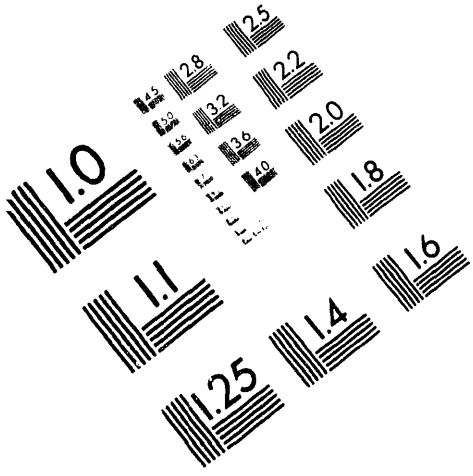

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Silver Spring, Maryland 20910
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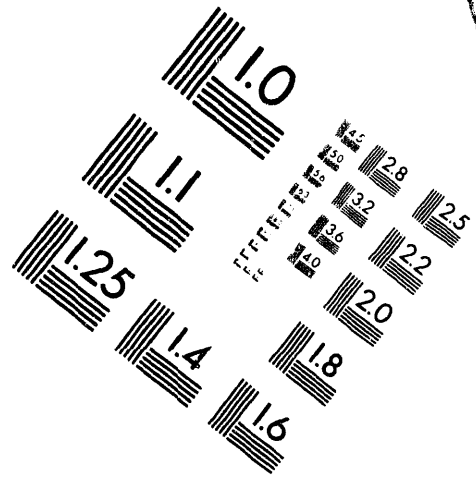

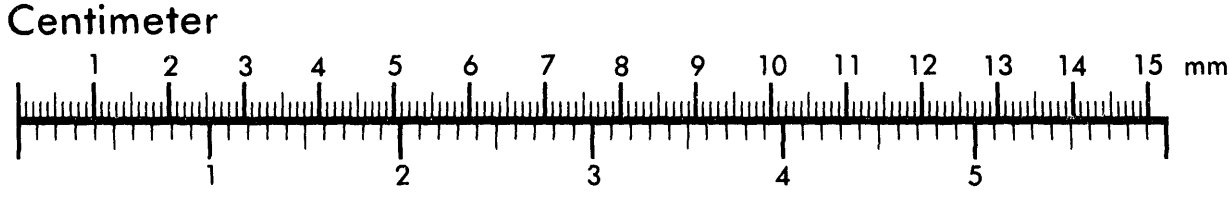

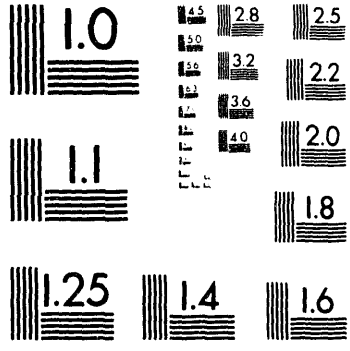

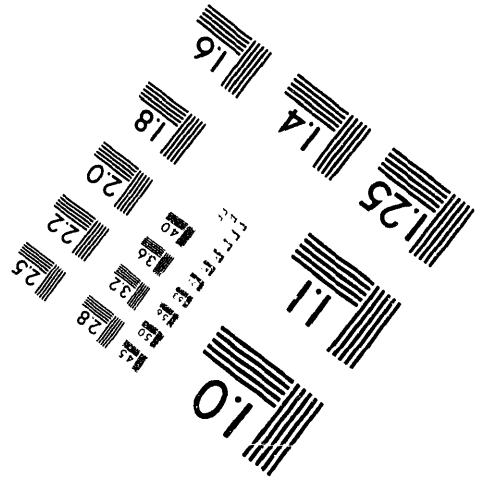

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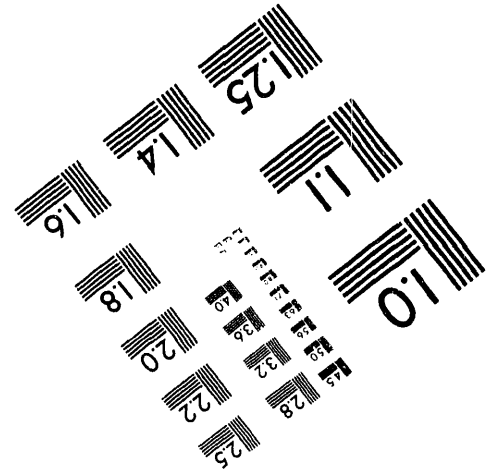


1 of 1

PULSED ATMOSPHERIC FLUIDIZED-BED COMBUSTOR DEVELOPMENT

(DOE/EA - 0646)

ENVIRONMENTAL ASSESSMENT

MAY 1992

DISCLAIMER

Prepared by

U.S. Department of Energy
Morgantown Energy Technology Center
P.O. Box 880
Morgantown, WV 26507-0880

ENVIRONMENTAL ASSESSMENT

This Environmental Assessment (EA) has been prepared by the Department of Energy (DOE) in compliance with the requirements of the National Environmental Policy Act of 1969 (NEPA). It has been prepared in accordance with the President's Council on Environmental Quality (CEQ) regulations implementing NEPA and the DOE Guidelines for compliance with NEPA (52 FR 47662, December 15, 1987). The sources of information for this EA include the following: discussions with ThermoChem staff, proposal documents prepared by ThermoChem for DOE, Phase 1 technical progress reports and site visits. As required by Section 1508.9 of the CEQ regulations, this EA includes the following sections:

1.0 Purpose and Need for the Proposed Action
2.0 Alternatives Including the Proposed Action
3.0 Environmental Impacts of the Proposed Action and the No Action Alternative
4.0 List of Agencies and Persons Contacted

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

The overall objective of the proposed project is to develop a more economical, efficient, and environmentally acceptable coal-fired combustion technology that can be used to generate heat and steam for commercial applications. Pulsed atmospheric fluidized-bed combustion (PAFBC) is a unique and innovative coal-fueled technology that has the potential to meet these conditions and provide heat and/or process steam to small industrial, commercial, institutional and residential complexes. The technology would be a significant addition to currently available options for coal combustion. The potential of Pulse Atmospheric Fluidized Bed Combustion (PAFBC) technology has been amply demonstrated under the sponsorship of a previous DOE/METC contract (DE-AC21-88MC25069). The environmental performance of a coal-fired laboratory-scale system (1.5 million British Thermal Units per hour) (MMBtu/hr) significantly surpassed that of conventional bubbling and circulating fluidized-bed combustion units (see Table 1 for performance comparison). Prompted by these encouraging results in combustion, sulfur capture, emissions control, and enhanced heat transfer, Island Creek Coal Company (ICC) and Baltimore Thermal Energy Corporation expressed interest in the technology and offered to participate by providing host sites for field testing. EA's have been submitted independently for each of these field test sites. This submission addresses the preliminary testing of the PAFBC unit at Manufacturing and Technology Conversion International's (MTCI)

Baltimore, Maryland, facility prior to shipment to the host sites.

