

**MEMORANDUM**

**DEPARTMENT OF STATE**

Proj. No. 6690071-  
**(3)**

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FROM . MONROVIA

SUBJECT . NONCAPITAL PROJECT PAPER (PROP)

REFERENCE . STATE 124843

**NONCAPITAL PROJECT PAPER (PROP)**

Country: Liberia

Project No. 669-51-210-071

Submission date: Sept 1970

Amendment No. 2 (Supersedes previous PROP and Amendments)

Project Title: Geological Survey and Appraisal (formerly titled as Geological Exploration and Resources Appraisal, "GERA").

U.S. Obligation Span: FY 61 through FY 72

Gross Life of Project Financial Requirements:

Gross Costs:

U.S. dollars: Project Grant	\$4,281,000
FSL Loan	51,500
Geophysical Survey Loan	850,000
Total	\$5,182,500

Cooperating Country:	
Cash Contribution	\$ 982,288
Geophysical Survey Loan	90,000
Total	\$1,072,288
Grand Total	\$6,254,788

**OTHER AGENCY**

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PAGE 1 OF 21 PAGES

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## I. Summary Description

### A. Overall Scope

The economy of Liberia has benefited over the past ten years from the rapid growth of the mining industry. Official GOL statistics reveal that 33 percent of the total economy is based on mining and directly related industries. The past four years has produced an annual average G.N.P. growth rate of 17 percent - much of which is attributable to increases in mineral exports. Continued expansion of this industry, even at the anticipated leveling-off growth rate, will bring corresponding benefits to the economy. This project was designed to help achieve and maintain this growth rate.

In Liberia, mining and mineral development is carried out primarily by private companies operating under government concession agreements. An effective means of stimulating this mining activity is a thorough-going compilation of the country's geologic and geophysical data to facilitate mineral prospecting by interested parties. The responsibility for collecting and disseminating the basic data lies with the Liberian Geological Survey (LGS) in the Bureau of Natural Resources and Surveys. The project described in this PNOP has operated within the framework of the LGS with the twofold objective of instigating mineral production and developing a more effective Liberian Geological Survey. (See Section V for detailed listing of intended results).

### B. Project Activity

This project was specifically designed to accomplish the following:

1. Prepare and publish maps of Liberia to include: base maps, geological reconnaissance quadrangle maps, large scale maps of mineral deposits, a small scale interim geologic map, large scale maps required for engineering projects, geophysical maps and, finally, commodity maps indicating distribution of economic minerals.

2. Evaluate known mineral deposits and explore for new deposits. Investigative methods include geological mapping, geochemical prospecting and the application of geophysical techniques. Corollary studies of mineral commodities (sand, clay, phosphates and other industrial minerals) have also been accomplished to appraise the feasibility of local industry development.

3. Develop a more effective Liberian Geological Survey. This is to be accomplished through academic and practical training of Liberian personnel in the US, through the provision of modern lab., field equipment and, most importantly, through in-service training of Liberian counterparts by US Geological Survey personnel. The in-service training will enable IGS staff to gain experience in all phases of a modern geological survey organization and help bring about the desired institutionalization of the IGS.

Thus, it is anticipated that the major result of this program will be the significant strengthening of Liberia's economic viability.

## II. Project Background

### A. Period 1963 - 1969

The project was started in 1963 and scheduled for completion in 1972. Personnel from the US Geological Survey were assigned under a PASA agreement as operating advisors to the Liberian Geological Survey. During the course of this project geologists, geophysicists, mineralogists, a cartographer and various administrative personnel were to be assigned to the team depending on the need of the program at a particular stage of progress. Some basic assumptions made in designing the scope of work were:

1. The main project end-product would be the compilation of the geological base maps scale 1:250,000.
2. Suitable topographic base maps would be made available to protect personnel as a product of a mapping program to be carried out by the US Army Map Service (AMS) and the Liberian Cartographic Service (LCS).
3. Mineral deposit studies would be limited to preliminary exploration.
4. A reasonable amount of institutional development would be sought.
5. A full complement of USGS and IGS staff would be maintained throughout the project's life.

Measurable progress was achieved during the early stages of the project (see Section VII for a partial listing). Several situations arose, however, which slowed the rate of progress toward initial targets.

