

INNOVATIVE COKE OVEN GAS CLEANING SYSTEM

FOR

RETROFIT APPLICATIONS

QUARTERLY ENVIRONMENTAL MONITORING REPORT NO. 4

FOR THE PERIOD COVERING

JANUARY 1, 1992 THROUGH MARCH 31, 1992

PARTICIPANT

BETHLEHEM STEEL CORPORATION

BETHLEHEM, PA

PREPARED FOR THE UNITED STATES DEPARTMENT OF ENERGY

UNDER COOPERATIVE AGREEMENT NO. DE-FC22-90PC89658

NOVEMBER 4, 1992

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SECTION 1.0 INTRODUCTION

Bethlehem Steel Corporation (BSC), in conjunction with the Department of Energy (DOE) is conducting a Clean Coal Technology (CCT) project at its Sparrows Point, Maryland Coke Oven Plant. This project combines several existing technologies into an integrated system for removing impurities from Coke Oven Gas (COG) to make it an acceptable fuel. DOE is providing cost-sharing under a Cooperative Agreement with BSC.

This Cooperative Agreement requires BSC to develop and conduct an Environmental Monitoring Plan (EMP) for the Clean Coal Technology project and to report the status of the EMP on a quarterly basis. This report is the second quarterly status report of the EMP. It covers the Environmental Monitoring Plan activities for the period January 1, 1992 through March 31, 1992

See Sections 2, 3 and 4 for status reports of the Project Installation and Commissioning, the Environmental Monitoring activities and the Compliance Monitoring results for the period. Section 5 contains a list of Compliance Reports submitted to regulatory agencies during the period.

1.1 EMP Purpose

The EMP describes in detail the environmental monitoring activities to be performed during the project execution. The purpose of the EMP is to: (1) document the extent of compliance of monitoring activities, i.e. those monitoring required to meet permit requirements, (2) confirm the specific impacts predicted in the National Environmental Policy Act documentation, and (3) establish an information base for the assessment of the environmental performance of the technology demonstrated by the project.

1.2 EMP Scope

The EMP as approved by DOE, specifies the streams to be monitored (e.g. clean coke oven gas, ammonia still effluent), and the species to be analyzed (e.g. sulfur compounds, nitrogen compounds, trace elements, etc.). The operation and frequency of the monitoring activities is specified, as well as the timing for the monitoring activities related to project phase (e.g. construction, pre-operational, operational, post-operational). Within the five project phases, monitoring is broken down into two types. COMPLIANCE monitoring is that which is or will be required under existing and/or anticipated regulatory requirements or permit conditions. SUPPLEMENTAL monitoring includes

data gathering activities deemed important to measure operational or environmental performance, but not required to be measured by permits or regulations. A list of the Compliance and Supplemental sample streams is given in Table 1-1.

### 1.3 Project Description

The coke plant at the Sparrows Point Plant consists of three coke oven batteries (A, 11 and 12) and two coal chemical plants (A and B). The by-product coke oven gas (COG) consists primarily of hydrogen, methane, carbon monoxide, nitrogen, and contaminants consisting of tars, light oils (benzene, toluene, and xylene) hydrogen sulfide, ammonia, water vapor, and other hydrocarbons. This raw coke oven gas needs to be cleaned of most of its contaminants before it can be used as a fuel at other operations at the Sparrows Point Plant.

In response to environmental concerns, BSC decided to replace much of the existing coke oven gas treatment facilities in the two coal chemical plants (A and B) with a group of technologies consisting of;

- o Secondary Cooling of the Coke Oven Gas
- o Hydrogen Sulfide Removal
- o Ammonia Removal
- o Deacidification of Acid Gases Removed
- o Ammonia Distillation and Destruction
- o Sulfur Recovery

The installation of this combination of technologies will replace the existing ammonia removal system, the final coolers, hydrogen sulfide removal system and the sulfur recovery system. The existing wastewater treatment, tar recovery and one of the three light oil recovery systems will continue to be used to support the new, innovative combination of COG treatment technologies. Figures 1-1 and 1-2 are simplified block diagrams of the new COG treatment process.

### 1.4 EMP Sampling Programs

The EMP consists of a Compliance Monitoring Sampling Program and a Supplemental Monitoring Sampling Program. The Compliance Monitoring Sampling Program will be conducted during a summer and a winter Baseline periods during the Pre-Construction/Construction phases of the Project and during a summer and a winter period following the successful Startup and Operational phase of the completed Project.