	Pulsed AFBC	Bubbling FBC	Circulating FBC
Combustion Efficiency (percent)	93-98	90-97	93-99
Sulfur Dioxide Capture (percent)	90-98	60-85	70-95
Nitrogen Oxide Emission (parts per million)	110-265	300-500	100-300
Carbon Monoxide Emission (parts per million)	180-800	400-1200	500-1500

Table 1 - PAFBC Performance Comparison

Research objectives are relevant to DOE's National Energy Plan to reduce the Nation's dependency on foreign oil and domestic natural gas and to increase the use of coal, an abundant available fuel. Compared to conventional combustor technology, the proposed technology is capable of lower system capital costs, and improved reliability, maintainability and environmental performance.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 THE PROPOSED ACTION

The DOE proposes to provide funding to proceed with the fabrication and testing of a PAFBC as part of Phase 2 of an existing cooperative agreement-type contract with ThermoChem, Inc. This project would be an extension of a Phase 1 effort that began in 1990. Phase 2 would determine the operational capability of the combustor prior to its field testing. The proposed Phase 2 activities would include the completion of final designs, procurement of major combustor components, fabrication/assembly of the combustor unit, and check-out testing. Systems and economics analyses would also be updated

from studies done in Phase 1 of the existing contract. Although significant information has been generated to date, additional data are necessary to prove the concept's economic and technical feasibilities. The project would continue research and development conducted during the previous Phase 1 of the DOE contract that concluded in March 1992.

2.1.1 Project Description

The PAFBC system would integrate a pulse combustor with an Atmospheric Pressure Bubbling Fluidized-Bed Combustor (Figure 1). The pulse combustor would burn coal fines (typically less than 30 mesh or 600 microns) and the fluidized bed would burn coarse coal particles. The gaseous combustion products from the pulse combustor would pass through the fluidized-bed combustor where limestone sorbent is used to capture sulfur dioxide (SO_2). The integration of pulse combustion and fluidized-bed combustion in this manner minimizes burning of fines in the freeboard area of the fluidized bed, thereby minimizing emissions of SO_2 and nitrogen oxides (NO_x).

In operating the demonstration facility, coal fines would be pneumatically conveyed to the pulse combustor, and combustion air would be supplied to the inlet air plenum by a forced draft fan. The coal fines would ignite and combustion would proceed to near completion within the pulse combustors combustion chamber and tailpipe assembly. Heat would be extracted to maintain non-slagging conditions.

Coarse coal and limestone would be fed to the fluidized bed portion of the system by a stoker spreader. The coarse coal would burn within the fluidized bed and the limestone would react to capture sulfur oxides released by combustion. The sulfur oxides, in the pulse combustor exhaust gases, would also be removed by the limestone sorbent in the fluidized bed. Combustion air would be supplied to the fluidized bed by the forced draft fan. Heat would be extracted from the bed through the heat transfer surface installed on the walls of the fluidized bed vessel, as well as by extended surface on the decoupler/ eductor on the pulse combustor tailpipe assembly.

The demonstration PAFBC system would incorporate a rectangular fluidized bed with inside dimensions of approximately 10 feet by 10 feet. The fluidized bed vessel would consist of a water-wall design; heat is extracted from the bed through the water-wall to generate steam at a pressure of approximately 175 pounds per square inch, gauge (psig). The fluidized bed depth is approximately 4 feet. The bed would operate at approximately 1,550 degrees F. In the freeboard area, the fluidized-bed combustor dimensions would be increased to approximately 12 feet

V - 1	V - 2	V - 3	V - 4	V - 5	V - 6	V - 7	V - 8
STEAM DRUM	LIMESTONE BIN	BED SOLIDS COLLECT DRUM	CYCLONE SOLIDS COLLECT DRUM	WATER DRAIN DRUM	CYCLONE	SILENCER	COAL BIN & STOKER FEEDER

B - 2	B - 3	B - 4	F - 1	P - 1	C - 1 / C -2	S - 1
PRIMARY AIR BLOWER	PRE-HEAT AIR BURNER	PILOT BURNER	FORCED DRAFT FAN	LIQUID PUMP	FLUID-BED STEAM COILS	SOLIDS DRAIN VALVE

B - 1	V - 9	H - 1	R - 1	S - 2	H - 2
FLUID-BED COMBUSTOR	PULSE COMBUSTOR	RAW COAL HOPPER	CRUSHER	SCREENS	COAL FINES HOPPER

