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DOE/EA-0404

Environmental Assessment

Innovative Clean Coal Technology Program
Coke Oven Gas Cleaning Demonstration Project

Bethlehem Steel Corporation
Sparrows Point Plant
Baltimore County, Maryland

December 1989

U.S. Department of Energy
Assistant Secretary for Fossil Energy

DOE/EA-0404

ENVIRONMENTAL ASSESSMENT

INNOVATIVE CLEAN COAL TECHNOLOGY PROGRAM
COKE OVEN GAS CLEANING DEMONSTRATION PROJECT

BETHLEHEM STEEL CORPORATION
SPARROWS POINT PLANT
BALTIMORE COUNTY, MARYLAND

DECEMBER 1989

U.S. DEPARTMENT OF ENERGY
ASSISTANT SECRETARY FOR FOSSIL ENERGY

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ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
AMA	Air Management Administration
avg.	average
BAT	Best Available Technology
BSC	Bethlehem Steel Corporation
Btu	British thermal unit
CAA	Clean Air Act
°C	degrees Celsius
CCTDP	Clean Coal Technology Demonstration Program
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
cm	centimeter
CO	carbon monoxide
CWA	Clean Water Act of 1987
d	day
dBA	decibels on the A-weighted scale
diam	diameter
DOE	(U.S.) Department of Energy
EA	Environmental Assessment
EPA	(U.S.) Environmental Protection Agency
ERM	Environmental Resources Management, Inc.
FR	*Federal Register*
°F	degrees Farenheit
FEMA	Federal Emergency Management Agency
ft	foot
FWS	(U.S.) Fish and Wildlife Service
gal	gallon
gpd	gallons per day
gpm	gallons per minute
h	hour
ha	hectare
H_2S	hydrogen sulfide
H_2SO_4	sulfuric acid
ICCT	Innovative Clean Coal Technology
in.	inch
kg	kilogram
km	kilometer
kWh	kilowatt-hours
L	liter
lb	pound
m	meter
m^3	cubic meter
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources

SUMMARY

This Environmental Assessment (EA) has been prepared by the U.S. Department of Energy (DOE), in compliance with the National Environmental Policy Act, to evaluate environmental issues associated with a project that will be cost-shared by DOE and private industry under the Innovative Clean Coal Technology Program. The proposed action is a coke oven gas cleaning technology demonstration project proposed to be installed and operated at the Bethlehem Steel Corporation, Sparrows Point Plant, in Baltimore County, Maryland. Alternatives to the proposed action, which include no action, delayed action, and the use of alternate sites or technologies, are discussed in this EA.

The impact analysis documented in this EA has concluded that no significant environmental impacts would result from the proposed demonstration project at the Sparrows Point site. The following points support this conclusion.

- The project would be installed and operated at an existing industrial facility in a previously disturbed location.

- The proposed coke oven gas cleaning technology would reduce atmospheric emissions of sulfurous compounds from the plant because the entire coke oven gas stream would be desulfurized, rather than only 60% of the stream that is cleaned by existing technology. The Sparrows Point Plant has received an Administrative Consent Order from the state of Maryland with regard to its violations of the state's "no visible emissions" regulation. The proposed action would improve local air quality and would enable the facility to attain its air quality permit requirements and the state regulations.

- Wastewater streams from the proposed system would reduce pollutant loadings of cyanide, ammonia, and phenols to the Coke Works biological treatment plant, which would improve treatment plant operating conditions. Discharges of effluent to Baltimore Harbor from the treatment plant would be in accordance with the National Pollutant Discharge Elimination System permit limitations. Existing effects on aquatic biota in the receiving waters would not be changed by the proposed project, because the characteristics of the existing effluent would either improve or remain unchanged.

- The groundwater in the confined Patuxent aquifer at the proposed project site is a potable supply and, therefore, a significant environmental resource. It would not be affected by the proposed project, because it is geologically isolated from the upper unconfined aquifer and therefore from surface contamination via spills and runoff. The unconfined aquifer, though not as important a resource in the region, would not be significantly impacted by project activities, because coke oven gas cleaning operations would be similar to existing operations and would be conducted in paved areas in which runoff and spills would be collected for treatment.

1. INTRODUCTION

In compliance with the National Environmental Policy Act (NEPA), this Environmental Assessment (EA) has been prepared by the U.S. Department of Energy (DOE) to evaluate the environmental impacts of a clean coal technology demonstration project that is proposed for cost-shared federal funding by DOE under the Innovative Clean Coal Technology (ICCT) program. The proposed action is a coke oven gas cleaning project to be conducted at the Bethlehem Steel Corporation (BSC), Sparrows Point Plant, in Baltimore County, Maryland.

1.1 BACKGROUND

In December 1987, Congress made funds available for the DOE ICCT Program by Public Law No. 100-202, An Act Making Appropriations for the Department of Interior and Related Agencies for the Fiscal Year Ending September 30, 1988. This act provided funds for the purpose of supporting cost-shared clean coal technology projects to demonstrate emerging coal utilization technologies that are capable of reducing atmospheric emissions of sulfur dioxide and oxides of nitrogen, and authorized DOE to conduct the ICCT program. On February 22, 1988, DOE issued a Program Opportunity Notice (PON) to solicit proposals for the conduct of the ICCT demonstration projects. The BSC proposal for a retrofitted coke oven gas cleaning system was selected for federal funding (along with 15 other clean coal technology proposals) from among 55 proposals received in response to the PON.

1.2 PURPOSE OF AND NEED FOR THE ACTION

The proposed action is intended to demonstrate the successful application of a practical, cost-effective coke oven gas cleaning technology that could be used by the U.S. coke-making industry to achieve compliance with environmental standards without replacing existing coke-making by-product facilities. The demonstration has been scaled to generate sufficient data from design, construction, and operation to enable private industry to assess the potential for commercial application of the technology.

This demonstration project is designed to achieve the objectives of the Clean Coal Technology Demonstration Program (CCTDP), of which the ICCT program is a part. CCTDP is a multi-phasic effort consisting of separate solicitations for clean coal technology projects (Fig. 1) intended to provide the U.S energy marketplace with an array of advanced, more

efficient, reliable, and environmentally sound coal utilization and pollution control technologies. The ICCT program, the second solicitation of the CCTDP, is intended to demonstrate technologies that are potentially more cost-effective than existing technologies and are capable of achieving significant reductions in sulfur dioxide (SO_2) and/or nitrogen oxide (NO_x) emissions from existing coal-burning facilities—in particular, those that contribute to acid rain and the issues of transboundary (U.S. and Canada) and interstate atmospheric pollution. The proposed action would reduce emissions of SO_2, cyanide, and volatile organic compounds (VOC) from the BSC Sparrows Point Plant.

1.3 NEPA STRATEGY

An overall strategy for compliance with NEPA was developed for the ICCT program, consistent with the Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508) and the DOE guidelines for compliance with NEPA (52 FR 47662, December 15, 1987). The strategy, which includes consideration of both programmatic and project-specific environmental impacts during and subsequent to the selection process, has three major elements.

The first element involves the preparation of a comparative programmatic environmental impact analysis (PEIA), based on information provided by the offerers and supplemented by DOE as necessary. The PEIA was issued by DOE as a public document (DOE/PEIA-0002) in September 1988. This environmental document analyzes the environmental consequences of the ICCT program and the technologies supported by the program compared with the "No Action" alternative. In the PEIA, the Regional Emission Database and Evaluation System was used to estimate the environmental impacts expected to occur in the year 2010 if each technology reaches full commercialization and captures 100% of its applicable market. The environmental impacts are compared with the "No-Action" alternative under which it is assumed that the use of conventional coal technologies would continue through 2010 with new plants using conventional flue gas desulfurization controls as needed to meet the New Source Performance Standards promulgated by the U.S. Environmental Protection Agency (EPA) (40 CFR Pt. 60) pursuant to the Clean Air Act (CAA). In addition, an analysis was made of the areas where environmental information was incomplete or unavailable and of the trade-offs between short-term uses and long-term productivity and the irreversible and irretrievable commitment of resources.

Continued commercial operation of the proposed coke oven gas cleaning system at the Sparrows Point Plant would result in the same impacts as the demonstration project; therefore, further impact analysis of commercialization is not provided in this EA.

During preparation of this EA, the following agencies and institutions were contacted.

- Maryland Department of the Environment
  - Air Management Administration
  - Hazardous and Solid Waste Management Administration
  - Water Management Administration
- Baltimore County Division of Air Pollution Control
- Maryland Department of Natural Resources
  - Water Resources Administration
  - Forest, Park, and Wildlife Services
  - Maryland Environmental Service
  - Tidewater Administration
- Maryland Department of Labor
  - Labor Statistics
- Maryland State Historical Society
- National Oceanic and Atmospheric Administration
  - National Marine Fisheries Service
- U.S. Fish and Wildlife Service
  - Northeast Regional Office
- University of Maryland Center for Environmental and Estuarine Studies
- Chesapeake Wildlife Heritage
- Chesapeake Bay Foundation

In addition, a site visit to the Sparrows Point Plant was conducted by DOE and representatives of Oak Ridge National Laboratory (ORNL), who prepared this document, and a meeting was held with the Maryland Air Management Administration.

2. THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROJECT LOCATION

The proposed demonstration project would be located at the BSC, Sparrows Point Plant, in Baltimore County, Maryland. The plant is located on 3000 acres (1214 ha) of the Sparrows Point Peninsula, about 10 miles (22 km) southeast of downtown Baltimore. The general location of the plant is shown in Fig. 2. The coke oven gas cleaning demonstration project would be located on 8.6 acres (3.5 ha) at the existing "B" Coal Chemicals Plant at the Sparrows Point Plant Coke Works, which is on the southernmost portion of the plant site. Figure 3 provides an aerial view of the proposed project location as it relates to the entire Sparrows Point Plant.

2.2 PROJECT DESCRIPTION

2.2.1 Existing Operations

2.2.1.1 Manufacturing processes

Three basic steel manufacturing operations are carried out at the Sparrows Point Plant: (1) pyrolytic conversion of coal to coke (carbon) in coke ovens; (2) combination of coke, iron ore, and limestone in a blast furnace to produce iron; and (3) refinement of iron to steel in oxygen or open-hearth furnaces. In 1988, the Sparrows Point Plant produced 3.9 million tons of steel products.

The Coke Works at the plant consists of three operational coke batteries, "A," "11," and "12," and two Coal Chemicals plants, "A" and "B." The coke batteries supply metallurgical coke for chemical reduction of iron ore in the blast furnaces. Bituminous coal is heated in a coke oven in the absence of air to remove its volatile components. About 70% of the coal feed is converted to coke; the remaining 30% consists of by-product gases and vapors. These by-product gases are treated in the Coal Chemicals plants to recover usable and marketable

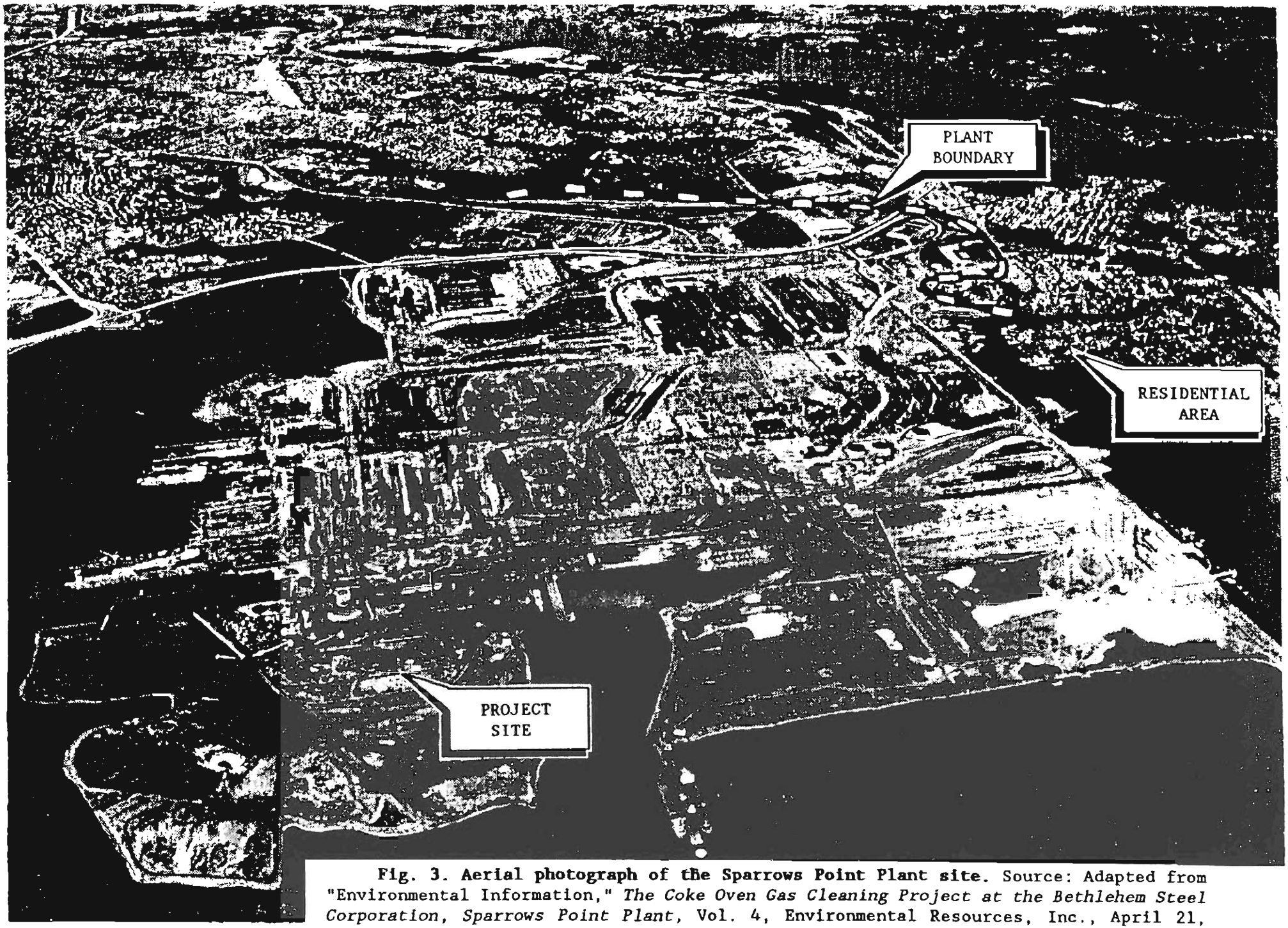


Fig. 3. Aerial photograph of the Sparrows Point Plant site. Source: Adapted from "Environmental Information," *The Coke Oven Gas Cleaning Project at the Bethlehem Steel Corporation, Sparrows Point Plant*, Vol. 4, Environmental Resources, Inc., April 21, 1989.

