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United States
Department of Energy

TECHNICAL SUPPORT PLAN

PRELIMINARY DESIGN AND ASSESSMENT
OF A 50,000 BPD COAL-TO-METHANOL-TO-GASOLINE PLANT

DECEMBER 1981

PREPARED FOR THE UNITED STATES
DEPARTMENT OF ENERGY
UNDER COOPERATIVE AGREEMENT NO. DE-FC01-80ET-14759

GRACE

W. R. GRACE & CO.
Agricultural Chemicals Group
Memphis, Tennessee

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December 8, 1981
DATE

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I. INTRODUCTION

This technical support plan outlines the anticipated subcontract effort required in performance of Cooperative Agreement No. DE-FC01-80ET-14759 (CA) between The Department of Energy (DOE) and W. E. Grace & Co. (Grace). The preliminary design and assessment activities for the Grace Coal-to-Methanol-to-Gasoline Plant (Gasoline Plant) will necessitate the subcontracting of certain work to other companies because of subcontractors' expertise in architect/engineering services, specialized technical experience, sole sources of required information, or licensors of particular technology. This plan outlines the technical support anticipated from Grace's first- and second-tier subcontractors.

In support of the preliminary design and assessment effort, Grace selected The Ralph M. Parsons Company (Parsons) to supply architect/engineering and related services. Parsons will incorporate their technical efforts with that developed by Texaco Development Corporation (TDC), Mobil Research and Development Corporation (MRDC), and other process technology licensors, both proprietary and nonproprietary, into the Gasoline Plant's overall design. The technologies offered by TDC and MRDC were specified in the CA for utilization in the Gasoline Plant design effort, while other commercially available technologies were selected following a detailed evaluation.

The fixed-bed version of the catalytic Mobil Methanol-to-Gasoline (MTG) process available through MRDC will be used for the conversion of crude methanol to gasoline. The conversion of feedstock coal to a raw synthesis gas, will be accomplished with the Texaco Coal Gasification Process (TCGP) which is licensed through TDC.

Initial efforts in the environmental area identified the need to prepare an Environmental Impact Statement (EIS) for the Gasoline Plant. Grace has been notified that the U. S. Corps of Engineers (COE), Louisville District, would serve the role of Lead Federal Agency (LFA) and supervise an environmental consultant in the EIS preparation activities. As a result, working relationships will be developed between Grace, COE, and an environmental consultant, with the environmental consultant conducting environmental technical support activities.

Each of the technical support subcontractors or data inputs is discussed in the following pages. Appendices include a technical support organizational chart and certain key documents specifying or describing technical support inputs to the Gasoline Plant design and assessment.

II. THE RALPH M. PARSONS COMPANY TECHNICAL SUPPORT

A. Vendor Technical Support

The majority of activities involved in the preliminary design and assessment of the Gasoline Plant was awarded to Parsons, with Parsons' services being in a subcontract role to Grace (see Figure 1). Included in the Parsons scope of work is preparation of the preliminary process and mechanical design, expansion and evaluation of the plant site, development of environmental permitting applications, preparation of capital and operating cost estimates followed by an economic assessment, and development of construction and operating plans.

With the exception of the TCGP and the MTG technologies, all processes incorporated in the Gasoline Plant design will be subject to Parsons' evaluation of alternatives which will result in preparation of process selection study reports. Such reports containing Parsons' recommendation will be reviewed by Grace in making the final selection.

Selection of a process will result in subcontracting or establishing a working relationship for the preparation of process design packages with various process vendors. These process vendors or licensors will generally furnish Parsons with a design package, including material and energy balance data and other design criteria required to enable Parsons to prepare an integrated Gasoline Plant process design.

Alternatives considered and the technologies selected for incorporation into the Gasoline Plant overall design based on the evaluation, review and selection procedure described above are indicated in the following paragraphs.

1. Kennedy Van Saun (KVS) - Coal Grinding

KVS will furnish coal size reduction and preparation information that will meet the TCGP design and normal operating condition specifications. The KVS area of expertise will be applied to initial reduction of the nominal two-inch delivery-sized coal, and wet grinding with rod and ball mills. Some of the data furnished will include product coal grind-size distributions, quantities of recycled solids, suitable grinding process flow configurations, capital investment requirements, and costs of operating coal grinding units.

2. Ruhrchemie - Heat Recovery

Parsons plans to develop a radiant waste heat boiler design based on the specifications and operating information supplied by Ruhrchemie. Ruhrchemie has responded to several written questions submitted by Grace and provided preliminary data concerning the operating characteristics of the radiant waste heat recovery systems installed at the Oberhausen-Holtien, West Germany, facilities. Ruhrchemie forwarded an invitation to tour their facilities and a trip was made by representatives of Grace and Parsons in order to obtain additional technical details. Further work anticipated from Ruhrchemie will include responding to technical questions and review of Parsons' design and equipment specifications for this unit.

3. Air Liquide - Oxygen Plant

Information was supplied by Lotepro, Air Products, Airco, Air Liquide, and Union Carbide for utilization in Parsons' air separation process selection study report. An evaluation of the

alternatives presented indicated that the system and data offered by Air Liquide best met the Gasoline Plant requirements. A specific vendor for the air separation plant was not selected at this time by Grace, so care will be exercised so that data and specifications do not contain requirements that are available only from Air Liquide.

A schedule for Air Liquide data has been established and data to be furnished will cover air and oxygen compressor material balances, cold box material and energy balances, a modified process flow diagram, power requirements and cost, and other data required to complete the design of this unit.

4. Lotepro - Acid Gas Removal

A process selection study report compared the acid gas removal technologies associated with Allied Chemical Corporation's Selexol process, and Lotepro's and Lurgi's Rectisol processes. Grace concurred with Parsons' recommendation that Lotepro Corporation's Selective Rectisol Process be fitted into the Gasoline Plant design. Lotepro has agreed to supply a design data package containing heat and material balances, utility consumptions, number of trains required, train flexibility, turndown capabilities, and emission characteristics based on feed and operating specifications submitted by Parsons.

5. Parsons - Bulk Sulfur Recovery

Parsons' Claus sulfur recovery unit was selected for the bulk removal of sulfur compounds contained in the acid gas stream from the Rectisol unit after a comparison was made with the Claus process licensed by Amoco. Parsons will be completing the

design specifications and process design package via their in-house sulfur technology engineering group.

6. Parsons - Tail Gas Sulfur Recovery

The processes evaluated for removal and recovery of sulfur dioxide from the Claus unit tail gas stream were Parsons' Beavon-Stretford Sulfur Recovery Process (BSRP) and Beavon/methyldiethanolamine (MDEA) Sulfur Recovery Process, and Wellman-Lord system licensed by Davy-McKee Corp. The BSRP was selected and the process reduces sulfur compounds to low levels before venting the tail gas to the atmosphere. As this is a Parsons process, all design activities associated with this unit can be completed in-house.