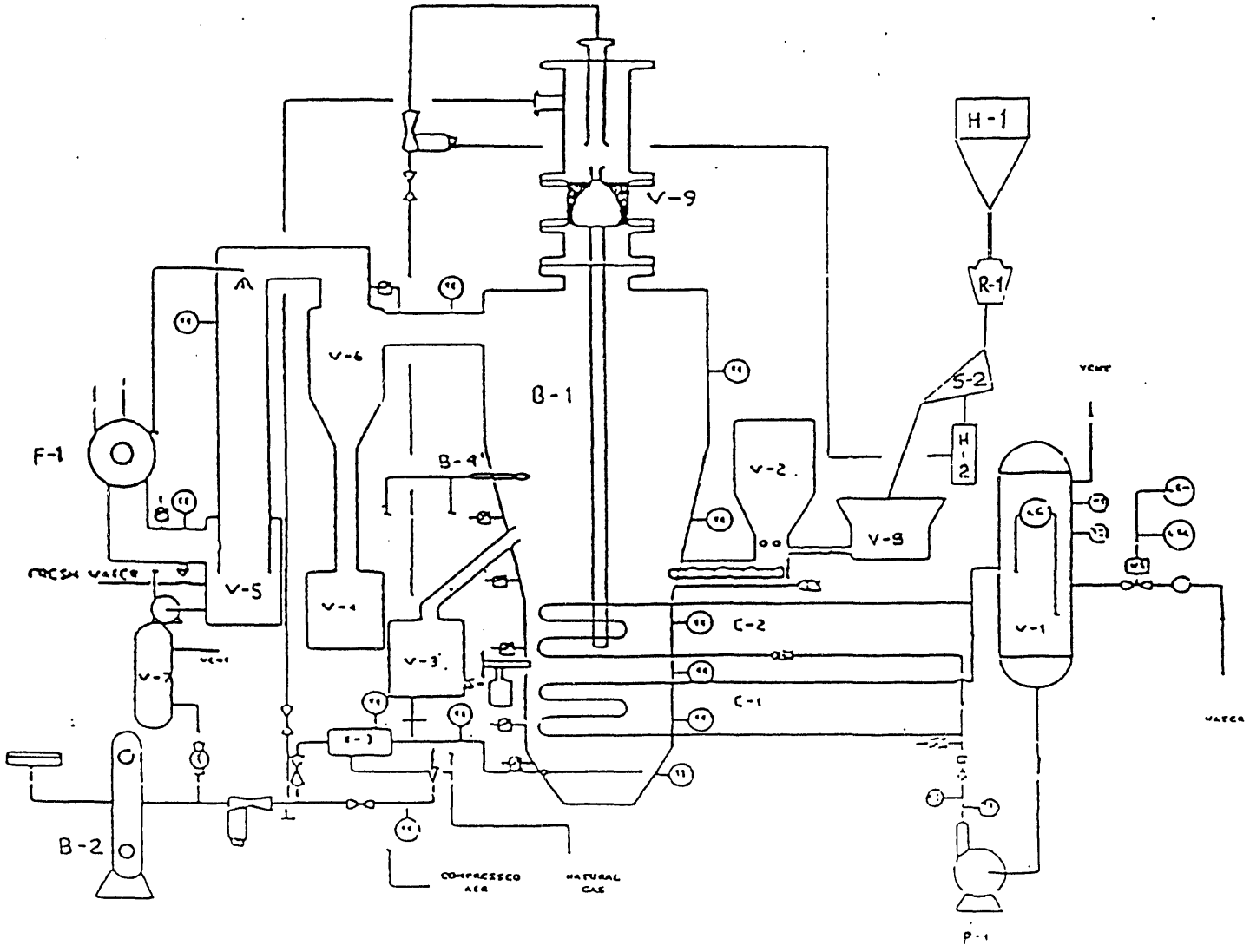


FIGURE 1 - PAFBC SYSTEMS LAYOUT

x 12 feet. The freeboard section would be approximately 15 feet tall. The pulse combustor would be mounted on the roof of the fluidized bed vessel and fires downward. The resonance tubes would pass through the freeboard section and a decoupler or eductor attached to the end of the tailpipe assembly would be immersed in the bubbling fluidized bed. All pulse combustor components would be double-walled; additional heat is extracted to generate 175 psig steam.

The combustion products would pass through a cyclone for initial removal of solids elutriated from the fluidized bed. The captured solids would be returned to the fluidized bed. Ash would be withdrawn from the fluidized bed, cooled, and conveyed to storage for ultimate disposal. The flue gases leaving the cyclone would pass through waste heat recovery components that include a boiler, an economizer, and possibly an air heater. A fabric filter (baghouse) would be located after the waste heat recovery equipment for removal of fine particulates. Finally, the flue gas would pass through an induced draft fan and pass up a stack. The flue gases would be essentially particulate-free and contain very low concentrations of carbon monoxide (CO), SO_2 and NO_x. The stack temperature would be approximately 375 degrees F.

Freeboard burning is significantly reduced by burning the fines in the coal feed in a pulse combustor; however, freeboard burning would not be totally eliminated. The cooling surface of the water-cooled tailpipe assembly passing through the freeboard would help to minimize the temperature increase that would typically result in the freeboard due to combustion above the bed. Additional cooling surface would be installed to maintain a freeboard temperature equal to, or slightly below, bed operating temperature. This would minimize the formation of NO_x while providing sufficient residence time to complete combustion of CO. Particulate emissions would be controlled to greater than 99% removal by the fabric filter. Anticipated emissions for each air contaminate are as follows:

SO_2	< 7.6 Pounds per hour
NO_x	< 7.0 Pounds per hour
CO	< 1.3 Pounds per hour

The PAFBC unit would undergo shakedown tests to verify satisfactory operation. Fuels used during the PAFBC check-out testing would be representative of those anticipated for use in the field tests. Limestone would be added to the PAFBC to control emissions of sulfur dioxide. The projected quantities of materials to be used and solids to be generated, during a total 350 hours of operation, at design conditions are the following:

Coal	825 Tons
Limestone	303 Tons
Water Used	1,644,000 Gallons
Solids Generated	345 Tons

The test objectives would include monitoring the continuous operation and performance of the unit at a variety of operating conditions. It is anticipated that this objective would be accomplished during a 2 month period during which check-out testing would require a total of about 350 hours of operation.

The test program would include two series of tests. The first series of tests would concentrate on assessing and tuning operation of the pulse combustor; the second series would evaluate and optimize integrated operation. In the first series, a portion of the fluidized bed heat transfer surface would not be installed in order to minimize the fuel requirements to the fluidized bed. Bed temperature would be maintained by burning natural gas to simplify operation and data analysis. The pulse combustor would be fired at rates of up to 18 MMBtu/hr, about 1,500 pounds-per-hour coal feed rate. Limestone would be added to the fluidized bed for sulfur removal. A total operating time of 100 hours is anticipated for this series of tests. Solids generated are expected to be nonhazardous, and would be sent to the Quarantine landfill for disposal.

In the second series of tests, coal would be fed to both the pulse combustor and the fluidized bed. Heat transfer surface would be installed in the bed as previously described. In these integrated tests, the maximum firing capacity is expected to be 72 MMBtu/hr (approximately 6,000 pounds per hour of coal, 1,500 pounds per hour to the pulse combustor, and 4,500 pounds per hour to the fluidized bed). The maximum resources consumed and emissions generated are presented below:

Coal Consumption	6,000 Pounds per hour
Limestone Consumption	2,200 Pounds per hour
Water Consumption	50,000 Pounds per hour (100 Gallons per minute)
Solid Waste	2,500 Pounds per hour
SO_2 Emissions	30 Pounds per hour
NO_x Emissions	28 Pounds per hour
CO Emissions	5 Pounds per hour
Particulate Emissions	2 Pounds per hour

For the 100 hours of testing, feed requirements, waste generation, and gaseous emissions for the emissions would be as follows:

Coal Consumption	75 Tons
Limestone Consumption	27 Tons
Water Consumption	660 Tons (144,000 Gallons)

Solid Waste Generated	30 Tons
SO_2 Emissions	760 Pounds
NO_x Emissions	700 Pounds
CO Emissions	13 Pounds
Particulate Emissions	54 Pounds

No effluent would be produced by the PAFBC; the water consumed by the demonstration facility would be converted to steam and, in these preliminary tests, released to the atmosphere as water vapor.

