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Science and industry have long known that vast amounts of manganese nodules lie on the ocean bottom in most parts of the world. These nodules commonly contain more than 30 mineral elements and are especially rich in nickel, copper, cobalt, and manganese. Mining consortia have spent at least \$140 million to develop deep ocean mining technology and will invest \$2.1 billion to \$3.1 billion to achieve commercial operations.

Findings/Conclusions: Two major problems may delay full-scale commercial mining operations: (1) the lack of mining site tenure guaranteed by domestic law or international agreement since assurances of tenure are needed to obtain financing for mining operations; and (2) the lack of a Federal environmental impact statement and resulting regulations which could have costly effects on equipment design decisions and operational techniques. No Federal agency is primarily responsible for deep ocean mining, and no Federal agency has been given the responsibility for preparing an environmental impact statement or environmental regulations. Agency programs and projects for deep ocean mining are fragmented and uncoordinated while needed programs have gone unattended or are behind schedule. Agency

officials, industry representatives, and marine scientists generally agree that the Federal role in deep ocean mining needs to be clearly defined. Recommendations: The Office of Management and Budget, with the advice of the Office of Science and Technology Policy, should designate a primary Federal authority to determine the Federal role and develop for congressional approval a comprehensive program to implement Federal responsibilities. (RRS)

6841

BY THE COMPTROLLER GENERAL

# Report To The Congress

OF THE UNITED STATES

## Deep Ocean Mining--Actions Needed To Make It Happen

Deep ocean mining for manganese nodules could benefit the U. S. economy in the coming decade, but it needs organized Federal support to become established.

There is no national program defining the Federal Government's role in developing ocean mineral resources generally and deep ocean mining for manganese nodules specifically. Further, responsibilities and expertise are divided among several Federal departments and agencies.

Accordingly, the Office of Management and Budget should designate a primary Federal authority to determine the Federal role and develop for congressional approval a comprehensive program to implement Federal responsibilities in accordance with national objectives.



PSAD-77-127  
JUNE 28, 1978



COMPTROLLER GENERAL OF THE UNITED STATES  
WASHINGTON, D.C. 20548


B-174316

To the President of the Senate and the  
Speaker of the House of Representatives

This report describes our review of deep ocean mining for manganese nodules. Because of extensive interest in this subject, we sought to evaluate the Federal Government's role in deep ocean mining.

This review was made pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Director, Office of Management and Budget and the Secretaries of Commerce, the Interior, and State.

ACTING   
Comptroller General  
of the United States

## D I G E S T

Manganese nodules, potato-shaped formations found on the ocean floor, contain minerals such as copper, nickel, cobalt, and manganese. While land-based mineral reserves are finite, seabed deposits are almost unlimited and could provide important resources for the United States. (See pp. 1 to 5.)

Mining consortia have spent at least \$140 million to develop deep ocean mining technology and will invest \$2.1 billion to \$3.1 billion to achieve commercial operations. (See p. 15.) However, there are two major constraints on U.S. mining firms, which will probably delay mining if they are not resolved.

### Site tenure

The primary problem is the need for mining site tenure at specific deep sea locations guaranteed by domestic law or international agreement. According to mining firm officials, assurance of continued rights to known mineral reserves is necessary if the firms are to obtain capital funding necessary to build ships, refineries, and mining systems. Adoption of an international Law of the Sea Treaty and/or passage of proposed domestic legislation governing deep ocean mining could resolve the site tenure problem. (See pp. 16 to 18.)

Officials of U.S. mining firms told GAO that since little progress has been made in the United Nations Law of the Sea negotiations, they have given up hope for an international treaty favoring mining by private enterprise. Therefore, they are supporting domestic legislation to protect their interests.

### Environment impact assessment

The second problem is the need for the Federal Government to complete a series of environmental studies or assessments and to develop

environmental regulations before commercial mining operations begin so that mining equipment, operating techniques, and refineries are environmentally acceptable. Timely completion of the deep ocean mining environmental study by the Department of Commerce's National Oceanic and Atmospheric Administration, and the writing of an environmental impact statement and regulations could resolve this problem. (See pp. 18 to 22.)

### Federal role

No Federal agency is primarily responsible for deep ocean mining. In addition, no Federal agency has been given the responsibility to prepare an environmental impact statement or environmental regulations. Many Federal agencies, however, already have projects or potentially useful resources that support deep ocean mining. These projects have been largely based on traditional agency missions and individual perceptions of what needs to be done. As a result, some agency programs and projects for deep ocean mining are fragmented and uncoordinated, while needed projects have gone unattended or are behind schedule. (See pp. 27 to 34.)

Federal officials, industry representatives, and marine scientists generally agree that the Federal role in deep ocean mining needs to be clearly defined. They also agree that this should include providing industry with a legal basis for mining activity and for environmental protection. They also want the Government to sponsor broad-based research programs related to deep ocean mining and to make the technical results available to scientists and industry. (See pp. 38 to 42.)

GAO believes that the various agencies' support of deep ocean mining should be coordinated in an overall program. Accordingly, GAO recommends that the Office of Management and Budget, with the advice of the Office of Science and Technology Policy, designate a primary Federal authority to determine the Federal role and

develop for congressional approval a comprehensive program to implement Federal responsibilities in accordance with national objectives. (See pp. 45 to 46.)

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**ABBREVIATIONS**

DOMES	Deep Ocean Mining Environmental Study
GAO	General Accounting Office
ICMSE	Interagency Committee on Marine Science and Engineering
NOAA	National Oceanic and Atmospheric Administration
USGS	United States Geological Survey

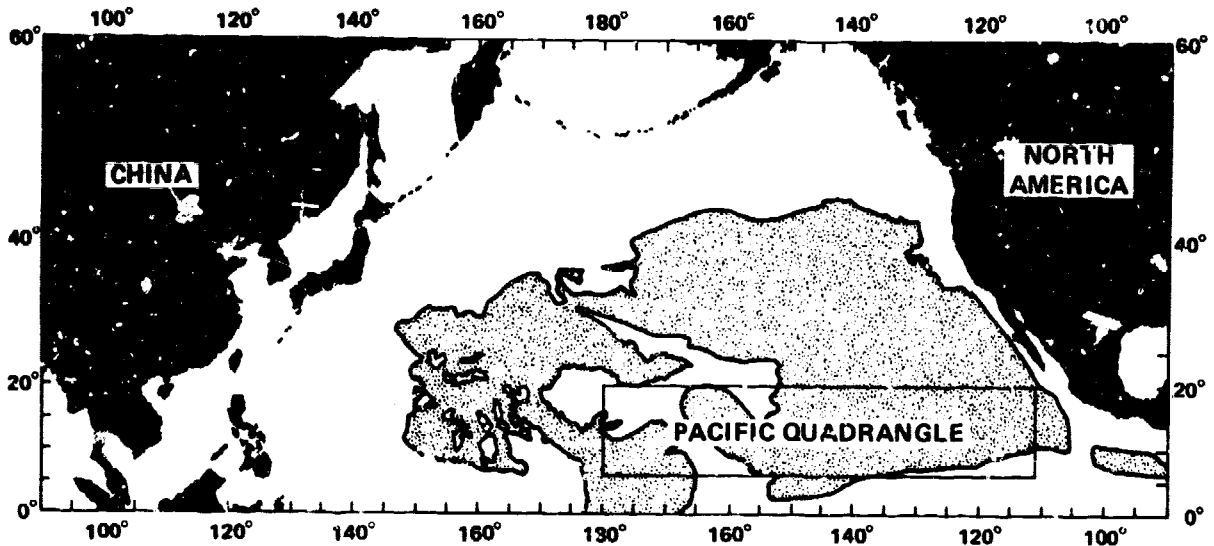
## CHAPTER 1

### INTRODUCTION

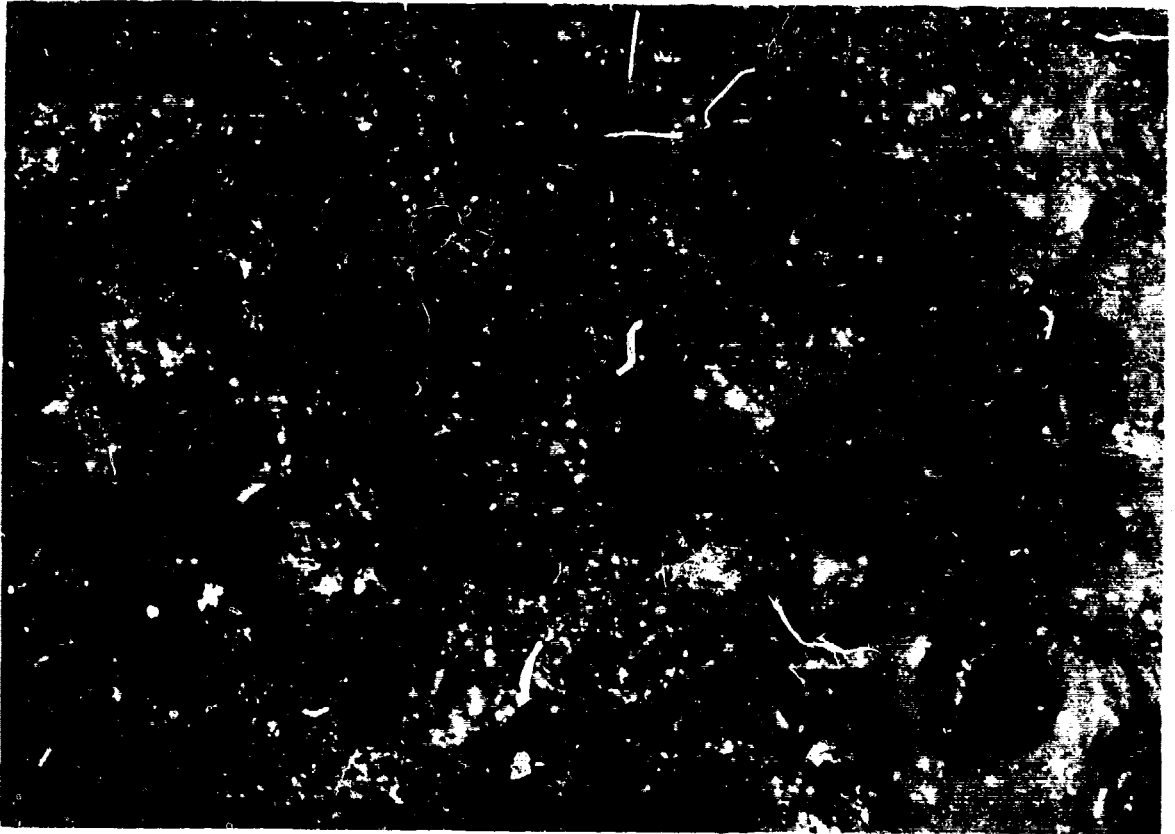
Science and industry have long known that vast amounts of manganese nodules lie on the ocean bottom in most parts of the world. These nodules of various sized, potato-shaped mineral formations commonly contain more than 30 mineral elements. Nodules are especially rich in several metals of economic interest--nickel, copper, cobalt, and manganese. The recent development of deep ocean mining technology, along with the growing worldwide demand for these metals, has heightened commercial interest.

Abundant evidence supports the fact that manganese nodule deposits exist in potentially commercial quantities. The deposits known to have the greatest economic potential are in the Pacific Ocean south of Hawaii and west of southern California. The richest deposits in this area (known as the Pacific Quadrangle) are found in an east-west belt about 1,500 kilometers long by 200 kilometers wide. (See chart below.)

#### MANGANESE NODULE DEPOSITS IN THE NORTH PACIFIC



SOURCE: FERROMANGANESE DEPOSITS ON THE OCEAN FLOOR, Horn, D.R. ed.,  
National Science Foundation, Washington, D.C., 1972, page 12.



SOURCE: OCEAN MANAGEMENT, INC.

**MANGANESE NODULES AND ASSOCIATED OCEAN BOTTOM SEDIMENT**



SOURCE: OCEAN MANAGEMENT, INC.

**CROSS-CUT VIEW OF MANGANESE NODULES**

These seabed deposits are so large that the first commercial ventures are likely to mine less than 5 percent of the deposits presently identified. Estimates of the total nodule resource range from 90 billion to 1.7 trillion tons. The mineral reserves in the nodules, however, are probably only 10 billion to 500 billion tons. 1/

The photographs on pages 2 and 3 show different views of manganese nodules.

The United States depends on imports for nickel, cobalt, and manganese. 2/ Over the past several years we have imported about 98 percent of the cobalt and manganese consumed. Our net imports of nickel are over 70 percent, while copper imports average around 10 percent. A 1974 Stanford Research Institute report on Strategic Resources and National Security ranked nickel, manganese, and cobalt among the minerals most critical to the economy and national security.

Benefits to the United States from seabed mining could include:

- Reducing nickel and manganese imports by more than 50 percent and eliminating all cobalt and most copper imports by 1985, which could reduce mineral import costs by over \$1 billion in 1985.
- Becoming independent of foreign supplies in meeting national security needs for these metals.
- Increasing U.S. employment through deep sea mining, shipbuilding, the production of mining equipment, and the operation of refineries within the United States.

