be treated to higher levels than are required for ash sluicing.

The effluent limitation regulations for new power plants (40 CFR § 423.15(g)) states: "There shall be no discharge of wastewater pollutants from fly ash transport water." This restriction effectively prohibits the use of wet fly ash sluicing in new or upgraded power plants. Current practice calls for pneumatic removal of fly ash to an ash silo. Ash in the silos is kept "dry" because moisture will cause bridging and clogging of the silo. Ash with a high calcium content can actually set up as a result of pozzolanic reactions.

If the fly ash is to be utilized, it may be transported in covered, bulk, pneumatically loaded and unloaded trucks. Water totalling between 5 and 10 percent by weight is generally added to the ash to control dust if it is transported in open rail cars or trucks. If bottom ash or fly ash is going to be recovered, separate ash facilities are generally provided. Combined fly ash and bottom ash silos may be used, if the ash is going to be land filled.

Most power plants, even if they sell or utilize a large portion of their bottom ash and fly ash, have landfills for ash disposal, or they contract with outside companies for ash disposal. In plants

producing Flue Gas Desulfurization (FGD) sludges, it is common practice to mix waste ash with the scrubber sludge prior to disposal in landfills.

Landfill disposal of power plant ash must consider the following media of concern:

1) Groundwater through leachate
2) Soil through wind erosion and runoff
3) Surface water through runoff
4) Air through wind erosion.

Water which percolates through the ash landfill can pick up contaminates which might pose a groundwater environmental problem. There is a growing trend among the states to require some form of impermeable liner under ash disposal landfills. Liner materials include flexible membrane liners such as polyvinyl chloride (PVC), high density polyethylene (HDPE), low density polyethylene (LDPE), imported natural clay, synthetic clay liners, bentonite liners, soil cement liners, or stabilized ash or sludge liners. Liners might be avoided if the landfill overlies natural clay soils or sound, unfractured bedrock.

Surface waters around the landfill are typically protected from contamination by the following practices:

1) Diversion of outside runoff around the landfill
2) Control and treatment of runoff from the active areas of the landfill
3) Covering inactive areas of the landfill.

Air pollution is typically prevented through control of fugitive dust. Measures that may be taken to control fugitive dust include the following:

1) Covering of inactive areas of the landfill
2) Use of water sprays for dust suppression on active landfill areas
3) Use of chemical sprays or foam applications for covering landfill areas
4) Use of soil or bottom ash as a daily cover material in the land fill
5) Production of fly ash pellets
6) Construction of wind breaks.

Contamination of the soil around the landfill is typically prevented by the following practices 2225

1) Control of surface water runoff, preventing erosion of the ash from the pile.
2) Control of wind borne erosion and fugitive dust.

3.2.3 Case Studies and Site Visits to Demonstrate Current Ash Disposal Practices

Current disposal practices are illustrated by several coal-burning power plants that have been designed, built, or retrofitted by Parsons in the past several years. Each of these plants employ dry ash disposal. Ash from these plants is landfilled in permitted on-site or off-site landfills. The details of these plants are presented in Tables 3-1 to 3-4. Plants in the local area were visited or contacted by telephone to determine the status of ash disposal at utilities in Ohio.

The Department of Energy Fernald Office (DOE/FO) and Westinghouse Environmental Management Company of Ohio (WEMCO) personnel toured three landfill disposal sites for non-toxic fly ash (leachate less than 30 times Ohio Drinking Water Standards (OEPA 1988)). Two of the sites (Site 1 and Site 2) are owned and operated by a southwestern Ohio electrical utility company and are located in that area. The third site (Site 3) is owned and operated by an east central Ohio electric utility company.

3.2.3.1 Site 1

This site is the older of the two sites. It is located in an abandoned gravel pit, above a sole source aquifer, approximately 100 meters east of the Great Miami River in a floodplain. Site 1 can be subdivided into the following three distinct areas: Area 1a is the active site landfill for fly ash disposal; Area 1b is a closed ash landfill; and Area 1c is a future disposal area. Groundwater is sampled semi-annually from four monitoring wells located around the site.

Area 1a - Active Landfill

The active area was constructed by excavating and grading the former gravel pit and adding a 5-foot-thick clay liner, which was compacted to a permeability of 10^{-7} cm/sec. The fly ash is wetted during the loading of the trucks at the boiler site, then transported and placed in 16-inch maximum thickness lifts on top of the liner. The ash is rewetted, and compacted to a minimum of 90 percent of the standard proctor density for the fly ash, which reduces fugitive dust emissions and water erosion. Stormwater runoff from the ash and other portions of the site is collected in the first of three synthetically-lined ponds. After a period of quiescence, much of the fly ash and other solids

Table 3-1 - Summary of Ash Handling at Schiller Station

Schiller Station	
Owner:	Public Service Company of New Hampshire
Location:	Portsmouth, N.H.
Size:	180 MW
Description of Plant:	Reconversion of oil-fired plant back to coal with installation of new electrostatic precipitator
Coal Type and Usage:	2,400 tpd
Ash Production:	Bottom Ash: N.A. Fly Ash: 360 tpd
Bottom Ash Handling:	Unit uses pulverized coal firing and produces little bottom ash.
Fly Ash Handling:	Collected dry and transferred to silos.
Ash Disposal:	Ash is wetted and loaded into open semi-trailer trucks.
Disposal Area Features:	Ash is hauled to a private landfill for disposal.
Source:	PARSONS Project Files