7. Lurgi - Methanol Synthesis

A process selection study report for this technological area was completed with a comparison of processes offered by Lurgi, Imperial Chemical Industries, and Topsoe. The process selected to convert synthesis gas to methanol was that licensed by Lurgi Corporation. Lurgi will assemble a design package for their catalytic process based upon specifications sent to them by Parsons.

8. Phillips - HF Alkylation

In order to maximize production from the Gasoline Plant, a C₄ hydrocarbon stream from the methanol conversion unit will require alkylation to upgrade it to gasoline. To select design information desired for the Gasoline Plant, the HF alkylation process offered by Phillips Petroleum Company and Universal Oil Products were evaluated. Phillips was selected and has agreed to supply a single-line flow sheet, overall material balance, utility

requirements, equipment specifications and a plot layout. This data will be incorporated by Parsons into the overall Gasoline Plant design.

9. Dames & Moore - Site Environmental Data

In support of Deliverables 13a and 20, Gasoline Plant Land Requirements and Site Confirmation Report, respectively, it was determined that additional site data would be required. The job of procuring this data was awarded to Dames & Moore. Dames & Moore will be supplying technical support for determination of site land requirements, design criteria assistance, site evaluation assistance, field investigations, floodway analysis, and location of satellite sites. Additional work includes air quality assistance, environmental permitting analysis, and safety and environmental plans. Parsons will utilize this data in preparation of the deliverables mentioned above.

10. Flue Gas Desulfurization (FGD)

Parsons completed an initial process selection study report for flue gas desulfurization technology which included discussions of wet and dry scrubbing processes. Specific technologies reviewed were the Wellman-Lord, Davy-McKee S-H, Niro/Joy, and Koch/Micropul processes. Grace requested that Parsons conduct further investigations for FGD processes and include systems that deal with lime and limestone wet scrubbing technology. An addendum to the initial FGD process selection study report was prepared by Parsons and submitted to Grace in mid-November. Based on the analyses performed by Parsons, Grace approved incorporation of the Research Cottreu Double-Loop Limestone Process. Arrangements for the supply of process information are being finalized between Parsons and Research Cottreu.

III. MOBIL RESEARCH AND DEVELOPMENT CORPORATION TECHNICAL SUPPORT

A. Design Support

The Gasoline Plant utilizes Mobil's fixed-bed version of the MTG process. A subcontract was executed in June 1981 between Grace and Mobil for the design effort of the Methanol-to-Gasoline (MTG) process and followed shortly thereafter by an initial three-party meeting between Grace, Mobil and Parsons. Mobil's technical support effort, as documented in the subcontract's Statement of Work (SOW), is comprised of five tasks which will be completed in the performance of the program of work. Technical activities associated with these tasks are represented by three primary technical deliverables that are scheduled for submission to Grace for review. Deliverables due are Basis of Design Report, Process Flow Diagrams, and an MTG Preliminary Process Design Package which will describe process design criteria within the MTG battery limits. Specific unit processes within the battery limits will include the MTG process, heavy Gasoline Treating (HGT), and process water treatment.

The preliminary Basis of Design and Process Flow Diagrams will provide operating guidelines which will be incorporated by Parsons into the initial design stages of the overall Gasoline Plant design. The finalized detail process flow diagrams, combined with the Preliminary Process Design Package, will provide the information necessary for establishing the design of the Mobil methanol conversion unit. Some commercial design and operating parameters to be developed are methanol feed requirements to the MTG unit, quantity and component makeup of the unleaded gasoline product, major driver power requirements, reactor sizing, catalyst charge, waste heat generation,

effluent flows and compositions, and others. The preliminary Basis of Design will be incorporated by Parsons into the initial stages of the overall Gasoline Plant design.

1. Foster Wheeler

The more detailed process design and engineering work required by the MTG Preliminary Process Design Package will be supplied through MRDC by Foster Wheeler, an architect/engineering firm under subcontract to MRDC. These detailed process flow diagrams will be utilized in a comprehensive process design report by Mobil and relayed to Parsons for developing the final commercial Gasoline Plant Design effort.

IV. TEXACO DEVELOPMENT CORPORATION TECHNICAL SUPPORT

The Texaco Coal Gasification Process (TCGP) was selected by Grace as the technology for generating a raw synthesis gas from high sulfur, agglomerating Kentucky No. 9 feedstock coal. A subcontract between Grace and Texaco Development Corporation (TDC) was executed in May 1981 which charges Texaco with supplying technical expertise and data in support of the preliminary design of the synthesis gas generation section of the Gasoline Plant.

TDC's initial technical support efforts are dedicated to developing Estimates of Operation which evaluate such process design information as coal, oxygen, and water feed rates, and synthesis gas and slag production. These estimates will establish general process design criteria so that more detailed commercial design information can be developed. The detailed design information will be assembled into a process flow diagram and a preliminary process design package which Parsons will incorporate into the overall Gasoline Plant design.

TDC will supply preliminary process flow information as developed by Estimate of Operation computer studies. The results of these studies, based on an established design coal and gasifier operating pressure, will provide preliminary design criteria for selection of design operating conditions. More detailed material and energy balances will follow once the initial design criteria is established. Preliminary and detailed commercial design parameters to be provided by TDC are TCGP material and energy balances developed from the gasifier's normal and design operating conditions, oxygen feed rates, slurry concentrations, raw synthesis gas composition, slag, carbon/ash recycle and effluents. TDC will also supply information regarding Texaco's Waste Water Treatment Process.

V. ENVIRONMENTAL IMPACT STATEMENT TECHNICAL SUPPORT

A. Preparation Support

The original SOW for the Gasoline Plant environmental analysis effort called for the preparation of an environmental report. The intent of this report was to provide data that could be incorporated into an EIS. However, work performed in the finalization of Deliverable No. 22 - Environmental Permitting Requirements, established the need for an EIS as a prerequisite to the construction and operation of the Gasoline Plant.

The modified SOW supplied to DOE on September 22, 1981, specifies the preparation of an EIS in conjunction with an LFA and Third-Party Environmental Consultant. Listed below are some of the technical support activities anticipated in preparation of an EIS.

1. United States Army Corps of Engineers (COE) - Lead Federal Agency

Grace was formally notified that the Louisville District of COE was to act as LFA for the preparation of the Gasoline Plant EIS located at the proposed Baskett, Kentucky, site.

The technical support activities that COE will be engaged in is overseeing the collection of necessary environmental information and general supervision for the preparation of an EIS. COE will also be responsible for assuring compliance with NEPA requirements, identifying cooperating federal, state, and local agencies, conducting public hearings and coordinating efforts associated with EIS preparation. The draft understanding between Grace and COE is included in Exhibit C.