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1/Government-funded research to determine how manganese nodules are formed has been underway for several years.

2/The United States has large deposits of these metals onshore that may be exploitable in the future under more favorable economic conditions or with improvements in technology. A Department of the Interior official described these deposits as low grade.

- Transferring manganese nodule mining technology to other types of ocean mining operations, and exporting this technology to other nations.
- Becoming a net exporter of these four metals, thus turning a projected \$6 billion annual balance of payments deficit into a surplus in the year 2000. 1/

### INTERNATIONAL INTEREST IN NODULE MINING

Manganese nodule mining has drawn the interest of several other industrially developed countries.

#### Japan

The Japanese Government has sponsored extensive nodule exploration and research and development in mining and refining technology. The Government has funded construction of an oceanographic research vessel designed to conduct manganese nodule surveys and a number of nodule studies by Japanese universities. The Government has also been active in funding and helping develop a continuous line bucket mining system. Thirty leading Japanese companies have formed the Deep Ocean Mining Association to advise the Government on technical progress.

#### West Germany

The Federal Republic of Germany has directly supported several projects for commercial recovery of metals contained in manganese nodules. The Government has chartered two oceanographic vessels to explore the Pacific Quadrangle for nodule deposits and an additional exploration ship is being built with Government subsidies. One West German mining consortium has received a Government subsidy for a nodule mining feasibility study.

#### France

The French Government has directly supported several projects for commercial recovery of manganese nodules. It is funding deep ocean nodule exploration, the development of exploration equipment to survey for nodules, and research on nodule processing techniques. The bulk of the funding is channeled through Centre National pour L'Exploitation

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1/These projections are necessarily dependent on the timing of investment in the ocean mining industry and subsequent commercial production.

des Oceans. This organization is also playing a leading role in developing a mining system.

### Soviet Union

The Soviet Union has been active in the exploration of manganese nodule deposits since the 1950s and has made much of its data available to the international scientific community. Large numbers of photographs and nodules have been obtained, and several technical papers have appeared in Soviet scientific journals describing nodule mineralogy, chemistry, internal structure, distribution, and hypotheses of origin. Nodule survey expeditions have been conducted in the Atlantic, Pacific, and Indian Oceans.

Although the Soviets have dredged many nodule samples from the deep seabed for study, there seems to be little progress toward commercial development. One reason may be that the Soviet Union is essentially an exporter of the major metals contained in manganese nodules. Thus, according to a Congressional Research Service report, developing expensive technology to recover nodules from the deep seabed may not be as pressing a concern to the Soviet Union as to other industrial countries dependent on imports of nickel, copper, cobalt, and manganese.

### Other nations

The British Department of Trade and Industry has offered a loan to the two British firms in the Kennecott group. <sup>1/</sup> These two firms would repay the loan if the venture proves profitable.

Several Canadian firms, including International Nickel Company, belong to international consortia which mine manganese nodule metals, but there is no direct Government assistance.

The New Zealand Oceanographic Institute surveyed nodule deposits between its shores and the Cook Islands, and found highly concentrated deposits. The Department of Scientific and Industrial Research is studying the distribution and chemical composition of these nodules.

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<sup>1/</sup>The Kennecott group is one of the international consortia in which U.S. firms are involved. (See p. 9.)

The Australian Government has done research on nodules using a naval ship to dredge.

#### SCOPE OF REVIEW.

We interviewed U.S. ocean mining industry officials of the following firms: Kennecott Copper Corporation; Deepsea Ventures, Inc.; Lockheed Missiles and Space Co.; Ocean Management, Inc.; Ocean Research, Inc.; and Global Marine Development, Inc. regarding their deep ocean mining plans and activities, and analyzed data they provided.

We also interviewed and analyzed data from marine scientists from Scripps Institution of Oceanography in La Jolla, California; Lamont-Doherty Geological Observatory in Palisades, New York; and the University of Washington in Seattle, Washington for their views on the environmental impacts of deep ocean mining.

We also interviewed 36 officials, and analyzed data from Federal agencies, councils, and committees that have an interest in or projects related to deep ocean mining. (See app. I.)



## CHAPTER 2

### PROGRESS AND PROBLEMS IN THE U.S. DEEP OCEAN

#### MINING INDUSTRY

Development of the complex technology for recovering and processing manganese nodules from the deep seabed has been underway for more than a decade, and great progress has been made. Commercial mining of the deep seabed for manganese nodules will probably begin in the 1980s and U.S. firms most likely will be involved.

A 1976 Congressional Research Service report stated that sustained long-term development of the nodule industry depends on its competitive position with alternative sources of metal supply, such as land-based mining and recycling. Industry sources believe that the first nodule mining could be profitable but that technological developments; political, legal, and environmental constraints; and fluctuating market conditions could affect the relative competitive position of nodule mining.

According to a Congressional Research Service report, profits of the deep ocean mining industry will be derived mainly from nickel and copper. Because of the great demand for these metals and the relatively small output from deep sea mining, added supplies from nodules may have little impact on world market prices. Possible declining market prices of cobalt and manganese caused by increased supplies from nodules are not expected to severely affect the profitability of nodule mining. The added supplies of these minerals, however, could affect the economies of some developing countries. According to a report done for the Office of Marine Minerals, Department of Commerce, successful nodule mining by U.S. firms would limit the prices that could be demanded by exporters for minerals found in nodules.

Two major problems that may delay full-scale commercial mining operations are:

- The lack of mining site tenure guaranteed by domestic or international law. The mining industry needs assurances of tenure to obtain financing for mining operations. (See p. 16.)
- The lack of a federal environmental impact statement and resulting regulations, which could have costly

effects on equipment design decisions and operating techniques. (See p. 19.)

Industry spokesmen stated that U.S.-based firms have a technological lead over foreign nations in the deep ocean mining field. They believe, however, that the technological advantage gained through early investment in the hardware for raising nodules and in the development of processing techniques could soon vanish as foreign firms increase their expenditures in seabed mining technology.

#### PRIVATE INDUSTRY'S PROGRESS TOWARD COMMERCIAL MINING

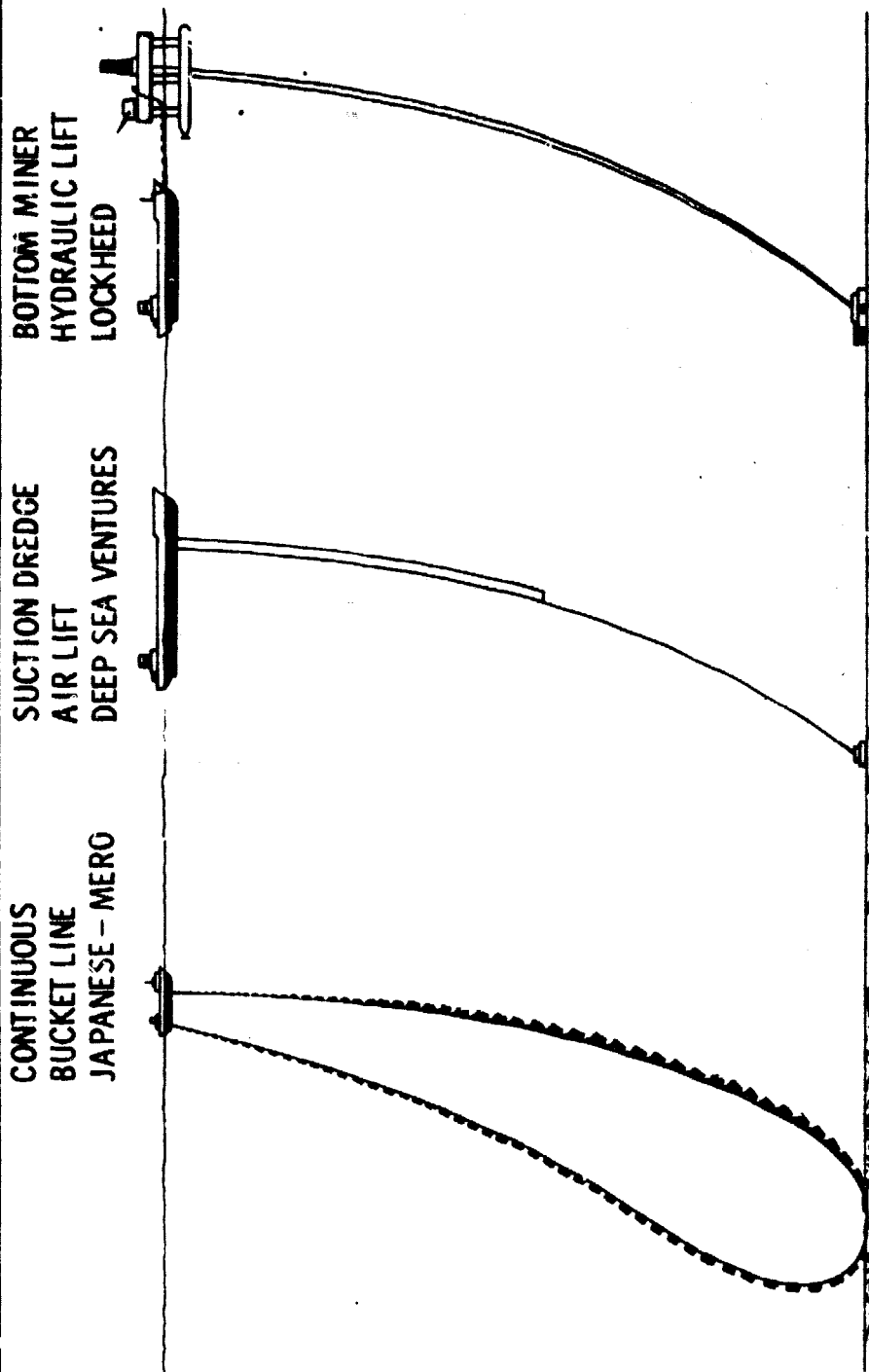
Several U.S. firms are involved in developing manganese nodule mining. These firms are part of four major international consortia. They include:

<u>Consortium</u>	<u>U.S. firms involved</u>
The Kennecott Group	Kennecott Copper Corporation
Ocean Mining Associates	The Sun Company United States Steel Corporation Union, Inc.
INCO	Sedco Incorporated
The Lockheed Group	Lockheed Missiles and Space Co. AMOCO Minerals

An October 1975 Department of the Interior report stated that the following milestones have been or would soon be reached by U.S. deep ocean mining companies:

- General seabed prospecting has been completed, and detailed exploration work is proceeding at potential mine sites.
- Components of nodule mining systems have been tested and prototype tests of the entire at-sea mining systems are being scheduled. (See pp. 10 and 11 for illustrations of proposed mining systems.)
- Pilot-size refining plants have been satisfactorily tested in anticipation of full-scale development. (See p. 12 for photo of a pilot processing plant.)