Table 3-2 - Summary of Ash Handling at New Bay Cogeneration Facility

New Bay Cogeneration Facility	
Owner:	Private
Location:	East Providence Rhode Island
Size:	79 MW
Description of Plant:	New coal-fired fluidized bed unit (presently under design and in licensing).
Coal Type and Usage:	750 tpd of Western Pennsylvania sub-bituminous coal
Ash Production:	Bottom Ash: 45 tpd (est.) Fly Ash: 45 tpd (est.)
Bottom Ash Handling:	Pneumatically conveyed from ash coolers to a single ash silo.
Fly Ash Handling:	Pneumatically conveyed to the ash silo.
Ash Disposal:	Ash will be wetted to control dust and either loaded on trucks for local private landfill disposal or loaded back on rail cars for disposal at the coal mine.
Disposal Area Features:	N.A.
Source:	PARSONS Project Files

Table 3-3 - Summary of Ash Handling at MacIntosh Unit 3

MacIntosh Unit 3

Owner:	City of Lakeland, Florida
Location:	Lakeland, Florida
Size:	650 MW
Description of Plant:	New coal/oil/gas fired power plant (1982)
Coal Type and Usage:	8,000 tpd of Kentucky bituminous coal
Ash Production:	Bottom Ash: 500 tpd Fly Ash: 300 tpd
Bottom Ash Handling:	Bottom ash is wet sluiced to dewatering bins
Fly Ash Handling:	Fly ash is collected dry in a silo
Ash Disposal:	Ash is blended with FGD sludge in pug mills. Stabilized sludge/ash mixture is landfilled on site.
Disposal Area Features:	Disposal area was sealed with a soil cement liner. All ash area runoff is collected and treated.
Source:	PARSONS Project Files

Table 3-4 - Summary of Ash Handling at Sunnyside Cogeneration Facility

Sunnyside Cogeneration Facility

Owner:	Private
Location:	Sunnyside, Utah
Size:	45 MW, Mine Mouth Plant
Description of Plant:	New fluidized bed waste coal fired unit under construction (1992 start-up)
Coal Type and Usage:	1,344 tpd of waste coal
Ash Production:	Bottom Ash: 220 tpd Fly Ash: 440 tpd
Bottom Ash Handling:	Dry ash is conveyed to the ash silo pneumatically.
Fly Ash Handling:	Fly ash is conveyed to the ash silo.
Ash Disposal:	Bottom ash and fly ash are wetted and blended in a pug mill and the ash is hauled in open, off-road dump trucks to on site landfill.
Disposal Area Features:	Because of the high lime content of the ash, its pozzolanic properties, the low site rainfall, and high evaporation rates, the 15 acre landfill will not be lined unless required by the state. Uncontaminated off-site runoff is diverted around the landfill.
Source:	PARSONS Project Files.

settle out. The water is then pumped to a settling pond where polymers are added to further reduce the amount of suspended solids. The water is then transferred to a third pond for more settling and final pH control before discharging to the Great Miami River. The discharge is monitored for parameters indicated in a National Pollutant Discharge Elimination System (NPDES) permit.

When the landfill reaches its capacity, it will be covered with a 2-foot compacted clay cap. The cap will be covered with 6 to 12 inches of material to establish a vegetative cover.

Area 1b - Closed Landfill

This closed landfill is adjacent and north of Area 1a. It uses the same three ponds for stormwater runoff as Area 1a and has the same type of liner. Fly ash was handled the same way in Area 1b as it is presently being handled in Area 1b. Area 1b is capped with 2 feet of compacted clay with a permeability of no more than 1×10^{-7} cm/sec. Six to twelve inches of top soil supports a well-established vegetative cover.

Area 1c - Future Landfill

The future landfill is under construction. It will contain a five-foot-thick clay liner, a leachate collection system, a surface water run-on diversion trench, and collection ponds.

3.2.3.2 Site 2

Site 2 is the newest fly ash landfill disposal facility operated by this utility. It is located in an upland area 1 km north of the Ohio River and is above the river's floodplain. The landfill is a classic valley fill-type operation.

The landfill has an underdrain system beneath a 5-foot compacted clay liner having a permeability of no more than 1×10^{-7} cm/sec. A leachate collection system is installed between the liner and the fly ash. Fly ash is placed on top of the liner in lifts not exceeding 16 inches. It is then wetted and compacted to 90 percent of the standard proctor density for the fly ash. Surface water runoff is collected in a pond allowing the solids to settle out before the water is discharged into the stream. The leachate is collected and pumped to a collection point for eventual treatment prior to surface water discharge. Groundwater monitoring wells are sampled at least semi-annually up to a maximum of eight times per year. New requirements also include gross alpha/beta radiological monitoring.

3.2.3.3 Site 3

Site 3 is a power station located in east central Ohio consisting of six units producing a total of 2,100 megawatts. Several methods are used at this facility for fly ash and bottom ash disposal. Ash waste from the older units composed of fly ash and bottom ash is transported to two unlined holding ponds via a wet slurry system. In the newer units, dry fly ash is temporarily stored in silos.

One of the ponds receives a mixture of bottom ash and fly ash, which is later excavated and sold to the state for road ice control. The other pond receives only a fly ash slurry and, after it is filled, the ash is excavated and landfilled.

The dry fly ash stored in the silos is used to stabilize the Flue Gas Desulfurization (FGD) wet scrubber sludge. Fly ash and lime are combined with dewatered scrubber slurry. This mixture is allowed to cure for several days, forming a solid material that is suitable for landfilling. Ash not used for stabilization of the FGD sludge is loaded into trucks, wetted, and landfilled.