Among these were:

1. The AMS-LCS base maps did not materialize. Thus, it was necessary to compile a form-line base maps of Liberia, scale 1:125,000 on which to plot the geology for publication at scale 1:250,000. Shaded relief maps were to be added with 10 quadrangles covering the entire country.

2. Several intensive mineral-target studies became necessary.<sup>1/</sup> One study grew out of a field-mapping expedition during 1965 which revealed significant deposits of barite and kyanite. In 1967, recognition of the possible existence of petroliferous sedimentary rocks resulted in considerable geophysical and geological effort being expended in evaluating and furthering development of Liberia's petroleum prospects. The results of these studies stimulated private investors to carry on further exploration and development. (See Section VIII). GOL income from these sources had, in fact, heavily amortized the GOL-AID investment but, it remains true, the project fell behind schedule because of the expended man-months.

3. The unfavorable nature of Liberia's geological/physical environment made necessary an airborne geomagnetic-radiometric survey in order to achieve the desired project results. Such a survey (which included the 25 mile off-shore strip) was completed in 1968 under an AID loan.

4. Man-months were diverted to development activities outside the primary program objectives. The project office became recognized as an excellent source of in-country information not generally available elsewhere in Liberia. Since the enquiring parties tended to be heavily involved in development activities, project staff felt compelled to accommodate their requests. Data furnished included information about localities based on maps and aerial photographs, petrographical data, hydrological and meteorological records and mineral and concession statistics.

5. Three field staff positions were eliminated during the BALPA II exercise. The personnel cut came at a particularly inopportune time since base map and geophysical data had only recently been completed.

D. Review of Work Status - April 1970

As a result of the change factors listed above (A), it became clear that target objectives could not be achieved within the scheduled period. Accordingly, representatives of USAID, GOL and USGS met in Monrovia during April 1970 to make necessary adjustments in project strategy. There was general agreement that the original project objectives should not be attenuated in view of the nature of the commitment made to the GOL in this program area and the potential impact of the project on the Liberian economy. Further, it was felt that these target objectives could be substantively achieved by June 1972 if project inputs were increased. Several program revisions were agreed upon to accelerate project implementation:

<sup>1/</sup> These were undertaken while waiting for the base maps, (referred to above), to be completed.

1. USGS/W would intensify its map compilation to bring about an earlier availability of the 1:125,000 scale form-line maps.
2. The field mapping scale would be changed from 1:40,000 to 1:125,000.
3. The field-mapping plan would be revised to allow certain remote and inaccessible areas to be shown blank on final geologic maps.<sup>1/</sup>
4. There would be extensive use of air-support (including helicopters) to speed up field mapping.
5. Up to four USGS/TDY personnel would be utilized during the dry season to compensate for the lost man-months referred to in II.A. above.

Finally, it was agreed that the success of the accelerated plan was contingent on the restoring of three field positions eliminated by BALPA II. Only with a fully staffed team could the critical balance be maintained between field personnel who collect the original data and staff personnel who plan and manage the operation, support the field work with lab and technical services and compile the geologic maps/reports. Lacking this balance, the operation's efficiency would be impaired.<sup>2/</sup>

Restoring the three field positions (together with the TDY personnel) would allow for completion of the project in the least time. Because of the shorter duration of support-staff assignments--as compared to a longer program requiring fewer field geologists--the properly balanced project could be completed at the least cost, and the outputs made available to the GOL at the earliest date.

#### C. Required life-of-project financial inputs

In addition to providing advisors, funds have been allotted for the purchase of commodities to equip the Liberian Geological Survey along adequate modern standards, for participant training of professional personnel, and in addition, a loan provided an airborne geophysical survey of the country. The following table shows the expenditures and the projected costs per year for the USAID and GOL.

<sup>1/</sup> This is standard practice in reconnaissance mapping and it avoids excessive expenditure of effort in areas of diminishing return.

<sup>2/</sup> At this writing, September 1970, the geological project is hampered by this lack of balance.