# THREE BASIC OCEAN MINING SYSTEMS



CONTINUOUS  
 BUCKET LINE  
 JAPANESE - MERO

SUCTION DREDGE  
 AIR LIFT  
 DEEP SEA VENTURES

BOTTOM MINER  
 HYDRAULIC LIFT  
 LOCKHEAD

THOUSAND TONS/DAY

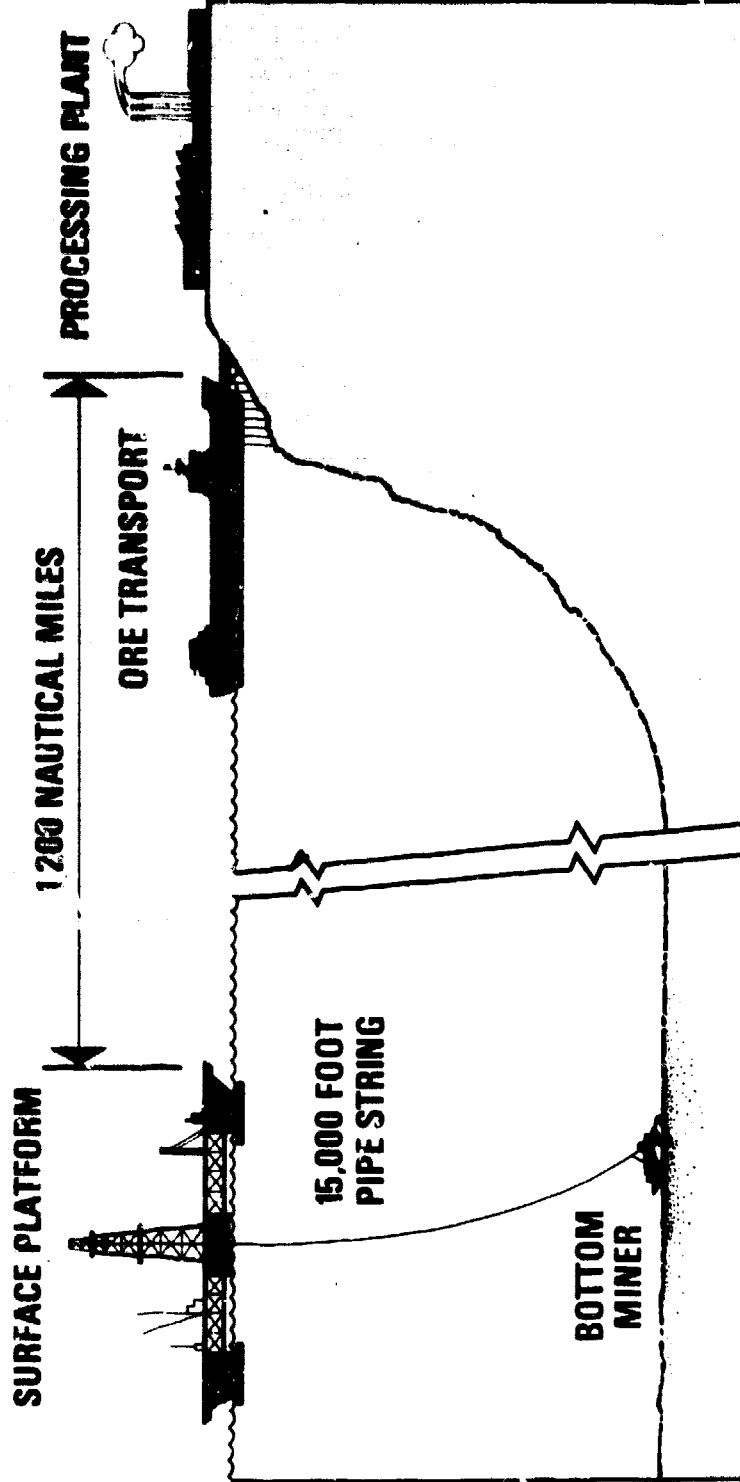
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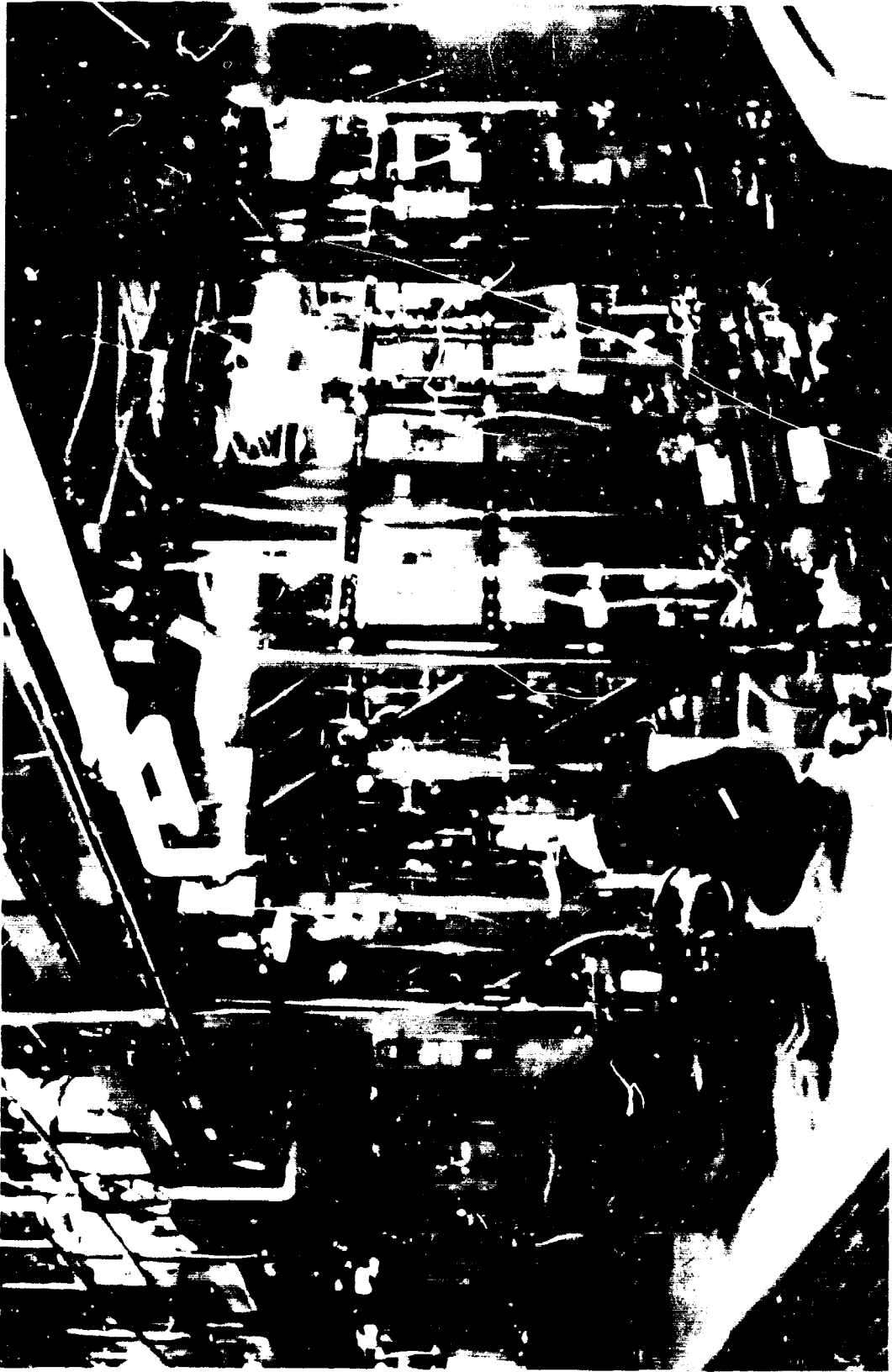
5-15

SOURCE: LOCKHEED MISSILES AND SPACE CO., INC.

# Manganese Nodule Mining & Processing System



SOURCE: LOCKHEED MISSILES AND SPACE CO., INC.



SOURCE: KENNECOTT COPPER CORPORATION

MANGANESE NODULE PILOT PROCESSING PLANT



SOURCE: DEEPSEA VENTURES, INC.

ARTIST'S CONCEPTION OF A MANGANESE MODULE MINING OPERATION--  
MINING VESSEL, ORE CARRIER, AND MINING DEVICE

--International consortia have been formed to provide more management, technical expertise, and financial backing and to spread the financial risks among several companies.

A senior mining engineer for the National Oceanic and Atmospheric Administration (NOAA) told us that the mining method favored by U.S.-based companies is similar to a huge 50-foot-wide vacuum cleaner sweeping the sea floor and drawing the nodules along with bottom water sediment up a large tube from 15,000-foot depths to the ocean surface. After the nodules are separated aboard the mining ship, the bottom water sediment and other seabed materials are discharged back into the ocean. (See p. 13.)

Mining firms 1/ plans for commercial mining

The following schedule shows the plans for commercial mining.

<u>Mining firm</u>	<u>First prototype mining tests (note a)</u>	<u>Decision regarding commercial mining</u>	<u>Begin commercial operations</u>
Ocean Mining Associates	First half 1978-79	late 1979	1982 or 1983
Lockheed Missiles & Space Company, Inc.	1979-80	1979 or 1980	1983 or 1984
INCO	Mar. 1978 to June 1978	by 1979	1983-85
The Kennecott Group	1981	Dec. 1981	Dec. 1985

a/For purposes of this report, the use of the term "prototype" refers to all mining tests. The Kennecott Group, Lockheed Missiles & Space Company, Inc. and INCO plan full-scale prototype tests of their mining systems. The Ocean Mining Associates consortium plans pilot (less than full-scale) tests.

1/For purposes of this report, the term "mining firm" is used to refer to both the consortia and individual mining companies.

Costs of developing commercial deep ocean mining

The mining consortium estimates cumulative expenditures of at least \$140 million to develop deep ocean mining technology, and cumulative investments of \$2.1 billion to \$3.1 billion to achieve commercial operations.

The following schedule, based on information provided by the mining firms, shows total seabed mining investment, including the costs of developing commercial mining and refining systems.

<u>Mining firm</u>	<u>Approximate costs to date to develop technology</u>	<u>Projected cumulative costs to achieve commercial operations</u>
(millions, 1976 dollars)		
Ocean Mining Associates	\$50 to \$75	\$500 to \$750
Lockheed Missiles & Space Company, Inc.	20 to 30	500 to 750
INCO	35 to 50	500 to 800
The Kennecott Group	25 to 50	600 to 800

PROBLEMS THAT MAY DELAY COMMERCIAL MINING

Domestic mining firms face two major problems which may delay mining. The primary problem is the need for mining site tenure at specific deep sea locations guaranteed by domestic law or international agreement. According to mining firm officials, legal assurance of continued rights to known mineral reserves is necessary if the firms are to obtain capital funding necessary to build ships, processing plants, and mining systems.

The second problem is the need for the Federal Government to complete a series of environmental studies or assessments and to develop environmental regulations before commercial mining operations begin so that mining equipment, operating techniques, and processing plants are environmentally acceptable.



## Need for mining site security

Deep sea prototype testing by U.S.-based companies is scheduled to start between 1978 and 1981. By 1980, most mining companies will decide whether to start commercial operations. Mining officials told us that if mining site security is not established by then they might be unable to obtain the \$300 million to \$800 million needed by each mining firm to build their facilities, and commercial operations might be delayed. The lending institutions must first be assured that the nodule deposits are proven and the site is secure. The mining industry wants insurance against the possible loss of its investments by the entry of the United States into an international Law of the Sea Treaty.

Officials of U.S. mining firms told us that since little progress has been made in Law of the Sea negotiations, they have given up hope for an international treaty favoring mining by private enterprise. Therefore, they are supporting domestic legislation to provide needed guarantees. Despite industry pessimism over the prospects of an international treaty, we favor continued initiatives in this area.

### Attempts at domestic legislation regulating deep ocean mining

Since 1971, legislation has been introduced in the Congress supporting domestic deep seabed mineral development through investment guarantee. However, the following bills died with the adjournment of each Congress:

- H.R. 13904 and S. 2801 in the 92nd Congress, 1971-72.
- H.R. 9, H.R. 12233, S. 2878--amendment no. 946 to S. 1134 in the 93rd Congress, 1973-74.
- H.R. 1270, H.R. 11879, and S. 713 in the 94th Congress, 1975-76.

Generally, the bills promoted the orderly development of hard mineral resources located on the ocean floor in international waters. The bills would have established investment guarantee or investment insurance programs to protect licensees from political and financial risks associated with deep sea mining. Under these various bills, licenses would be issued by either the Secretary of the Interior or the Secretary of Commerce. The license would

provide the right to recover hard minerals from a designated mine site for a certain period of time for a set fee. Guarantees against investment losses caused by imposition of a new international regulatory regime were also included. Several similar bills have been introduced in the present Congress.

The past administration opposed the legislation for fear of prejudicing United Nations negotiations on a Law of the Sea Treaty. Congressional opponents of domestic legislation felt that because land-based mineral reserves are extensive, diverse, and dependable, and since the U.S. mining firms have a technological lead, there was no need to rush into deep seabed mining on a unilateral basis. They felt this would jeopardize the prospects of a favorable international treaty. The present administration's position is intended to encourage continued investments by private firms in deep seabed mining technology while negotiations continue on a draft Law of the Sea Treaty.

We believe that deep ocean mining legislation should be closely coordinated with overall U.S. initiatives and policy objectives under the Law of the Sea Conference. We also believe legislation should be considered in the framework of a coherent deep sea mining development program that clarifies the Federal role and clearly assigns responsibilities for carrying it out.

#### Attempting an International Law of the Sea Treaty for deep sea mining

International legal and political developments bear directly on the investment climate for ocean mining. The United Nations Conference on the Law of the Sea has tried to achieve an internationally acceptable approach to deep seabed mining beyond the limits of jurisdiction. In 1970, the Seabed Committee of the United Nations began preparing for the Law of the Sea Conference. Eleven proposals put to the committee between 1970 and 1972 ranged from placing complete discretion for mining production in the hands of countries exploiting the seabed to an international authority which would exploit the seabed on behalf of the international community. Most of the developed nations favored some form of licensing arrangement. The debate has not significantly changed since then.

The second session of the third Law of the Sea Conference convened in Caracas, Venezuela, in the summer of 1974. While little actual negotiating occurred, the discussions focused on two issues:

--Who may exploit the deep seabed.

--The likely economic effects of seabed exploitation on mineral exporting developing countries.

Neither issue was settled by the end of the Caracas session. The next session in Geneva, in 1975, tried to circumvent these crucial issues and to work out a regulatory regime for seabed exploitation that both developed and developing nations could support. This attempt was unsuccessful.

The Law of the Sea Conference reconvened in New York in 1976 but produced no definitive results. The U.S. delegation reported that there was little evidence that the differences between the developed and developing nations had been resolved. In the sessions concluded in New York in July 1977, no further progress was made. 1/

A 1976 National Science Foundation report states that the United States has three options in achieving mining site tenure and a stable investment climate for deep ocean mining:

--Continue with international negotiations hoping for an acceptable treaty.

--Enact domestic legislation granting U.S. mining firms tenured mining sites in the deep seabed.

--Delay all action and hope that seabed mining becomes sufficiently attractive at some future date to warrant mining without legislation or treaty assurance.

The international implications of deep ocean mining are more fully discussed in chapter 3.