The second series of tests would include approximately 250 hours of operation. Feed requirements, waste generation, and gaseous emissions would be as follows:

Coal Consumption	750 Tons
Limestone Consumption	275 Tons
Water Consumption	6,375 Tons (1.5 million Gallons)
Solid Waste Generated	312.5 Tons
SO_2 Emissions	3.7 Tons
NO_x Emissions	3.5 Tons
CO Emissions	126 Pounds
Particulate Emissions	540 Pounds

2.1.2 Description of Project Location

2.1.2.1 General Description of the Area

The initial testing would be conducted at the MTCI Baltimore facility in southeast Baltimore, Maryland. Maps depicting the location of the project are attached (Figures 2-4). The MTCI facility is located within an industrial area that includes a municipal waste water treatment facility, a landfill, and a chemical plant. There is no residential area within a five mile radius.

2.1.2.2 Description of Project Site

Fabrication and shakedown testing would be conducted in the 77,000 square feet MTCI Chemical Road facility (see Figure 5). The MTCI laboratory is currently a permitted R&D facility. MTCI's facilities are dedicated to development of innovative technologies for environmentally acceptable, efficient fuels utilization. Coal-fired test units up to 15 MMBtu/hr are currently operated in MTCI's Baltimore facility. The project would occupy a small plot (20 feet x 20 feet) in the existing lab facility. Coal would be delivered from mines in Cumberland, Maryland and the Island Creek Corporation's Alpine plant in