<u>Fiscal Year</u>	<u>GOL Actual or Current Estimate</u>	<u>U.S. Actual or Current Estimate</u>
1964 & prior	E \$ 35,000	\$ 154,000
1965	65,250	263,000
1966	90,974	430,000
1967	112,373	431,000
1968	94,018	559,000
1969	93,673	553,000
1970	E 156,000	E 395,000
1971	E 160,000	E 786,000
1972	E <u>170,000</u>	E <u>710,000</u>
<b>Totals</b>	<b>\$982,288</b>	<b>\$4,281,000</b>

In addition to above there have been PSL loan amounts expended as follows:

PSL AID No. 669-II-010	\$ 33,000
PSL AID No. 669-II-012	8,500
PSL AID No. 669-II-015	<u>10,000</u>
<b>Total</b>	<b>\$ 51,500</b>

AID loan financing provided for an airborne geophysical survey of the country at cost of:

AID Loan No. 669-II-014	\$350,000
GOL Contribution	<u>20,000</u>
<b>Total</b>	<b>\$370,000</b>

### III. Setting

The mineral industry is one of the major dollar earners in Liberia, and projected trends indicate that mineral production will be a major source of revenue for many years to come. Scientific exploration for minerals and efficient development of the deposits depend on basic regional geologic data supplied by high quality geologic maps and reports. As procurement of these data is, in most cases, beyond the capability of the individual mining companies, the logical function of the Liberian Geological Survey is to provide this information required for development.

E = Estimate

Large areas of Liberia are unexplored and it is quite possible that heretofore unknown economic mineral deposits or mineralized districts may be found during the course of the geological mapping activity. It is because of this possibility that the geochemical and heavy minerals prospecting activities are included as part of the geological mapping program.

Liberia at the inception of the project had limited geologic information, no minerals exploration program, and a geologic staff with only a small amount of experience but with reasonably adequate academic training. The staff was and is underpaid and field operating funds were insufficient to support necessary field activities.

The present project was designed as an operational type of activity which would use the LGS geologists as much as possible and which would attempt to maximize GOL participation. Major areas of activity would be confined to: map production; a minerals exploration program; and, the establishment of a functioning LGS division within the MRR&S. It was felt that a LGS-USGS cooperative effort would insure the desirable technical expertise, a good working environment and a stimulating scientific atmosphere.

#### IV. Strategy

The development of the mineral resources of Liberia depends to an extent on the availability of information on the geology of the country. The present project is addressed to obtaining and disseminating this information by means of: (1) geological and geophysical studies and (2) the training of Liberian counterparts in this work. At the termination of the project, these Liberian counterparts who comprise the staff of the Liberian Geological Survey will be capable of continuing the work. Thus, the approach is to make information available during the life of the project and at the same time enable Liberia to gain a viable institution which can serve the geological needs of the country in the future.

An alternative approach to the problem of providing geological information to accelerate development of the mineral industry would have been to hire a contract team of geologists from a private firm to do the work. This would have been a rapid way of completing an initial survey but the approach entailed two significant disadvantages: first, the cost would have been considerably greater given the desirability of obtaining results comparable to those from the present project. Secondly, at the termination of the work, Liberia would have been in no better position than before to continue this work.

Another alternative would have been to train LGS geologists outside Liberia and have them return as full staff members of the Liberian Geological Survey to carry out the necessary work. However, this approach would have resulted in production at a level too modest to keep up with the developing needs of the

country. Academic training overseas without further guidance and training on-the-job in the country itself is less effective than a combination of the two.

#### V. Planned Targets, Results and Outputs

The overall target which is to provide Liberia with the basic geologic and mineralogic information essential to its development and to provide it with means by which it can continue to generate this type of information as needed after the project has terminated.

The basic body of information will be produced by the joint effort of the U.S. Geological Survey and the Liberian Geological Survey staffs during the existence of the project. The means to continue producing geologic information after termination of the project will be established by training and development of the Liberian Geological Survey.

For each of the major operational activities, the specific activity targets are given below:

#### A. Production of multipurpose maps of Liberia:

##### 1. Geographical base maps:

- (a) Systematic compilation and production of scale 1:40,000 form-line base sheets covering the 506 mosaic blocks of Liberia (each complete sheet covers an area of approximately 86 square miles).
- (b) Reduction and compilation of the mosaic block maps to scale 1:125,000 intermediate quadrangle work sheet copy.
- (c) Reduction and compilation of the intermediate materials to scale 1:250,000 shaded relief quadrangle map publication materials, and
- (d) Publication and release of the base maps so that they can be utilized not only in geological survey activities, but also for planning and implementing both public and private sector development activities of many types (development of mineral, agricultural, hydroelectric, transportation and even, human resources).