The landfill operations consist of one closed landfill and one active permitted landfill. The active landfill is located in an abandoned surface mine in an upland area, and utilizes a classic valley fill method with terracing to increase slope stability. This landfill has an underdrain system, a three foot compacted clay liner (10^{-7} cm/sec) covered by a synthetic liner, a leachate collection system, and a surface water runoff collection system. These collection systems drain into three holding ponds for settling and treatment. These ponds are clay lined, and have an automatic pH monitoring system. Carbon dioxide is used for pH adjustment prior to discharge under an NPDES permit to a local unnamed tributary.

The material being received at the active landfill consists of the stabilized scrubber product, fly ash excavated from the wet ponds, and dry fly ash (wetted prior to transport) from the silos. The material is placed in 12 inch lifts and then compacted to 90 percent of the standard proctor density for the fly ash. This continues until a permitted terrace elevation has been reached. Then a compacted clay liner is placed on top of the landfilled material.

Pursuant to a Fugitive Dust Emissions Permit, extensive road wetting and truck wash operations are utilized to mitigate dust emissions from truck traffic transporting the ash and scrubber product.

3.2.3.4 Results of Phone Survey

The practice of two other Ohio electrical utilities, each operating two ash disposal facilities, were obtained by phone survey and are described below.

Northeastern Ohio Utility

Two of the four sites are managed and owned by a northeastern Ohio electric utility company. Fly ash disposed at these sites is collected from electrostatic precipitators and is pneumatically conveyed to temporary holding silos prior to loading into trucks. The ash is wetted on loading to 20 to 25 percent water by weight and transported to one of the two landfills described below.

One landfill, which has been in operation for approximately 12 years, is located in an area of low environmental sensitivity (i.e., not over a sole source aquifer, etc.). Due to the age of this landfill, it is unlined and does not require any ground water monitoring. Water run-on is mitigated by diversion ditches, and is directly discharged into a waterway. Fugitive dust emissions are controlled pursuant to an air emissions permit. This landfill will be closed with a two-foot clay cap covered with six to twelve inches of topsoil, which will maintain a vegetative cover.

The other landfill is still under construction, but a portion is in use. It has been cut forty feet below grade in glacial clays in an area of low environmental sensitivity, and covers thirty acres. The landfill is lined with eighteen inches of compacted clay, which has been sloped towards a trench of crushed stone and geofabric to collect leachate. Provisions were made with the OEPA for pumping the leachate, if required. Surface water run-on is mitigated by diversion ditches and discharged to a waterway. Surface water runoff from the fly ash is collected in a holding pond where settling and pH control take place before discharging pursuant to an NPDES permit. Groundwater from monitoring wells is sampled twice a year. Monitoring will continue for five years after closure. Also, fugitive dust emissions are controlled pursuant to an air emissions permit.

Southwestern Ohio Utility

The other two sites, described below, are owned and operated by a southwestern Ohio utility company. The fly ash is retrieved from electrostatic precipitators, and transported to holding ponds via a wet slurry stream. Four separate holding ponds are used on a rotating basis. Overflow from the wet ponds is pH adjusted before being discharged as required by the NEPDS permit. At one site, filled ponds are left to dry out, after which they are excavated, and the ash is trucked to a landfill. This landfill is OEPA permitted, has a clay liner, and leachate and runoff collection systems. At the other site, the fly ash remains in the ponds, which will be covered when capacity is reached.

The bottom ash is handled separately from the fly ash. It is also transported to a holding pond via a wet slurry system. The runoff from the bottom ash pond is treated in a manner similar to the fly ash ponds, with the exception that treatment for total suspended solids is performed as needed. Ultimate disposal of the bottom ash takes several different routes. A portion of the bottom ash is

applied to the surface of the fly ash ponds for dust suppression purposes. Some of the bottom ash is marketed and sold as a component for light-weight concrete blocks. The remaining portion is landfilled.

3.3 Utilization of Ash by Utilities

Utilization of bottom ash and fly ash has been a high priority of the utility industry. As early as 1978, surveys showed that 24 percent or 16.4 million tons per year of the 68.1 million tons of utility fly ash, bottom ash, and boiler slag was utilized. (GAI Inc. 1979, pp. 3-1 to 3-2). In the early 1980s, 17 percent of the fly ash and 33 percent of the bottom ash produced was utilized (Shepard 1985). The break down of bottom ash utilization is as follows:

1)	Sand Blasting Grit	24.5 percent
2)	Fill Material	13.8 percent
3)	Roofing Shingle Granules	13.6 percent
4)	Road Construction	11.8 percent
5)	Ice Control	11.4 percent
6)	Cement Additive	9.7 percent
7)	Concrete Admixture	2.5 percent
8)	Aggregate	1.3 percent
9)	Concrete Block	0.9 percent
10)	Miscellaneous Uses	10.4 percent

The breakdown of fly ash utilization follows:

1)	Concrete Admixture	35.6 percent
2)	Cement Additive	18.6 percent
3)	Grouting	6.2 percent
4)	Fill Material	4.5 percent
5)	Concrete Block	3.6 percent
6)	Road Construction	2.6 percent
7)	Dam Construction	1.8 percent
8)	Aggregate	0.7 percent
9)	Hazardous Waste Fixation	0.7 percent
10)	Ice Control	0.5 percent
11)	Miscellaneous Uses	25.1 percent

Utilization of fly ash and bottom ash is a topic of considerable interest to the utility industry. Areas which are being studied include fly ash fillers in asphalt roofing shingles, industrial coatings and plastics, highway fills and embankments, soil amendments for restoration of surface mines and coal refuse materials, and as a source for recovery of iron or silica (Browman 1991).

SECTION 4

UTILITY PRACTICES FOR OPEN STOCK PILES

4.1 General

Utilities do not presently, as a rule, maintain open piles of ash. They do, however, have open piles of coal. The practices used by utilities in dealing with coal piles may be applicable for short-term or long-term use in controlling possible contaminant migration from the active ash pile at the FEMP site.