2. Environmental Consultant

For the preparation of an EIS, an environmental consultant is needed to provide technical support for establishing environmental baseline conditions, reviewing existing environmental work, and utilizing this data and design data developed by Parsons assess impacts on the environment associated with construction and operation of the Gasoline Plant. In response to a Request for Proposal (RFP) issued by Grace, proposals were received by several environmental consulting firms and Dames & Moore has been selected to fulfill the environmental consultant role. Dames & Moore will be requested to fulfill those requirements contained in the draft Environmental Consultant SOW, attached as Exhibit D. All EIS technical efforts will be documented in a Plan of Study, Draft EIS, and Final EIS. Negotiations are still ongoing with Dames & Moore.

FIGURE 1

SUBCONTRACT ORGANIZATIONAL CHART

SUBCONTRACT ORGANIZATIONAL CHART
COOPERATIVE AGREEMENT NO. DEACO1-80ET-14759
PRELIMINARY DESIGN AND ASSESSMENT OF
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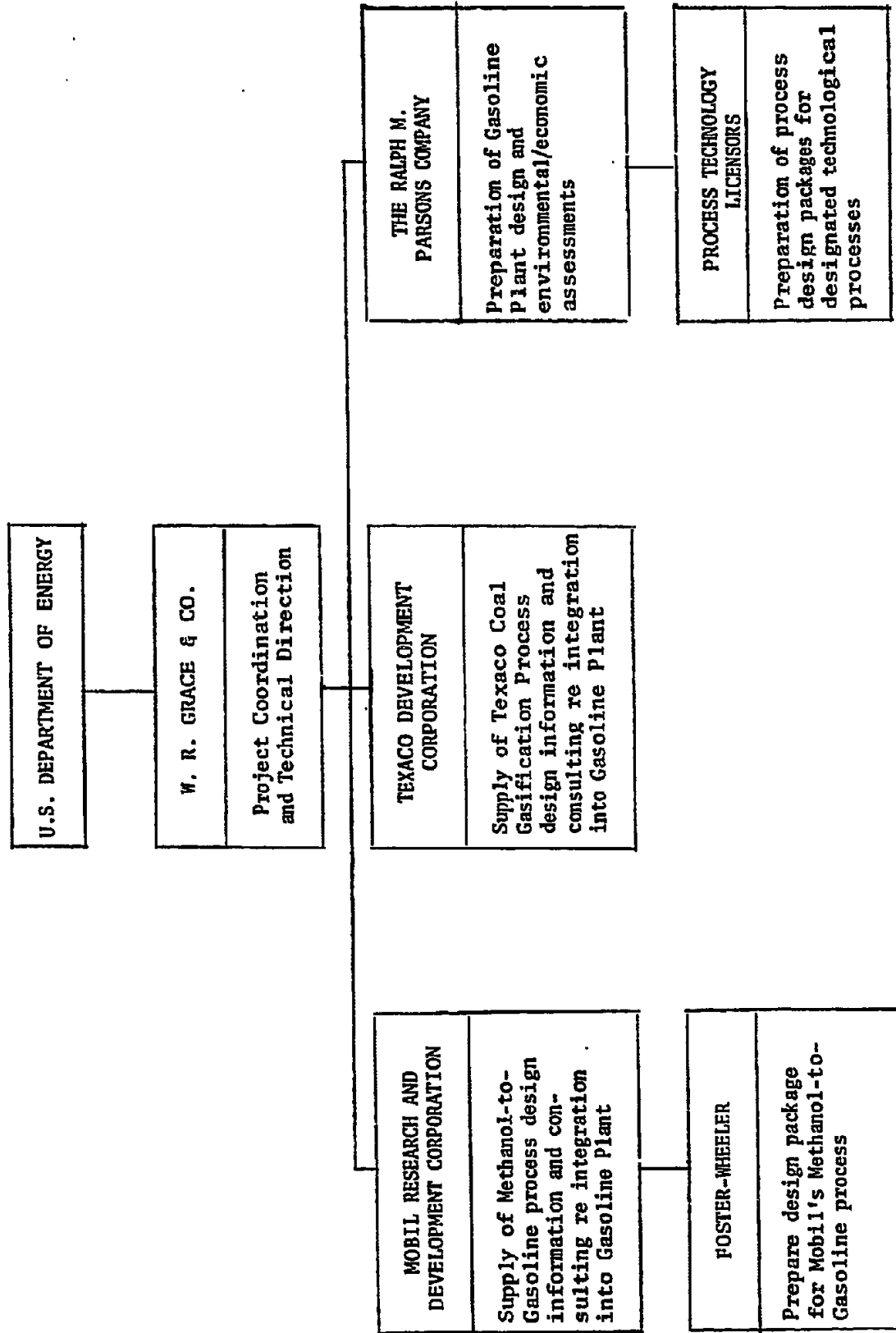


FIGURE 1

EXHIBIT A

MOBIL RESEARCH AND DEVELOPMENT CORPORATION
STATEMENT OF WORK

EXHIBIT A

MOBIL RESEARCH AND DEVELOPMENT CORPORATION STATEMENT OF WORK

INTRODUCTION

W. R. Grace & Co. ("Grace") has entered into Cooperative Agreement No. DE-FC01-80ET14759 with the United States of America (the "Government") acting through the Department of Energy ("DOE") to perform a program of work for the preliminary design and assessment of a 50,000 barrel per day coal-to-methanol-to-gasoline plant ("Gasoline Plant"). The Cooperative Agreement stipulates the use of the Mobil fixed bed methanol-to-gasoline (MTG) catalytic process. Mobil Research and Development Corporation (the "Contractor") will perform a program of work to provide to Grace an MTG design basis, a process design document for the MTG processing units considered as a battery limit facility, and engineering support.

The process design document shall describe the MTG units in sufficient detail for Grace and its architect/engineering subcontractor ("A/E") to prepare an estimate of construction cost. The Contractor's design responsibilities are limited to the MTG process battery limits, consisting of dimethyl ether and conversion reactors, effluent heat exchangers, recycle compression system and product/vent separators, with associated equipment for process regulation and catalyst regeneration. The Contractor shall also identify environmental emissions at the point source within the MTG process battery limits. As the technical director of the Gasoline Plant project, Grace will coordinate the transfer of the information on the MTG units to its A/E, who will design the utilities, offsites and any related downstream units (fractionation, alkylation, blending) necessary to produce finished gasoline from raw MTG product. The Contractor shall provide engineering effort as reasonably required to support Grace and its A/E in their program of work as it relates to the battery limit MTG facility.

The work to be performed by the Contractor under this contract is specifically set forth in the following tasks.

TASK 1 - BASIS OF DESIGN

After conferring with Grace, the Contractor shall define the process design basis for the MTG units.