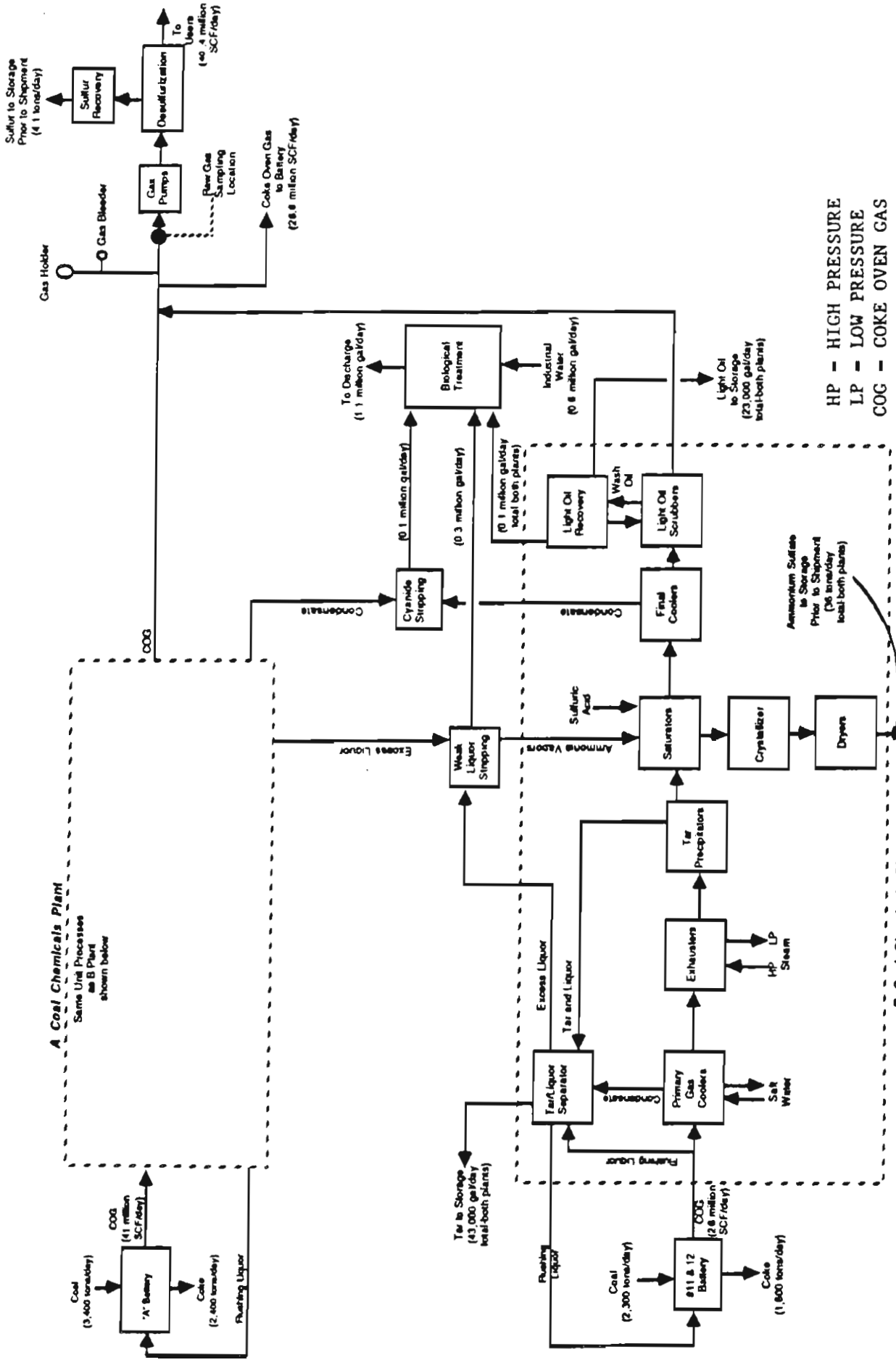


Fig. 4. Flow diagram for the existing coke oven gas cleaning processes at the Coal Chemicals Plants, Sparrows Point. Source: "Environmental Information," *The Coke Oven Gas Cleaning Project at the Bethlehem Steel Corporation, Sparrows Point Plant*, Vol. 4, Environmental Resources, Inc., April 21, 1989.

Liquid wastes from all Sparrow Point Plant operations are treated at three on-site wastewater treatment plants and are discharged to Baltimore Harbor under a National Pollutant Discharge Elimination System (NPDES) permit. Influents to one of the plants, a biological wastewater treatment system at the Coke Works, include the ammonia still effluent, light oil recovery unit wastewater, and cyanide stripper effluent from the Coal Chemicals plants.

Solid waste generated by existing operations at the Coke Works includes nonhazardous sludge from the wastewater treatment plant (900 lb/d). The sludge is discharged to the Back River Sewage Treatment Plant via the plant sewer line. Also, the existing Claus sulfur recovery plant replaces spent alumina catalysts (2-3 tons) at 5- to 8-year intervals. The spent alumina is also nonhazardous and is disposed of in a state-permitted on-site landfill (Joseph Mendelson, BSC, personal communication with Andrea Campbell, ORNL, September 1, 1989).

2.2.2 Demonstration Project

2.2.2.1 Construction activities

The proposed project would be constructed on the site of the "B" Coal Chemicals Plant and would be laid out as indicated in Fig. 5. While the proposed project area is about 8.6 acres (3.5 ha), the area required for new equipment installation is much less. The demonstration equipment would replace the existing NH_3 removal system, final coolers, H_2S removal system, and sulfur recovery system in both the "A" and "B" Coal Chemicals Plants. The existing tar recovery system and one of two light oil recovery systems would continue to be used.

Significant downtime of the coke oven gas cleaning system is not expected during construction and start-up of the new system. The new equipment would be installed while the existing plant is operational, and tie-ins to the coke oven gas mains would be done by hot-tapping (a routine utility tie-in activity during which a special valve and flange are attached to an operational line to enable drilling and hookup to be performed without disturbing gas flow). Figure 6 shows how the existing equipment and new equipment would be used in the proposed gas treatment system.

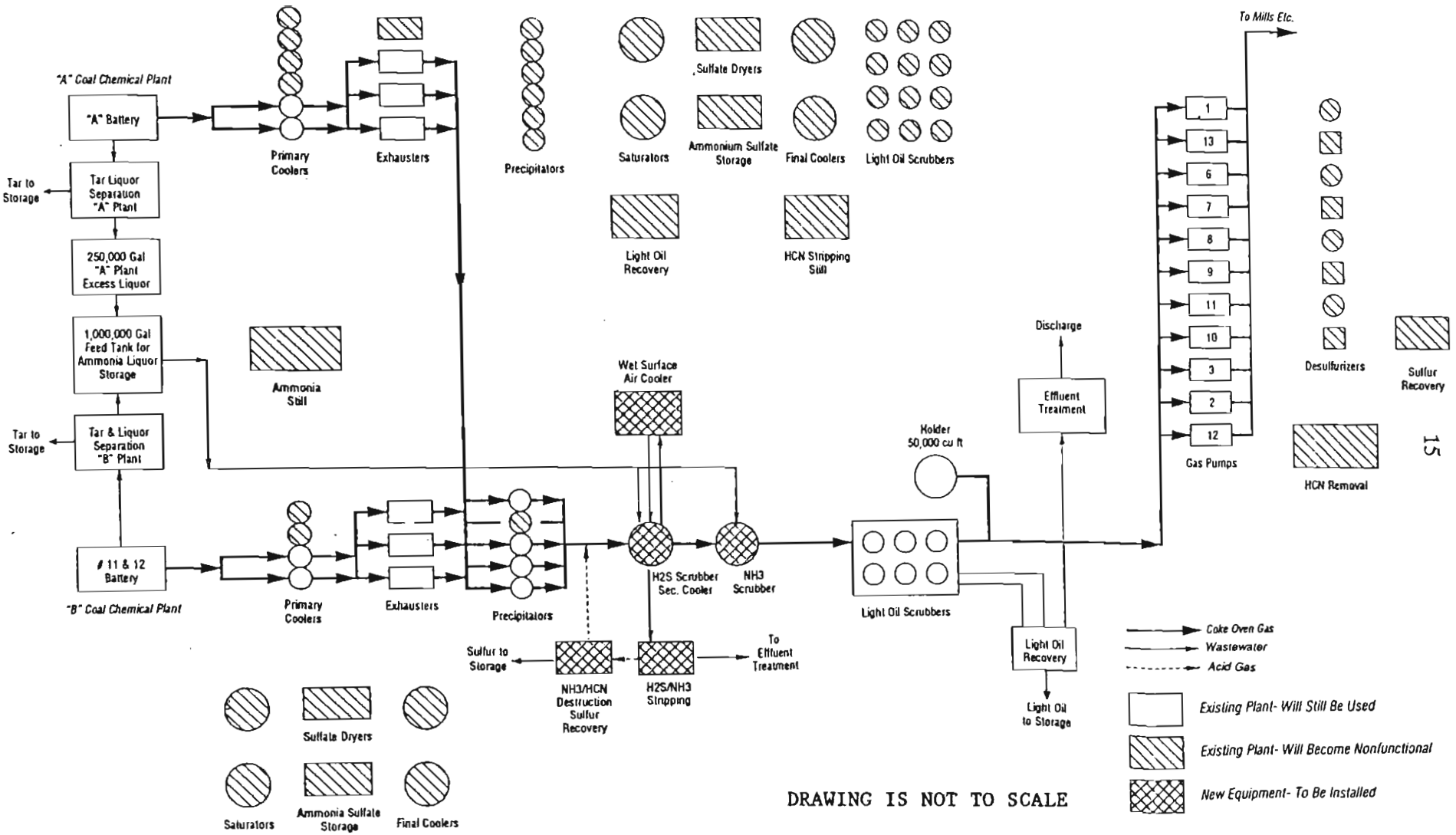


Fig. 6. New and existing coke oven gas cleaning equipment to be used in the Bethlehem Steel Corporation, Sparrows Point Plant, demonstration project. *Source:* "Environmental Information," *The Coke Oven Gas Cleaning Project at the Bethlehem Steel Corporation, Sparrows Point Plant*, Vol. 4, Environmental Resources, Inc., April 21, 1989.