Compliance monitoring consist of conducting all the sampling and observation programs associated with existing required Federal, State, and Local Regulations, Permits and Orders. These include air, water, and waste monitoring and OSHA and NESHAP monitoring.

The Supplemental Monitoring Program will also be conducted during a summer and a winter Baseline periods during the Pre-Construction/Construction phases of the Demonstration Facility and during a summer and a winter period following the successful startup and Operational phase of the completed Facility.

Supplemental Monitoring includes sampling of 27 additional streams that are important to measure operational or environmental performance and impacts of the installation of the new COG treatment facilities.

Collecting Compliance Monitoring data and Supplemental Monitoring data during the Baseline and Operational Phases of the Facility will provide a basis for comparing and estimating the impact of the Demonstration Facility on the compliance streams and important influent and effluent streams of treatment facilities.

Collecting Compliance monitoring data and Supplemental Monitoring data during summer and winter periods will provide a basis for demonstrating the impact of ambient temperature on the performance of the Demonstration Facility and hence, the impact on the compliance streams. This is important since the solubility of the hydrogen sulfide and ammonia contaminants in the COG are temperature dependant and the performance of the wet surface air cooler equipment at the initial part of the Demonstration Facility will be impacted by the ambient summer and winter temperatures and humidities.

#### 1.5 Contents of EMP Reports

The quarterly and annual EMP reports will present information on the status of planned supplemental and compliance environmental monitoring activities. It will also contain a brief summary of the results of these monitoring activities. The sampling campaign reports will contain all of the data collected during the various sampling campaigns.

TABLE 1-1 ENVIRONMENTAL MONITORING PLAN SAMPLE STREAMS  
List of Compliance and Supplemental Monitoring Streams

A. List of Compliance Streams (Sampled during all Phases of Project)

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1. PERMITTED STREAMS

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STREAM      STREAM NAME

Gaseous

G-1      Battery 'A' Stack Gas  
G-2      Battery 11 Stack Gas  
G-3      Battery 12 Stack Gas

Aqueous

A-5      Monitoring Point 121-Effluent from Waste Water Treatment Plant  
A-6      Outfall 021-Discharge to Patapsco River

Solids

S-4      Sludge Blowdown to BRWWTP from Waste Water Treatment Plant

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2. BENZENE NESHAP WASTEWATER STREAMS

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A-7      Tar Sludge Decanter  
A-8      'A' Flushing Liquor Strainer  
A-9      'B' Secondary Decanter  
A-10     Final Cooler Emulsified Oil  
A-11     Final Cooler Condensate  
A-12     Desulfurizer Blowdown  
A-13     Coke Oven Drip Condensate  
A-14     Gas Pump Tank Condensate  
A-15     Light Oil Still Drainage  
A-16     Vapor Oil Exchanger Condensate  
A-17     Primary Light Oil Condensate  
A-18     Secondary Light Oil Condensate  
A-19     'B' Reflux Condensate  
A-20     Centrifuge Water  
A-21     Vapor Oil Exchanger and Centrifuge Condensate  
A-22     Secondary Light Oil Tank Drainage

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3. OSHA WORKER EXPOSURE DATA-Quarterly Monitoring of Coke Oven and  
Coal Chemical Worker Exposure

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TABLE 1-1 ENVIRONMENTAL MONITORING PLAN SAMPLE STREAMS  
List of Compliance and Supplemental Monitoring Streams - continued

B. List of Supplemental Streams

1. Sampled During Pre-Construction/Construction and Operational Phases

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<u>STREAM</u>	<u>STREAM NAME</u>
<u>Gaseous</u>	
G-1,G-7	Battery 'A' Stack Gas
G-2	Battery 11 Stack Gas
G-3	Battery 12 Stack Gas
G-5	Blast Furnace Gas to Mixing Station
G-6	Mix Gas to Coke Oven Underfire Burners
G-23	Coke Oven Gas to Mixing Station
<u>Aqueous</u>	
A-24	Composite Feed from Equilization Tank
A-42	Fixed Ammonia Still Wastewater
<u>Solids</u>	
S-26	Coal Mix Feed to Coke Ovens
S-27	Coke Product