A Basis of Design report shall be prepared by the Contractor and submitted to Grace as Deliverable No. 5 in accordance with the Deliverables Schedule attached hereto as Exhibit 1. The contents of the Basis of Design report shall be the following:

- a. Process description with preliminary process schematics.
- b. Estimates of the MTG process battery limit entering and leaving streams' flows, temperatures, pressures, and stream components. To integrate the MTG process with the Gasoline Plant facility, estimates of crude methanol and hydrocarbon product flows required for the production of 50,000 barrels per day of gasoline shall be provided.
- c. A description of all waste streams.
- d. Train and spare equipment philosophy, including the Contractor's rationale for selecting the number of MTG process trains and spare equipment required for the MTG section of the Gasoline Plant.
- e. Detailed description of all information to be supplied by Grace which the Contractor requires in order to perform a preliminary process design of the MTG units.

TASK 2 - MTG PROCESS DESIGN DOCUMENT

The Contractor shall develop the preliminary MTG process design. To convey the design concept, the Contractor shall prepare and deliver to Grace the following:

- a. Process Flow Diagrams - Drawings shall be provided which show MTG process streams, equipment names, heat duties, operating temperatures and pressures, principal in-line instrumentation, and major pipeline sizes. Also to be included are complete process material balances showing stream flow rates and compositions for normal operating conditions.

All drawings shall be a standard size specified by Grace after consultation with the Contractor. The Contractor shall submit the number and type of copies of such drawings called for under Deliverable No. 6 of the Deliverables Schedule attached hereto as Exhibit 1.

- b. Detailed Process Description - A narrative of the technical aspects of the process flow through the MTG process including the specific function of each item of equipment. Operating temperatures, pressures, flows, heat duties, and other parameters are to be included as may be appropriate.
- c. Process Flow Diagrams - Reduced sized (to be specified by Grace) diagrams showing all process streams.
- d. Heat and Material Balances - Balances are to be included, based on normal operating conditions. Included shall be all process and waste streams. Battery limit requirements/delivery of all process and selected utility streams are to be clearly shown.
- e. Raw Material/Product Specifications - The specifications required by the MTG process for the crude methanol raw material, including maximum or minimum allowable concentration of stream components and applicable temperature and/or pressure specifications. In addition, the specification of the battery limit hydrocarbon products shall be provided including flows, temperature, pressures and maximum/minimum components compositions.
- f. Process and Selected Mechanical Duty Specification Sheets - Specification sheets shall be provided for key equipment items. To be included are process information for sizing equipment, materials of construction, sketches of reactor vessels, description of internal components, one layout drawing, and other appropriate safety and design data. Data sheets will be provided for reactors, compressors, pumps, exchangers, furnaces, product separators and knock-out drums only.
- g. Instrument Information - Description of the basic mode of process regulation and instrumentation. A description and the requirements of any safety interlock shutdown system are also to be included.
- h. Operating Procedures - Description of preliminary start-up, shutdown and emergency procedures for the MTG units. A description of all catalyst regeneration procedures is also to be included.
- i. Environmental Data - Process and fugitive emission data including flows, analyses and data on all effluent streams including waste products.

- j. Cost Data and Other Information - Information on chemical requirements and catalyst life.

Description of and a cost estimate for the Contractor's support of detailed engineering design, including, but not limited to, cost estimate for providing review and comment on key documents drawing specifications by an A/E.

Other information which in the view of the Contractor required for preliminary design and assessment of the MTG process.

Items b through j shall be assembled as a document to be called the MTG Preliminary Process Design Package and shall be submitted to Grace as Deliverable No. 7 in accordance with the Deliverables Schedule.

TASK 3 - ENGINEERING SUPPORT

The Contractor shall provide engineering services as reasonably required to support Grace and its A/E in their program of work as it relates to the MTG process units. By attending scheduled progress meetings and, when necessary, by the review of documents prepared by Grace and/or its A/E, this engineering support shall consist of:

- a. Design Reviews - Evaluate and comment on the final draft issue of key drawings and data sheets, prepared by the A/E for the MTG process units and associated systems. The key drawings and data sheets shall be determined by mutual agreement between Grace and the Contractor.
- b. Operating Procedures - Review and comment on descriptions of proposed procedures for start-up, shutdown, emergency conditions and catalyst regeneration.
- c. Presentations to DOE - Provide expert personnel to present data and commentary on the MTG process at scheduled reviews arranged by Grace for DOE.
- d. Other Matters - Provide whatever additional assistance the Contractor considers essential to ensure the successful incorporation of the MTG process in the Gasoline Plant, subject to the prior approval of Grace.

TASK 4 - PROGRAM MANAGEMENT

The program of work required by this contract shall be organized and conducted as set forth in a Management Plan to be submitted to Grace as Deliverable No. 1 of the schedule attached hereto as Exhibit 1. The Plan shall include organi-

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zation charts, manpower plans and expenditure forecasts. The manpower and cost information is to be prepared in accordance with the DOE Uniform Contractor Reporting System (UCRS) guidelines and shall be provided as Deliverables No. 2 and 3 in the Deliverables Schedule. A progress report shall be provided monthly to Grace, which shall describe the Contractor's work and that of any subcontractor. It shall also include data on manpower and cost management. The progress report shall be submitted as Deliverable No. 4 in accordance with the Deliverables Schedule.

EXHIBIT 1

DELIVERABLES SCHEDULE

Deliverable No.	Description	Statement of Work Task Reference	Submission/Review Data				
			Draft		Final		
			Date Due	No. of Copies	Grace Review Period (a)	Date Due	
1	Management Plan	4	4 weeks from Effective Date	10	1 week	6 weeks from Effective Date	15
2	Cost Plan	4	To be included in Management Plan				
3	Manpower Plan	4	To be included in Management Plan				
4	Monthly Progress Statement	4	N/A	N/A	N/A	5th calendar day of each month (b)	15
5	Basis of Design Report	1	4 weeks from Effective Date	10	1 week	7 weeks from Effective Date	15
6	Process Flow Diagrams	2	10 weeks from Effective Date	10	1 week	13 weeks from Effective Date	20
7	MTC Preliminary Process Design Package	2	30 weeks from Effective Date	10	3 weeks	35 weeks from Effective Date	15

(a) After receipt by Grace.

(b) Should the 5th calendar day of a month fall on other than a normal workday, the Monthly Progress Statement shall be due the first working day following the 5th calendar day.

EXHIBIT B

TEXACO DEVELOPMENT CORPORATION
STATEMENT OF WORK

P

SUBCONTRACT BETWEEN W.R. GRACE & CO.
AND TEXACO DEVELOPMENT CORPORATION

EXHIBIT B

STATEMENT OF WORK

Introduction

W. R. Grace & Co. ("Grace") has entered into Cooperative Agreement No. DE-FC01-80ET-14759 with the U. S. Department of Energy ("DOE") to perform a program of work for the preliminary design and assessment of a 50,000 barrel-per-day coal-to-methanol-to-gasoline plant ("Gasoline Plant"), which is assumed to be located in Baskett, Kentucky. The coal gasification technology to be incorporated in the Gasoline Plant design is the Texaco Coal Gasification Process ("TCGP"). In support of this design effort, which is to be performed by an Architect/Engineer subcontractor to Grace, the Contractor shall provide technical expertise, design services and other assistance as set forth below.