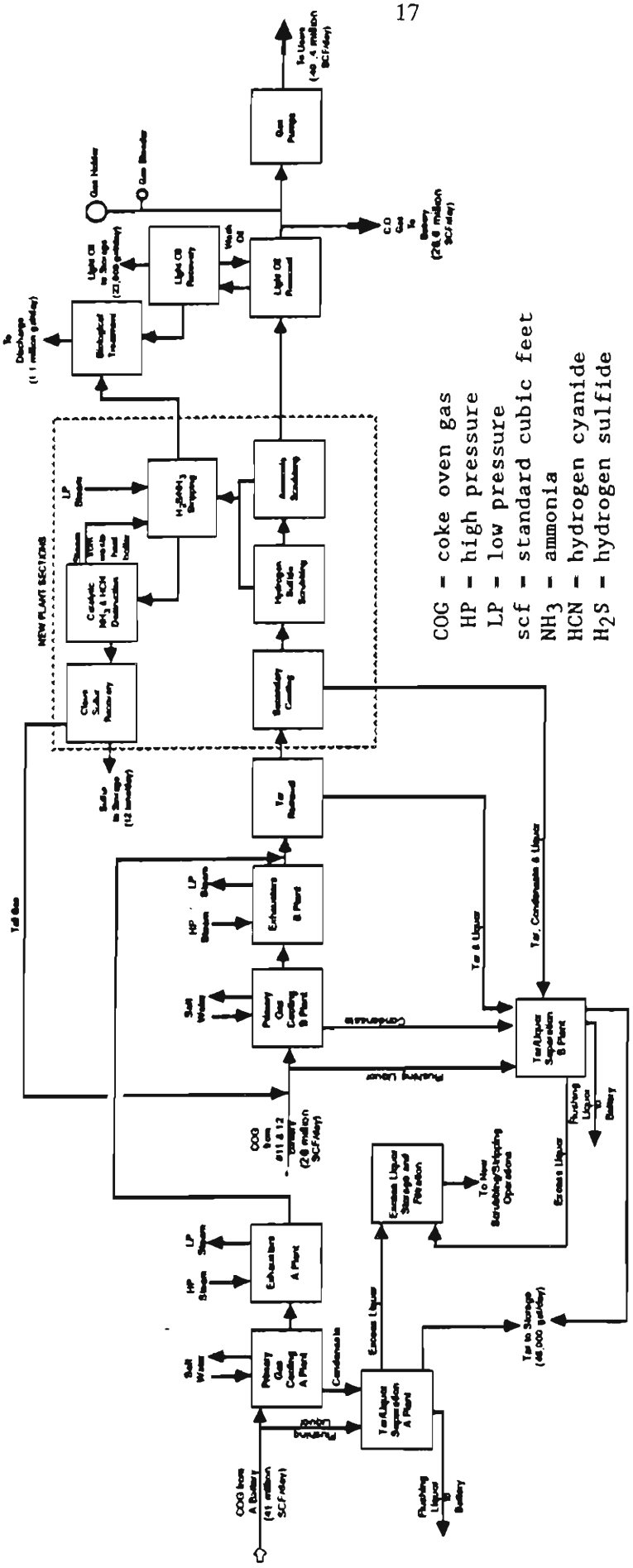


Fig. 7. Flow diagram of processes in the proposed coke oven gas cleaning demonstration project at the Bethlehem Steel Corporation, Sparrows Point Plant. Additions to the existing plant are illustrated within the dashed line. Source: "Environmental Information," *The Coke Oven Gas Cleaning Project at the Bethlehem Steel Corporation, Sparrows Point Plant*, Vol. 4, Environmental Resources, Inc., April 21, 1989.

Table 2. Resource requirements for existing and proposed coke oven gas cleaning process at Bethlehem Steel Corporation, Sparrows Point Plant[a]

Resource	Existing plant	Proposed plant
Land	8.6 acres ("B" Plant only)	No change
Potable water	20,800 gpd	32,000 gpd
Industrial water	580,000 gpd	910,000 gpd
Patapsco River water	28.6 million gpd	21.6 million gpd
Electricity	121,000 kWh/d	106,000 kWh/d
Steam	58,158 pounds/h	No change
Natural gas	151 million Btu/d	77 million Btu/d
Alkali	6.2 tons/d of lime	3.9 tons/d of sodium hydroxide

[a]Average daily values are based on continuous operation (Btu = British thermal units; gpd = gallons per day; kWh = kilowatt-hours).

Total emissions of SO_2 resulting from combustion of coke oven gas are expected to be approximately 2600 tons per year (Table 3). This rate is based on (1) a projected hydrogen sulfide concentration in the coke oven gas of 70 grains/100 scf [1000 parts per million (ppm)], (2) an actual gas flow rate of 67 million scf/d, and (3) continuous operation. As Table 3 indicates, this rate represents a net reduction of approximately 6300 tons per year of SO_2 (71%) from 1986 emissions of 8900 tons [the last year prior to the issuance of an Administrative Consent Order (see Sect. 5.1)].

For both the existing and proposed systems, total SO_2 emissions are associated with four emissions sources: combustion of coke oven gas in coke ovens, combustion of coke oven gas as a plant fuel, combustion of Claus plant tail gas, and combustion of acid gases during Claus plant shutdown. The first two sources represent emissions from the two general processes that use the coke oven gas as fuel. The third source is the combustion of the remaining sulfur in the tail gas following desulfurization at the Claus plant. The final source, which is only applicable during a shutdown of the Claus plant, is the combustion of acid gases removed from the coke oven gas in a standby incinerator. With the existing system, this practice occurs approximately

50% of the time because of scheduled and unscheduled maintenance; with the proposed plant, the practice is expected for only 2 weeks of the year when the plant is off-line for boiler inspections. Unscheduled maintenance is not anticipated because the plant will be new.

Table 3 indicates that reductions are expected for each of the four SO_2 emission sources. Emissions from combustion of coke oven gas in coke ovens would decrease by about 3500 tons per year (79%) because, unlike present practice, this portion of the gas stream (40% of the total stream) would be desulfurized. Emissions from combustion of coke oven gas as a plant fuel would be lowered by over 850 tons per year (40%) due to increased efficiency in removing sulfur from the gas. Emissions from combustion of Claus plant tail gas would be eliminated because the unburned tail gas would be recycled to the raw gas stream. Because Claus plant outages are expected to occur much less frequently, annual emissions from the standby incinerator are predicted to decrease by almost 2000 tons (85%).

At a steel plant, VOC are emitted by the final coolers; these will be eliminated by the new process. In addition, the installation of the new system would result in a significant decrease in fugitive VOC emissions at Sparrows Point because of the shutdown of one of two light oil recovery units and the replacement of old, leaking equipment with new equipment.

Wastewaters produced during normal operation of the proposed project would contain ammonia, hydrogen sulfide, hydrogen cyanide, and phenols. During normal operating conditions, the new hydrogen sulfide and ammonia removal and recovery system would discharge 202 gpm wastewater to the existing treatment plant at the Coke Works. Its approximate composition would be 20 ppm hydrogen sulfide, 150 ppm ammonia, 200 ppm carbon dioxide, 10 ppm hydrogen cyanide, and 350 ppm phenols, on the basis of operating data from similar plants. The existing light oil recovery plant waste would contribute an additional 35 gpm of wastewater to this flow. Blowdown from the boilers and the wet surface air cooler would generate approximately 120 gpm of wastewater which would be discharged without treatment.

A small amount of routine solid wastes would be generated by construction activity. Larger volumes of construction by-products would be salvaged for scrap. Excavation during preparation of foundations for new facilities would remove several hundred cubic meters of old construction fill (slag). This material would be stockpiled for reuse in future construction projects. Several existing tanks and associated piping would be taken out of service and salvaged for scrap (Joseph Mendelson, BSC, personal communication with W. P. Staub, ORNL, May 11, 1989).

2.3.2 Delayed Action

Delaying the installation and operation of the proposed coke oven gas cleaning technology would delay the environmental benefits of compliance with the Administrative Consent Order and also delay the availability of data and information on the process, which, in turn, would delay the commercial application of the technology. Further, delay of action would not be consistent with the framework and schedule of demonstrations defined by the CCTDP (see Fig. 1) and would not immediately contribute to the accomplishment of the objectives of the program.

2.3.3 Alternative Sites

In its selection of proposals for funding by the ICCT program, DOE considered the technical and environmental merit of the proposals. In the PON, DOE did not define limits for the location of the proposed demonstrations; therefore, proposals were received for projects located across the United States. Because the BSC proposal was designed to retrofit the Sparrows Point Plant, off-site alternative sites were not a viable consideration within the BSC proposal. Furthermore, the BSC proposal was intended not only to demonstrate an important technology for future commercial application but also to enable BSC to achieve compliance with an Administrative Consent Order (see Sect. 5.1) issued by the state of Maryland for control of emissions from the Sparrows Point Plant.

An on-site alternative to the proposed location of the demonstration at the "B" Coal Chemicals Plant would be to locate it at the "A" Coal Chemicals Plant. The "B" plant was chosen for the project because both its layout and the condition of existing equipment were better suited to the installation of the new system.

2.3.4 Alternative Technologies

Other commercially available hydrogen sulfide removal technologies could be used at the Sparrows Point Plant to treat the coke oven gas. Similarly, the existing coke oven gas cleaning process could be expanded to treat the entire gas stream rather than the 60% of the stream currently treated. However, if an alternative technology or full stream treatment with the existing process were chosen, the data and information to be gained by demonstration of the proposed technology would not be realized. The proposed process was selected because of its potential for economic and environmental improvement over existing technology.

3. THE AFFECTED ENVIRONMENT

3.1 NATURAL ENVIRONMENT

3.1.1 Climate and Air Quality

3.1.1.1 Climate

The climate of the Baltimore area can be characterized as continental because of the general flow of winds from west to east that brings air from the inland portion of the continent. Temperature varies considerably during the year, but precipitation is evenly distributed with an annual total of about 42 in. (107 cm). The area experiences four well-defined seasons. Severe weather usually occurs during the late spring and summer in the form of thunderstorms.