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OSHA WORKER EXPOSURE DATA-Quarterly Monitoring of Coke Oven and  
Coal Chemical Worker Exposure

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2. Sampled During Operational Phase of Project

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<u>STREAM</u>	<u>STREAM NAME</u>
<u>Gaseous</u>	
G-25	Coke Oven Gas to Secondary Cooler
G-29	Coke Oven Gas to H2S Scrubber
G-41	Coke Oven Gas to Light Oil Scrubber
G-54	Air to Catalytic Oxidizer
G-55	Process Gas to Claus Plant
G-57	Tail Gas to Primary Cooler
<u>Aqueous</u>	
A-28	Flushing Liquor and Tar to Tar Decanter
A-31	Flushing Liquor to Secondary Cooler
A-39	Excess Flushing Liquor to Ammonia Scrubber
A-40	Stripped Liquor from Ammonia Still
A-42	Fixed Ammonia Still Wastewater
A-45	NaOH to Fixed Ammonia Still
<u>Solids</u>	
L-32	Tar to Sump of Secondary Cooler
L-56	Sulfur Product from Claus Plant
S-58	Catalytic Oxidizer Spent Catalyst
S-59	Claus Unit Spent Catalyst

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Figure 1-1  
 Bethlehem Steel's Innovative  
 Coke Oven Gas Cleaning System