Task 1 - Technical Information and Data

The Contractor shall provide all of the technical information and data (including Technical Data and Proprietary Data as defined in Article 27 of the General Provisions) that Grace and Grace's Architect/Engineer subcontractor may reasonably need to develop and support the preliminary design of the synthesis gas

generation section of the Gasoline Plant (which will utilize the TCGP).

Task 2 - General Technical Expertise and Design Services

The Contractor shall provide general technical expertise and design services to Grace and Grace's Architect/Engineer subcontractor in support of the TCGP design for the Gasoline Plant. Such technical expertise and design services shall include:

1. Providing technical assistance in establishing general design criteria, or data base, for the TCGP;
2. Review and comment on process design drawings, balances, data sheets and other documents pertaining to the TCGP;
3. Assistance in the preparation for and presentation of periodic design reviews;
4. Assistance in developing estimates of capital and operating costs for the TCGP;
5. Assistance in performance of a detailed risk assessment of the TCGP;
6. Assistance in the development of preliminary operations and maintenance requirements for the TCGP; and
7. Assistance in preparation of a process and mechanical design report which will record the basis for the TCGP design and the rationale for TCGP decisions.

Task 3 - Estimates of Operation

The Contractor shall provide TCGP Estimates of Operation at conditions specified by Grace and acceptable to the Contractor. For this purpose, gasifier pressures up to 900 psi are acceptable to the Contractor. Such Estimates of Operation shall include:

1. Coal feedrate;
2. Oxygen feedrate;
3. Water feedrate;
4. Synthesis gas production;
5. Synthesis gas composition; and
6. Output of slag.

These Estimates of Operations shall be submitted to Grace as requested.

Task 4 - Feasibility Study Package

In support of the design of the TCGP to be developed and integrated by the Architect/Engineer subcontractor to Grace, the Contractor shall provide engineering information and technical data (including Technical Data and Proprietary Data as defined in Article 27 of the General Provisions) in the form of a feasibility study package, which shall include the following:

1. Preliminary curve-type installed capital cost estimate for battery limits, consisting of:
 - a. Final Coal Grinding, Slurry Preparation and Coal Gasification Sections, including Gas Cooling/Heat Recovery Section;

- b. Particulate (char) removal from synthesis gas, recovery and recycle of char removed from synthesis gas; and
 - c. Slag removal from process unit.
2. Utilities requirements for above battery limits including:
 - a. Steam consumed;
 - b. Steam produced;
 - c. Boiler feedwater required;
 - d. Cooling water required; and
 - e. Electric power required.
 3. Listing of major pieces of equipment, including weights, sizes, and suggested metallurgy based, among other factors, on already completed extended run test coupons.
 4. Simplified process flow diagram, including the above major pieces of equipment and major control valves;
 5. Heat Balance for same battery limits defined in 1, above;
 6. Material Balance for same battery limits defined in 1, above;
 7. Utilities breakdown for major pieces of equipment; and
 8. Rough plant layout for same battery limits defined in 1, above; as well as final grinding and slurry preparation sections.

Task 5 - Project Coordination

The Contractor shall perform the technical coordination as required in connection with the arrangement for and performance under this contract. This coordination will be performed on a schedule mutually agreed to by Grace and the Contractor.

Task 6 - Project Management/Administration

The Contractor shall provide project management and other auxiliary services in conjunction with performance under this contract. Such services shall include responsibility for the submission of monthly overview reports indicating the status of progress on the work under this contract (by the 25th of the month, covering that month). The Contractor shall also assist in the preparation of technical and management reports, as requested by Grace.

EXHIBIT C

UNDERSTANDING
BETWEEN THE
UNITED STATES DEPARTMENT OF THE ARMY, LOUISVILLE DISTRICT,
CORPS OF ENGINEERS
AND
W. R. GRACE & CO.

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EXHIBIT C

UNDERSTANDING
BETWEEN THE
UNITED STATES DEPARTMENT OF THE ARMY, LOUISVILLE DISTRICT,
CORPS OF ENGINEERS
AND
W. R. GRACE & CO.

I. INTRODUCTION AND PURPOSE

Pursuant to Cooperative Agreement No. DE-FC01-80ET-14759 (the "Cooperative Agreement") between W. R. Grace & Co. ("Grace") and the United States Department of Energy ("DOE"), effective as of August 22, 1980, Grace is performing a program of work for the preliminary design and assessment of a coal-to-methanol-to-gasoline plant to be located at Baskett, Kentucky (the "Project"). It has been determined that an Environmental Impact Statement ("EIS") for the Project is required pursuant to the National Environmental Policy Act of 1969 ("NEPA") and that the Army Corps of Engineers, Louisville District, ("COE") will be the lead federal agency and as a result will oversee the collection of information necessary for the preparation of the EIS. Pursuant to the Cooperative Agreement, Grace will enter into a subcontract with an environmental consultant for the collection and array of information necessary for preparation of the EIS.

It is the purpose of this understanding to establish a working relationship between Grace and COE under the conditions and procedures to be followed in the preparation of the EIS and other related documents.

II. GENERAL PROVISIONS

1. COE is responsible for assuring compliance with the requirements of NEPA. COE shall identify cooperating federal, state and local agencies and shall coordinate participation of those agencies in the EIS preparation.

2. Grace shall retain an environmental consultant (the "Consultant") to provide the supportive expertise, manpower, and technical capabilities required for collection of data necessary for preparation of the EIS in accordance with this understanding.

3. The contract between Grace and the Consultant ("Consulting Contract") will require the satisfactory and timely performance and completion of work, with submission of information in the format of a Draft EIS to COE with a target date of 42 weeks after consent to the Consulting Contract and a Final EIS as expeditiously as possible.

Both Grace and COE will:

- a. Review all substantive phases of the EIS data preparation and analysis;
- b. Designate representatives to review all work pertaining to EIS data as it is developed and completed;

Encl,

c. Have their respective representatives attend regular meetings with federal, state, regional, and local agencies for the purpose of increasing communication and receiving comments in the preparation of the EIS, as required by law; and

d. Insure coordination of effort and exchange of information among Grace's staff, COE representatives, the Consultant and the Consultant's subcontractors concerning the planning, design and construction of the Project to the extent such effort and information are relevant to the preparation of the EIS.

III. PROCEDURES

1. Grace will select the Consultant in accordance with Federal Procurement Regulations. The Request for Proposals will require that respondents review the environmental work reported in the Grace Synthesis Gas Demonstration Plant ("SGDP") facility, proposed for location at the same site under Contract No. DE-AC02-77ET13042, together with all relevant deliverables and documentation produced by others in developing the Gasoline Plant design, including trade-off studies, design deliverables, flow diagrams, site confirmation information and material supporting environmental permitting. The respondents shall determine the maximum extent such data and information can be used in preparation of the EIS and provide detailed descriptions and pricing of the additional work required (as outlined in the attached Statement of Work). After selection of the Consultant by Grace and approval by COE, the Consultant will finalize a detailed Plan of Study based upon the SOW. The Plan of Study will include a detailed description of each task to be performed by the Consultant, the estimated man-hours required for each such task, and the schedule for performing each such task.