Prevailing winds are from the west in the Baltimore area. The average wind speed is approximately 9 miles (20 km) per hour, with highest wind speeds generally occurring in the winter and spring. Annual frequencies of wind direction and speed at nearby Baltimore/ Washington International Airport are depicted in a wind rose (Fig. 8). In this graph, the frequency of wind blowing from each direction is plotted as a bar that extends from the center of a circular diagram. Wind speeds are denoted by bar widths; the frequency of wind speed within each wind direction is indicated according to the length of the bar. Note that the points on the wind rose represent the directions from which the winds originate.

The Chesapeake Bay has a significant impact on the micrometeorology in the immediate vicinity of Sparrows Point. A land-sea atmospheric circulation is frequently established, which results in wind blowing from the bay during the day and toward the bay at night. The sea breeze in the daytime keeps temperatures cooler at the site than at similar inland areas.

3.1.1.2 Air quality

National Ambient Air Quality Standards (NAAQS) exist for the following criteria pollutants: particulate matter [less than or equal to 10 μm in diameter (PM_{10})], sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), and lead (Pb); Maryland has adopted the NAAQS as the state standards (Table 4). The Sparrows Point Plant is located in the southeastern corner of Baltimore County, which is in attainment with NAAQS for all pollutants except O_3 and PM_{10} (Ed Carter, Maryland Air Management Administration,

Table 4. National Ambient Air Quality Standards adopted by the state of Maryland

Pollutant	Averaging period	Standards ($\mu g/m^3$) Primary[a]	Standards ($\mu g/m^3$) Secondary[a]
Particulate matter ≤10-μm diam	Annual (arithmetic mean)	50	50
	24-h[c]	150	150
Sulfur dioxide	Annual (arithmetic mean)	80	
	24-h[c]	365	
	3-h[c]	1,300	
Nitrogen dioxide	Annual (arithmetic mean)	100	100
Ozone	1-h[d]	235	235
Carbon monoxide	8-h[c]	10,000	10,000
	1-h[c]	40,000	40,000
Lead	Calendar quarter	1.5	1.5
Gaseous fluoride[e]	24-h	1.2	1.2
	72-h	0.4	0.4

Source: 40 CFR Pt. 50; 40 CFR Pt. 52, Subpart V.

[a]Primary standards are set to protect human health; secondary standards are set to protect human welfare (e.g., livestock, vegetation, economic value of objects).

[b]Not to be exceeded more than three days in three years when data are adjusted to an everyday sampling schedule.

[c]Not to be exceeded more than once per year.

[d]Expected number of days in which one or more hourly ozone concentrations exceed this value must be less than or equal to 1.

[e]Applies to state of Maryland only.

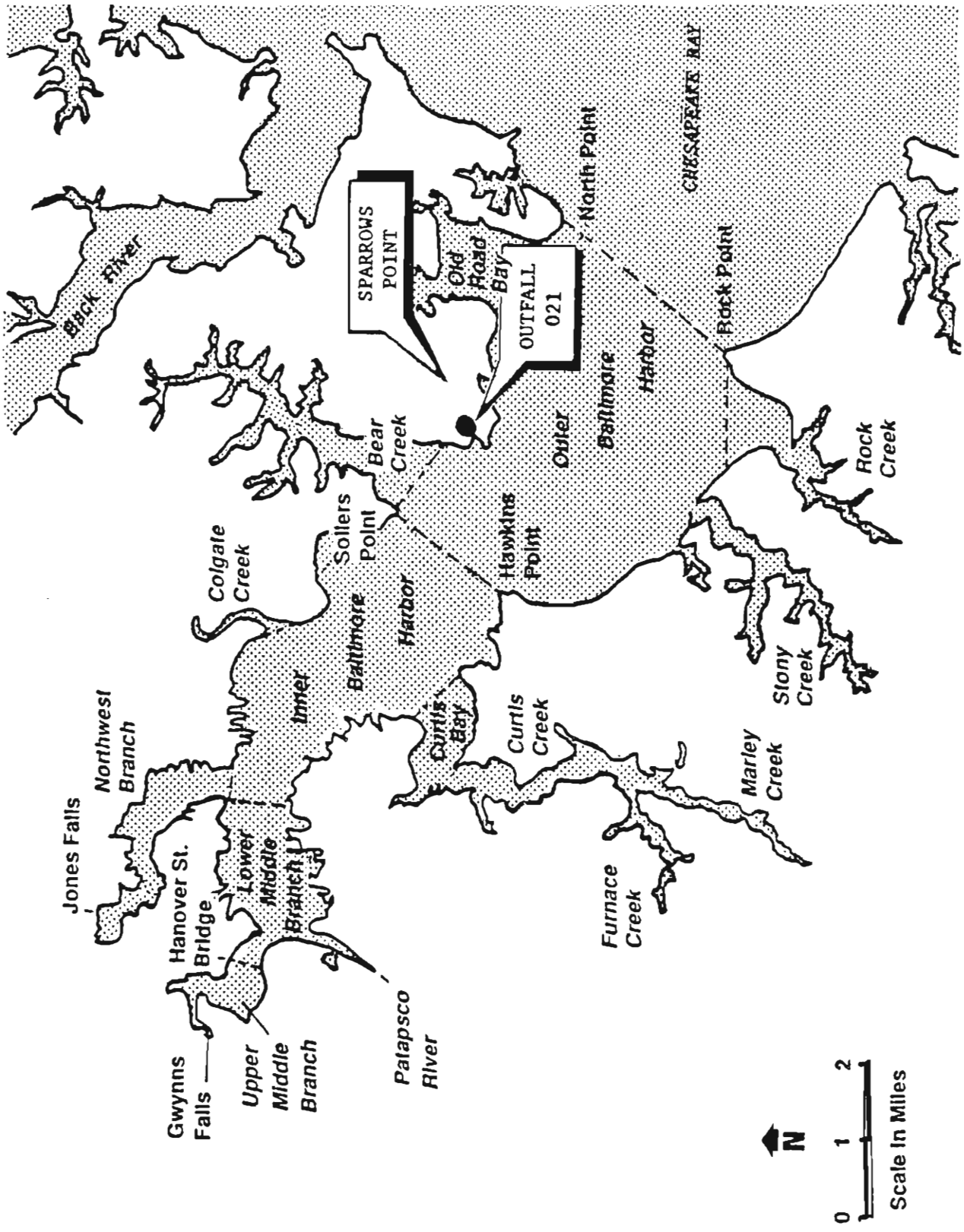


Fig. 9. Surface water resources in the vicinity of the Bethlehem Steel Corporation, Sparrows Point Plant. *Source:* Adapted from "Environmental Information," *The Coke Oven Gas Cleaning Project at the Bethlehem Steel Corporation, Sparrows Point Plant*, Vol. 4, Environmental Resources, Inc., April 21, 1989.

Table 5. Water quality criteria applicable to Class I waters (state of Maryland)

Property	Criteria
Bacteriological	There may not be any sources of pathogenic or harmful organisms in sufficient quantities to constitute a public health hazard. A public health hazard will be presumed: (i) If the fecal coliform density exceeds a log mean of 200 per 100 mL, based on a minimum of not less than five samples taken over any 30-d period; (ii) If 10% of the total number of samples taken during any 30-d period exceed 400 per 100 mL; or (iii) Except when a sanitary survey approved by the Department of the Environment discloses no significant health hazard, §D (3)(a)(i) and (ii) does not apply.
Dissolved oxygen	The dissolved oxygen concentration may not be less than 5.0 mg/L at any time.
Temperature	(i) The maximum temperature in accordance with §F of this regulation or with COMAR 26.08.03.03 may not exceed 90°F (32°C) or the ambient temperature of the surface waters, whichever is greater. (ii) thermal barrier that adversely affects aquatic life may not be established.
pH	Normal pH values may not be less than 6.5 or greater than 8.5.
Turbidity	(i) Turbidity may not exceed levels detrimental to aquatic life. (ii) Turbidity in the surface water resulting from any discharge may not exceed 150 units at any time or 50 units as a monthly average. Units may be measured in Nephelometer Turbidity Units, Formazin Turbidity Units, or Jackson Turbidity Units.

Table 6. Effluent limitations and monitoring requirements for Outfall 021 at the Bethelem Steel Corporation, Sparrows Point Plant[a]

Constituent	Effluent limitations (lb/d)				Monitoring requirements[b]	
	Avg.	Max.	Monthly avg.	Daily max	Measurement frequency	Sample type
Flow	N/A[c]	N/A	[d]	[d]	Continuous	Recorded
Total suspended solids	2837	5481	[d]	[d]	2/week	24-h composite
Oil and grease	N/A	708	N/A	[d]	2/week	3 grabs in 24 h
Phenols (4AAP)[e]	2.9	8.7	[d]	[d]	5/week	24-h composite
Ammonia as nitrogen[e]	1968	4724	[d]	[d]	2/week	24-h composite
Total cyanide	75.8	138	[d]	[d]	2/week	24-h composite
Benzene	N/A	0.69	N/A	[d]	1/month[f]	24-h composite
Naphthalene	N/A	0.69	N/A	[d]	1/month[f]	24-h composite
Benzo(a)pyrene	N/A	0.69	N/A	[d]	1/month[f]	24-h composite
GC/MS acid fraction organics[g]	N/A	N/A	[d]	[d]	1/month[f]	24-h composite

[a]Beginning on the effective date of the permit and lasting through the expiration date, the permittee is authorized to discharge from Outfall 021, monitoring point 121, consisting of coke oven wastewater. Such discharge shall be limited and monitored at discharge from coke oven wastewater treatment plant to Outfall 021 by the permittee as specified.