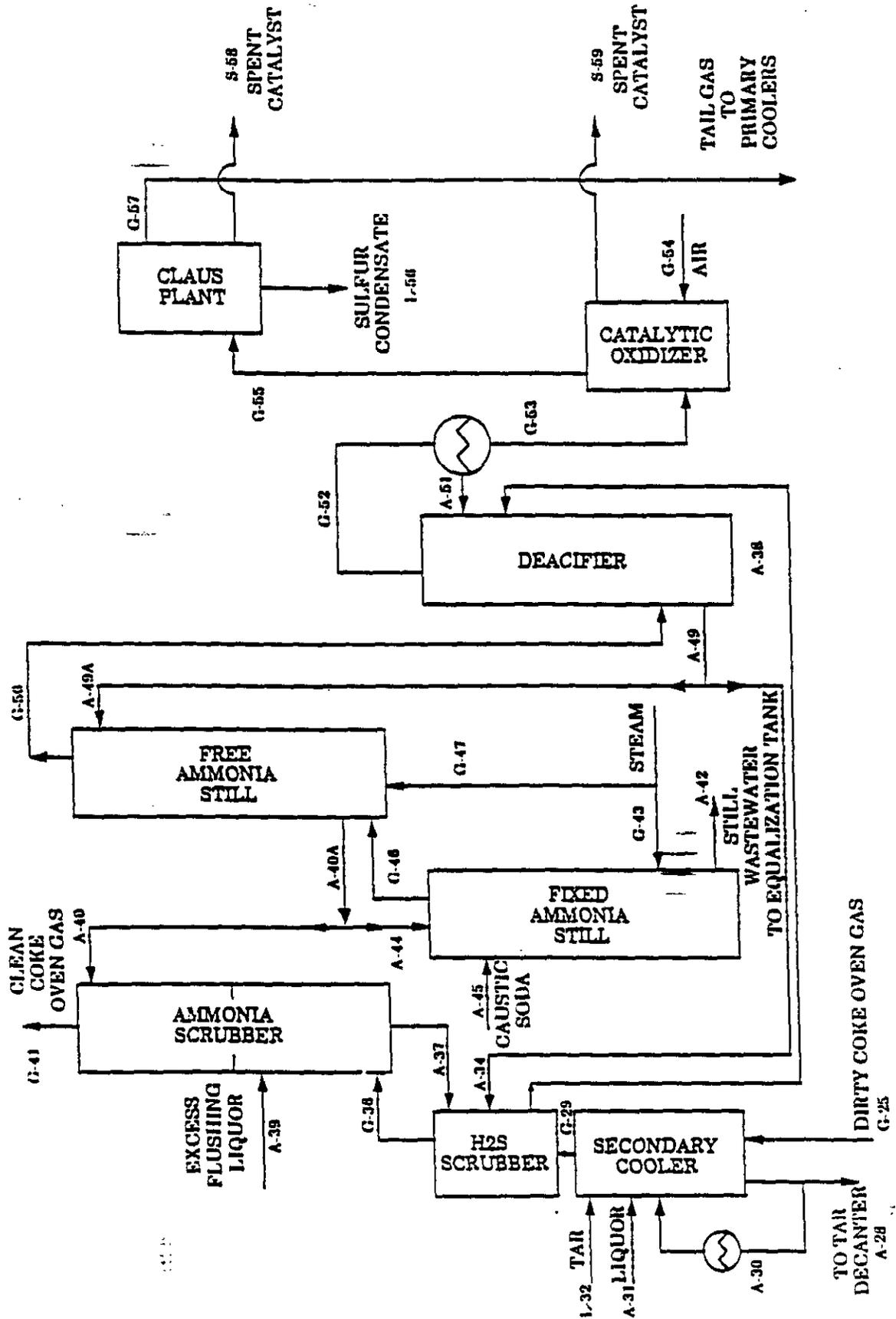
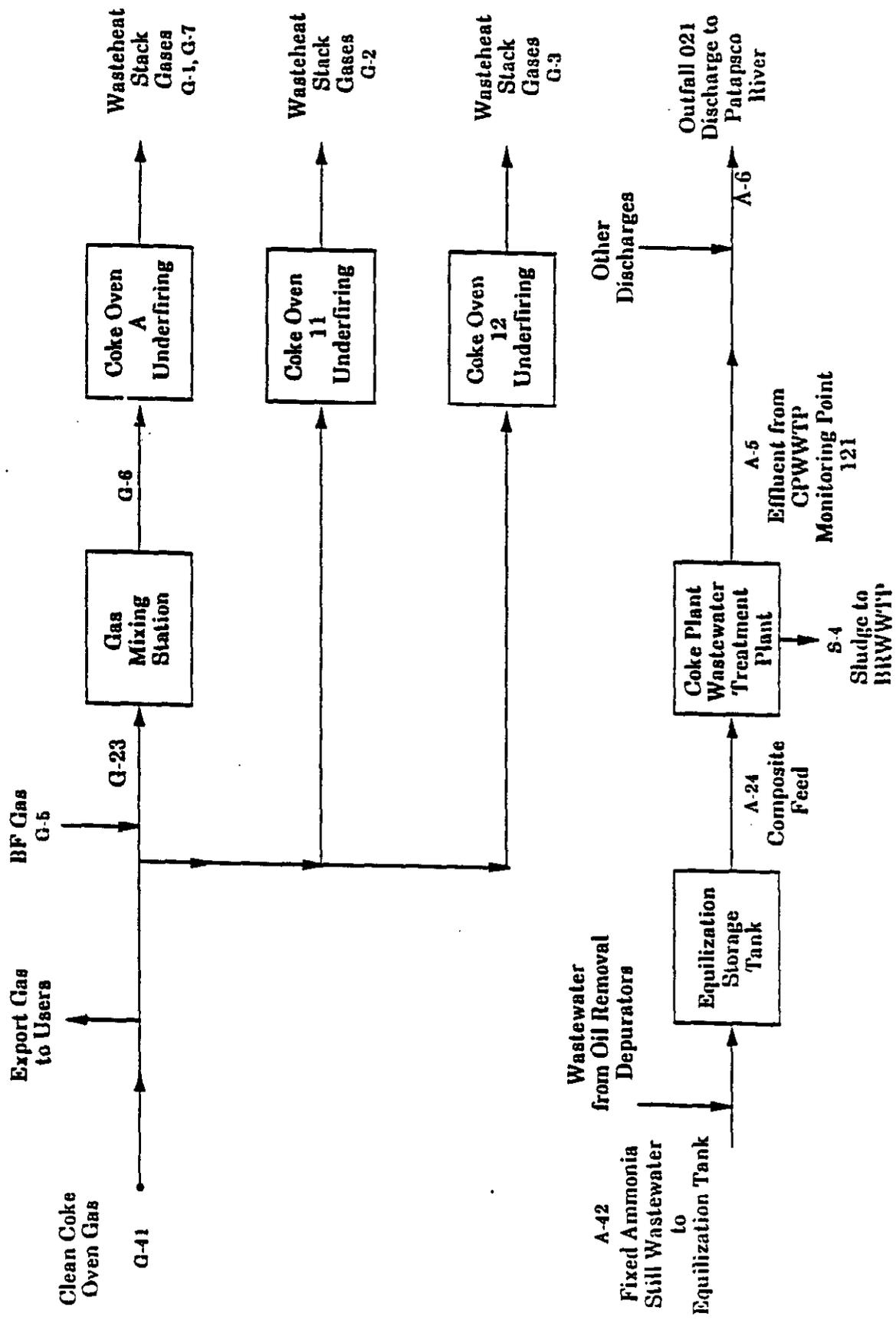