2. Any and all work performed by the Consultant in the preparation of the EIS will be submitted directly to COE with copy to Grace.

3. The Consultant will submit a monthly progress report to COE and Grace. This report will address the present status of each task included in the Plan of Study, any problems encountered, and any changes made in personnel or methodology. As each portion of any draft of final document is completed, the responsible COE official will review such portion and those tasks completed thereunder and be given an opportunity to approve, modify or comment thereon. Said directions or comments will be made by COE in a timely manner, and the Consultant will insure incorporation of the COE comments into any editorial changes to the satisfaction of COE. All drafts of all work to be delivered will be submitted directly to COE for review and approval with copy to Grace for review and comment.

4. To coordinate data collection for EIS preparation, joint meetings between Grace, COE and the Consultant will be held. COE reserves the right to work directly with the Consultant for purposes of assuring objectivity in preparing reports or for assuring expeditious communications. Any substantive instructions by COE to the Consultant will be reduced to writing and Grace will be provided a copy. Notwithstanding any other provision of this agreement to the contrary,

COE shall not issue any instructions to the Consultant which would require the expenditure of additional funds under the Consulting Contract without the prior knowledge and approval of Grace.

5. Grace will include in the Consulting Contract provisions requiring the full cooperation of the Consultant and its subcontractors with respect to participation in any public workshops, hearings, meetings, and the like, as required by COE to foster public familiarity or participation with respect to the assessment of impacts related to the Project.

6. With respect to all reports and documents, including draft and final copies of the EIS, Grace will be responsible for the costs of stenographic, clerical, graphics, layout, printing, and the like, and Grace will also be responsible for the aforesaid costs in preparing and providing to COE twenty (20) copies of both an EIS draft and final report, including one "camera ready" copy of each sufficient for reproduction and distribution.

7. Upon completion of the draft EIS, COE will be responsible for organizing and conducting any public hearing. COE will also be recipient of all comments during the draft EIS review and comment period. This period (at least 45 days) will be initiated when the Environmental Protection Agency publishes the "Draft EIS Receipt" in the Federal Register.

8. At the close of the Draft EIS review and comment period, COE will identify the issues and comments submitted which will require response in the Final EIS. COE will direct those comments to the Consultant for preparation of proposed responses. The Consultant will furnish proposed responses directly to COE with copy to Grace for review. COE may modify the proposed responses as it determines necessary. COE will provide the final version of such responses to Grace and the Consultant for inclusion in the Final EIS.

IV. CONFIDENTIALITY

1. Notwithstanding any other provision of this understanding confidential business or financial information of Grace, the Consultant, or any subcontractor to Grace or the Consultant, required to be delivered to COE in connection with the preparation of the EIS for the Project and other related documents, reports or evaluations, may be marked with an appropriate legend requiring COE and its officers, agents and employees to maintain such information in confidence and COE and its officers, agents and employees will comply with the terms of such legend unless:

- a. Such information is generally known or is available from other sources without obligations concerning its confidentiality;
- b. Such information has been made available by the owner thereof to others without obligations concerning its confidentiality; or

c. Disclosure of such information is required by law or by the provisions of NEPA and/or regulations promulgated thereunder.

2. Neither the EIS nor any of the other related documents, reports or evaluations delivered to COE pursuant to this understanding will contain any proprietary data, as defined in Attachment B. If proprietary data is used by Grace, the Consultant or any subcontractor to the Consultant in the preparation of the EIS or any of the related documents, reports or evaluations delivered to COE pursuant to this understanding, representatives of COE shall be permitted access to such proprietary data at facilities designated by the owner of such proprietary data at any time prior to the earlier of (a) October 1985, or (b) the date of issuance of the final EIS for the Project, subject to the following procedures and limitations. If it is determined that access to proprietary information by employees of COE is necessary, proper assurances will be afforded to all parties prior to any COE review. Such assurances may be in the form of the nondisclosure agreement set out in Appendix B; provided however, such assurances must be acceptable to the proprietary vendor whose information COE desires to review. If any of said representatives are not U.S. Government employees, each such representative and the organization by which such representative is employed shall execute and deliver to Grace and the owner of such proprietary data an appropriate secrecy agreement in favor of the owner of such proprietary data.

V. TERMINATION

1. Either party may terminate this understanding for good cause upon written notice to the other party.

2. In the event of a termination of this understanding or the Consulting Contract, it is agreed as follows:

a. Grace will assure that copies of all documentation, reports, analyses, data, etc., developed by the Consultant are delivered to COE except as provided in IV, above.

b. Should an EIS for the Project be required, COE will assume the responsibility for preparing the EIS.

VI. MODIFICATION

This understanding may be modified only by a written amendment executed by both parties hereto.

NONDISCLOSURE AGREEMENT FOR U. S. GOVERNMENT EMPLOYEES DISCLOSURE OF INFORMATION

As a U. S. Government employee, subject to 18 U.S.C. 1905 (1976), I, the undersigned, agree that, except to the extent authorized by law, I shall not reveal any designated proprietary or confidential information furnished to or acquired by me in connection with (identify proprietary data) by oral, visual, or documentary means, to anyone except a Government employee who has signed a similar Nondisclosure Agreement, or a non-Government entity who has entered into an appropriate secrecy agreement with the owner of such proprietary data, and with respect to Government employees, only to the extent that such information is required in connection with his official or assigned duties. Further, I understand that the right to such proprietary data on this need-to-know basis does not normally extend to any chain of supervision.

I hereby certify that I shall not make any copies, or remove any such proprietary or confidential information, or any copies thereof, or any notes or calculations that I may derive therefrom, from the facilities, custody or control of (owner of proprietary data), W. E. Grace & Co., or third parties whose facilities are approved by (owner of proprietary data) for my access to such designated proprietary or confidential information. In addition, I certify that I will not disclose such proprietary or confidential information except as provided herein.

Signature

Date

Title

Witness

Employing Agency

All obligations under the above nondisclosure agreement shall survive any termination of this agreement. For purposes of this agreement, the terms "technical data" and "proprietary data" shall mean the following:

- a. "Technical data" means recorded information regardless of form or characteristic, of a scientific or technical nature.

It may, for example, document research, experimental, developmental, or demonstration, or engineering work, or be usable or used to define a design or process, or to procure, produce, support, maintain, or operate material. The data may be graphic or pictorial delineations in media such as drawings or photographs, text in specifications or related performance or design type documents or computer software (including computer programs, computer software data bases, and computer software documentation). Examples of technical data include research and engineering data, engineering drawings and associated lists, specifications, standards, process sheets, manuals, technical reports, catalog item identification, and related information. Technical data as used herein does not include financial reports, cost analyses, and other information incidental to administration.

b. "Proprietary data" means technical data which embody trade secrets developed at private expense such as design procedures or techniques, chemical composition of materials, or manufacturing methods, processes, or treatments, including minor modifications thereof, provided that such data:

- (i) Are not generally known or available from other sources without obligation concerning their confidentiality,
- (ii) Have not been made available by the owner to others without obligation concerning their confidentiality, and
- (iii) Are not already available to the United States Government without obligation concerning their confidentiality.