[b]The pH shall be monitored twice per week by grab sample but shall not be limited at this point.

[c]N/A = not applicable.

[d]Monitoring required without limits.

[e]These are interim limitations; the permittee has requested a 301(g) variance for these pollutants. EPA has decided to stay the Best Available Technology limits (346.4 lb/d average and 1176.4 lb/d maximum for ammonia, 0.69 lb/d average and 1.38 lb/d maximum for phenols) pursuant to Section 301(j) of the Clean Water Act. Until the expiration of the stay, the permittee must comply with the alternate limits.

[f]After 1 year following the date on which the final effluent limitations become effective, the monitoring frequency may be reduced to 1/quarter, provided that permittee has consistently complied with the effluent limitations.

[g]This requirement is effective only if and when a Section 301(g) variance for phenol (4AAP) is granted.

Table 8. Composition of treated coke plant wastewater from the Coke Works at Bethlehem Steel Corporation, Sparrows Point Plant[a]

Constituent	Concentration (mg/L)
Chemical oxygen demand	490
Total organic carbon	51.5
Total suspended solids	278
Ammonia as nitrogen	119
pH, units	7.0-7.1
Nitrate as nitrogen	<0.1
Total organic nitrogen	1.4
Oil and grease	2.3
Phosphorus, total as phosphorus	0.33
Sulfate	825
Aluminum	1.5
Magnesium	10.5
Manganese	0.09
Arsenic	0.02
Cadmium	<0.05
Chromium	0.09
Lead	0.25
Mercury	0.001
Nickel	<0.1
Selenium	0.08
Zinc	0.09
Cyanide	1.78
Phenols, total	<0.01
Bis(2-ethyl-hexyl)phthalate	0.036
Di-N-octyl-phthalate	0.013

[a]Data based on one analysis, as reported on U.S. Environmental Protection Agency's National Pollutant Discharge Elimination System Form 2C to the Maryland Department of the Environment, 1987. All other priority pollutants were below the limit of detection. Effluent flow was 0.75 million gallons/d.

Source: Appendix A, Environmental Resources Management, Inc., *Environmental Information Volume for the Coke oven Gas Cleaning Project at the Bethlehem Steel Corporation, Sparrows Point Plant,* April 21, 1989.

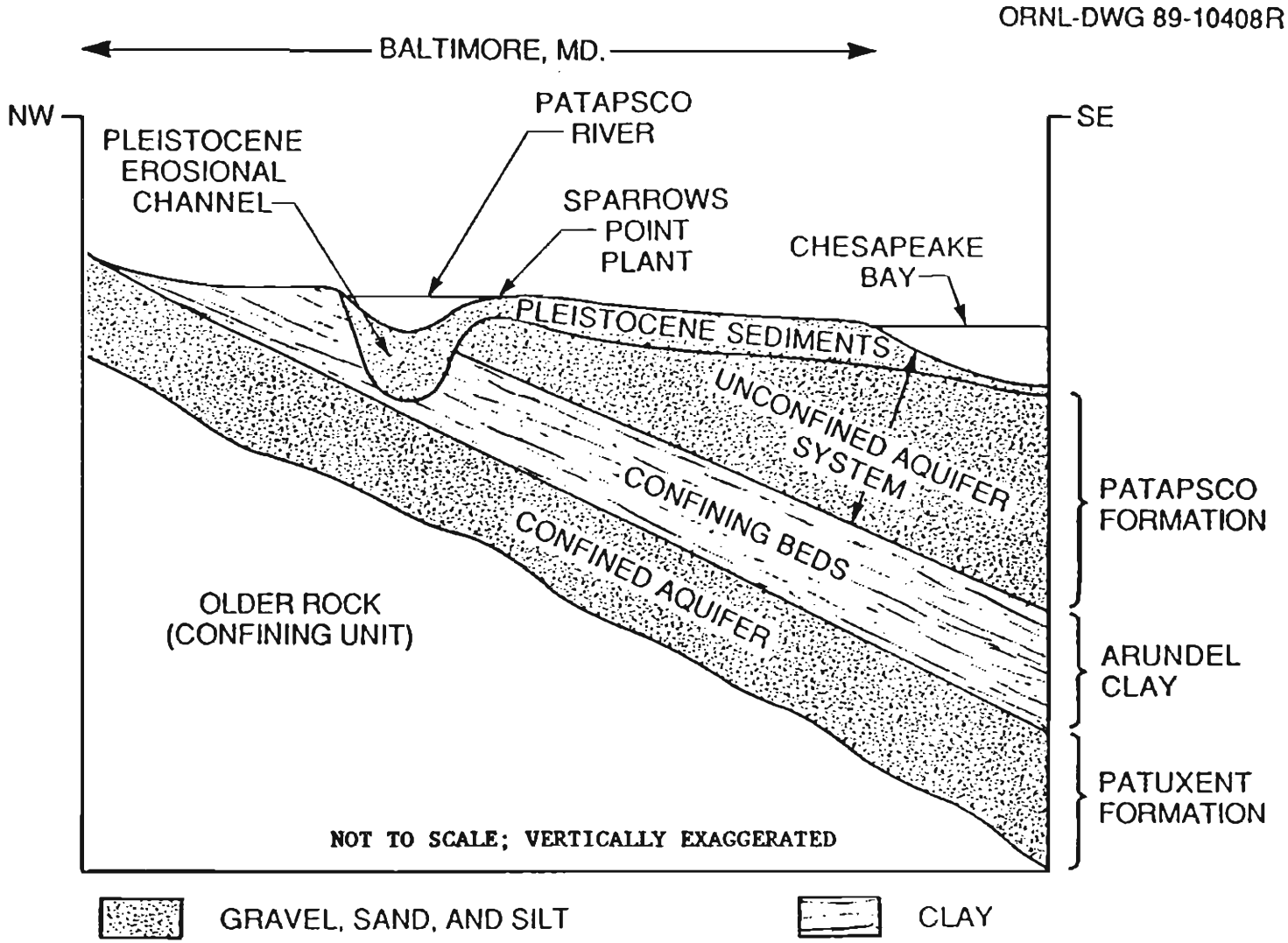
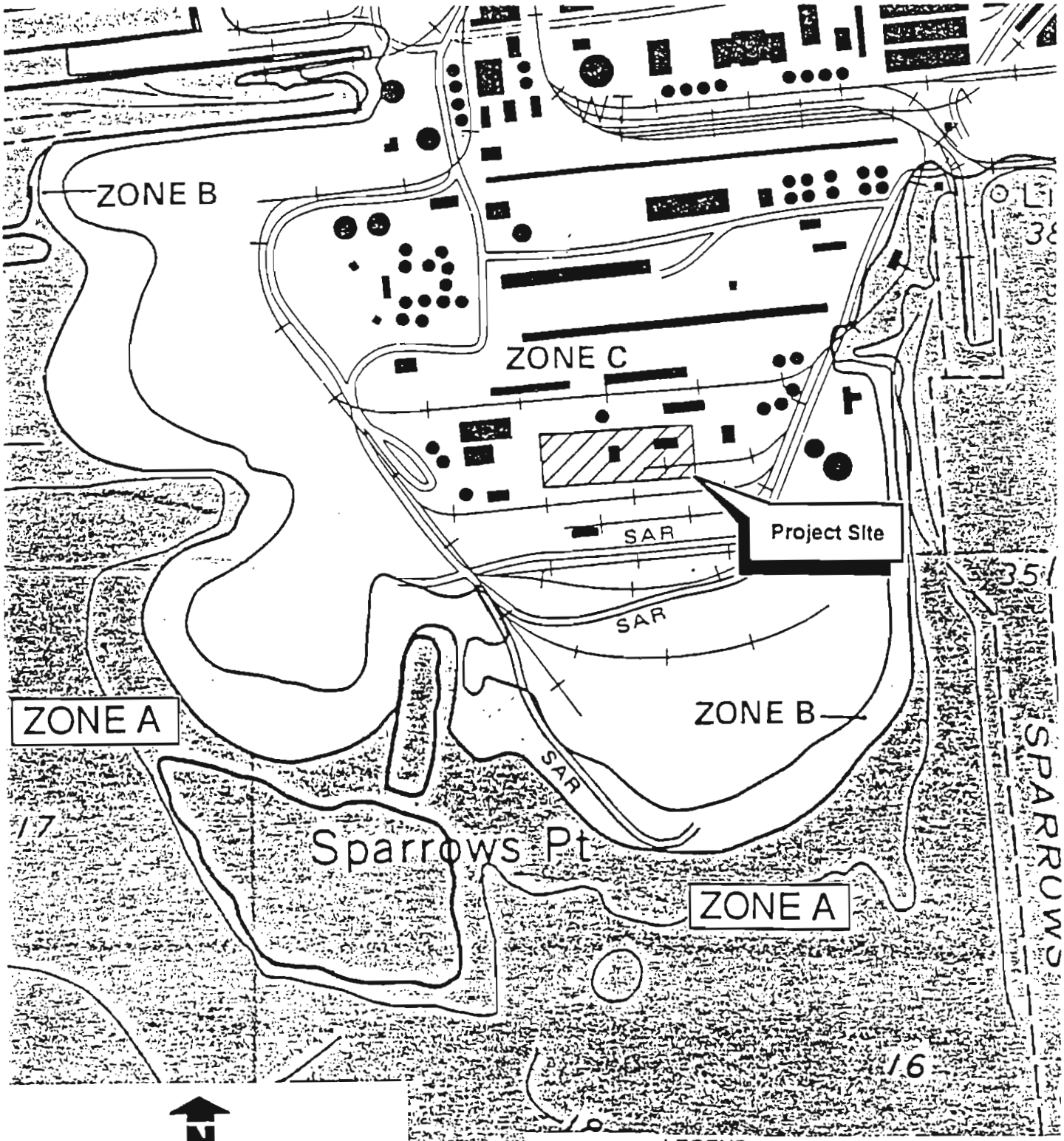