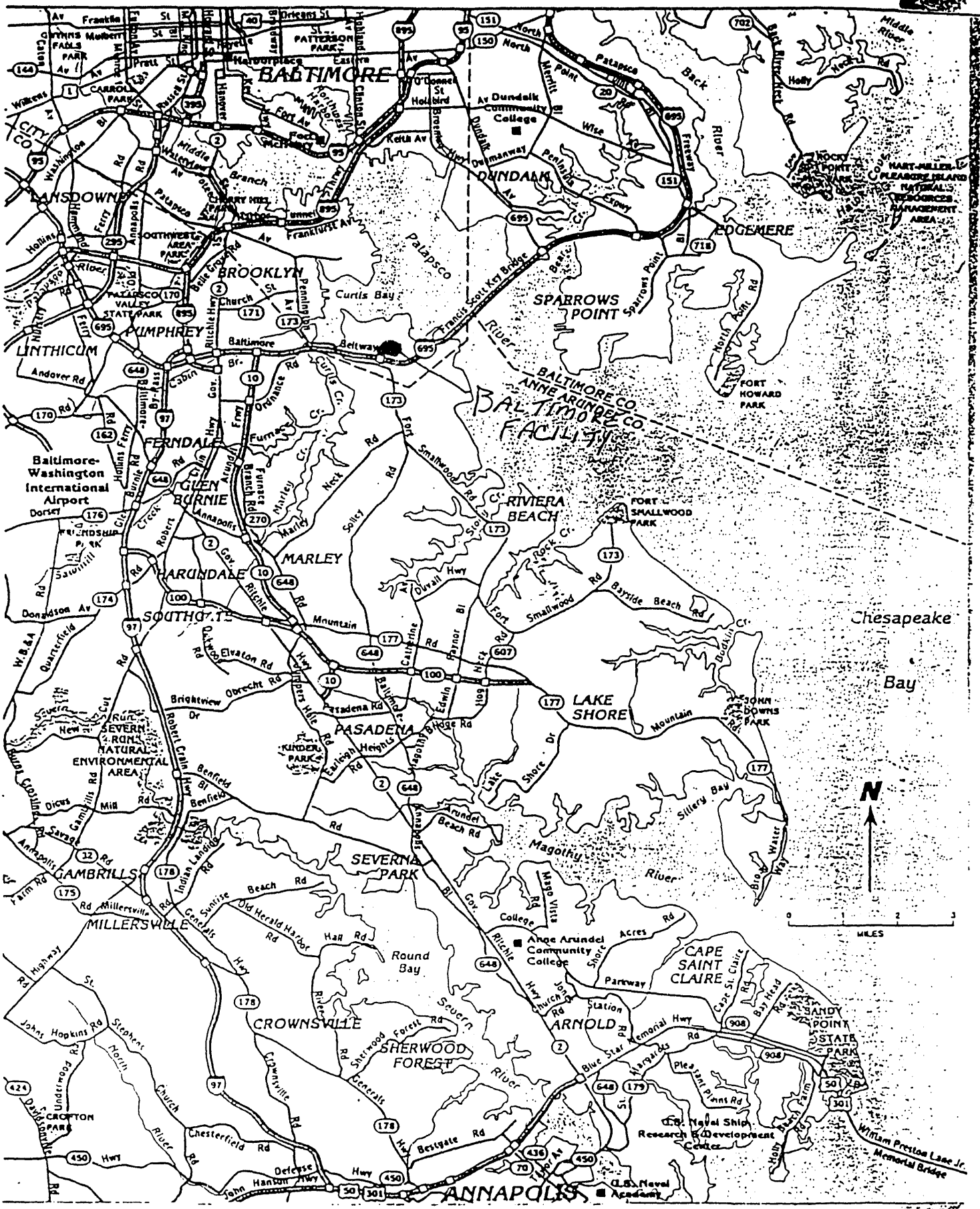


FIGURE 2 - PROJECT SITE VICINITY

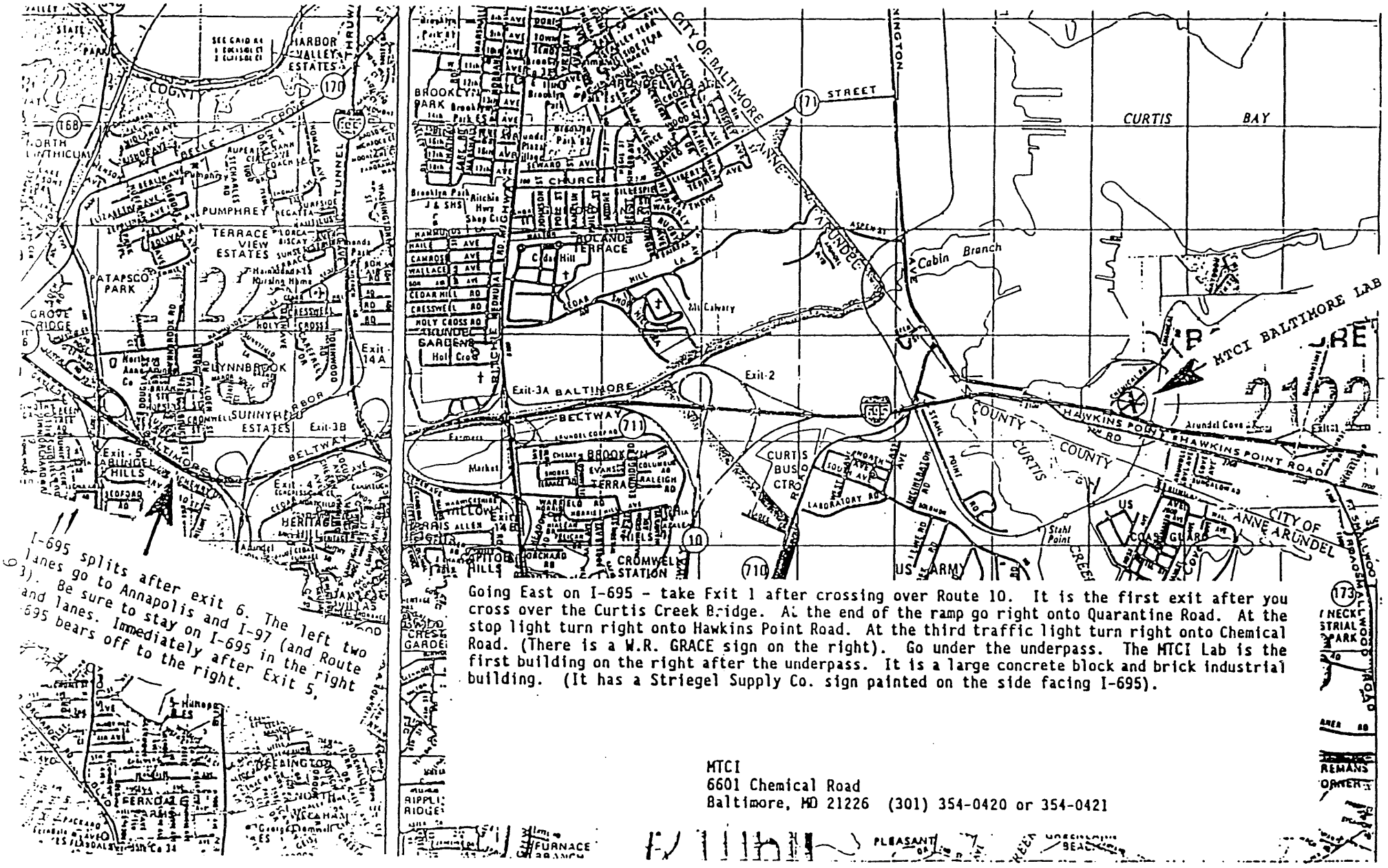
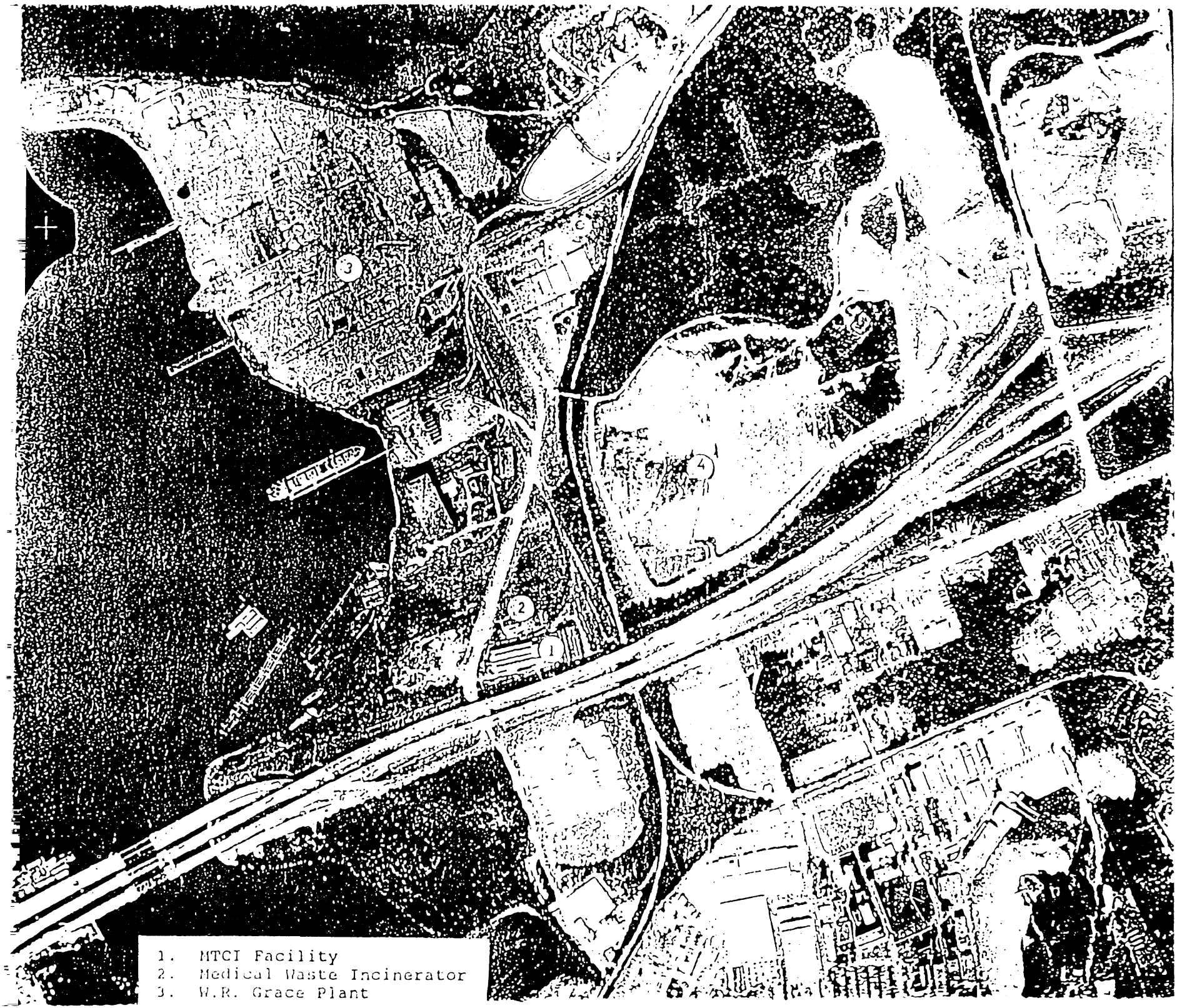
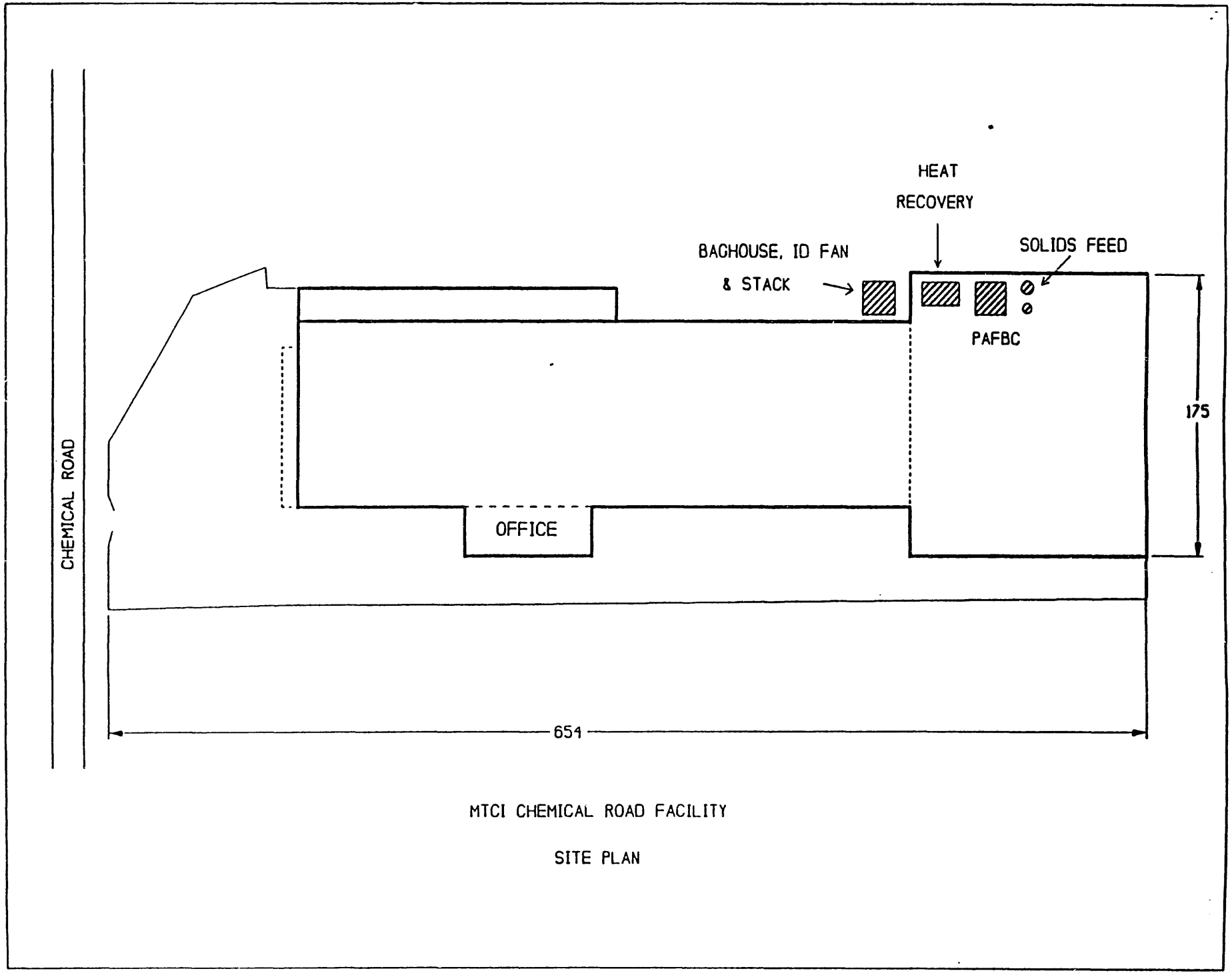