4.2 Operational Considerations

Utilities generally try to maintain coal reserves on site sufficient for 90 days of operation. Most plants achieve this reserve by maintaining two separate coal piles. The active coal pile is fairly small, providing from several days up to 2 or 3 weeks coal supply. The active coal pile is constantly receiving coal deliveries and is constantly feeding coal to the power plant. The 90-day storage pile is usually inactive for weeks or months at a time. It is usually referred to as the dead or inactive coal pile.

Dead coal piles are frequently treated with chemical agents which form a crust over the pile surface. The chemicals, which consist of wetting and binding agents, act to reduce fugitive dust, reduce water infiltration into the pile, and to reduce the pick-up of suspended solids in the pile runoff.

Active coal pile areas are treated with water sprays or chemical agents to control fugitive dusts. These areas are subject to continuous traffic and movement of materials so that dust control is more difficult than on inactive areas. It is the goal of the plant operators to minimize the active coal pile area so that runoff and dust problems can be minimized.

Operational considerations for dust control at a coal ash pile would be similar to those for coal storage piles. Problems would be minimized by maintaining as small an active area as possible while permanently or semi-permanently closing or sealing the rest of the area.

4.3 Control of Fugitive Dust

Control of fugitive dust from open storage piles can fall into several categories including wet suppression, chemical stabilization, and physical stabilization (Corbitt 1989).

4.3.1 Wet Suppression

Spraying water on the surface is the simplest method of dust control. It often is only effective for a short time before the surface dries and must be sprayed again. Extended use can aggravate dust problems by causing the dust particles to become smaller and more prone to becoming airborne. Roads and surfaces that can support vehicle traffic can be sprayed from a water truck. A fixed spray system can be used for piles and areas that are not accessible to vehicles. A spray system can also be automated reducing the amount of operator attention required.

4.3.2 Chemical Stabilization

Chemical stabilizers act to bind the particles at the surface to form a crust. The chemical types include "salts, lignin sulfonate, wetting agents, petroleum derivatives, and special mixtures" (Corbitt 1989). Salts, including magnesium and calcium chlorides, tend to adsorb moisture from the air and thus keep the surface damp. Since they are soluble, they tend to wash off in heavy rains and require frequent reapplication. Surfactants and wetting agents are used to lower the surface tension of the water and to improve the penetration of the chemicals. Surfactants can be used in conjunction with other chemicals to enhance their performance. Petroleum derivative and polymeric compounds can actually bind the surface particles together. Different formulations may be either water impervious or allow water penetration of the surface. The chemical formulations and application rates to establish a crust on the surface of a stockpile will depend on the wettability of the material, particle size, porosity and the permeability. In addition, application rates must be higher if the crust is to resist water infiltration as well as limit fugitive dust (Parks 1980).

Dust control at ash loading or unloading points is typically performed with water sprays, but the use of a foam system has been found to be far more effective than the use of water sprays alone (Rowsome 1980).

Manufacturers of chemical stabilizers were contacted, including Betz, DeTer, Nalco, Martin Marietta, Mateson Chemical, Penetone, and 3-M. Product information is summarized in Appendix B.

4.3.3 Physical Stabilization

Physical stabilization is achieved by placing covers or cover material over the storage piles. Cover material may include soil, rock, mulch, membranes, fabrics, or paving. These materials are not commonly used for covering coal piles, but they are used for landfills and waste piles. In some cases utilities have fully enclosed coal piles within buildings to control fugitive dust. Other practices, such

as construction of wind breaks and planting of vegetative covers, are also used for fugitive dust control.

4.4 Control of Surface Water Contamination

Since the runoff from utility coal piles is regulated under NPDES effluent limitations, utilities have established sophisticated surface water runoff controls. These include diversion of uncontaminated runoff around the storage area and collection and treatment of the run-off from storms up to and including the 10-year, 24-hour frequency rainfall event. Some of the methods of controlling fugitive dust from coal and ash piles will also control or minimize the contamination of the stormwater which runs off of the storage area. Cover materials include soil, membrane covers, and chemical stabilizers which form impervious crusts.

4.5 Control of Groundwater Contamination

Due to the tightening regulatory concern over groundwater contamination, impervious liners are now common under open material stockpile areas. Coal pile and ash handling areas are lined with clay, synthetic liners, bentonite, soil cement, asphalt, or concrete pavement.

SECTION 5

UTILITY PRACTICES FOR CLOSING FLY ASH PONDS AND LANDFILLS

Guidelines for the design and closure of non-RCRA waste ash disposal landfills were published by EPRI (GAI Inc. 1979, pp. 8-1 to 8-3). The major design requirements include:

1) Diversion of uncontaminated runoff from up gradient of the landfill around the fill area.
2) Provide final finished slopes on the fill area that do not exceed 33 percent (1:3).
3) Provide a maximum height of slope of 20 vertical feet. Higher slopes should be sub-divided by terraces set no further than 20 vertical feet apart.
4) A minimum of 2 feet of cover material should be placed over the landfill surface. The cover should consist of 6 inches of compacted clay, 12 inches of soil which would support vegetation, and a final 6 inches of topsoil.
5) The surface should be planted with a good vegetative cover of native grasses suitable for the local climate and soil conditions.

The final grading and cover of the landfill area should serve to reduce ponding of water on the surface of the landfill to minimize infiltration through the cover, reduce the rate of leachate production, and reduce soil erosion and help establish and maintain vegetative cover (SCS 1982 p. 8-4).