#### Need to resolve environmental impact uncertainties

The second major problem impeding deep ocean mining is the need to determine and regulate its environmental impacts. Resolution of this problem is necessary to:

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1/For detailed discussion of the Law of the Sea negotiations see our report "Results of the Third Law of the Sea Conference from 1974 to 1976" (ID-77-37).

- Meet the requirements of the Law of the Sea Convention on the High Seas Treaty of 1962 and the National Environmental Policy Act of 1969 (Public Law 91-190).
- Provide information essential for industry to proceed with the development of environmentally acceptable mining and refining technology and operating techniques.

Industry needs to know the environmental protection rules and regulations before designing and building commercial facilities, such as refineries, ships, and mining equipment, and before developing operating procedures. Otherwise, industry may face costly changes in its facilities and operations and suffer production delays.

NOAA has started research to assess the impact of mining on the marine environment and the impact of processing on the shoreline environment. NOAA officials told us that it is possible to design mining systems compatible with the environment, and that current information suggests there should not be any insurmountable environmental problems.

However, the different mining systems proposed for deep sea mining could have adverse environmental effects, such as

- destruction of seafloor organisms and habitats in the path of the mining device;
- pollution at the seabed by clouds of sedimentary material stirred up as the mining device sweeps the ocean floor; and
- pollution of the upper water column caused by introducing seafloor sedimentary material, associated bottom organisms, abraded nodule material, and bottom water dumped overboard after being brought to the surface with the nodules.

Environmental groups have objected to proposed U.S. legislation for seabed mining. A spokesman for several groups has testified before the Congress that although domestic legislation supporting deep ocean mining may satisfy the needs of industry, it should be modified to consider other national interests, including environmental protection.

Marine scientists generally agreed that an environmental impact assessment is needed to determine the actual

effects of ocean mining and thus provide a basis for guidelines and regulations to insure that the marine environment will be protected.

Some marine scientists we interviewed believe that the long-term impact of deep ocean mining on the environment will probably be negligible due to little interaction between life in the ocean bottom and life in the middle and upper water zones, and because the ocean is able to quickly recover from disturbances.

One marine research group told us that processing manganese nodules, either at sea or onshore, is a far greater potential environmental hazard to the ocean and coastal zones than the act of mining.

In June 1976, the Office of Marine Minerals in the Department of Commerce initiated a three phase study on the potential environmental impact of onshore nodule processing. These phases were:

- Establishment of relevant transportation, processing plant, and waste disposal standards.
- Identification of representative geographical areas for processing and associated facilities.
- Studies of environmental and socioeconomic effects of facilities in representative geographical areas.

The final report for phase I was issued in August 1977. Phase II started in the summer of 1977, and phase III is scheduled to start in 1978. The entire report should be completed in 1979.

#### NOAA's Deep Ocean Mining Environmental Study

Since 1972, NOAA has been working with industry and other Federal agencies to assess the potential environmental effects of deep ocean mining. In 1975, NOAA began the Deep Ocean Mining Environmental Study (DOMES).

The purpose of DOMES is to acquire the information necessary to provide a timely and independent environmental impact assessment of deep ocean manganese nodule mining on the marine ecosystem before commercial operations begin. DOMES is expected to help meet National environmental Policy Act requirements which apply to major Federal actions following Law of the Sea Treaty agreements or enactment of domestic legislation. DOMES is also expected to provide environmental guidelines for industry to use in

designing mining equipment and operational techniques that would avoid or minimize adverse mining effects.

DOMES, together with the processing plant environmental studies, is supposed to provide the necessary information for an environmental impact statement; however, no Government agency has been assigned the responsibility for preparing the statement or related regulations.

DOMES was formulated in cooperation with the marine academic community and the mining industry. It is a two-phase study. The objective of phase I is to obtain enough premining environmental information to (1) develop statistically defensible data on the mining region, (2) develop the ability to predict the consequences of ocean mining on the marine environment, and (3) allow establishment of preliminary environmental guidelines for mining manganese nodules.

Phase II involves the actual monitoring of industrial mining equipment tests. The objectives of phase II are to verify and, where necessary, modify phase I predictive models and provide additional information for an environmental impact statement, permitting development of scientifically sound environmental guidelines and regulations. The guidelines are expected to allow any necessary final modifications of mining system hardware and operational techniques before commercial mining begins.

The Department of Commerce budget request for fiscal year 1977 did not include phase II funding. At the request of the Chairman of the Senate Subcommittee on Public Lands and Resources, Committee on Energy and Natural Resources, we reviewed the potential effects of not funding phase II.

We reported to the Subcommittee in September 1976 <sup>1/</sup> that completion of the two-phase study is needed to resolve environmental impact questions which may arise when commercial manganese nodule deep ocean mining begins. The Department agreed with our conclusion and said it would, if necessary, reprogram funds internally to conduct prototype test monitoring. NOAA reprogrammed about \$1.1 million for phase II in fiscal year 1977.

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<sup>1/</sup>"Deep Ocean Mining Environmental Study - Information and Issues" (PSAD-76-135).

Although NOAA prepared draft phase II plans in November 1975, the plans were not made final pending the completion of the phase I progress report on existing baseline conditions. A draft progress report on phase I was completed in August 1976 and distributed in July 1977. The final report, due in 1978, will differ from the draft report only by having more complete data on mining systems, and should better predict the long-term effects of deep ocean mining on marine plant and animal life. It will also be expanded to include potential effects for different volumes of ocean mining. According to the DOMES project director, phase II has been funded, equipped, staffed, and organized and is monitoring the first prototype mining tests, which are now in progress.

DOMES is also scheduled to monitor a later prototype test. Neither of these tests will be fully monitored, however, because \$1.1 million is sufficient to equip and staff only one oceanographic vessel. That vessel is now scheduled to measure the benthic (ocean bottom) impact of mining during and after the first tests. It is then scheduled to monitor the euphotic (ocean surface) impact.

The DOMES project director estimates that to monitor both the surface and bottom zones during both tests would require an additional \$1 million for each operation.

The DOMES project director stated that he was unsure of how much scientific data would be lost by monitoring only one-half of each prototype test. He did say that there certainly will be some decrease of the scientific value of phase II because of the partial monitoring of the two mining systems. He feels, however, that DOMES can still accomplish very nearly what was originally planned, particularly if two full-scale monitoring operations (both top and bottom using two ships) can be completed during the prototype mining tests now scheduled for 1979.

## CHAPTER 3

### INTERNATIONAL IMPLICATIONS OF DEEP OCEAN MINING

About 100 developing nations have joined in international negotiations for a Law of the Sea Treaty that will protect their interests. One of the major political focal points of these negotiations is the question of how deep ocean mining will effect the economies of developing countries which export minerals. Any loss of export revenues for these countries would create additional difficulties for their already strained economies.

#### IMPACT ON DEVELOPING COUNTRIES

Some developing countries have vast mineral reserves, which play an important role in industrializing their economies. Of the known mineral reserves, these countries have nearly one-half of the nickel, over one-half of the copper, three-quarters of the cobalt, and about one-quarter of the manganese. The U.S. Bureau of Mines estimates that world reserves of these minerals are sufficient to meet even high demand projections through the year 2000 at only slightly increasing prices.

According to a 1976 Johns Hopkins University report, developing countries now supply nearly 15 percent of the world's nickel, nearly 75 percent of the world's cobalt, and nearly 40 percent of the world's manganese and copper. Exports of these metals brought 19 producers from developing countries a total of \$4.8 billion in 1970.

Supplies of nickel, copper, cobalt, and manganese from seabed mining operations have the potential to stabilize prices of these four metals. Studies prepared by the United Nations Conference on Trade and Development in 1973-74 on these minerals showed that in each case the export earnings of some developing country producers would be lower if seabed mining occurs. Estimated reductions in export earnings, based on the potential volume of seabed mining output in 1980 alone were:

<u>Mineral</u>	<u>Earnings</u>	<u>Percent</u>
	(000,000 omitted)	
Cobalt	120	50
Manganese	40	42
Copper	200	3
Nickel	218	20



Other studies by the World Bank and Johns Hopkins University show a similar price decline which could benefit consumers located primarily in the developed countries. Since some of the developing countries are large exporters of these minerals, price declines would be a major concern to them.

Some developing nation exporters face the combined effect of lost markets and reduced price levels brought about by seabed nodule production. Unless seabed mining is regulated this would have serious adverse effects on their foreign exchange income.

On the basis of projections in a 1974 Johns Hopkins University report, copper production from manganese nodules will be small compared to world consumption; thus, only a minimal price impact is anticipated and no injury to existing land-based producers is likely. However, cobalt, nickel, and manganese production from ocean nodules may have adverse impacts on some developing countries. Zaire and Zambia and, to a lesser extent, Morocco and Cuba could suffer income losses from cobalt exports. Gabon is also highly dependent on manganese export revenues.

Some developing countries may be especially injured by seabed mining because:

- They have a large portion of known world mineral reserves and are major suppliers to world markets of most minerals retrievable from ocean nodules.
- They depend on revenue earned from mineral exports more than do developed nations.
- They have less flexibility in transferring production to other product lines.
- They lack the technological and economical requirements necessary to mine the oceans and, therefore, face the prospect of being excluded from the economic benefits of deep ocean mining.
- Several developed producer nations have joined together in international mining consortia to participate in nodule mining which would offset any losses they might sustain if land-based mining declines.

Several United Nations' proposals would diminish the impact of seabed mining on the land-based mining industries in developing countries. These proposals include

- limiting production to levels that would not disrupt land-based production or prices,
- controlling both deep sea and land-based mining equally so as not to discriminate against seabed production,
- limiting ocean mining licenses to an amount judged appropriate to maintain a balance between land and sea production,
- limiting annual production and new licenses for market and price stability,
- having an international authority compensate the countries affected by declines in mineral export revenues, and
- providing preferential technical assistance to developing countries adversely affected by seabed production to help them broaden their economic base.

No action has yet been taken on any of these proposals in the Law of the Sea negotiations.

#### IMPLICATIONS FOR U.S. INTERESTS

Much of the contention between developed and developing countries stems from what developing country spokesmen see as the continuance of rich country control of world production, investment, and trade. As industrialization takes hold, however, many developing countries are shifting toward export oriented trade policies, largely based on the development of their natural resources, to spur economic development. In this context, ocean mining can be seen as a potential growth deterrent which could have serious implications for economies in mineral producing and exporting countries. While estimates of the economic effects of ocean mining on land producers vary, they show that some land producers must sacrifice part of their markets to ocean mining operations, and expectations are that mineral prices may be lower than would be the case without ocean mining.

If producer countries are not provided assurances against injury, U.S. interest could be jeopardized by unilateral claims by such countries over ocean fishing and transportation rights, nationalizations, and exorbitant taxing practices.

As Secretary of State Kissinger stated at the 1976 United Nations Conference on Trade and Development session in Nairobi:

"There is before us all the imperative of world stability, the task of resolving conflicts, reducing tensions, and resisting the encroachment of new imperialisms \* \* \* and of assuring that the prosperity of some nations does not come at the expense of others."

Although seabed mining could be expected to contribute to world economic development and result in benefits to the United States, the manner in which the Federal Government deals with the possible economic impacts on traditional mineral producers is important. Further increases in the income gap among countries may result in confrontation rather than cooperation over the riches of the sea.

Efforts made by the U.S. Government and U.S. mining companies to arrive at an international agreement that would improve relations and permit peaceful mining of the seabed--going so far as to accept the concept of production controls to assure a continued market for products of land-based producers--demonstrate the high value placed on an orderly and stable system in which investments are secure.

## CHAPTER 4

### FEDERAL ACTIVITIES RELATED TO DEEP OCEAN MINING

No Federal agency has responsibility for coordinating deep ocean mining activities. Many Federal departments and agencies, however, already have projects or potentially useful resources that support deep ocean mining. These programs have been developed or expanded to support needs as perceived by individual agencies rather than according to an overall plan. As a result, some agency programs and projects for deep ocean mining are paralleled in other agencies and may not be needed, while activities needed to support ocean mining may have gone unattended or are behind schedule.

Government programs directly related to deep seabed mining or to manganese nodule research are summarized in the following table.

<u>Federal agency</u>	<u>Brief description of project activity</u>	<u>Fiscal year budget</u>		
		<u>1975</u>	<u>1976</u>	<u>1977</u>
Department of the Interior: Ocean Mining Administration	Oversee and coordinate Interior's deep ocean mining activities, prepare environmental impact statement, draft ocean mining policy and regulations.	\$120,000	\$ 213,000	\$ 213,000 (proposed)
U.S. Geological Survey	Mineral resource analysis, nodules origins research.	-	307,000	1,180,000 (proposed)
Bureau of Mines	Mining technology assessment, developing new refining techniques, mineral economic assessment.	-	130,000	200,000
Department of Commerce: NOAA				
Office of Marine Minerals	Coordinate existing and implement new marine minerals programs, ocean mineral technology assessment, environmental impact assessment.	-	229,000	495,000 (proposed)
Environmental Research Laboratory	DOMES.	-	3,000,000	1,100,000 (proposed)
National Sea Grant Program	Grants to study the origins of manganese nodules and to develop new refining techniques.	79,000	94,000	206,000
National Science Foundation: International Decade of Ocean Exploration	Grants to study the origins of manganese nodules and their composition and distribution.		<u>a/686,000</u>	<u>a/671,000</u>
National Security Council: Department of State and others Law of the Sea Negotiations	Represents U.S. in international negotiations to establish mining rights on the deep sea floor.	(b)	(b)	(b)

a/Calendar year figure.

b/Information not available.