##### 2. Geologic maps:

- (a) To prepare and publish a set of multicolor geological maps covering appropriate quadrangle areas of Liberia at a scale of 1:250,000, with accompanying explanations and descriptive texts.

- (b) To prepare and publish maps of selected areas at larger scales for industrial or mineral development.

### 3. Geophysical maps

- (a) To prepare and publish sets of geophysical maps covering quadrangle areas of Liberia at a scale of 1:250,000 with accompanying explanations and interpretive text.
- (b) To prepare and publish maps of various areas of Liberia that show the significant results of geophysical investigations in Liberia.

### B. Mineral resources evaluations:

1. To prepare interim reports as necessary and a final report by the end of the project, summarizing the available information on mineral resources and mineral development possibilities in Liberia.
2. To prepare comprehensive reports on selected mineral commodities of economic significance.
3. To prepare reports of investigation of individual prospective mineral deposits to stimulate exploration and development by the private sector.

### C. Development and expansion of the Liberian Geological Survey Division of the BIRCS:

1. To provide guidance and experience for existing staff of the Liberian Geological Survey in the field, office, and laboratories under the tutelage of USGS specialists.
2. To provide academic and practical training in the U.S. for eight (8) participants in addition to eight others previously sent as AID participants; selected and approved jointly by the Director of BIRCS, the Chief of LGS, and the Project Advisor. Participants are selected on the basis of academic records and their actual performance and potential, demonstrated on assignments with the Liberian Geological Survey. Objective of this training is to develop a technical staff qualified to carry out geological mapping and resources appraisal in Liberia as specific responsibilities and functions of the Liberian Geological Survey.

3. To help establish desirable operational procedures and organizational structure for the Liberian Geological Survey. To assist the LIGS in preparation of a management manual that defines and establishes LIGS management control functions.
4. To encourage the GOL to recognize the need for a competent Liberian Geological Survey organization and the services it can provide. A measure of this recognition will be indicated by the extent to which the funding needs of the Liberian Geological Survey are met.

## VI. Course of Action

### A. Prepare geographical base maps of Liberia: (Grant financed)

Adequate base maps of Liberia are vitally needed not only as fundamental source material for geological survey activities but also for planning and implementing both public and private sector development activities of many types (development of mineral, agricultural, hydroelectric, transportation, and even human resources). In order to provide the base maps necessary to compile geological data, the project personnel undertook systematic production of scale 1:40,000 form-line bases in FY 1967 utilizing the USGS Branch of Special Maps in Washington, D.C. The individual mosaic block form-line sheets were reduced and compiled into smaller scale base materials by GERA staff in Liberia.

### B. Prepare basic geological maps of Liberia: (Grant financed)

1. Map specific quadrangle areas to provide geologic data for maps of 1:250,000 scale. Field efforts have been concentrated initially in the Voinjama, Bopolu, Zorzor, and Monrovia quadrangles in north-western Liberia. Compilation of preliminary base maps for these quadrangles is planned for completion in FY 1971 and geologic map manuscripts are in preparation.
2. The primary quadrangle mapping program is to be supplemented by country-wide geologic and minerals field reconnaissance in critical areas. The desirability of such additional preliminary reconnaissance is evident with receipt of regional geophysical data. This basic geologic intelligence will provide a preliminary basis for interpretation of geophysical survey data and for scheduling more intensive systematic mapping and evaluations of possible mineral deposits.