Surface liners including "conventional asphalt, hot sprayed asphalt, asphalt-sealed fabric, polyethylene (PE), polyvinyl chloride (PVC), butyl rubber, hypalon, ethylene propylene diene monomer (EPDM), chlorinated polyethylene (CPE), compacted clay, and mixtures of native soil with either bentonite, or cement" can be used (SCS 1982 p. 8-6).

A reasonable maintenance period should follow the closure of the landfill. During this period, the landfill cover would be inspected and repaired as required. Erosion damage would be refilled and the vegetative cover and reestablished. Annual mowing of the field grass on the landfill surface is required. Access to the area should be limited by construction of a fence around the area to prevent damage to the cover and vegetation on the slopes by all-terrain vehicles.

SECTION 6

SUMMARY AND CONCLUSIONS

1) Utilities generate many times more ash than is generated at the FEMP site. Because of the high volumes of material they handle, ash disposal has been a critical issue for the utility industry for many years.

2) Utility ash is an excluded solid waste from RCRA and the vast majority of tested ash has been found to be non-toxic. Utility ash handling and disposal is, thus, based on its non-hazardous and non-toxic status. Utility ash handling and disposal practices are only applicable to the FEMP fly ash pile to the extent that this ash is determined to be non-toxic.

3) Utilities generally are not holding or storing ash in open storage piles, as has been the practice at FEMP.

4) Utilities today either landfill ash or recover ash for utilization in a variety of ways. Ash disposal ponds, although still in use, are being phased out.

5) Utility practices in controlling fugitive dust and runoff at open stock piles, such as coal piles, may be applicable for implementation at the ash pile at FEMP.

6) This review of electrical utility industry practice is being used to help identify possible alternatives to be considered for the Removal Action Work Plan. Options that will be considered include the following:
   a) Chemical dust suppressants and stabilizers will be considered for short term or intermediate term use.
   b) Options for control of surface runoff.
   c) Reuse or utilization of the currently produced ash and the material already stockpiled.

7) Utility practices for closing old landfills are appropriate for consideration during future project orders for the remediation of the site. These include the methods of covering and capping finished landfills.

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APPENDIX A

CASE STUDIES ON HISTORICAL UTILITY ASH DISPOSAL PRACTICES

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ASH HANDLING AND DISPOSAL AT ALLEN STATION

Owner:	Duke Power Company
Location:	Near Charlotte, North Carolina
Size:	1,140 MW
Coal Type and Usage:	5,155 tons per day of bituminous coal
Bottom Ash Production:	175 tons/day
Fly Ash Production:	526 tons/day
Bottom Ash Handling:	Wet sluiced
Fly Ash Handling:	Dry vacuum conveyed to ash sluicing area
Ash Disposal:	Ash ponds for combined fly ash and bottom ash
Disposal Area Liners:	No liners were installed since the site overlies a natural clay deposit.
Closure Methods:	Old ponds are covered with topsoil to support vegetation

Source: GAI 1979, pp. 6-7 to 6-14

ASH HANDLING AND DISPOSAL AT GIBSON STATION

Owner:	Public Service Company of Indiana
Location:	Mt. Carmel, Illinois
Size:	2,600 MW
Coal Type and Usage:	23,000 tons per day of bituminous coal
Bottom Ash Production:	700 tons/day
Fly Ash Production:	2,800 tons/day
Bottom Ash Handling:	Wet sluiced
Fly Ash Handling:	Dry vacuum conveyed to ash sluicing area where it is combined with bottom ash
Ash Disposal:	Ash ponds
Disposal Area Liners:	Clay liner used to minimize percolation from ponds
Closure Methods:	No information

Source: GAI 1979, pp. 6-14 to 6-21

ASH HANDLING AND DISPOSAL AT KEYSTONE STATION

Owner:	Pennsylvania Electric Company
Location:	Elderton, Pennsylvania
Size:	1,680 MW
Coal Type and Usage:	15,000 tons per day of bituminous coal
Bottom Ash Production:	560 tons/day
Fly Ash Production:	2,800 tons/day
Bottom Ash Handling:	Wet sluiced to dewatering bins for sale or disposal
Fly Ash Handling:	Dry transfer to storage silos. Ash is either sold or mixed with water for dust control prior to disposal.
Ash Disposal:	Solid waste landfill of strip mined area
Disposal Area Features:	The ash is placed within embankments constructed of ash. Embankment slopes are covered with 6 inches of soil and then seeded and mulched. Surface water runoff is collected, treated, and monitored.

Source: GAI 1979, pp. 6-21 to 6-25

ASH HANDLING AND DISPOSAL AT SAN JUAN PLANT

Owner:	Public Service Company of New Mexico and Tucson Electric Power Company
Location:	Farmington, New Mexico
Size:	700 MW, Mine Mouth Plant
Coal Type and Usage:	9,000 tons per day of western sub bituminous coal
Bottom Ash Production:	300 tons/day
Fly Ash Production:	1,500 tons/day
Bottom Ash Handling:	Wet sluiced to dewatering bins with recirculation of water
Fly Ash Handling:	Dry pressurized conveying to silos
Ash Disposal:	Fly ash moistened with 5 to 6 percent water and bottom ash are transported by truck to landfills with the strip mine.
Disposal Area Features:	The landfilling is done in conjunction with site restoration of the strip mine area. Eight inches of topsoil is placed and vegetative cover is established.

Source: GAI 1979, pp. 6-25 to 6-36

ASH HANDLING AND DISPOSAL AT BULL RUN STEAM PLANT

Owner:	Tennessee Valley Authority
Location:	Oak Ridge, Tennessee
Size:	950 MW
Coal Type and Usage:	8,000 tons per day of Kentucky bituminous coal
Bottom Ash Production:	340 tons/day
Fly Ash Production:	1,360 tons/day
Bottom Ash Handling:	Wet sluiced
Fly Ash Handling:	Pumped as wet slurry
Ash Disposal:	Once through sluicing system for both bottom and fly ash to a 200-acre pond system.
Disposal Area Features:	The pond effluent is monitored before discharge.