Other Federal activities indirectly related to the development of ocean mineral resources are scattered throughout several agencies as shown below.

<u>Federal agency</u>	<u>Brief description of activity</u>
Department of Defense: Department of the Navy oceanographic programs (several agencies)	Develops knowledge of the deep seafloor; ocean floor survey and mapping; deep sea program in geodetics, bathymetrics, geology, geophysics; programs in physical, chemical, and biological oceanography; inventory of deep sea research exploration vehicles; ocean engineering research; and rescue and salvage operations.
Defense Mapping Agency	Produces topographical charts of the deep ocean floor
Defense Advanced Research Projects Agency	Produces advanced marine technology such as deep sea submersibles, power systems, viewing equipment, a precision navigation system, and sonar.
Department of Commerce: NOAA	
Office of Marine Technology	Gathers and disseminates operational results and technical information to serve the oceanographic community.
Environmental Data Service	Accumulates, assesses, and provides oceanographic data to the marine science community, industry, Federal and State governments.
Domestic and International Business Administration	Studies international mineral market trends, and is concerned with adequate U.S. supplies of minerals and mineral prices.

## FEDERAL AGENCIES' ACTIVITIES SUPPORTING DEEP OCEAN MINING NEED COORDINATION

In our October 1975 report "The Need for a National Ocean Program and Plan" (GGD-75-97), we noted that 21 different Federal organizations in 6 departments and 5 independent agencies conduct marine science and oceanic research. We concluded that the United States does not have a comprehensive, coordinated national ocean policy and that, because of the vital role the oceans play in the Nation's welfare, economic self-sufficiency, and national security, a concerted effort should be made to establish a comprehensive national ocean program and plan.

We believe these same conditions exist on a smaller scale among the agencies with programs which support manganese nodule mining in the deep ocean.

Agency participation in deep ocean mining is mostly an outgrowth of traditional agency missions. Coordination of the various agencies' deep ocean mining programs and activities is principally provided by the Interagency Committee on Marine Science and Engineering (ICMSE) 1/ through periodic seminars, conferences, and informal conversations among agency officials. This coordination, however, has not caused the agencies to eliminate programs and projects with similar objectives or to integrate their program needs with those of other agencies.

Despite such major coordinating activities, an ICMSE spokesman told us that agencies still start deep ocean mining projects on the basis of their traditional missions and their individual perceptions of what programs are needed.

### Need to better define agency missions, responsibilities, and activities

Because missions, responsibilities, and activities have not been well integrated or coordinated among the agencies involved in deep ocean mining projects, two or more agencies were performing similar work with similar objectives. Although in some cases officials did not consider the projects to be duplicative, the similarities suggest a need for better coordination of agency activities.

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1/ICMSE is being replaced by the Committee on Oceans and Atmosphere of the Federal Coordinating Council for Science, Engineering, and Technology.

## Jurisdiction disputes

The Departments of Commerce and the Interior each want authority to direct and oversee Federal activities in deep ocean mining. This has led to overlapping program functions. For example, both Commerce and Interior created new agencies in 1975 to coordinate and oversee their own ocean mining activities. In Commerce, the Office of Marine Minerals was established to coordinate and oversee existing marine mineral programs within NOAA and to implement new programs, such as DOMES. The Ocean Mining Administration was established to coordinate and plan Department of the Interior activities relating to ocean mineral resources.

Commerce and Interior spokesmen believe there is a jurisdictional dispute between the two agencies. Interior officials believe that the Interior has a traditional jurisdiction over seabed mining policy, technology assessment, and mineral resource assessment. Interior's position is that Commerce should be involved only in environmental assessments and marine resource development, leaving Interior with primary authority over most other marine mineral areas.

Commerce officials believe that they have the mandate to administer Federal deep ocean mining activities and the experience to support the mining industry in technology assessment, economic assessment, and economic growth stimulation.

Although NOAA has been developing data to support an environmental impact statement for deep ocean mining, no Federal decision has yet been made as to which agency will be responsible for preparing the statement. Both Commerce and Interior feel that they should be the one to prepare the environmental impact statement, provide environmental guidelines to industry, issue environmental regulations, and regulate deep ocean mining.

### Some Federal projects are similar

The National Science Foundation's research on manganese nodule formation is similar to Commerce's research under the sea grant project. In addition, Interior's U.S. Geological Survey (USGS) also has plans to do research on nodule formation for fiscal year 1977 and beyond.

Agency officials told us that, in some cases, they communicate with their counterparts in other agencies; however, there appears to be no effective way to integrate these efforts on a Government-wide basis. For example, National Science Foundation representatives were unaware in October 1976 of USGS' plans to conduct further studies on nodule origins in 1977.



## Other Federal projects need more attention

While some Federal programs and projects supporting deep ocean mining are similar, other areas which would benefit by increased Federal support have received limited attention. There is widespread agreement among Federal agency project managers, industry representatives, and marine scientists that activities necessary or beneficial to an emerging deep ocean mining industry are (1) basic geological assessment of ocean floor resources, (2) a better system for accumulating and disseminating oceanographic data, and (3) environmental protection. We found, however, that these activities are unaccomplished or are behind schedule.

### A consolidated geologic resource assessment of deep sea minerals will benefit deep ocean mining

Mining companies and Federal agencies, including the Navy, NOAA, USGS, and National Science Foundation have gathered geological data from the deep ocean floor to serve their needs. At present, this marine geophysical survey data is recorded in the individual data systems of the many Federal agencies involved in marine survey methodology, data acquisition, data processing, storage, retrieval, and data presentation. There is no compatible system whereby this data is gathered, collated, stored, and disseminated. As a result, much of it is not readily available for a resource assessment. We were told by an official of an oceanographic data bank that much information, including ocean floor samples and photographs, are not yet part of any data system.

The ocean floor contains extensive deposits of minerals, but only about 3 percent of the deep ocean floor has been extensively surveyed. According to involved industry and Federal officials, the deep ocean mining industry could use basic geological survey data to locate areas where rich deposits of manganese nodules exist.

The July 1973 Report of the Federal Mapping Task Force on Mapping, Charting, Geodesy, and Surveying found that 17 Federal agencies within 4 departments and 3 independent agencies spent over \$219 million and 5,371 staff-years in fiscal year 1972 on marine mapping, charting, and related surveys. The report cited inefficiencies, such as agencies doing marine geophysical surveys in the same general ocean area to obtain the same general kinds of information. The report stated that these uncoordinated and fragmented programs produced in-house oriented results, incompatible data, and project duplications and overlaps.

The task force report also stated that no all-source, common filing, or reference system existed, so that only users working within narrow disciplines were aware of the location of pertinent survey data.

The report made several recommendations including that:

- Navy data and charts be declassified and made available to civilian agencies.
- The Department of Defense review all Federal marine survey data acquisition programs.
- Civilian agency activity be consolidated to form a central mapping, charting, and geodesy organization.
- The Department of Defense modify its marine science programs to include civilian agency needs.
- A new agency be created to centralize map, chart, and photograph depository libraries, and standardize filing and reference systems.

We discussed the outcome of these task force recommendations with NOAA and Navy officials and the former task force chairman. They said that there has been considerable improvement in all areas since 1973.

Although some NOAA officials said that their new data banks and referral systems had largely eliminated the problems, other NOAA officials, officials from other agencies, and marine scientists told us that there is still a need for additional integrated data acquisition and referral systems for marine mapping, charting, and geodesy.

#### Need to accelerate environmental protection program

The National Environmental Policy Act and associated regulations made Federal agencies responsible for considering environmental, technical, and economic factors in deciding actions which could affect the environment. According to the Marine Board, agency actions required to carry out this responsibility can be broadly described as follows:

- Determine existing environmental conditions in the potential mining areas, monitor prototype mining operations, and evaluate changes caused by mining.

- Recommend to industry, on the basis of DOMES findings, any changes in mining methods and equipment necessary to protect the environment.
- Develop an environmental impact statement for deep ocean mining.
- Develop environmental criteria and regulations for mining operations.
- Evaluate environmental impact reports the mining companies submit in support of their applications for lease and production licenses.
- Prepare specific environmental impact statements for each mining lease and production license.
- Monitor and enforce the environmental regulations.

NOAA's DOMES project, phases I and II, is designed to fulfill the first two of these actions. While the Ocean Mining Administration has assumed responsibility for drafting an environmental impact statement for deep ocean mining, neither the preparation of the statement nor the remaining four actions needed to assure environmental protection have yet been assigned to any Federal agency. Timely assignment and accomplishment of these activities is essential to meet the needs of either an international treaty or domestic legislation.

#### FEDERAL AGENCIES' LONG-RANGE PLANS

There are many possible future agency projects related to deep ocean mining. The Department of the Interior, through USGS and the Bureau of Mines, and the Department of Commerce, through the Office of Marine Minerals and NOAA, have each been developing proposed programs and projects for their future involvement in deep ocean mining. Although most of the proposed programs are not firm, the fact that agencies are still developing independent plans suggests the continuing potential for project similarities.

Further, the differing views of Government and industry officials regarding the proper role of the Federal Government raise questions as to the need for some of the activities and programs being considered by these Federal agencies. We believe that the overall role of the Federal Government must be determined before detailed planning can be properly carried out and Federal resources can be wisely allocated.

## CHAPTER 5

### WHAT SHOULD THE FEDERAL ROLE BE IN DEEP OCEAN MINING?

There is much controversy over the Government's role in the emerging deep ocean mining industry. Major new long-term commercial ventures requiring large capital investments need favorable investment climates. The political, technological, and market uncertainties involved in establishing a new industry like deep ocean mining, combined with the necessary long time frames and the large capital investment, require some Federal involvement. The question is how and to what extent?

The Government can either do nothing; provide financial guarantees or subsidies to the ocean mining industry; or take a middle ground, such as fostering a favorable financial climate with some regulation of mining sites and environmental protection. In the case of the deep ocean mining industry, the Federal role may best be determined by future economic and social benefits to the Nation and by the mining industry's ability and willingness to invest its own resources.

The consensus of involved Federal officials is that deep ocean mining for manganese nodules will benefit the Nation's economy. Arguments against Federal support to the industry concern the timing of such support. There is no immediate need for Federal support for national security reasons, and early unilateral support may adversely affect Law of the Sea Treaty negotiations and alienate developing nations which supply minerals.

If the Federal Government decides to support industry's current timetable for initiating commercial mining operations, we believe it must resolve the immediate constraints by (1) providing a legal basis for securing mining sites, (2) completing an environmental impact analysis and statement, and (3) establishing regulations before commercial mining begins. Once these immediate needs are satisfied, the nature and extent of future Federal involvement in ocean mineral resource development should be determined.

### EFFORTS TO DEFINE THE FEDERAL ROLE IN DEEP OCEAN MINING

The Marine Resources and Engineering Development Act of 1966 (Public Law 89-454) established broad comprehensive policy statements governing the Federal role in the development of ocean resources. The act includes eight

objectives toward which U.S. marine science activities should be directed:

- The accelerated development of the resources of the marine environment.
- The expansion of human knowledge of the marine environment.
- The encouragement of private investment enterprise in exploration, technological development, marine commerce, and economic use of the resources of the marine environment.
- The preservation of the role of the United States as a leader in marine science and resource development.
- The advancement of education and training in marine science.
- The development and improvement of the capabilities, performance, use, and efficiency of vehicles, equipment, and instruments for use in exploration, research, surveys, the recovery of resources, and the transmission of energy in the marine environment.
- The effective use of the scientific and engineering resources of the Nation, with close cooperation among all interested agencies, public and private, in order to avoid unnecessary duplication of effort, facilities and equipment, or waste.
- The cooperation by the United States with other nations and groups of nations and international organizations in marine science activities when such cooperation is in the national interest.

The act did not, however, designate an authority to implement these objectives. Thus, specific roles for Federal agencies in long-range support of ocean policies have not been identified, assigned, or carried out.

The act authorized the President to establish a Commission on Marine Science, Engineering, and Resources and a National Council on Marine Resources and Engineering Development. The Commission, which disbanded after submitting a final report in 1969, recommended the establishment of a new agency to bring together Federal marine programs. As a result, NOAA was established in 1970. NOAA was to, among other

things, explore, map, and chart the global ocean and its living resources; and manage, use, and conserve these resources. However, its role did not specifically include development of deep ocean mineral resources.

The National Council was to help the President plan and coordinate the Nation's marine science activities. The Council provided some guidance for the Nation's marine science activities, but provisions of the act limited the life of the Council and it expired in April 1971.

#### Other established ways to coordinate national ocean policy and projects

Two committees were established in 1971 to further Federal activity in ocean affairs--the National Advisory Committee on Ocean and Atmosphere and ICMSE. Although both committees have made contributions in accordance with their charters, neither has been involved with Federal activity in deep ocean mining. According to a June 1973 JACO report regarding the need for a national ocean resources policy:

"There are too many actors, too many separate chains of command, too many crosscutting policies, too many separate budgets, appropriations, and programs. In this confusion, national priorities have no perspective and neither the Executive Branch nor the Congress is in a position to lead effectively, much less enforce accountability for results."