Figure 1-2  
**Bethlehem Steel's Innovative  
 Coke Oven Gas Cleaning System**  
**Utilization, Treatment and Disposal of Principal Process Product Streams**



## SECTION 2.0 PROJECT STATUS

### 2.1 Installation and Commissioning of Clean Coal Technology (CCT) Facilities

Construction and Commissioning Status. As of the end of March, 1992 the Project Status as noted in the March, 1992 Monthly Report was as follows;

	<u>Percent Complete</u>
Engineering	100 %
Materials Ordered	100 %
Materials Delivered	100 %
Construction	100 %

Construction of the CCT facilities was completed on December 6, 1991.

Significant Events and Comments. As previously reported, all coke production at Sparrows Point was suspended on December 5, 1991. On January 24, 1992 the "hot idle" status of the coke batteries ended when the batteries were allowed to go cold. Resumption of coke production, operational testing and supplemental environmental monitoring of the CCT facilities have been deferred pending rebuilding of coke production capacity at the Sparrows Point plant. Mothballing of the CCT facilities has been completed.

### 2.2 Environmental Monitoring Plan

The final version of the Environmental Monitoring Plan was issued on July 5, 1991 and sent to the Department of Energy on July 25, 1991.

## SECTION 3.0 ENVIRONMENTAL MONITORING STATUS

### 3.1 Overall Schedule

Figure 3-1 shows the overall schedule of the Innovative Coke Oven Gas Cleaning Project including the design and construction Phases (Phases I and II) and the Environmental and Operational Monitoring Phase (Phase III).

The Environmental Compliance Monitoring portion of the EMP is continuing throughout the duration of the project.

The Environmental Supplemental Monitoring portion of the EMP began with the winter baseline sampling period conducted in March, 1991 and continued with the conduct of the summer baseline sampling period in August, 1991.

Operational Environmental Supplemental Monitoring was scheduled to begin in the first quarter 1992 following startup of the CCT facilities. However, as a result of the suspension of coke production at the Sparrows Point, all Operational Supplemental Environmental Monitoring has been suspended.

### 3.2 Planned Activities for the Period (1992)

Gaseous, Aqueous and Solid Streams. Operational Environmental Compliance Monitoring Sampling was scheduled as required by Federal, State, and local government regulations.

The winter sampling program of the Operational Supplemental Environmental Supplemental Monitoring Programs was scheduled for the period January through March, 1992. The streams to be sampled are listed in Tables 3-1 and 3-2.

OSHA Supplemental Personnel Monitoring. Supplemental Personnel Monitoring for personnel exposure to hydrogen sulfide, ammonia, carbon monoxide, and fugitive hydrocarbons was scheduled for the period January to March, 1992 for the Coal Chemical plant area.

### 3.3 Completed Activities This Period (1992)

Gaseous, Aqueous and Solid Streams. The Compliance Monitoring Sampling Program was completed as required by Federal, State, and Local regulations. However, as a result of the suspension of coke production at Sparrows Point, there was no compliance sampling conducted for the gaseous emissions listed on Table 1-1 (Battery 'A', Battery 11 and Battery 12 stack gases) since there were no emission from these stacks.

During the period there were residual liquid discharges from the monitoring point 121 and outfall 021 as a result of emptying and cleaning of pipelines and storage tanks following the shut down of cokemaking operations. These residual liquids were processed in the wastewater treatment system prior to discharge.

During the period there was no sampling of the sludge blowdown to BRWWTP from Waste Water Treatment Plant.

All planned Operational Supplemental Environmental Monitoring Program activities was deferred as a result of the suspension of coke production at Sparrows Point.

All planned OSHA Supplemental Personnel Monitoring scheduled for the Coal Chemical plant area was deferred as a result of the suspension of coke production at Sparrows Point.

3.4 Problems With Sampling and Analytical Efforts

There were no major problems with the Compliance Monitoring Sampling Program.