EXHIBIT D

ENVIRONMENTAL CONSULTANT
STATEMENTS OF WORK

EXHIBIT DSTATEMENTS OF WORKINTRODUCTION

W. R. Grace & Co. ("Grace") has entered into Cooperative Agreement No. DE-FC01-80ET-14759 (the "Cooperative Agreement") with the United States Department of Energy ("DOE") to perform a program of work for the preliminary design and assessment of a coal-to-methanol-to-gasoline plant (the "Gasoline Plant") to produce 50,000 barrels per day of gasoline from high-sulfur agglomerating coal. The facility is to be located near Baskett, Kentucky.

Pursuant to the Cooperative Agreement, Grace is technical director of the project. The Ralph M. Parsons Company of Pasadena, California, ("Parsons"), has been selected to provide architect/engineering and related services for the project including process and mechanical engineering design, preparation of capital and operating cost estimates, site evaluation, economic assessments and preparation of required documents for permitting and planning for construction and operation of the facility. It has been determined that an Environmental Impact Statement ("EIS") for the Gasoline Plant project is required pursuant to the National Environmental Policy Act of 1969 ("NEPA") and that the U.S. Army Corps of Engineers, Louisville District, ("COE") will be the Lead Federal Agency.

An environmental consultant ("Contractor") is to provide supportive expertise, manpower and technical capabilities required for the preparation of the EIS which is to describe the proposed project, including its need and practical alternatives and identify its expected effects on the environment. The EIS to be prepared by the Contractor must comply with all provisions of: 1) NEPA and any and all regulations and/or guidelines related to NEPA, 2) all local and state laws, and 3) this contract.

In establishing an environmental baseline for the EIS, the Contractor shall utilize to the maximum extent that it is applicable existing environmental work reported in the design of the Grace Synthesis Gas Demonstration Plant ("SGDP") facility, proposed for location at the Baskett, Kentucky, site under Contract No. DE-AC02-77ET-13042. The Contractor shall further utilize data supporting the Gasoline Plant project produced by Parsons, Parsons' subcontractors and other firms. The Contractor shall develop other data not otherwise available necessary to prepare the EIS.

Grace will provide for liaison between the Contractor and Parsons pertaining to the work under Contract No. DE-AC02-77ET-13042 and shall also supply to the Contractor all relevant deliverables and documentation produced pursuant to the Gasoline Plant design including trade off studies, design deliverables, flow diagrams, site confirmation information, and material supporting environmental permitting.

Certain of the engineering data included in the SGDP project and in the design basis of the Gasoline Plant is held proprietary by several licensors of proprietary technologies. Included are processes of Texaco Development Corporation, Mobil Research and Development Corporation, Lotepro Corp. (Linde AG), The Ralph M. Parsons Co., Lurgi Corporation, and others. In the event that it becomes necessary for

the Contractor to have access to such proprietary information the Contractor shall promptly execute any secrecy agreements required by such licensors.

The work to be performed by the Contractor under this contract is segregated into a Basic Statement of Work and an Option Statement of Work.

The Tasks comprising the Basic and Option Statements of Work are as listed below and detailed separately in the following pages.

- Basic Statement of Work

- Task 1 - Prepare Environmental Plan of Study
- Task 2 - Develop Supplemental Baseline Data
- Task 3 - Prepare Draft Environmental Impact Statement
- Task 4 - Coordinate Effort with COE and Others
- Task 5 - Program Management for Basic Statement of Work

- Option Statement of Work

- Task 6 - Prepare Final Environmental Impact Statement
- Task 7 - Coordinate Effort with COE and Others
- Task 8 - Program Management for Option Statement of Work

The Effective Dates, completion dates, and estimated cost plus fixed fee for both the Basic Statement of Work and Option Statement of Work are specified in Articles II and III of the Schedule of this contract.

BASIC STATEMENT OF WORK

TASK 1 - PREPARE ENVIRONMENTAL PLAN OF STUDY

The Contractor shall utilize data from:

- The environmental work reported in the design of the Grace SGDP facility, proposed for location at the same site under Contract No. DE-AC02-77ET-13042,
- Deliverables and documentation currently available concerning the Gasoline Plant including descriptions and plans for work by Parsons and others in the plant design, site confirmation studies and environmental permitting efforts.
- Other information available to the Contractor from public or private sources

to the maximum extent such data are applicable to the Gasoline Plant EIS.

The Contractor will prepare a Plan of Study for preparation of the Gasoline Plant EIS. The Plan of Study will be based on this SOW and the detailed description of the additional work proposed by the Contractor in its response to the Grace solicitation. The contents of the Plan of Study will, as a minimum, include the following:

- a. A complete description of the full scope of field sampling and monitoring, laboratory testing and data analysis required to establish the Gasoline Plant environmental baseline.
- b. A summary of those requirements described in a. above that can be satisfied with information available from the SGDP project, work being performed by Parsons in support of the Gasoline Plant project, or data available from other public or private sources.
- c. A detailed description of supplemental work required to define the social and environmental baseline, including descriptions of samples required, monitoring schedules and methodologies.

- d. Identification of the individuals that will perform each task including employees of any subcontractor, if subcontracting is necessary.
- e. An estimate of the manhours required for each task.
- f. A schedule for the performance of each task.

The Plan of Study is to be finalized by the Contractor after consultation with Grace and COE and in accordance with the terms and conditions of this contract. The Plan of Study shall be submitted directly to COE and Grace as Deliverable No. 5 in accordance with the Deliverables Schedule for the Basic Statement of Work attached hereto as Exhibit 1.

TASK 2 - DEVELOP SUPPLEMENTAL BASELINE DATA

The Contractor shall develop the supplemental information by field data collection and analysis as required to form, when combined with other available data, the overall baseline of the environment affected by the construction and operation of the Gasoline Plant all in accordance with the provisions of the Plan of Study.

The Contractor will provide, subject to the terms of the Contractor's Secrecy Agreement with licensors of proprietary data where applicable, and to the extent requested by Grace or COE, access and review of all procedures and underlying data used by the Contractor in developing any and all reports, including but not limited to field reports, subcontractor reports and records of interviews with concerned private and public parties whether or not such information may be reflected in a draft or final report.

TASK 3 - PREPARE DRAFT ENVIRONMENTAL IMPACT STATEMENT

The Contractor shall prepare and assemble documentation fully describing the environmental issues, potential alternative actions, assessments of the environmental impacts, mitigation measures and other NEPA requirements into a comprehensive draft EIS. The draft EIS must comply with all provisions of: 1) NEPA and any and all regulations and/or guidelines related to NEPA, 2) all local and state laws, and 3) this contract.