Several other scientific panels, interagency committees, commissions, and conferences have reviewed, evaluated, and reported on Government programs related to marine science activities and oceanic affairs. These groups include:

- The National Planning Conference on the Commercial Development of the Oceans.
- The National Ocean Policy Study.
- The Marine Petroleum and Minerals Advisory Committee.

The National Planning Conference on the Commercial Development of the Oceans was held during June 1976. It was attended by 145 senior representatives from Government, industry, academia, and public interest groups. Sponsored

by the Department of the Interior, NOAA, the Maritime Administration, and the Energy Research and Development Administration (now the Department of Energy), the conference was held to bring together concerned members of the private sector and Government to identify and propose solutions to problems limiting commercial development of the oceans. A 5-year plan was developed that the Government, either alone or with industry, could follow to develop the commercial technology required for future ocean development.

The conference was divided into five panels, one of which dealt with hard minerals. The panel members felt that most of the technology needed to develop deep ocean mineral resources was available, and what was needed was a sound investment climate to spur development and environmental guidelines for deep ocean mining. The conference report stated that only manganese nodules in the deep seabed and sand and gravel on the continental shelf clearly have present economic potential.

In addition, the hard minerals panel recommended that the Government undertake a 5-year plan of technological support to include (1) development of ocean bottom survey and sampling techniques, (2) better availability of unique Government facilities to industry, (3) an ocean minerals information and technology transfer center, (4) a method for trade-off between economic and environmental concerns, and (5) research on environmentally acceptable methods for disposal or use of residue from manganese nodule refinery operations. The panel estimated that the total costs of these and other proposals would be \$100 million over the 5-year period.

Officials of the National Ocean Policy Study and the Marine Petroleum and Minerals Advisory Committee told us that their groups had not issued any reports on deep ocean mining. They also said that the policy study group has monitored developments in deep ocean mining but has taken no active role, and the advisory committee no longer exists.

#### EXPERT OPINIONS ON THE FEDERAL ROLE IN DEEP OCEAN MINING

Because of the possible benefits to the Nation from deep ocean mining, and because the supporting Federal role has not been determined, we interviewed officials of Federal agencies with projects that have deep ocean mining applications, deep ocean mining industry representatives, and concerned marine scientists and engineers to obtain opinions on what the Federal role should be.

The officials agreed that there is a need to define the Federal role. They also agreed that the Government's role should include providing industry with a legal basis for its mining activity and with environmental protection, including assessment and regulation. They also believed the Government should perform broad-based research programs related to deep ocean mining and make the technical results available to scientists and industry. The needs most frequently mentioned were general geological surveys, charting, mineral resource assessments of the deep ocean floor, and improved collection and dissemination of deep ocean scientific data and technology. The various views expressed are discussed below.

### Views of Federal agency officials

All Federal officials interviewed believe that the Federal Government should support deep ocean mining by resolving legal and environmental problems which are constraining progress. They are divided, however, as to what the specific Federal role in scientific and technological support should be. Some officials believe private industry is capable of developing the necessary mining and refining technology and that the Federal role should be confined to those areas where industry cannot reasonably act alone, such as in preparing an independent environmental impact assessment.

Officials from agencies with resources potentially useful to deep ocean mining generally favored expanding their agencies' role. For example, a USGS official believed the deep ocean floor should be extensively surveyed by USGS for minerals and the Bureau of Mines plans to expand its manganese nodule refining research. Other officials generally preferred projects that involved or would involve their agencies.

The following list summarizes the views of 36 Federal officials we interviewed.



What Federal Officials Believe the Role  
of the Federal Government Should Be  
in Support of Deep Ocean Mining

	<u>Percent in favor</u>
1. Provide the deep ocean mining industry with a secure legal basis for mining that includes site tenure and regulation.	100
2. Provide for environmental protection that includes assessing the impact of deep ocean mining and refining on the environment, guidelines to industry, regulations, and enforcement.	100
3. Provide for a more integrated collection and dissemination of general geological information on the location, content, and abundance of deep ocean mineral resources.	47
4. Provide for better collection, integration, and dissemination of information on other federally funded technology and marine science that can be useful to industry.	36
5. Mining and refining technology assessment.	19

While there was a wide range of opinion over what specific scientific and technological projects the Federal Government should support, the need for coordinated large-scale deep seabed geological assessment and a more consolidated collection and dissemination of deep ocean scientific data were most often mentioned.

Views of mining industry officials

Most representatives of the five mining firms based in the United States said that Federal support for deep ocean mining should include, in addition to providing legally tenured mine sites and environmental support, a general geological survey (which would not reveal their mine sites), mapping, and charting of the deep ocean floor. Most believed further Federal support of mining and refining technological development was needless because their consortia already had mining and refining technology that was more advanced than federally sponsored research.

## Views of the marine sciences and engineering community

In addition to legal tenure and environmental needs, areas of Federal support mentioned by representatives of the marine sciences and engineering community included general seabed mapping, charting, and geological assessment; manganese nodule origins studies; mining technology monitoring and transfer; better consolidation and dissemination of oceanographic data; and finding new uses for deep ocean minerals.

A 1975 report by the Marine Board, Assembly of Engineering of the National Research Council, "Mining in the Outer Continental Shelf and in the Deep Ocean," outlined in detail marine science and engineering community views on what the Federal role should be. The Marine Board, composed of marine scientists and engineers and others, reported that the Federal Government should support the deep ocean mining industry in the following ways:

- Provide incentives for developing deep ocean minerals by establishing regulations and licensing and leasing procedures for mining sites.
- Provide for environmental protection.
- Continuously assess deep ocean mineral technology and resources.
- Establish a national clearinghouse for the collection and distribution of deep ocean data from diverse sources.
- Support education, research, exploration, and technological development in deep ocean mining.

Although the Federal Government has been active in the development of ocean resources, there is no formal, continuing mechanism for review, analysis, or long-range policymaking. Further, there is no plan for a national program that meets either the overall objectives of the 1966 act or the specific needs for deep ocean mineral resource development. This situation has occurred despite congressional attention and the conclusions of independent studies during the past 10 years on the importance of the oceans as a source of minerals.

One reason for this situation is that organizations established to help accomplish the objectives of the 1966 act

expired by 1971. A second reason is that committees, such as NACOA and ICMSE; the scientific study panels; conferences; and interagency committees attempting to plan, advise, and coordinate national ocean policy either have not considered deep ocean mining or have not had the authority to act, or require others to act, on their conclusions and recommendations.

## CHAPTER 6

### CONCLUSIONS AND RECOMMENDATIONS

#### CONCLUSIONS

Deep ocean mining of manganese nodules by U.S.-based firms could benefit the national economy and may be important from a national security standpoint. The national interest in development of this ocean resource has been demonstrated by efforts to negotiate an acceptable international Law of the Sea Treaty and to pass domestic legislation governing deep ocean mining. A major concern is how deep ocean mining will affect the economies of the mineral exporting countries. Any loss of export revenues would create additional difficulties for the already strained economies of developing countries.

Deep ocean mining by U.S.-based firms probably will not reach the commercial operations stage until either an international treaty or domestic legislation is enacted. An estimate of the time available for resolution of these constraints can be made by examining industry's schedule for moving to commercial operations. The U.S.-based firms plan to decide during the period 1978-80 whether to mine commercially and, if they decide to proceed, will begin commercial operations during the 1980s.

This time frame is also important in resolving the other major constraint to deep ocean mining--completion of environmental impact assessments--and the related environmental impact statements and regulations to guide development of environmentally acceptable mining equipment, mining techniques, and onshore refining processes. NOAA's DOMES project, although critical to resolving environmental impact questions, has been weakened by funding limitations and planning slippages. It may not be completed in time to provide either needed guidance to industry or the environmental impact statement needed to meet international treaty or domestic legislation requirements. In addition, the final results of the project will be less than originally planned because some of the phase II prototype test monitoring has been canceled.

Another stumbling block is that no Federal agency has been assigned responsibility for preparing the environmental impact statement and related regulations for deep ocean mining. Although NOAA's role has been limited to developing the information necessary for those purposes, its Office of Marine

Minerals believes it has the capability to prepare the environmental impact statement. Interior's Ocean Mining Administration, however, has assumed responsibility for preparing the environmental impact statement.

If the Federal Government decides that deep ocean mining is in the national interest and that it should provide industry the support necessary to maintain its schedule, it must resolve two major problems:

--The lack of deep sea mining site tenure guaranteed by domestic or international law. The mining industry needs assurances of tenure to obtain financing for mining operations.

--The lack of environmental impact studies, statements, and regulations to meet legislative requirements and to provide guidelines for industry in advance of commercial operations.

Moreover, the role of the Federal Government in support of deep ocean hard mineral resource development needs to be defined. The Marine Resources and Engineering Development Act of 1966 provided national objectives and a framework for Federal activity to support economic development of ocean resources, including hard minerals. However, the act neither established a plan to implement the objectives nor designated a Federal authority to develop such a plan.

In the case of deep ocean mining for manganese nodules, several task forces, interagency coordinating committees, and expert panels have made recommendations concerning the long-term Federal role. However, because these have lacked the weight of authority, individual Federal projects supporting deep ocean mining have been largely based on agencies' traditional missions and their individual perceptions of what needs to be done. As a result, related responsibilities and expertise are divided among several Federal departments and agencies; for example, both the Departments of Commerce and the Interior believe they should be responsible for regulating deep ocean mining and both seek to develop programs toward that end.

We believe that the various agencies' missions in support of deep ocean mining and the interrelationships among them should be defined and coordinated in an overall program within the context the Marine Resources and Engineering Development Act of 1966. The program should establish the Federal role in ocean hard mineral resource development generally, and deep ocean mining for manganese nodules, specifically.

RECOMMENDATION TO THE OFFICE  
OF MANAGEMENT AND BUDGET

The Office of Management and Budget is responsible for, among other things, assisting in development of efficient coordinating mechanisms to implement Government activities and to expand interagency cooperation.

The Office of Science and Technology Policy has among its functions the responsibility for assisting the Office of Management and Budget in matters involving science and technology.

We recommend that the Office of Management and Budget, along with the Office of Science and Technology Policy, designate a primary Federal authority to determine the Federal role in deep ocean mining and develop for congressional approval a comprehensive program to implement Federal responsibilities in accordance with national objectives.

We believe that the following should be considered in establishing and implementing the Federal role:

- Complementing the national objectives established in the Marine Resources and Engineering Development Act of 1966 and moving toward meeting the Nation's economic and national security needs.
- Providing for an orderly and integrated Federal implementation of administrative, regulatory, scientific, and technological support programs which meet national needs but are beyond the means of industry to accomplish alone.
- Placing deep ocean mining under the general direction of a Federal authority whose responsibilities would include (1) comprehensive planning to meet identified short- and long-term needs, (2) evaluating agencies' programs and plans in terms of overall program objectives and priorities, and (3) coordinating all agency efforts to avoid unnecessary duplication and overlap. This authority would also insure that program elements are integrated and information is effectively exchanged.
- Making the Federal role consistent with overall U.S. foreign policy objectives.

An immediate need in deep ocean mining for manganese nodules is to assign Federal responsibility for preparing required environmental impact statements.

Over the long term, many of the likely Federal program elements in support of deep ocean manganese nodule mining would relate to ocean hard mineral resource development in general. We believe the following are some of the major elements that should be considered in developing a comprehensive program:

- General ocean geological surveys to locate and assess ocean hard mineral resources with early emphasis on manganese nodule deposits.
- Improved means of collecting, integrating, and disseminating oceanographic survey and scientific data useful to Government agencies, the scientific community, and industry.
- Development of technologies needed by Federal agencies to carry out future monitoring and regulatory functions.

## CHAPTER 7

### AGENCY COMMENTS AND OUR EVALUATION

We sent our draft report to the Departments of Commerce, the Interior, and State; the Office of Science and Technology Policy, the National Science Foundation; and Office of Management and Budget for review and comment. (See app. II through VIII.) The Office of Management and Budget called to our attention several actions which have taken place during the several months since we requested their review and comments.

The most important action was the administration's endorsement of interim legislation, if amended as recommended by the administration, to license and regulate the activities of U.S.-based firms which are commercially recovering manganese nodules from the deep seabed. The administration's position on this legislation is intended to encourage continued investments by private firms in deep seabed mining technology while negotiations continue on the draft Law of the Sea Treaty.

A second significant event has been the formation of the President's Reorganization Project. Topics under consideration by the project include what changes, if any, to recommend for the organization of Federal activities related to natural resources, including the mineral resources in the seabed. The administration's recommendations with regard to agency missions to seabed mining will be made in the context of its overall recommendations concerning natural resources organization.