3.5 Plans For the Next Reporting Period (2Q92)

The collection of the Compliance Monitoring Samples will continue as required by Federal, State, and Local regulations.

No Operational Supplemental Environmental Monitoring is planned for the second quarter 1992.

3.5.1 Preparation of Baseline Environmental Monitoring Report

During the second quarter of 1992 compiling and analyses of the data collected during the 1991 baseline period will begin.

FIGURE 3-1 OVERALL SCHEDULE OF INNOVATIVE COKE OVEN GAS CLEANING PROJECT

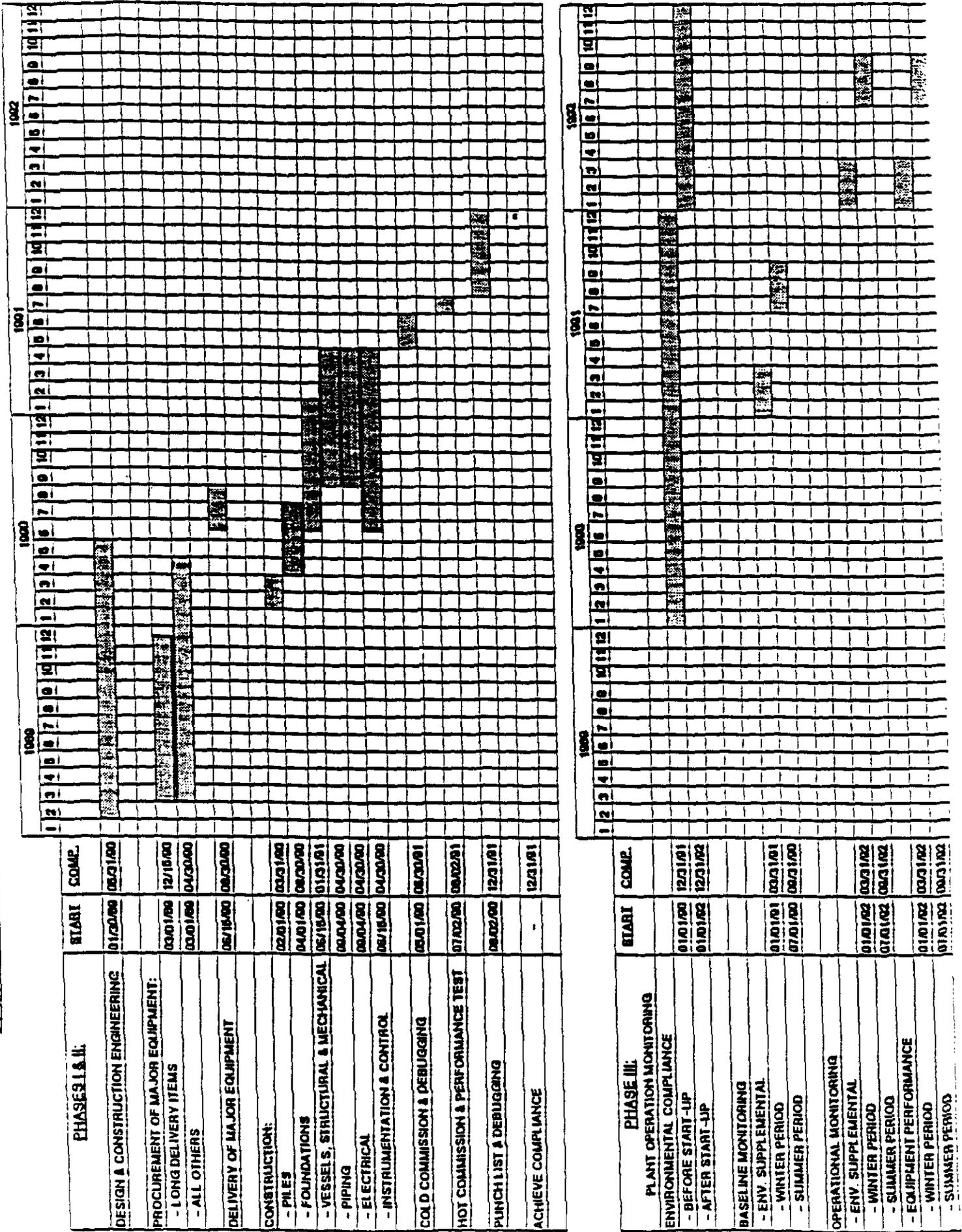




Table 3-2 Sample Time Log for Gaseous Samples  
 Environmental Monitoring Plan - Supplemental Samples - Winter 1991  
 Sparrows Point Coke Oven - ICCI Demonstration Project