FIGURE 3 - PROJECT SITE LOCATION


1. MTCI Facility
2. Medical Waste Incinerator
3. W.R. Grace Plant



MTCI CHEMICAL ROAD FACILITY

SITE PLAN

northeast West Virginia. Limestone would be delivered from Baltimore, Maryland. These feed materials would be delivered by covered trucks using existing truck routes, unloaded, and stored in an enclosure to prevent fugitive emissions of limestone and coal dust. The total truck traffic, using 15 ton trucks, would not exceed 76 round trips for delivery. Sewerage is available via septic tanks adequate to receive and treat expected waste and located on the site. Water, natural gas, and electrical utilities are available at the site from existing municipal sources.

2.2 Alternatives

There are three alternatives considered in this EA: No Action, Alternative Sites, and Alternative Technologies.

2.2.1 No Action Alternatives

Under the "no action" alternative, the proposed project would not be funded by DOE. Gas combustors would continue to be fired by natural gas or other fuels. Coal would continue to be burned in boilers to provide steam. If the "no action" alternative were selected, the benefits expected to result from successful development of PAFBC technology would be precluded or delayed. A "no action" alternative would, thus, delay or eliminate the lower system capital costs, and improved reliability, maintainability and environmental performance that the PAFBC technology can provide in comparison with conventional combustor technology.

2.2.2 Alternative Sites

There were alternative sites, considered by ThermoChem, to conduct the basic check-out testing activities. However, ThermoChem concluded these sites would become available only at substantially increased cost to ThermoChem and therefore to DOE. Selection of an alternative site would also require the ample floor space for offices and for the small shop fabrication/ assembling effort in erecting the hardware. This would involve duplicating existing facilities available at the proposed site, adding significant expense, and delaying the technology development process. Alternative potential sites were, therefore, eliminated from further analysis. Note that this proposed action should not be confused with the field testing at the host sites of Baltimore Thermal Energy or Island Creek Coal companies.

2.2.3 Alternative Technologies

Alternative technologies include conventional coal-fired systems and oil-fired systems. These commercially available systems lack the lower system capital costs, and improved reliability,

maintainability and environmental performance that the PAFBC combustor technology is expected to demonstrate. Another advanced system which could potentially be an alternative to the PAFBC technology, is the circulating fluidized-bed combustors. These were evaluated and are in similar stages of research and development, but do not project the enhanced system efficiency provided by the pulse combustion technique. Circulating fluidized-bed boilers have not been accepted by industry for applications under about 100,000 pounds of steam generation per hour due to height requirements and cost. The PAFBC could potentially to extend the applicability of coal-fired systems to smaller industrial installations. Selecting an alternative technology could delay, or preclude, the PAFBC technology from inclusion among the technologies available to provide clean, efficient electric power generation.

3.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND THE NO ACTION ALTERNATIVE

3.1 PROPOSED ACTION

3.1.1 Air Quality

The tests at the MTCI plant would be of short duration, and appropriate emission controls would be employed. The emissions and the short duration of them are expected to have minimal effects on air quality. Estimated emissions for pollutants, and the new source performance standards (NSPS) values are as follows:

	NSPS	PAFBC
Nitrogen Oxide	1.0 lb/MMBtu	0.39 lb/MMBtu
Sulfur Dioxide	1.2 "	0.42 "
Carbon Monoxide	---- "	0.07 "
Particulates	0.05 "	0.03 "
Nitrous Oxide	---- "	0.10 "

The MTCI plant, being in Anne Arundel county, is in Area III as defined by the Maryland Department of Environment and as such is in a non-attainment area as specified in the Code of Maryland Regulations (COMAR 26.11.06.11). The proposed project would be a New Source Impacting on a Non-Attainment Area (NSINA) which would require MTCI to apply for construction and operation permits. These are currently in preparation.