Third, there have been coordinated Executive Office reviews of both the fiscal year 1978 and 1979 budget requests by the Departments of Commerce and the Interior for activities related to deep seabed mining. These reviews have been made on the basis of definitions of the appropriate Federal role, both in relation to the Law of the Sea negotiations and the bills under consideration of the Congress. A clear result of these reviews has been to provide adequate funding for the Department of Commerce's Deep Ocean Mining Environmental Studies so that adequate environmental information and technology is developed in anticipation of some form of deep ocean mining regime. Other activities which have been funded are studies of international supply and demand for the principal minerals which could be recovered from the nodules and support for the United States negotiators in the Law of the Sea Conference.



The Office of Management and Budget believes that the executive branch has been encouraging deep seabed mining generally consistent with the recommendations outlined in our report.

We agree with this view. We believe, however, that there is still a need to specifically assign Federal responsibility for preparing the required environmental impact statements so that industry will know as soon as possible the environmental protection rules and regulations under which it must operate.

The Office of Science and Technology Policy and the National Science Foundation both agree that the Government needs to establish environmental protection standards. The Office said that it intends to review the Deep Ocean Mining Environmental Study program to satisfy itself that the current schedule will be sufficient.

The Office further stated that it could not agree in principal that deep ocean mining should be initiated. It, therefore, found it difficult to reach the conclusion that the Government needs to centralize authority, accelerate the environmental assessment, unilaterally provide a legal basis for multinational industrial activity, or offer financial protection to industry by completing legislation.

We believe, however, that the Office of Management and Budget's reply listing the steps the administration has taken to encourage deep seabed mining tend to support our conclusions and recommendations.

Both the Departments of Commerce and the Interior stated that they have certain responsibilities under their legislative authority with regard to deep ocean mining. We acknowledge that both of these agencies are deeply involved in activities directly and indirectly related to ocean mining and believe we have recognized these activities in this report. We believe, however, that this supports our finding that programs have been developed or expanded to support deep ocean mining needs as perceived by individual agencies rather than according to an overall plan.

The Department of State said that because of the many technical and financial unknowns surrounding the subject of seabed mining, it is not possible now to make definite assertions about future production or income aspects. They said that such assertions occur at various places in our report. We agree that at this time exact predictions for future production and income aspects for seabed mining cannot

be made. The information contained in this report, however, represents estimates and predictions found in various Federal agency reports, private industry reports, congressional testimony, and interviews with knowledgeable individuals engaged in seabed mining activities and represent the best predictions available at this time.

FEDERAL AGENCIES, COUNCILS, AND COMMITTEESINTERESTED IN DEEP OCEAN MINING

Department of the Interior:  
Ocean Mining Administration  
U.S. Geological Survey  
Bureau of Mines

Department of Commerce:  
National Oceanic and Atmospheric Administration  
Office of Marine Minerals  
Environmental Research Laboratory  
Office of Sea Grant

National Science Foundation:  
Office for the International Decade of  
Ocean Exploration

Department of State

Department of Defense:  
Department of the Navy

National Security Council:  
Interagency Task Force on Law of the Sea

National Advisory Committee on  
Oceans and Atmospheres

Interagency Committee on Marine  
Science and Engineering

The Office of Management and Budget

We also interviewed officials and analyzed data from the following agencies and congressional committees:

Office of Technology Assessment

Congressional Research Service

Senate Committee on Commerce  
National Ocean Policy Study

EXECUTIVE OFFICE OF THE PRESIDENT  
OFFICE OF SCIENCE AND TECHNOLOGY POLICY  
WASHINGTON, D.C. 20500

July 12, 1977

Mr. R. W. Gutmann  
Director  
Procurement and Systems  
Acquisition Division  
U.S. General Accounting Office  
Washington, D.C. 20548

Dear Mr. Gutmann:

We appreciate the opportunity to comment on the draft GAO report, "Deep Ocean Mining -- Actions Needed to Make it Happen" in which you recommend that the OSTP advise the OMB on designating or creating a Federal authority to determine the Federal role in deep ocean mining.

Without knowing in detail the question asked of the GAO by a member or a Committee of the Congress to which this report responds, we are unable to assess the report completely. The report appears strongly predicated on the assumption that deep ocean mining should happen, and happen rather quickly. Given that premise, the further premise is made that government inaction and uncertainties of technology, economics, and future international agreement are the obstacles to development in this area. Given these premises, the conclusions of the report follow, namely that (1) the government should resolve its internal policy and organizational differences; (2) that authority within the government should be centralized; (3) that the environmental review should be expedited; (4) that a firm legal basis should be provided to industry; (5) that financial protection for industry would be very useful; and (6) that legislation is probably necessary. We do not believe the premises and conclusions are self-evidently true, and the failure to demonstrate them by way of analysis is a major problem with the report.

There is to our knowledge no national consensus that deep ocean mining should begin quickly. It has been the position of successive Administrations that unilateral action independent of the resolution of international issues within the law-of-the-sea context is unwarranted and counterproductive from a foreign policy perspective while negotiations are underway. Only if these negotiations were protracted indefinitely, should the question arise on the extent to which the United States should underwrite the risks involved to industry in loss of access to the resource.

Aside from the law-of-the-sea context, the report's conclusion about the need and utility of government intervention do not follow. One body of opinion holds that since the interests so far exhibited by U.S. firms

have been expressed through the formation of multinational consortia, guarantee of site by a unilateral U.S. government legal action would be presumptuous. Others contend that the risk to investing firms has been overplayed since the technology is quite advanced and largely possessed by organizations in a very few industrial nations. As the report mentions, mining could have a disruptive effect on the economy of some developing nations; some contend that such an economic disruption would not be supportive of the U.S. long-range interests internationally. Still others contend that the primary factor inhibiting ocean mining is that it is only marginally economic. The economic analyses that we have seen suggest that ocean mining may remain marginal much of the rest of this century.

Without agreement in principle that deep ocean mining should be initiated, we find it difficult to reach the conclusion that the government needs to centralize authority, accelerate the environmental assessment, unilaterally provide a legal basis for multinational industrial activity, or offer financial protection to industry by completing legislation.

The Office of Science and Technology Policy considers the determination of the federal role in deep ocean mining to be one of several policy and organizational issues related to the oceans which should be examined by his Administration. President Carter has expressed an interest in the need for a comprehensive review of these questions. The President has also asked the Secretary of the Interior and the Director of the Office of Science and Technology Policy to conduct a general review of policies in the mineral area. We believe that these questions can be addressed through a series of domestic and international policy reviews, and, by the President's Reorganization Project. The Office of Science and Technology Policy will work closely with other Executive Office units and the Departments and Agencies on these questions.

We share with you the concern that environmental studies be undertaken sufficiently in advance of actual operations so as to diminish the chance for surprise in environmental regulation and intend to satisfy ourselves that the current schedule will be sufficient by reviewing the Deep Ocean Mining Environmental Study program.

Thank you for giving us an opportunity to examine this report.

Sincerely yours,



Philip M. Smith  
Assistant Director  
Natural Resources and  
Commercial Services

NATIONAL SCIENCE FOUNDATION  
WASHINGTON, D.C. 20550

August 10, 1977

Mr. Richard W. Gutman  
Director, Procurement and Systems  
Acquisition Division  
U. S. General Accounting Office  
441 G Street, NW - Room 6915  
Washington, D. C. 20548

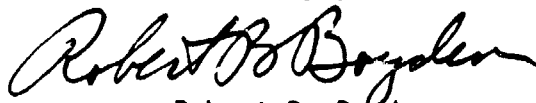
Dear Mr. Gutman:

This is in response to the GAO letter of June 16, 1977 to Dr. Richard C. Atkinson, Director, National Science Foundation, requesting comments on a draft of a proposed report to the Congress on "Deep Ocean Mining - Actions Needed To Make It Happen."

NSF memorandum, dated July 14, 1977 is enclosed for your information.

This office sincerely regrets the delay in responding to your request.

Sincerely yours,



Robert B. Boyden  
Audit Officer

Enclosure

OPTIONAL FORM NO. 10  
MAY 1962 EDITION  
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

# Memorandum

TO : R. B. Boyden  
Audit Officer

DATE: July 14, 1977

FROM : Acting Assistant Director, AAEO

SUBJECT: Comments on GAO Draft Report Entitled, "Deep Ocean Mining - Actions Needed to Make It Happen"

In response to your memorandum of 17 June 1977, the GAO Report on "Deep Ocean Mining - Actions Needed to Make It Happen" has been reviewed by the Earth Sciences Division and Ocean Sciences Division of my Directorate and the Advanced Environmental Research and Technology Division of the RANN Directorate.

The staff members reviewing the report noted no errors in the facts presented. We do not choose to express any opinions on the policy recommendations set forth. Our discussions with a few people in the field over the past few years indicate that the report is indeed correct in stressing the need for some guarantee of site tenure before companies would be willing to move forward. This question is one of the larger obstacles to substantial capital investments in deep sea mining. It is also true that the government needs to establish environmental protection standards.

We feel that the Foundation could well concur with the sense of urgency communicated in the report about the need for the U.S. to accelerate its efforts toward development of an overall policy for ocean mining. However, it might be even better to focus on formulation of policies aimed at assuring an adequate supply of minerals to the U.S. beyond the Year 2000, including, if necessary, the utilization of deep sea manganese nodules.

15/  
Edward P. Todd



## DEPARTMENT OF STATE

Washington, D.C. 20520

October 21, 1977

Mr. J. K. Fasick  
Director  
International Division  
U.S. General Accounting Office  
Washington, D. C.

Dear Mr. Fasick:

I am replying to your letter of June 16, 1977, which forwarded copies of the draft report: "Deep Ocean Mining - Actions Needed to Make it Happen."

The enclosed comments were prepared by the Director, Office of Law of the Sea Negotiations.

We appreciate having had the opportunity to review and comment on the draft report. If I may be of further assistance, I trust you will let me know.

Sincerely,

A handwritten signature in cursive script, appearing to read "D. Williamson, Jr.", written in dark ink.

Daniel L. Williamson, Jr.  
Deputy Assistant Secretary  
for Budget and Finance

Enclosure: As stated



GAO DRAFT REPORT: "DEEP OCEAN MINING -  
ACTIONS NEEDED TO MAKE IT HAPPEN

Following are the comments of the State Department on the above-captioned GAO Draft Report:

1) It is the position of the State Department that, because of the many technical and financial unknowns surrounding the subject of seabed mining, it is not possible now to make with certainty assertions about the future production or income aspects of that activity. Assertions of this nature are speculative at best and cannot aid the very delicate negotiations of the Third UN Law of the Sea Conference.

Such assertions occur at various places in the GAO Draft Report. If these assertions are attributed (for example, to "the mining firms", as on p. 21), they are not objectionable. Unattributed assertions, however, are objectionable and they occur on: pp.5, 6, 12, 20, 35, 38, 39, 41, 42, 74.

[See GAO note, p. 57.]

4) Pp. 35, 36, 38 and 42 treat the developing countries as an undifferentiated bloc. In fact developing countries which consume more nickel, cobalt, copper and manganese than they produce stand to benefit from lower mineral prices. Furthermore no one really benefits from artificially high mineral prices because such artificiality causes a misallocation of resources.

[See GAO note, p.57.]

[See GAO note.]



Alan Berlind  
Director,  
Office of Law of the Sea  
Negotiations

GAO note: The deleted comments relate to matters in the draft report which have been revised as suggested by the agency or omitted from this final report.



EXECUTIVE OFFICE OF THE PRESIDENT  
OFFICE OF MANAGEMENT AND BUDGET  
WASHINGTON, D.C. 20503

JAN 25 1978

Mr. Victor L. Lowe  
Director  
General Government Division  
General Accounting Office  
Washington, D.C. 20548

Dear Mr. Lowe:

We appreciate the opportunity to comment on the draft General Accounting Office Report, "Deep Ocean Mining -- Actions Needed to Make it Happen." In the months since you requested comments by the Office of Management and Budget and the other Federal agencies, several significant events have occurred which directly relate to the subjects discussed in the report and the recommendations it contains.

The most important event was the endorsement by the Administration of enactment by Congress of interim legislation, if amended, as recommended by the Administration, to license and then to regulate the activities of United States-based firms taking steps to commercially recover manganese nodules from the deep seabed. Administration views on S. 2053, the Senate bill, were outlined in testimony and agency reports to the Commerce and the Energy and Natural Resources Committees in October 1977. Amendments to the House bill, H.R. 3350, will be transmitted to the Committees after Congress reconvenes in January 1978. The Administration's position on this legislation is intended to encourage continued investments by private firms in deep seabed mining technology while negotiations continue on the draft Law-of-the-Sea Treaty.

A second significant event has been the formation of the President's Reorganization Project (PRP). Topics under consideration by the PRP include questions of what changes, if any, to recommend concerning the organization of Federal activities related to natural resources, including the mineral resources in the seabed. While the Administration's views of the limits of the appropriate Federal role concerning deep seabed mining have been reflected in the proposed amendments to the introduced bills, the question of designating a lead and other agency missions related to that role currently are being considered by the PRP. The Administration's recommendations with regard to agency missions related to seabed mining will be made in the context of its overall recommendations concerning natural resources organization.