Sample	Date - 3/25/91		Date - 3/26/91		Date - 3/27/91							
	Time	Time	Time	Time	Time	Time						
Coke Oven/Blast Furnace Mix	0945	1045	1145	1345	0955	1100	1150	1245	1135	1225	1255	1345
Coke Oven Gas	0950	1050	1150	1355	1005	1105	1205	1250	1140	1230	1305	1350
Blast Furnace Gas	1000	1055	1155	1400	1010	1110	1200	1255	1145	1235	1310	1355

Sample	Date - 4/01/91		Date - 4/02/91		Date - 4/03/91							
	Time	Time	Time	Time	Time	Time						
Coke Oven/Blast Furnace Mix	1040	1145	1305	1400	0910	1000	1100	1155	0925	1015	1115	1250
Coke Oven Gas	1035	1155	1315	1405	0920	1010	1105	1200	0935	1020	1120	1255
Blast Furnace Gas	1030	1140	1320	1415	0925	1015	1110	1205	0940	1025	1125	1300

#### SECTION 4.0 COMPLIANCE MONITORING RESULTS - 1Q92

The following compliance areas of the Sparrows Point Coke Plant will be impacted by the implementation of the new COG treatment system;

- o Coal Chemical Plants A and B
  - Benzene NESHAP emissions
  - OSHA worker exposure monitoring
  - NPDES outfalls 121 (discharge from the coke oven wastewater treatment plant)
  - NPDES outfalls 021 (combined discharges from the coke plant area) plant
  - spills
- o Coke Ovens Batteries No. 11, No. 12 and A
  - waste heat stack for each battery(continuous opacity monitoring)

#### 4.1 Air Compliance Monitoring Results

Coke Oven Waste Heat Stack Monitoring. Since coke production stopped in December, 1991 and the battery heating systems turned off on January 24, 1992, there were no waste heat stack emissions from the batteries for most of the 1Q92. Consequently, there were no emission problems during the period. Quarterly reports of the results were reported to Maryland's Department of Environment on January 27, 1992 for the fourth quarter, 1991 and on April 26, 1992 for the first quarter 1992. There were no exceedances of the waste heat stack opacity standards in 1Q92. There were no coke oven data to report for the 1Q92.

#### 4.2 Water Compliance Monitoring Results - Coke Oven Outfalls.

All sampling programs required for compliance monitoring for Outfall 021 and Monitoring Point 121 were completed during the period January 1, 1992 through March 31, 1992. Daily Monitoring

During the period there were residual liquid discharges from the monitoring point 121 and outfall 021 as a result of emptying and cleaning of pipelines and storage tanks following the shut down of cokemaking operations. These residual liquids were processed in the wastewater treatment system prior to discharge.

Reports were submitted to Maryland Department of Environment and the US EPA-Region III on a monthly basis and non-compliance reports were filed for Outfalls 021 and 121 on an as needed basis. See Section 5.2 for references to Water Compliance Monitoring Reports submitted during the period.

Outfall 021. This is the outfall for all non-contact cooling waters and treated wastewaters from the coke ovens area. During the first quarter of 1992 there were no exceedances of the NPDES permit limitations.

Monitoring Point 121. This monitoring point is the discharge from the coke oven wastewater biological treatment plant. It is a tributary to Outfall 021. During the first quarter of 1992 there were no exceedances of the NPDES permit limitations.

#### 4.3 Solid Waste Compliance Monitoring Results

Sludge Blowdown to Back River WasteWater Treatment Plant. The coke oven wastewater biological treatment plant sludge that is discharged to Baltimore's Back River Municipal Wastewater Treatment plant was not sampled during the first quarter of 1992.

Spills. During the first quarter of 1992 there were no spill incidences in the coke plant area.

#### 4.4 Benzene NESHAP Monitoring Results

Equipment Monitoring. There was no Benzene NESHAP monitoring performed during the first quarter 1992 in the Coal Chemical Plants at Sparrows Point due to the suspension of coke making operations in December, 1991.