3.1.2 Water Quality/Quantity Impacts

The PAFBC system would require that water be used to cool the particulate matter prior to entering the cyclone, and be heated for steam generation. This water (approximately 100 gallons per minute) would be vented as low-pressure (10 pounds per square inch, gauge) steam. The water (totally 1,644,000 gallons) would be provided by the municipal supply system and would tax neither the supply system nor the existing MTCI facility system.

3.1.3 Solid Waste Disposal

General construction waste would be sent to the adjacent Quarantine Road landfill.

During operation, the amount of solid waste (ash and spent carbonate used for sulfur capture) generated would not be expected to exceed 345 tons over the entire 2 month period of project operation. Based upon prior waste chemical analyses, no hazardous wastes, per the criteria of the Resource Conservation Recovery Act (RCRA), would be generated. The transport and ultimate disposal of the waste would be in accordance with state and local regulations.

Ash and spent carbonate would be stored in covered barrels within the project building. Once collected, the ash and carbonate would be delivered to the State of Maryland licensed Quarantine Road landfill. In order to prevent fugitive emissions in preparation for transport, the solid wastes would be vacuumed into covered trucks.

3.1.4 Noise

In the internals of the pulse combustor, high levels of sound are generated. Dependent upon research test requirements, the noise levels generated inside the pulse combustion chamber and tailpipe could be 120 decibels at 60 cycles-per-second frequency. Because of the refractory lining and structural steel designed into the unit, sound is quickly attenuated. Measurements of the integrated pulse combustor demonstrated that the effect of operation does not add to the ambient decibel reading. Measurements are typically less than 80 decibels within five feet. Workers in the test facility would be protected with ear plugs. Any potential exposure of employees to hazards would be minimized by an appropriate combination of engineering controls, procedures, and good work practices. All operations would be conducted within the test facility. Measurements would be made during the check-out of the equipment at the MTCI development facility. It is not anticipated that project noise levels outside the lab facility would be distinquishable from background

noise of the surrounding industrial complex. In the event that higher noise levels would be generated, additional building wall silencing would be installed. The nearest residences are about five miles away. Complaints of noise would be resolved by adding silencers to reduce the noise to inaudible levels.

3.1.5 Floodplains or Wetlands

The project equipment would be installed inside or attached to an existing building and would have no effect on floodplains or wetlands because no new area would be disturbed by equipment fabrication and assembly.

3.1.6 Historic Areas

The project equipment would be installed inside or attached to an existing building. The project would not affect any existing archeological, cultural, or historic resources.

3.1.7 Ecological Impacts

The field test installation would be within an existing lab facility, no additional land is required. There would be no zoning restrictions since the facility is presently in compliance with zoning requirements.

There are minimal anticipated ecological impacts expected due to the project. The project would involve relatively short-term (350 hour) tests on a site already operating similar equipment. The project would not change the present operational environment. Based on U.S. Fish and Wildlife Service literature, the site is not within range of any federally-listed endangered species. There would be no direct impact to terrestrial and aquatic ecology, since the operations would be conducted within an existing structure.

3.1.8 Socioeconomic Impacts

The project, lasting some nine months from the time of completing design through approximately 350 hours of testing to final technical reporting, would be accomplished by the existing staffs of ThermoChem and MTCI. It would not require additional local labor, extended or expanded use of existing facilities or additional public services. Transportation of all solid materials (coal, limestone, ash and spent limestone) would be provided by trucks carrying 15 ton loads. The total truck traffic would not exceed 76 round trips for coal/limestone delivery spaced out over the five months from the project initiation to just before testing would begin. The solids waste

disposal would require 23 round trips following test completion. This truck traffic would be over vicinity highways which are major truck routes and interstates including the route leading to the plant. The impact of this additional traffic during the project period would be negligible.

3.1.9 Summary of Impacts

The environmental effects associated with the PAFBC development program at the MTCI research laboratory have been assessed. This project would have limited impact on air quality, water quality/quantity, solid waste management, noise level, floodplains, wetlands, historic areas, or the ecology. The shakedown tests of the field test units would be conducted at the same site as the laboratory-scale technology development tests and would present minimal environmental impacts.

3.2 The No Action Alternative

Under the "no action" alternative, DOE would not fund the proposed project. In the absence of these funds, the proposed work would not be expected to proceed in Maryland. Therefore, if the action were canceled, the impacts described hereunder would not occur. The current technology would continue to be used, and coal could continue to be burned in less efficient and less environmentally safe boilers than those proposed for testing through this project.

4.0 LIST OF AGENCIES AND PERSONS CONSULTED

Mr. Mario Korquera
Air Toxics and New Sources Permits Program
Air Management Administration
Maryland Department of the Environment
2500 Broening Highway
Baltimore, MD 21224

Mr. Richard Collins, Acting Director
Hazardous and Solid Waste Management Administration
2500 Broening Highway
Baltimore, MD 21224

Mr. Ralph Cullison, Acting Chief
Bureau of Water and Waste Water
City of Baltimore
407 Abel Wolman Municipal Building
Baltimore, MD 21202

Finding of No Significant Impact

ThermoChem, Inc.

Pulsed Atmospheric Fluidized-Bed Combustor Project

at

Manufacturing and Technology Conversion, Inc.

Baltimore, Maryland

AGENCY: U.S. Department of Energy (DOE)

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: The DOE has prepared an Environmental Assessment (EA) (DOE/EA-0646) that analyzes the potential impacts for conducting research and testing of a Pulsed Atmospheric Fluidized-Bed Combustor (PAFBC). The pulsed combustor would combust fine coal in a pulsating sound field to provide the fluidizing force for an atmospheric fluidized-bed combustor. The combustor would provide the heat and/or process steam to small industrial, commercial, institutional and residential complexes. In the proposed project, ThermoChem, Inc., of Columbia, Maryland, would complete final designs, procure major combustor components, fabricate/ assemble the combustor unit, and conduct proof-tests at the Manufacturing and Technology Conversion International, Inc. (MTCI) facility in Baltimore, Maryland. Based on analysis in the EA, DOE has determined that the proposed action is not a major federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act of 1969 (NEPA). Therefore, the preparation of an Environmental Impact Statement is not required and the Department is issuing this FONSI.