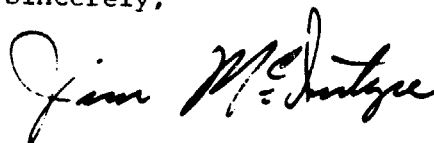
Third, there have been coordinated Executive Office reviews of both the Fiscal Year 1978 and 1979 Budget requests by the Departments of Commerce and Interior for activities related to deep seabed mining. These reviews have been made on the basis of definitions of the appropriate Federal role, as well as the positions then being taken by the Executive Branch, both in relation to the Law-of-the-Sea negotiations and the introduced bills under consideration by the Congress. A clear result of these reviews has been to provide adequate funding for the Department of Commerce's Deep Ocean Mining Environmental Studies (DOMES), so that an adequate basis of environmental information and technology related to deep ocean mining is developed in anticipation of some form of deep ocean mining regime. Other activities which have been funded are studies of international supply and demand for the principal minerals which could be recovered from the nodules and support for the United States negotiators in the Law-of-the-Sea Conference.

In brief, we believe the Executive Branch has been taking steps to encourage deep seabed mining generally consistent with the recommendations outlined in the report. These steps have been taken in coordination with the continuing efforts by our negotiators to achieve an overall Law-of-the-Sea Treaty that, at least, is minimally acceptable in all of its provisions to the United States. The Administration is continuing to work with other Nations to try to achieve that treaty result.

Agency comments on the draft General Accounting Office report recommend a number of significant changes in it concerning both matters of fact and characterizations of agency actions related to seabed mining. We have reviewed these agency comments and concur with the recommendations by them.

Thank you again for the opportunity to comment.

Sincerely,



James T. McIntyre, Jr.  
Acting Director



# United States Department of the Interior

OFFICE OF THE SECRETARY  
WASHINGTON, D.C. 20240

MAR 8 1978

Mr. Henry Eschwege  
Director, Community and Economic  
Development Division  
U.S. General Accounting Office  
Washington, D.C. 20548

Dear Mr. Eschwege:

This responds to your draft report, "Deep Ocean Mining - Actions Needed To Make It Happen."

The Department appreciates your description of the situation concerning ocean mining and activities within the Executive Branch related to it. An explanation of Interior's activities related to ocean mining and specific suggestions for changes in the draft report are as follows:

1. The Ocean Mining Administration was established by Secretarial Order No. 2971 of February 24, 1975, as the focal point for policy development for the Assistant Secretary--Energy and Minerals on issues relating to development of a domestic ocean mining capability. The legislative authority to engage in the activities described exists in various statutes conferring on Interior responsibilities relating to mineral resources including 43 U.S.C. 31(b) for the Geological Survey and 30 U.S.C. 3 for the Bureau of Mines. Further, the Mining and Mineral Policy Act of 1970 (30 U.S.C. 21(a)) requires the Secretary of the Interior to foster and encourage private enterprise in mining or mineral activities.

2. Besides the activities indicated in the report, additional resource evaluation and operations management responsibilities for marine areas are carried out by the Geological Survey under the authority of the OCS Lands Act of 1953 (43 U.S.C. 1331-1343). Facilities and expertise for marine geological investigations and mineral operations management have been developed by the Geological Survey over many years.



With respect to the description of ocean mining as a national and international phenomenon and the predicted impacts for ocean mining, the consensus of Departmental experts is that the report reaches some extreme conclusions in view of the available data and the most likely set of events current technology will permit. Some specific suggestions covering this and other points are offered in the attachment.

We appreciate the opportunity to comment on your draft report.

Sincerely,



Acting Assistant Secretary -  
Policy, Budget, and Administration

Attachment

Comments on GAO Draft Report -  
"Deep Ocean Mining - Actions Needed to Make it Happen"

Page 1, first paragraph: Nodules lie on the ocean bottom in most parts of the world, and the total amount is vast, but in some areas the number of nodules per unit of area is quite low, not "vast." Only some of the nodules are rich in copper, cobalt, manganese, and nickel, and these apparently occur only in certain areas.

[See GAO note, p. 64.]

Page 2, last paragraph: This comparison is inconsistent as written. Nodule deposits that appear to be commercially recoverable, that is, those with sufficient density; areal extent; and copper, nickel, cobalt, and manganese content, may be very large in total, but are not unlimited.

[See GAO note, p. 64.]

Page 27: First item under "Resolution of this problem is necessary to meet the requirements of . . . ." This statement would not be true if the companies went on their own under the existing High Seas Convention or under a foreign flag.

[See GAO note, p. 64.]

Page 38, first paragraph: This paragraph begins with a conclusion that is completely unwarranted. The UNCTAD paper contained hypothetical scenarios, not "case studies." Little understanding of deep sea mining costs existed in the early 1970's, and the UNCTAD authors did no cost research to justify their extrapolations. Studies done for NOAA and DOI indicate that first generation operations will be little more than competitive with laterite nickel deposits.

Page 38, second and third paragraphs: First, although "other studies" are not identified, only now are informed studies of likely deep sea mining costs being completed. These studies indicate that nodule miners will depend on expanding world markets that have laterite nickel costs as a floor. Second, "the developing countries" must be qualified. A few developing countries are large exporters, and a few more depend on exports of one or more of the four metals mentioned for some export revenue.

[See GAO note, p. 64.]

Page 45: "U.S. Geological Survey activities related to Deep Ocean Mining" does not reflect the activities of the Conservation Division. The efforts have not been separately funded and amount to less than \$50k in each of the Fiscal Years 1975-1977.



[See GAO note.]

Page 75, last paragraph: In March 1974 a draft environmental impact statement on deep seabed mining was prepared by the Geological Survey personnel for the Department of the Interior, Office of Ocean Resources. The Department of State was the lead agency, and inputs were developed by other agencies including the Bureau of Mines and NOAA. The statement was given a public hearing at the State Department on June 10, 1974.

GAO note: The deleted comments relate to matters in the draft report which have been revised as suggested by the agency or omitted from this final report.



UNITED STATES DEPARTMENT OF COMMERCE  
The Assistant Secretary for Administration  
Washington, D.C. 20230

14 MAR 1978

Mr. Richard W. Gutmann  
Director, Procurement and Systems  
Acquisition Division  
U. S. General Accounting Office  
Washington, D. C. 20548

Dear Mr. Gutmann:

This is in reply to Mr. Eschwege's letter of June 16, 1977, requesting comments on the draft report entitled "Deep Ocean Mining - Actions Needed To Make It Happen."

We have reviewed the enclosed comments of the Administrator, National Oceanic and Atmospheric Administration, and believe they are responsive to the matters discussed in the report.

Sincerely,



E. A. Porter  
Assistant Secretary  
for Administration

Enclosure



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
 Rockville, Maryland 20852

**MAR 9 1978**

Mr. Richard W. Gutmann  
 Director, Procurement and Systems  
 Acquisition Division  
 U.S. General Accounting Office  
 Room 6915, 441 G Street, N.W.  
 Washington, D.C. 20548

Dear Mr. Gutmann:

We appreciate the opportunity to review and comment on the General Accounting Office's (GAO's) draft report entitled, "Deep Ocean Mining - Actions Needed to Make It Happen," which was transmitted to the Secretary of Commerce by Mr. Eschwege of GAO on June 16, 1977.

We also appreciate having had the opportunity for a meeting with GAO representatives to discuss editorial and other minor problems which arose during our review. Since it is understood that the GAO will be making these minor corrections and checking those areas which we questioned, this letter will only address matters of significant concern to the Department of Commerce (DOC) and the National Oceanic and Atmospheric Administration (NOAA).

These matters include: (1) the activities of DOC and NOAA as related to deep ocean minerals; (2) the assignment of environmental impact statement responsibilities; (3) the status and results of NOAA's Deep Ocean Mining Environmental Studies (DOMES) Project and complementary environmental impact research; (4) NOAA's activities and future plans with respect to deep ocean mining; and (5) certain of the conclusions reached. In general, we feel the GAO has made a significant contribution with this report.

1. The first comment concerns statements in the draft report on NOAA's marine hard minerals-related responsibilities and activities, as addressed in Chapter 4 (pages 48 and 50) and in Chapter 5 (page 65). These statements refer to when NOAA was founded, the major responsibilities assigned to NOAA and the expertise of NOAA and the Department.

The report states (page 65) that NOAA was assigned responsibility "to explore, map, and chart the global ocean and its living resources; and manage, use and conserve these resources. NOAA's assigned mission, however, did not specifically include development of deep ocean mineral resources."



This statement we believe overlooks Reorganization Plan No. 4 of 1970. Under that Plan certain functions relating to marine minerals that had been carried out through the Marine Minerals Technology Center of the Bureau of Mines were transferred to NOAA. While the scope of these functions is still subject to debate, nonetheless the transfer of the Center and its functions is the basis for NOAA's present marine mineral activity. NOAA has carried out activity through the Office of Marine Minerals (now the Marine Minerals Division) and these efforts have been supported in part by specifically appropriated funds.

There are other NOAA activities that relate either directly or indirectly to deep ocean mining. Specifically, NOAA's existing role in marine fisheries, weather services, marine and geophysical data services, and coastal zone management are capabilities related to marine resource development.

In addition, Commerce's traditional role in economic development and maritime operations are also related to deep seabed mineral development. In this regard Commerce is responsible for such matters as promoting and strengthening U.S. maritime operations; spurring economic development in areas where per capita income lags the remainder of the Nation; promoting and reporting on international trade; and assuring the flow of needed commodities to the U.S. economy. These overall Department responsibilities and activities directly relate to deep seabed mining and have been expanding. For example, the Department was recently authorized to embark on a series of international economic and legal studies for deep ocean mining.

Thus, in essence, we feel the discussion of responsibilities and activities should reflect the matters referred to above. Further, the report should note that the President's Reorganization Project is addressing the question of lead and other agency missions in relation to deep seabed mining activities.

2. There were statements regarding the assignment within the Executive Branch for the preparation of an environmental impact statement (EIS) on deep ocean mining at various places in the report (e.g. pages iii, 57, 75, and 81). NOAA, with Congressional appropriations, is developing a considerable body of knowledge regarding the potential environmental effects of both at-sea deep ocean mining operations and onshore processing activities. This knowledge should form the core of an EIS.

Additional information of course will be required in an EIS. However, the nature of this additional information will depend to a large extent on whether the "major Federal action" which triggers the need for an EIS under the National Environmental Policy Act is associated with a Law of the Sea Treaty or with the implementation of interim domestic legislation. We believe that our work has progressed to the point where we or whatever agency is called upon to prepare the EIS can respond promptly.

[See GAO note, p. 69.]

4. With respect to comments on certain of NOAA's marine hard minerals activities and planned activities, as addressed in Chapter 4 (pages 52, 53, 54, 57, and 60) there are several problems.

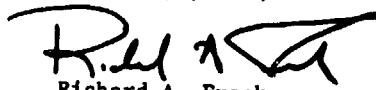
First, there is a point on the Federal role in manganese nodule processing technology which we would like to make. Specifically, at the March 1976 NOAA-sponsored Marine Minerals Workshop (the proceedings of which are, incidentally, not cited on page 66 of Chapter 5), the industry-academia-government participants recommended some fundamental research (but not full process development) be sponsored by Government in processing technology to explore new concepts. It is this type of work which Sea Grant has sponsored.

Second, NOAA was established with an ocean survey arm and with ocean data systems responsibilities. Recommendations in the "Report of the Federal Task Force on Mapping, Charting, Geodesy, and Surveying," which are cited (on page 54), have been implemented to the extent possible without legislation establishing a central agency for these functions. Thus, there has been a significant improvement.

[See GAO note.]

5. With respect to the recommendations made in Chapter 6, we agree an effort should be made to determine the Federal role in deep ocean mining. This is receiving considerable attention at the Department of Commerce level and the Administration position has been presented before various Congressional Committees recently. We feel that the list of "major elements [of]...a comprehensive program" on page 80 should be expanded to include environmental safeguard development and economic and legal studies needed not only to support the Law of the Sea negotiations, but for potential implementation of a domestic legal regime. In the development of such a program, great care must be taken to define Federal and private sector roles so as to prevent needless duplication of effort.

Sincerely yours,



Richard A. Frank  
Administrator

GAO note: The deleted comments relate to matters in the draft report which have been revised as suggested by the agency or omitted from this final report.

PRINCIPAL OFFICIALS RESPONSIBLEFOR ADMINISTERING ACTIVITIES

<u>Tenure of office</u>	
<u>From</u>	<u>To</u>

DEPARTMENT OF THE INTERIOR

## SECRETARY OF THE INTERIOR:

Cecil D. Andrus	Jan. 1977	Present
Thomas S. Kleppe	Oct. 1975	Jan. 1977
Ken Frizzell (acting)	July 1975	Oct. 1975
Stanley K. Hathaway	June 1975	July 1975
Ken Frizzell (acting)	May 1975	June 1975
Roger C.B. Morton	Jan. 1971	May 1975

DEPARTMENT OF COMMERCE

## SECRETARY OF COMMERCE:

Juanita M. Kreps	Jan. 1977	Present
Elliot L. Richardson	Feb. 1977	Jan. 1977
Roger C.B. Morton	May 1975	Jan. 1976
Frederick B. Dent	Feb. 1973	Mar. 1975

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

## ADMINISTRATOR:

Richard A. Frank	July 1977	Present
Dr. Robert M. White	Jan. 1971	June 1977