Fig. 10. Geologic cross section from central Baltimore through Sparrows Point. *Source:* Based on data from "Environmental Information," *The Coke Oven Gas Cleaning Project at the Bethlehem Steel Corporation, Sparrows Point Plant*, Vol. 4, Environmental Resources, Inc., April 21, 1989.



Source: Flood Insurance Rate Map, Baltimore Co., Maryland

Fig. 11. Flood zones at the Bethlehem Steel Corporation, Sparrows Point Plant.

BSC maintains a small security force on site. The plant and surrounding area are in the jurisdiction of the Baltimore County Police Department. An infirmary and facilities for emergency medical treatment are onsite. The plant also has access to the Baltimore County emergency helicopter service for medical emergencies that cannot be handled on site.

Housing for rent or purchase is widely available throughout the Baltimore area.

3.2.1.5 Utilities

The Sparrows Point Plant uses large quantities of water in its operation. Potable water is from the city of Baltimore; process water (treated effluent) from the Back River Sewage Treatment Plant; water for noncontact cooling from the Patapsco River; and a small amount of water required for contact cooling from well water. The whole plant uses about 14 million gal (5.3×10^4 m^3) of potable water from the city of Baltimore per day.

The Sparrows Point Plant also has significant energy requirements. In 1988, the plant used 814,000 MWh of electricity that was internally generated and 1,212,000 MWh of electricity from Baltimore Gas and Electric Company and purchased 19,400,000 million Btu of natural gas from Baltimore Gas and Electric (Joseph Mendelson, BSC, personal communication with J. W. Van Dyke, ORNL, April 14, 1989). The existing coke oven gas cleaning process requires about 44,000 MWh annually and 55,000 million Btu of natural gas. This usage represents about 2% of the plant's annual electricity consumption and less than 1% of annual natural gas consumption.

3.2.2 Cultural Resources

There are no recreational areas within 1 mile of the proposed site. Within 3 miles (5 km) of the site are Fleming Park, Fort Howard, Fort Armistead Park, Sparrows Point Country Club, and Fort Smallwood Park. There are two unconfirmed archaeological sites within 1 mile. They are underwater and thought to be locations of old piers. Both sites are over 1000 ft (305 m) from the project site. The National Register of Historic Places does not list any sites within 1 mile of the proposed project. Consultation regarding historic resources has been completed by DOE and the State Historic Preservation Officer (SHPO) (see Sect. 4.2.2).

Fort Carroll, about 2 miles (3 km) from the project site in Baltimore Harbor, is eligible for the National Register of Historic Places. The Sparrows Point Plant is visible from Fort Carroll (ERM 1989).

4. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.1 AIR QUALITY

4.1.1 Construction

Air quality impacts resulting from construction of the proposed project would be temporary, occurring for approximately 2 years during the construction period, and would be insignificant. Effects of construction equipment emissions are anticipated to be minimal. Removal of existing equipment and construction and installation of new equipment would generate fugitive emissions of dust at the project site, but fugitive emissions from construction are not expected to have a major impact on air quality for the following reasons. Construction of the proposed project does not involve substantial earth moving. All roads to be used for access to the construction site are paved, so any increase in traffic on roads in the plant area during construction should not result in large increases in airborne road dust. In addition, the area affected by the proposed project is less than 10 acres (4 ha) and is located in an area within the plant boundaries that has been previously developed.

4.1.2 Operation

Air quality would improve as a consequence of implementing the proposed project, primarily because of a reduction in emissions of sulfurous compounds. Particulate emissions are expected to decrease also, because the new gas cleaning system will clean all of the coke oven gas. Using an integrated system of four processes (see Sect. 2.2.2.1), the entire coke oven gas stream would be desulfurized, instead of only 60% of the stream as in current practice. Total SO_2 emissions from combustion of the coke oven gas are expected to decrease approximately 71% from 8897 to 2566 tons per year (see Table 3). This decrease is based on an assumed concentration of 1000 ppm H_2S in the coke oven gas (70 grains per 100 scf) or about one-third the permitted sulfur concentration limit [3000 ppm H_2S (213 grains H_2S per 100 scf)] (ERM 1989). Other assumptions include continuous operation of the gas cleaning system at a flow rate of 67 million scf per day.

Table 3 indicates that reductions are expected for each of the four sources contributing to total SO_2 emissions. Emissions from combustion of coke oven gas in coke ovens would decrease by about 3500 tons per year (79%) because, unlike present practice, this portion of

fuel-bound nitrogen content or heating value of the coke oven gas. Similarly, the proposed project is not expected to eliminate the odor associated with the coke ovens at the Sparrows Point Plant (Ronald E. Lipinski, Maryland AMA, personal communication with R. L. Miller, ORNL, March 30, 1989). The project may result in a slight improvement, but because the existing odor probably is associated to a large extent with the coke oven batteries themselves rather than the coke oven gas stream, the change is anticipated to be minimal.

During start-up and shutdown, the H_2S and NH_3 removal and recovery units would not be as efficient as during normal operation, which would result in higher concentrations of these compounds in the coke oven gas that exits the cleaning system and is combusted in plant processes. Therefore, SO_2 and NO_x emissions from in-plant combustion of the coke oven gas would also increase correspondingly. The H_2S and NH_3 removal and recovery processes are not expected to require scheduled outages, however. The design of the gas cleaning system includes a redundant ammonia stripping column. In the event either the hydrogen sulfide scrubber or ammonia scrubbing tower were shut down and restarted, equilibrium operating conditions would be reached within a few hours (ERM 1989). A Maryland state regulation mandates that SO_2 emissions from coke oven gas must average less than 1% for a 2-h period on a plant-wide basis. Because low-sulfur coal is being used, SO_2 emissions are not expected to exceed this standard during start-up and shutdown. Therefore, these emissions are not expected to be of concern. BSC is not required to notify the state of Maryland of an outage unless the upset is anticipated to last for an extended period of time (Ralph Hall, Maryland AMA, personal communication with R. L. Miller, ORNL, September 15, 1989).

4.2 SURFACE WATER RESOURCES

4.2.1 Construction

Project construction would occur in a previously disturbed land area. Construction would not be expected to cause impacts to surface water because of the distance from the project site to the harbor [~1000 ft (305 m)], the small area that would be disturbed, the level terrain of the project site, and the use of standard erosion and sedimentation control practices during construction.

the industrial water in-flow used as diluent prior to treatment would remain the same. The new system would add a combined blowdown stream (120 gpm) from the boiler and wet-surface air cooler, but this stream would bypass the treatment plant and would be discharged directly to Outfall 021. The total average stream flow to the Coke Works treatment plant would decrease by about 10% with the proposed technology.

Table 10. Changes in volumetric flow to the Coke Works biological wastewater treatment plant at the Bethlehem Steel Corporation, Sparrows Point Plant

Process wastewater stream	Existing flow (gpm)	Proposed flow (gpm)
Amonia still effluent	219	202
Cyanide stripper	50	0
Light oil recovery unit	35	35
Industrial water (diluent)	400	400
Total	704	637

Because of the decreased pollutant loadings to the treatment plant, effluent discharged to Baltimore Harbor during the demonstration project would be expected to have lesser concentrations of phenols, ammonia, and cyanide than at present. The composition of the effluent will not be known until operation of the new coke oven gas cleaning system begins. Nevetheless, the discharge will meet the limitations of the NPDES permit for Outfall 021, and no change in impacts to water quality is foreseen.