3. An interim geologic map of Liberia showing the known geology and data sources is to be compiled. Information derived from rapid field reconnaissance is to provide as much basic geologic coverage as possible.
4. The geology of sites for engineering purposes (such as dams or other major structures) is to be mapped if necessary to help in reaching basic decisions which will result in lowest cost construction within adequate safety margins.
- C. Evaluate the mineral resources of Liberia and prepare recommendations for future mineral exploration development: (Grant financed)

Inventory and evaluate all known or discovered mineral deposits and document the results in the form of maps and reports so that favorable deposits can be brought to attention of developers and producers. Specific efforts in progress or scheduled include the following:

1. Mineral commodity maps based on available information are being compiled in conjunction with the interim geologic map of Liberia. Individual commodity reports will be prepared when warranted by priority interest and sufficient data.
2. Intensive investigations of favorable mineral prospects made by utilizing detailed geologic mapping, geophysical techniques and geochemical analyses where applicable.
3. An airborne geophysical survey of Liberia, is part of the exploration program. The results of this survey serve as a direct guide to magnetic and radioactive minerals and are of significant assistance in resolving many evaluation and geologic mapping problems. It has already served to indicate the likelihood of sedimentary rock formations offshore which has stimulated intense interest among petroleum companies. This survey was funded by a \$1,000,000 AID loan and a \$200,000 GOL contribution.
- D. Help establish a more effective Liberian Geological Survey in the Bureau of Natural Resources and Surveys:

Improve the competence of the Liberian Geological Survey in terms of its ability to accomplish geological mapping and mineral evaluation studies both in the field and in the laboratories and in terms of administrative and management activities necessary to implement an efficient geological survey organization. Upgrading will continue along the following lines:

**1. Improving technical competence:**

- (a) Existing staff members including subprofessional assistants, will continue in-service training by working in counterpart positions in all mapping, evaluation, and supporting activities.
- (b) Existing and future staff members are receiving academic degrees and practical experience in the United States in USAID-sponsored Participant Training programs.

**2. Improving field and laboratory facilities:**

With assistance of PASA backstopping, AID grant, Project Support Loan and some GOL funding, stocks of field equipment and various supplies adequate to carry on efficient and safe operations for several field parties are being established. Laboratory equipment items and sufficient supplies to accomplish necessary laboratory work are being installed and maintained.

**3. Improving technical backstopping:**

- (a) Through the USGS technicians, the LGS Branch of Publications and Geologic Cartography receive assistance in providing base materials and documentation of results of investigative studies in forms suitable for release in official publications.
- (b) A technical data depository is being developed. Technical data report and map files are being indexed by areas, author, mineral commodities and major geologic subjects; the scientific library is being assembled and organized; and the museum is accumulating a collection of representative rock and mineral specimens of Liberia.

**4. Improving work facilities and conditions:**

Additional usable space in the Liberian Geological Survey building, funded essentially by the GOL, is being gained by conversion of areas formerly used for other purposes, by better utilization of existing space, and by construction of a new four-room annex.

**5. Improving administration and management support:**

- (a) Continue the efforts to upgrade the Liberian management and administrative activities required to operate and maintain an effective technical organization. A middle level administrative assistant in the Liberian Geological Survey has been employed as of mid-1969.

- (b) Continue to assist in improving the management and administrative operation of the LGS and the MRRS by in-service and participant training.
- (c) The administrative staff should at the termination of the project be capable of planning and directing the research and service activities of a geological survey organization including:
- (i) The preparation of an inclusive budget,
  - (ii) The determination of the logistic support required for field operations in geologic mapping and mineral commodity investigation,
  - (iii) Determination of the equipment and supply requirements of field and laboratory operations,
  - (iv) The procurement of commodities on a timely basis,
  - (v) The effective management of the technical and clerical staff so that optimum productivity is maintained, and
  - (vi) The timely processing of reports so that publication is prompt.

The technical staff should have the capability to continue to carry out all phases of research and investigation in the type of geologic and mineral studies that were conducted during the active part of the present project. This includes geologic mapping, economic mineral studies, geochemical studies, geophysical investigations, petrographic studies, map compilation, photographic services in support of map compilation, map and illustration preparation, and all related activities.

Managerial training will be provided for the GOL Project Operations Officer of the Liberian Geologic Survey similar to that provided previously for the Deputy Director, Bureau of Natural Resources and Surveys. This training has proved beneficial in improving the decision-making of the supervisory officer and the general administrative management of the MRRS.