Source: GAI 1979, pp. 6-37

ASH HANDLING AND DISPOSAL AT LABADIE PLANT

Owner:	Union Electric Company
Location:	Labadie, Missouri
Size:	2,400 MW
Coal Type and Usage:	14,000 tons per day of southern Illinois bituminous coal
Bottom Ash Production:	405 tons/day
Fly Ash Production:	1,216 tons/day
Bottom Ash Handling:	Wet sluiced
Fly Ash Handling:	Wet sluiced
Ash Disposal:	A single ash pond handles all ash and station wastewater.
Ash Disposal Features:	The high pH of the ash sluice water is neutralized with the other station wastewaters and carbon dioxide gas to maintain effluent pH levels within limits.

Source: GAI 1979, pp. 6-37 to 6-41

ASH HANDLING AND DISPOSAL AT RUSH ISLAND PLANT

Owner:	Union Electric Company
Location:	Rush Tower, Missouri
Size:	1,200 MW
Coal Type and Usage:	8,800 tons per day of bituminous coal
Bottom Ash Production:	300 tons/day
Fly Ash Production:	890 tons/day
Bottom Ash Handling:	Wet sluiced
Fly Ash Handling:	Wet sluiced
Ash Disposal:	Fly ash and bottom ash are piped separately to a single 96.4-acre constructed pond.
Disposal Area Features:	Embankments of the pond were constructed of the natural silts, sandy silts, and clays from the site. The pond effluent is pH adjusted with CO_2.

Source: GAI 1979, pp. 6-41 to 6-44

ASH HANDLING AND DISPOSAL AT BRUNNER ISLAND POWER PLANT

Owner:	Pennsylvania Power and Light Company
Location:	York Haven, Pennsylvania
Size:	1,485 MW
Coal Type and Usage:	12,500 tons per day of Pennsylvania bituminous coal
Bottom Ash Production:	370 tons/day
Fly Ash Production:	1,100 tons/day
Bottom Ash Handling:	Wet sluiced
Fly Ash Handling:	Wet sluiced
Ash Disposal:	Ash Ponds
Disposal Area Features:	Dikes of new ponds built higher than the flood level. Acid is used as required for ash pond pH control.

Source: GAI 1979, pp. 6-44 to 6-46

ASH HANDLING AND DISPOSAL AT SUNBURY POWER PLANT

Owner:	Pennsylvania Power and Light Company
Location:	Sunbury, Pennsylvania
Size:	362 MW
Coal Type and Usage:	4,100 tons per day of anthracite, coke, and bituminous coal
Bottom Ash Production:	180 tons/day
Fly Ash Production:	550 tons/day
Bottom Ash Handling:	Wet sluiced
Fly Ash Handling:	Wet sluiced
Ash Disposal:	Bottom ash and fly ash are discharged to separate ponds.
Disposal Area Features:	Lime is added to the ash ponds to raise the pH for discharge. Bottom ash is dredged from the primary bottom ash pond and is reused as sandblasting grit.

Source: GAI 1979, pp. 6-47 to 6-48

ASH HANDLING AND DISPOSAL AT KINGSTON STEAM PLANT

Owner:	Tennessee Valley Authority
Location:	Kingston, Tennessee
Size:	1,700 MW
Coal Type and Usage:	12,000 to 16,000 tons per day of Kentucky and Tennessee bituminous coal
Bottom Ash Production:	360 tons/day
Fly Ash Production:	2,700 tons/day
Bottom Ash Handling:	Wet sluiced
Fly Ash Handling:	Wet sluiced
Ash Disposal:	Bottom ash and fly ash are sluiced together to a 248-acre ash pond.
Disposal Area Features:	The ash pond overflows to the plant intake canal, providing partial recycling of ash sluice water. Bottom ash is dredged from the pond and used locally for roadbed and aggregate.

Source: GAI 1979, pp. 6-48 to 6-50

ASH HANDLING AND DISPOSAL AT PLANT McDONOUGH

Owner:	Georgia Power Company
Location:	Smyrna, Georgia (near Atlanta)
Size:	490 MW
Coal Type and Usage:	3,800 tons per day of Kentucky and Tennessee bituminous coal
Bottom Ash Production:	76 tons/day
Fly Ash Production:	304 tons/day
Bottom Ash Handling:	Wet sluiced
Fly Ash Handling:	Fly ash is moved to silos for reuse off site or to a wet sluicing system.
Ash Disposal:	Thirty-five percent of the fly ash is used in concrete. The rest is sluiced to ash ponds.
Disposal Area Features:	About 50 percent of the ash sluice water is recirculated. An old pond has been covered with soil and reseeded.

Source: GAI 1979, pp. 6-50 to 6-54

ASH HANDLING AND DISPOSAL AT MONTROSE STATION

Owner:	Kansas City Power and Light Company
Location:	Clinton, Missouri
Size:	510 MW, mine mouth plant
Coal Type and Usage:	5,000 tons per day of sub bituminous coal
Bottom Ash Production:	173 tons/day
Fly Ash Production:	855 tons/day
Bottom Ash Handling:	Wet sluiced to dewatering bins. Sluice water is recycled. Ash is taken to the disposal area by railroad.
Fly Ash Handling:	Conveyed to a storage silo from which it is trucked away for reuse or loaded on rail cars for transport to the disposal area.
Ash Disposal:	Ash is landfilled in the strip-mined area.
Disposal Area Features:	The ash area is covered with soil and revegetated.