Any and all work performed by the Contractor in preparation of the draft EIS will be submitted directly to COE and Grace by the Contractor. As each portion of any draft or final document is completed, COE will review such portion and those tasks completed thereunder and will approve, modify or comment thereon. Any directions or comments by COE will be made in a timely manner, and the Contractor will insure incorporation of the COE comments into any editorial changes to the satisfaction of COE. All drafts of all work to be delivered will be submitted, as prepared, to Grace for review and comment and to COE for review and approval.

Neither the draft EIS nor any of the other related documents, reports or evaluations delivered to COE shall contain any proprietary data. Copies of the draft EIS prepared hereunder shall be submitted to Grace and COE as Deliverable No. 6 in accordance with the Deliverables Schedule for the Basic Statement of Work (Exhibit 1 hereto).

TASK 4 - COORDINATE EFFORT WITH COE AND OTHERS

The Contractor, and any subcontractors reporting to the Contractor, will participate in public workshops, hearings, meetings, etc., as required by COE and/or Grace to foster public familiarity or participation with respect to the assessment of the impacts related to the project.

To coordinate preparation of the draft EIS, joint meetings between Grace, COE, and the Contractor will be held. COE has reserved the right to work directly with the Contractor for purposes of assuring objectivity in preparing reports or for assuring expeditious communications. The Contractor will reduce to writing any substantive instructions by COE to the Contractor, and Grace will be provided a copy.

TASK 5 - PROJECT MANAGEMENT FOR BASIC STATEMENT OF WORK

The program of work required by this contract shall be organized and conducted as set forth in a Management Plan to be submitted to Grace and COE as Deliverable No. 1 in accordance with the Deliverables Schedule for the Basic Statement of Work attached hereto as Exhibit 1. The Management Plan shall include organization charts, manpower plans, and expenditure forecasts for the Basic Statement of Work.

The cost and manpower information is to be prepared in accordance with the DOE Uniform Contractor Reporting System ("UCRS") guidelines and shall be submitted to COE and Grace as Deliverables No. 2 and 3, respectively, in accordance with the Deliverables Schedule for the Basic Statement of Work (Exhibit 1 hereto).

A progress report shall be provided to Grace and COE on a monthly basis. The progress report shall describe work performed by the Contractor and any lower-tier subcontractor during the reporting period and shall be submitted as Deliverable No. 4 in accordance with the Deliverables Schedule for the Basic Statement of Work (Exhibit 1 hereto). The progress report will address the present status of each task included in the Plan of Study, any problems encountered, and any changes made in personnel or methodology. It shall also include data on manpower and cost management.

OPTION STATEMENT OF WORK

TASK 6 - PREPARE FINAL ENVIRONMENTAL IMPACT STATEMENT

At the close of the draft EIS review and comment period, COE will identify the issues and comments submitted which will require response in the final EIS. COE will direct those comments to the Contractor for preparation of proposed responses. The Contractor will furnish proposed responses to COE and Grace for review. COE may modify the proposed responses as it determines necessary. COE will provide the final version of such responses to Grace and the Consultant for inclusion in the final EIS. Copies of the final EIS shall be submitted to Grace and COE as Deliverable No. 7 in accordance with the Deliverables Schedule for the Option Statement of Work (Exhibit 2 hereto).

TASK 7 - COORDINATE WITH COE AND OTHERS

The Contractor, and any subcontractors reporting to the Contractor, will participate in public workshops, hearings, meetings, etc., as required by COE and/or Grace to foster public familiarity or participation with respect to the assessment of the impacts related to the project.

To coordinate preparation of the final EIS, joint meetings between Grace, COE, and the Contractor will be held. COE has reserved the right to work directly with the Contractor for purposes of assuring objectivity in preparing reports or for assuring expeditious communications. The Contractor will reduce to writing any substantive instructions by COE to the Contractor, and Grace will be provided a copy.

TASK 8 - PROGRAM MANAGEMENT FOR OPTION STATEMENT OF WORK

It is anticipated that the management philosophies set forth in the Management Plan developed pursuant to Task 5 of the Basic Statement of Work shall continue in practice in support of the Option Statement of Work. Cost and manpower plans reflecting the requirements of this Option Statement of Work prepared in accordance with the DOE Uniform Contractor Reporting System ("UCRS") guidelines shall be prepared and submitted as Deliverables No. 8 and 9 in accordance with the Deliverables Schedule for the Option Statement of Work (Exhibit 2 hereto).

A progress report shall be provided to Grace and COE on a monthly basis. The progress report shall describe work performed by the Contractor and any lower-tier subcontractor during the reporting period and shall be submitted as Deliverable No. 10 in accordance with the Deliverables Schedule for the Option Statement of Work (Exhibit 2 hereto). The progress reports will address the status of preparation of the final EIS. Data on cost and manpower expenditures will be included.

EXHIBIT 1

DELIVERABLES SCHEDULE
FOR THE BASIC STATEMENT OF WORK

Deliverable No.	Description	Statement of Work Task Reference	Submission to Grace and COE (d)		Copies Grace/COE
			Draft	Final	
			Date Due (a)	Date Due (a)	Copies Grace/COE
1	Management Plan	5	4 weeks	6 weeks	15/5
2	Cost Plan	5			To be included in Management Plan
3	Manpower Plan	5			To be included in Management Plan
4	Monthly Progress Report	5	N/A	N/A	5th calendar day of each month (b)
5	Plan of Study	1	December 18, 1981	January 29, 1982	20/20
6	Draft Environmental Impact Statement	3	July 2, 1982	October 5, 1982	60/20 (c)

(a) Period from Effective Date unless otherwise noted.

(b) Should the 5th calendar day of a month fall on other than a normal workday, the Monthly Progress Report shall be due the first working day following the 5th calendar day.

(c) Including one "camera ready" copy.

(d) Dated deliverables assume commencement of performance by December 1, 1981.

EXHIBIT 2
DELIVERABLES SCHEDULE
FOR THE OPTION STATEMENT OF WORK

Deliverable No.	Description	Statement of Work Task Reference	Submission to Grace and COE		
			Draft	Final	Copies Grace/COE
			Date Due(a)	Date Due(a)	
7	Final Environmental Impact Statement	6	NA	April 1, 1983	60/20(c)
8	Cost Plan	8	NA	2 weeks	15/5
9	Manpower Plan	8	NA	2 weeks	15/5
10	Monthly Progress Report	8	NA	5th calendar day of each month(b)	15/5

(a) Period indicated is from Effective Date for performance of Option Statement of Work unless otherwise specified.
 (b) Should the 5th calendar day of a month fall on other than a normal workday, the Monthly Progress Report shall be due the first working day following the 5th calendar day.
 (c) Including the "camera ready" copy.