Upset conditions would occasionally be expected during the demonstration, although no more frequent or severe than those experienced with the existing coke oven gas cleaning system. Such upsets may result in shock loadings to the wastewater treatment system. However, because the plant was designed to treat a wastewater flow up to 1422 gpm, which is more than twice the average flow from the proposed technology, it would be expected to be capable of successfully treating increased flows or loadings due to process upsets.

4.5 AQUATIC ECOLOGY

4.5.1 Construction

The coke oven gas cleaning project would be constructed within the boundaries of the highly disturbed Sparrows Point Plant, approximately 1000 ft (305 m) from the nearest shoreline property. There are no freshwater habitats on the site, and the distance from the proposed site to the Patapsco River would prevent construction impacts to estuarine biota. A Sediment and Erosion Control Plan would be submitted to and approved by the Baltimore County Department of Public Works before any grading or construction occurs. Proper implementation of the approved plan would prevent significant impacts to aquatic resources from construction activities.

4.5.2 Operation

The proposed project would reduce cooling water requirements by approximately 24%. As a result, the existing impacts to Patapsco River biota from operation of the once-through cooling water system (e.g., effects of thermal discharges, impingement, entrainment) would be reduced. To the extent that water quality of treated wastewater is improved by the proposed project (Sect. 4.2), adverse effects to aquatic biota should also be reduced. Paving and curbing of the process area would permit the treatment of storm water that might otherwise run off into nearby surface waters and affect aquatic organisms. No significant impacts to aquatic biota are expected from normal operation of the project.

The Sparrows Point Plant has a Spill Prevention, Control, and Countermeasures Plan, which would be modified to include new operations under the proposed project. The new process area would be paved and curbed to collect spilled materials and contaminated runoff (Sect. 4.2), which would be treated prior to discharge to Baltimore Harbor. Because of these measures, significant adverse impacts to aquatic biota would not be expected from accidents during the demonstration project.

4.6 FLOODPLAINS AND WETLANDS

Because the proposed site is outside the 100-year floodplain, the project would not occupy or modify any floodplain.

4.7.3 Transportation

A slight increase in traffic during construction would result as workers arrive and depart the site and as materials and equipment are delivered. This temporary traffic increase would represent only small fluctuations within the normal range for the Sparrows Point Plant's capital construction activities and would not be significant.

Transportation during operation would not be expected to change from existing levels.

4.7.4 Infrastructure and Public Services

Because there would be no induced change in local population, there would be no associated effect on local infrastructure and public services such as schools, roads, and police. The increased value of the plant would be approximately $40 million. However, the taxable value of the Sparrows Point Plant would not increase, because industrial equipment is exempt from local taxes.

4.7.5 Utilities

Operation of the project would increase consumption of potable and industrial water (see Table 2). Potable water requirements from the city of Baltimore would increase by about 316,000 gal (948 m^3) per month, an increase of <0.1% of the total water consumption of the entire plant. This small increased requirement for potable water from the city of Baltimore would be insignificant and would not affect water supply for other uses. Industrial water requirements would increase by about 5.3 million gal (1.6×10^4 m^3) per month, representing a net increase of about 5% of total requirements for industrial water. Sparrows Point industrial water is taken from the Back River Sewage Treatment Plant. Currently, this source of water is in abundant supply and BSC is the only user. Increased use of this water would not have significant effect on the source. Electricity and natural gas requirements would decrease during the demonstration project (see Table 2); therefore, no negative impacts are foreseen.

4.8 CULTURAL RESOURCES

Consultation with the SHPO and the Advisory Council on Historic Preservation (ACHP) has resulted in a determination that there will be no adverse effect on the eligibility of the Sparrows Point Plant for the National Register of Historic Places [G. J. Andreve (SHPO) and

5. PERMITS AND REGULATORY COMPLIANCE

5.1 AIR QUALITY

The proposed project would require a Permit to Construct and an annually renewable Permit to Operate from the Maryland AMA. The amount of information required in the permitting process would depend on several factors to be decided upon by the AMA, such as whether the project is considered a new source or a modification to an existing source. Other areas of consideration include the applicability of Maryland's VOC regulations to the project, details of applying the proposed federal emissions standard for benzene at Coal Chemicals plants, and requirements of Maryland's Toxic Air Pollutant regulations pertaining to the project. No major obstacles to the air permitting process are expected, because the project involves installation of pollution control equipment and should eliminate the violations that led to the issuance of an Administrative Consent Order (Ronald E. Lipinski, Maryland AMA, personal communication with R. L. Miller, ORNL, March 30, 1989).

An Administrative Consent Order was issued on October 30, 1987, by the state of Maryland for the Sparrows Point Plant, primarily to address the presence of condensing sulfate emissions in the plumes from the coke oven battery stacks. The white plumes are in violation of opacity and particulate matter standards. No visible emissions (other than steam) are allowed from stationary sources in the Baltimore-Washington metropolitan area (with a few exceptions, such as variances for blast furnaces). The state of Maryland has ruled that the coke oven battery stacks are subject to the "no visible emissions" regulation. Stack testing (using EPA Method 5) indicated that both stacks were in violation of particulate matter standards.

Numerous discussions regarding reduction of sulfate emissions were held between BSC and the state of Maryland. BSC tried unsuccessfully to obtain a variance from the opacity standard and subsequently agreed to attempt to comply with opacity and particulate matter standards. The deadline in the original Consent Order to demonstrate compliance was October 31, 1990. On June 19, 1989, BSC and the state of Maryland amended the Consent Order to extend the date for demonstrating compliance to March 31, 1992 (final reports of stack testing to demonstrate compliance must be submitted to AMA by this date). The state is willing to allow this extension with the proposed project because it would incorporate additional benefits

require modification of the permit. Although the proposed facility would not trigger modifications of the existing permit, other ongoing regulatory reviews could modify the NPDES permit limitations at about the time the proposed facility would come on-line. If EPA denies BSC's request for a Sect. 301(g) waiver, more stringent effluent limitations for ammonia and phenols may be imposed (see Sect. 3.1.2). Additionally, the adoption of an individual control strategy for dischargers identified under Sect. 304(l) might result in changes of the effluent limitations for the coke plant wastewater discharge (see Sect. 3.1.2). However, these actions are independent of the proposed coke oven gas cleaning facility and would not directly affect the permitting of the project.

5.3 ECOLOGY

5.3.1 Threatened or Endangered Species

Informal consultation with the FWS, in compliance with Section 7 of the Endangered Species Act, has indicated that no federally proposed or listed threatened or endangered species or proposed or designated critical habitats would be impacted by this project (John P. Wolflin, FWS, letter to G. F. Cada, ORNL, April 12, 1989). The Maryland Department of National Resources (MDNR) has also reported that there are no known state threatened and endangered species at the project site (Appendix D in ERM 1989). In addition, the National Marine Fisheries Service has determined that the project will not adversely affect the shortnose sturgeon or its habitat (Doug Beach, NMFS, letter to G. F. Cada, ORNL, September 19, 1989).

5.3.2 Floodplain/Wetlands

Because the proposed project would not occupy or modify any floodplain or destroy or modify any wetlands, a floodplain/wetlands assessment in accordance with 10 CFR Pt. 1022 (DOE Regulations for Compliance with Floodplains/Wetlands Environmental Review Requirements) would not be required.

project is consistent with Maryland's coastal zone managment program (James M. Teitt, MDNR, Tidewater Administration, letter to Edward Simek, Environmental Resources Management, Inc., Annapolis, MD, July 6, 1989).

6. FINDINGS

The impacts expected from the proposed action have been evaluated relative to ten criteria specified by the CEQ (40 CFR Pt. 1508.27). The results of this evaluation follow.

1. Both beneficial and adverse impacts

The foremost beneficial effect of this project would be to demonstrate the economic viability and environmental acceptability of the coke oven gas cleaning technology for future commercial applications. Coal is a significant energy resource of the United States. This proposed action would provide coal-consuming steel manufacturing plants capable of retrofitting coke oven cleaning systems with a technology that reduces atmospheric emissions and, thus, improves air quality. For the BSC Sparrows Point Plant specifically, reduction in emissions of sulfurous compounds is expected to result in compliance with opacity and particulate matter standards in accordance with the Administrative Consent Order issued by the state of Maryland. The proposed project would also have a positive, although small and temporary, impact on the local economy during a 23-month construction period.

No adverse impacts would be expected from the proposed action.

2. Public health and safety

Public health and safety would not be affected by this project.

3. Unique characteristics of the geographical area

No parks, wilderness areas, wild and scenic rivers, refuges, or national natural landmarks are located near the site. Historic and cultural resources that have been identified can be avoided or protected to prevent significant adverse impacts.

4. The degree of expected controversy

The proposed project is not expected to generate significant public controversy.

5. Level of uncertainty of impacts or uniqueness of risks to the human environment

The proposed project has no uniqueness or uncertainty that would affect the conclusion that no significant impacts would occur to the human environment.

7. LIST OF PREPARERS

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