Source: GAI 1979, pp. 6-54 to 6-57

ASH HANDLING AND DISPOSAL AT NAUGHTON POWER PLANT

Owner:	Utah Power and Light Company
Location:	Kemmerer, Wyoming
Size:	688 MW, mine mouth plant
Coal Type and Usage:	9,000 tons per day of sub bituminous coal
Bottom Ash Production:	153 tons/day
Fly Ash Production:	612 tons/day
Bottom Ash Handling:	Removed, quenched, and wet sluiced
Fly Ash Handling:	Fly ash that is not sold is sluiced with bottom ash.
Ash Disposal:	Ash is sluiced to two sets of two ponds operated in series.
Disposal Area Features:	The pond is divided using a dike constructed of the ash which is self-hardening.

Source: GAI 1979, pp. 6-57

ASH HANDLING AND DISPOSAL AT CLIFTY CREEK POWER PLANT

Owner:	Privately owned
Location:	Madison, Indiana
Size:	1,284 MW
Coal Type and Usage:	11,000 tons per day of Indiana and Kentucky bituminous coal
Bottom Ash Production:	665 tons/day
Fly Ash Production:	814 tons/day
Bottom Ash Handling:	Wet sluiced
Fly Ash Handling:	Collected dry and then sluiced to disposal pond
Ash Disposal:	Fly ash and bottom ash are sluiced to separate disposal ponds. Fifty-five percent of the fly ash and 45 percent of the bottom ash are sold.
Disposal Area Features:	Ponds feature movable, floating ash inlet pipes to distribute the ash in the ponds.

Source: GAI 1979, pp. 6-58 to 6-60

ASH HANDLING AND DISPOSAL AT MARSHALL STATION

Owner:	Duke Power Company
Location:	Terrell, North Carolina
Size:	2,025 MW
Coal Type and Usage:	10,000 tons per day of Kentucky and Tennessee bituminous coal
Bottom Ash Production:	186 tons/day
Fly Ash Production:	552 tons/day
Bottom Ash Handling:	Removed, quenched, and slurried to disposal.
Fly Ash Handling:	Most of the fly ash is sold, but the remainder is wet sluiced with the bottom ash.
Ash Disposal:	Ash is routed to a 248-acre pond which was formed by damming a small stream.
Disposal Area Features:	Ash is dredged and discharged to empty areas of the pond to maximize utilization of the pond volume.

Source: GAI 1979, pp. 6-60 to 6-64

ASH HANDLING AND DISPOSAL AT NAVAJO STATION

Owner:	Salt River Project
Location:	Page, Arizona
Size:	2,400 MW
Coal Type and Usage:	24,000 tons per day of sub bituminous coal
Bottom Ash Production:	480 to 960 tons/day
Fly Ash Production:	1,920 to 2,400 tons/day
Bottom Ash Handling:	Quenched and sluiced to dewatering bins. Sluice water is treated and recirculated.
Fly Ash Handling:	Ash is conveyed dry to storage silos from which most of it is sold. The remainder is wetted and transported in open, off-road dump trucks to disposal.
Ash Disposal:	Ash is landfilled in a canyon 2 miles from the site.
Disposal Area Features:	Ash is placed in 2-foot lifts and compacted. Fly ash solidifies naturally. Slopes are maintained at 3 to 1 ratio. Completed areas are covered with 2 feet of sand. Runoff from the 100-year storm is collected and evaporated.

Source: GAI 1979, pp. 6-64 to 6-66

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ASH HANDLING AND DISPOSAL AT FRONT STREET STATION

Owner:	Pennsylvania Electric Company
Location:	Erie, Pennsylvania
Size:	110 MW
Coal Type and Usage:	1,000 tons per day of Western Pennsylvania bituminous coal
Bottom Ash Production:	30 tons/day
Fly Ash Production:	120 tons/day
Bottom Ash Handling:	Removed and slurried to ponds
Fly Ash Handling:	Conveyed dry to a storage silo
Ash Disposal:	Bottom ash is dredged from the ponds, dewatered in piles, and loaded on trucks. Fly ash is wetted before loading on trucks for disposal with the bottom ash in a landfill constructed in a gravel pit.
Disposal Area Features:	The landfill has a PVC liner, an underliner drainage system, and a leachate collection system.

Source: GAI 1979, pp. 6-66 to 6-69

ASH HANDLING AND DISPOSAL AT WAUKEGAN STATION

Owner:	Commonwealth Edison Company
Location:	Waukegan, Illinois
Size:	800 MW
Coal Type and Usage:	5,000 tons per day of western sub bituminous coal
Bottom Ash Production:	100 tons/day
Fly Ash Production:	500 tons/day
Bottom Ash Handling:	Wet sluiced to dewatering bins
Fly Ash Handling:	Conveyed dry to a silo. It is loaded dry to dry bulk tank trucks for reuse or for disposal.
Ash Disposal:	Bottom ash is either sold or used as road base at the disposal site. The fly ash is stabilized with water and proprietary chemicals prior to landfilling.
Disposal Area Features:	Clay lined cells. Finished areas will be covered with a clay topsoil mixture and will be used for agriculture.

Source: GAI 1979, pp. 6-69 to 6-71

ASH HANDLING AND DISPOSAL AT ALLEN S. KING PLANT

Owner:	Northern States Power Company
Location:	Oak Park Heights, Minnesota
Size:	581 MW
Coal Type and Usage:	5,100 tons per day of Montana and Illinois sub bituminous coal and petroleum coke
Bottom Ash Production:	160 tons/day
Fly Ash Production:	160 tons/day
Bottom Ash Handling:	Wet sluiced and dewatered
Fly Ash Handling:	Conveyed dry to an ash silo. Ash is wetted and loaded in open trucks.
Ash Disposal:	Trucked to a landfill
Disposal Area Features:	Leachate production is being tested in the landfill.