Waste Water Streams. No sampling or analyses was conducted during the first quarter 1992 on the 16 Benzene NESHAP wastewater streams listed in Table 1-1, Section A.2.

#### 4.5 OSHA Monitoring Results

Coal Chemical Plants. There was no monitoring personnel exposures during the first quarter 1992 due to the suspension of coke making operations in December, 1991.

SECTION 5.0 APPENDIX

List of Compliance Reports  
Submitted January 1, 1992 through March 31, 1992.

5.1 AIR COMPLIANCE REPORTS

1. Coke Oven Wasteheat Stack Opacity Measurements - Quarterly Reports

1. Mr Ronald E. Lipinski, Administrator  
Enforcement Programs  
Air Management Administration  
Maryland Department of the Environment  
2500 Broeing Highway  
Baltimore, Maryland 21224

January 27, 1992 (for 4th Qtr 1991)  
April 30, 1992 (for 1st Qtr 1992)

2. Coke Oven Wasteheat Stack Opacity Measurements - Monthly Reports

1. Mr Ronald E. Lipinski, Administrator  
Enforcement Programs  
Air Management Administration  
Maryland Department of the Environment  
2500 Broeing Highway  
Baltimore, Maryland 21224

No monthly reports filed in 1Q92.

5.2 WATER COMPLIANCE REPORTS

1. Non-Compliance Reports for NPDES Monitoring Program

1. Mr. James Metz, Administrator  
Enforcement Programs  
Water Management Administration  
Maryland Department of the Environment  
2500 Broeing Highway  
Baltimore, Maryland 21224

No exceedances to report.  
No Non-Compliance Reports filed in 1Q92.

2. Daily Monitoring Reports for NPDES Monitoring Program in 1Q92

1. Mr. James Metz, Administrator  
Enforcement Programs  
Water Management Administration  
Maryland Department of the Environment  
2500 Broeing Highway  
Baltimore, Maryland 21224

and

United States Environmental Protection Agency  
Region III: Attention 3WM-55  
841 Chestnut Building  
Philadelphia, PA 19107

Reports issued	January	27, 1992 (for December, 1991)
	February	28, 1992 (for January, 1992)
	March	27, 1992 (for February, 1992)
	April	28, 1992 (for March, 1992)

5.3 SOLID WASTE COMPLIANCE REPORTS

1. Analyses of Sludge Blowdown to Back River Wastewater Treatment Plant

to

Mr. Gary Sipes  
Bureau of Utilities  
Pollution Control Section  
9901 York Road  
Cockesville, MD 21030

July 1, 1991 (report for first half of 1991)  
December 6, 1991 (report for second half of 1991)  
January 20, 1992 (report of required followup sampling for  
second half of 1991)

2. Telephone Reporting of Spills to

(a) James Lizear, Acting Head  
Hazardous and Solid Waste Management  
Maryland Dept. of Environment  
2500 Broeing Highway  
Baltimore, Maryland 21224  
Telephone No. 301-631-3400

(b) National Response Center  
800-424-8802  
(for oil to water and  
reportable quantity spills)

(c) U. S. Coast Guard  
Marine Safety Office  
U. S. Customs House  
40 So. Gay St.  
Baltimore, MD 21202-4022  
Telephone No. 301-962-5100

List of Spills in the Sparrows Point Coke Plant Area - 1Q92

Date      Spill Description

There were no spills in the coke oven area during 1Q92.

5.4 BENZENE NESHAP MONITORING AND SAMPLING PROGRAM

1. Equipment Monitoring Program - Semi-Annual Reports sent to

Mr. Thomas Maslany  
Air Management Division  
United States Environmental Protection Agency  
841 Chestnut Building  
Philadelphia, PA 19107

Summary of Benzene Leak Detection for Period (1Q92)

	----- <u>Valves</u>	Number of Leaking <u>Pumps</u>	----- <u>Exhausters</u>
Sampling Frequency	monthly	monthly	quarterly

No Benzene NESHAP Monitoring or Sampling was done during the first quarter 1992 and no reports were sent in.

2. Benzene NESHAP Wastewater Sampling Program

No reports during the period.

5.4 OSHA - PERSONNEL MONITORING

1. Compliance Monitoring

No personnel monitoring in the coke oven or by-product plants was done during the first quarter 1992 as a result of the suspension of coke making in December, 1991.