COPIES OF THE EA ARE AVAILABLE FROM:

John R. Ganz, NEPA Compliance Officer or
Elizabeth Dolezal, Environmental Project Manager
Morgantown Energy Technology Center
P.O. Box 880
Morgantown, WV 26505
(304) 291-4135 or (304) 291-4634

FOR FURTHER INFORMATION CONTACT:

Carol Borgstrom, Director
Office of NEPA Oversight
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585
(202) 586-4600 or (800) 472-2756

BACKGROUND: The DOE proposes to provide funding to proceed with the fabrication and testing of a PAFBC as part of Phase 2 of an existing contract with ThermoChem, Inc., of Columbia, Maryland. This project extension would determine the operational capability of the combustor prior to its field testing. The proposed Phase 2 activities include the completion of final designs, procurement of major combustor components, fabrication/assembly of the combustor unit, and proof-testing. Systems and economics analyses would also be updated from studies done in Phase 1 of the existing contract. Although significant information has been generated to date, additional data is necessary to prove the concept's economic and technical feasibilities. The proposed project would continue research and development that is now being conducted as Phase 1 of an existing DOE contract. Phase 1, which included laboratory-scale testing of the PAFBC, was concluded in March 1992.

The DOE has prepared this FONSI and the EA upon which the FONSI is based. It is in compliance with the NEPA, the President's Council on Environmental Quality (CEQ) regulations, and the DOE Regulations for compliance with NEPA (57 FR 15122, April 24, 1992).

DESCRIPTION OF THE PROPOSED ACTION: The proposed action would include the design, fabrication, and testing of a demonstration scale Pulse Atmospheric Fluidized-Bed Combustor operating as a steam generator. The PAFBC has been tested in a laboratory-scale facility in MTCI's Baltimore facility. Environmental performance of the PAFBC in these laboratory-scale tests surpassed that of conventional bubbling and circulating fluidized-bed combustors.

The PAFBC system integrates a pulse combustor with an atmospheric pressure bubbling fluidized-bed combustor. In this modular configuration, the pulse combustor burns the fuel fines and the fluidized bed burns the coarse fuel particles. The combustion products from the pulse combustor pass through the fluidized-bed combustor where limestone sorbent is used to capture sulfur dioxide (SO_2). The integration of pulse combustion and fluidized-bed combustion in this manner minimizes burning of fines in the freeboard area of the fluidized bed, thereby minimizing emissions of SO_2 and nitrogen oxides (NO_x).

The test program would include two series of tests and would require approximately 350 hours to complete. In operating the demonstration facility, coal fines would be pneumatically conveyed to the pulse combustor, and combustion air would be supplied to the inlet air plenum by a forced draft fan. The coal fines would ignite and combustion would proceed to near completion within the pulse combustors combustion chamber and tailpipe assembly. Heat would be extracted to maintain non-slagging conditions.

Coarse coal and limestone would be fed to the fluidized bed portion of the system by a stoker spreader. The coarse coal would burn within the fluidized bed and the limestone would react to capture sulfur oxides released by combustion. The sulfur oxides, in the pulse combustor exhaust gases, would also be removed by the limestone sorbent in the fluidized bed. Combustion air would be supplied to the fluidized bed by the forced draft fan. Heat would be extracted from the bed through heat transfer surface installed on the walls of the fluidized bed vessel as well as extended surface on the decoupler/eductor on the pulse combustor tailpipe assembly.

ENVIRONMENTAL IMPACTS: Potential environmental impacts of the proposed action were analyzed. The project would require no new construction, but would involve fabrication of PAFBC equipment to be placed within an existing laboratory facility. Analyses of air emissions, water effluent, and solid waste discharges were conducted.

The MTCI laboratory is currently a permitted R&D facility. The R&D work to be conducted at this facility would not generate any new air emission constituents compared to current operations. An estimated 1,644,000 gallons of water required for process R&D activities would be vaporized to steam and vented to the atmosphere. Based on current understanding of the solid wastes produced (coal ash, lime, and calcium sulfate), the project's solid wastes would not be classified as hazardous wastes under the Resource Conservation and Recovery Act. These wastes would be disposed in the approved Quarantine Road landfill in accordance with state and local regulations.

The project involves the fabrication of the PAFBC and associated installation of new components within MTCI's current Baltimore facility. Since the PAFBC testing system would be located within an existing structure, except for the baghouse, induced draft fan and stack (located within the lab facility and attached to the building), minimal impacts to land use, floodplains, wetlands, archaeological, historic, cultural, or ecological resources including threatened or endangered species would be anticipated. With the exception of the induced draft fan, noise would be confined to within the current structure. Suitable soundproofing of the induced draft fan would be included in the demonstration facility to assure that no increase in noise external to the test facility would be apparent. Any potential exposure of employees to hazards would be minimized by an appropriate combination of engineering controls, procedures, and good work practices. Pressure components of the PAFBC would be designed and fabricated in accordance with the American Society of Mechanical Engineers Pressure Vessel code.

Operation of the demonstration facility would be similar in nature to current operations at MTCI's Baltimore facility, therefore limited negative impacts on occupational safety or health are anticipated.

Impacts on air quality and solid waste management are expected to be minimal. Approximately four tons each of sulfur dioxide and nitrogen oxides, less than 150 pounds of carbon monoxide, and less than 600 pounds of particulates would be produced. Less than 350 tons of solid waste would be produced. Water quality would be unaffected.

ALTERNATIVES CONSIDERED: Alternatives to the proposed action were considered in the EA. These included the "No Action Alternative", "Alternative Sites", and "Alternative Technologies". Under the "no action alternative," DOE would not provide funding. Absent Government funding the proposed project would be canceled. The "no action alternative" would delay or prohibit acquisition of performance data required to assess industrial acceptance of the PAFBC technology. All of the alternative sites considered would require duplicating facilities and services already available at the MTCI Baltimore facility, thereby rendering such alternatives significantly more expensive without any environmental advantage. An alternative technology for increasing industrial use of coal-fired boilers in an environmentally acceptable manner includes the circulating fluidized-bed boilers concepts which are in similar stages of research and development. Selection of alternative technologies would delay or preclude availability of the PAFBC technology to provide clean and efficient electric power generation.

PUBLIC AVAILABILITY: Copies of the EA and the FONSI will be distributed to all persons and agencies known to be interested in or affected by the proposed action or alternatives including appropriate agencies within the State of Maryland. Additional copies of the EA and FONSI are available on request from the Morgantown Energy Technology Center at the address given above.

DETERMINATION: Based on the analyses provided in the EA, DOE has determined that the proposed ThermoChem PAFBC is not a major federal action significantly affecting the quality of the human environment within the meaning of the NEPA, 42 U.S.C. 4321 et seq. Therefore, an Environmental Impact Statement is not required.

ISSUED IN WASHINGTON, D.C. this 26th **of June 1992.**

for Paul L. Ziemer, Ph.D.
Assistant Secretary
Environment, Safety and Health

DATE
FILMED
9/14/93

END