Source: GAI 1979, pp. 6-70 to 6-74

ASH HANDLING AND DISPOSAL AT POWERTON STATION

Owner:	Commonwealth Edison
Location:	Pekin, Illinois
Size:	1,800 MW
Coal Type and Usage:	12,000 tons per day of Illinois bituminous coal or western sub bituminous coal
Bottom Ash Production:	685 tons/day
Fly Ash Production:	500 tons/day
Bottom Ash Handling:	Wet sluiced to a dewatering bin
Fly Ash Handling:	Dry conveyed to two storage silos
Ash Disposal:	Ash which is not sold is trucked to the disposal area. Ash is stabilized prior to landfilling. Pozzolanic material containing lime, fly ash, and boiler slag is produced.
Disposal Area Features:	The landfill is lined with 8 inches of pozzolanic material. The landfill is 30 feet thick and has 2 to 1 side slopes. Finished surfaces are covered with 18 inches of silty clay and 6 inches of topsoil and then seeded. Winter wheat has been grown on the finished areas.

Source: GAI 1979, pp. 6-74 to 6-78

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APPENDIX B

CHEMICAL DUST SUPPRESSANT PRODUCT INFORMATION

BETZ INDUSTRIAL

Product Name or Number	General Description	Uses	Hazardous or Toxic Constituents
FLOWPRO 1505	Surface binding agent	Use on active landfill surfaces or haul roads	Mineral oil, heavy paraffinic distillate
FLOWPRO 1512	Surface binding agent	Use on active landfill surfaces or haul roads	Not hazardous (OSHA)
FLOWPRO 1415	Dust control crusting agent - blend of wetting and binding agents	Used for dust control and for reduction of water infiltration into the stockpile or in hauling vehicles.	Nonylphenoxypoly (Ethyleneoxy) Ethanol

DETER COMPANY, INC.

Product Name or Number	General Description	Uses	Hazardous or Toxic Constituents
MicroFoam Dust Arresting System	Surfactants used in special foam generation equipment	Control of dust at loading and unloading points	No information presented

MARTIN MARIETTA MAGNESIA SPECIALTIES, INC.

Product Name or Number	General Description	Uses	Hazardous or Toxic Constituents
Dust-Buster CDS 80	Foaming dust suppressant	Used at crushers, transfer points, stack out areas and reclaim areas.	No information given.
Dust-Buster RDC 8020	Residual dust suppressant, dust suppressant foam with residual affects.	Used at materials handling and processing systems at mines, utilities, aggregate plants and coke plants.	No information given.
Dust-Buster EA - 1	Encrusting agent	used as an encrusting agent on static piles and forms a protective film on the pile.	No information given.

MATESON CHEMICAL CORP

Product Name or Number	General Description	Uses	Hazardous or Toxic Constituents
DUST-SET	Polymeric compound which penetrates, saturates and bonds surface dust and aggregate and cements these to the subbase	Dust control on roadways, road berms, parking areas, ash piles, coal piles. Material is used for dust control and at highER dosages for runoff erosion control.	No information given.

NALCO CHEMICAL COMPANY

Product Name or Number	General Description	Uses	Hazardous or Toxic Constituents
90DS164	Mineral and soil binder utilizing a latex polymer emulsion. It is an aqueous solution of glycol and polymer.	Top sealing of rail cars, trucks and open stock piles	Ethylene glycol (1-5%)
DUST-BAN 8802	Organic based surfactant and tackifier. Agglomerates fine particles and holds them together. It is an aqueous solution of polyglycol and sulfonate.	Dust control in storage piles and in open trucks and rail cars.	Ethylene glycol (10-20%) Diethylene glycol (1-5%)
DUST-BAN 8803	Dust binder. It is an acrylamide modified polymer in a hydrocarbon solvent/water emulsion.	Dust control in open rail cars and ore piles.	Ethoxylated nonylphenol (1-5%) Hydrotreated light distillate (20-40%)
DUST-BAN 89WF030	It is an aqueous solution of fatty ester, an oxyalkylate and a sulfonate.	Dust control of piles and in open trucks or rail cars.	Ethoxylated nonylphenol (1-5%)

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PENTEONE CORPORATION

Product Name or Number	General Description	Uses	Hazardous or Toxic Constituents
DUST - ARREST	Surfactant agents allow better penetration of sprays.	Enhances water spray system efficiency.	No hazardous ingredients.
D - DUST FFC	Liquid foaming agent which produces a thick foam.	Reduces airborne dust contamination at transfer points and loading stations.	No information given.
D - DUST FAC	Concentrated liquid dust suppressant.	Causes ash particles to stick together when sprayed during loading and unloading operations.	No information given.

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3M INDUSTRIAL CHEMICAL PRODUCTS DIVISION

Product Name or Number	General Description	Uses	Hazardous or Toxic Constituents
Sani Foam System	System to apply foam concentrate and resin stabilizer.	Landfill daily cover.	N/A
Foamat System	System to apply foam concentrate and resin stabilizer.	Landfill daily cover.	N/A
Foam Concentrate FX - 9162	Biodegradable foam concentrate for short-term applications.	Used alone it is applicable for daily cover.	No information given.
Foam Stabilizers FX - 9161	Addition of foam stabilizers creates a longer lasting foam which is not biodegradable.	With stabilizers added, the foam is longer lasting and resists water erosion better.	No information given.

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