It is further proposed to continue on-the-job training. By example and demonstration, improvement in skill and the will to perform will be realized. There is no possibility of producing an organization comparable to the USGS by the time the project terminates. The intent is to produce a foundation upon which to build such an organization, and the future belongs to those individuals who perceive the need, possess the skills, and apply their energies to this end. UNCLASSIFIED

### VII. GOL Contributions to the Project

Analysis of several previous budget requests indicates that the LGS budget figure is generally divided up into three components approximately as follows:

Personnel services	50%
Other services	35%
Commodities	15%

Although the amount for GOL commodity procurement is commonly substantially cut, it should be noted that the approved 1970 LGS budget (LGS direct \$122,494 + \$17,500 for 5 vehicles) includes the following amounts for commodities and services formerly provided entirely by AID funding:

Maintenance and repairs of equipment	\$2,400
Publications, printing and binding	2,000
Small tools	300
Household and sanitary supplies	500
Printing and binding pre-publication supplies	1,000
Parts for scientific and technical equipment	2,000
Laboratory supplies	500
Photographic supplies	<u>1,500</u>
Total	\$8,200

The figure for in-country travel and subsistence (\$44,200) is also substantial and, if fully utilized for allocated purpose, should adequately support the LGS field activities.

It should also be recognized that the amount budgeted for personnel (at the prevailing GOL rates) provides salaries for a total of 32 LGS employees in the following personnel categories:

<u>Personnel</u>	<u>Number</u>
Professional staff	9
Middle-level assistants	8
Field and laboratory aids	12
Messengers and watchmen	3
Total	32

Including the amounts currently scheduled for both the present project and the UN Mineral Survey, the total GOL outlay for activities related to development of the nation's mineral resources will aggregate in excess of \$1.5 million by the end of 1972. Obviously this is an expression of significant GOL interest in mineral resources development.

It can be anticipated that this interest will continue in one form or another after the current project ends in recognition of the long-term development potential inherent in an active and competent Geological Survey organization.

### VIII. Progress to Date

#### A. Production of multipurpose maps of Liberia:

##### 1. Preparation of geographical base maps of Liberia:

- (a) The long standing impediment to the project resulting from a lack of adequate base maps has been overcome by arranging compilation of mosaic block scale 1:40,000 base sheets in the Branch of Special Maps of the U.S. Geological Survey in Washington. Maps from this source are now available for most immediate field requirements.

##### 2. Geological mapping and preparation of basic geological maps of Liberia:

- (a) Systematic reconnaissance field mapping has been completed over approximately 25% of Liberia and a scale 1:250,000 geological map of one of the total of 10 quadrangles covering Liberia is in preparation for publication.
- (b) Rapid geologic reconnaissance has been successfully accomplished over approximately half of the routes amenable to rapid traversing. Much of the data thus collected are already incorporated into reports and maps produced by the GERA project. All of it is available as field data and is thus utilized in preliminary interpretations of the geophysical survey results and scheduling of mapping and evaluation activities.

- (c) An interim geologic map of the western half of Liberia has been prepared and released as follows:

Leo, G. S., and White, R. W., 1967, Geologic reconnaissance in western Liberia: Symposium on Continental Drift, Montevideo, Uruguay, 16-19 Oct. 1967 (in press);

U. S. Geol. Survey open-file rept. IR-LI-13; Liberian Geological Survey rept., 29 p.

An extensively revised version of the western Liberia paper is currently in preparation for publication in 1970 as Liberian Geological Survey Special Paper 1.

Data for an interim map of the eastern part of Liberia are being accumulated from all available sources. Compilation will commence when manpower availability permits efficient scheduling of the extensive work that will be required. Meantime, these data are utilized when required for spot interpretations relative to various mineral prospects in the area.

- (d) Although the GERA project has not yet participated in any intensive mapping of sites for engineering purposes, much informal assistance has been rendered to public individuals, other GOL agencies and private contractors involved in various development activities in Liberia. Inasmuch as there is no other local capability to supply such help, the Liberian Geological Survey has become a much used source of reliable information and informal assistance.

3. Preparation and publication of geophysical maps of Liberia:

- (a) Interpretation of preliminary aeromagnetic and aeroradioactivity maps is in progress and preparation for publication will commence upon receipt of final materials from the geophysical survey contractor. There is high interest in these data and publication in a preliminary form is desirable as soon as it can be achieved. Lack of suitable base sheets will delay preparation of final geophysical map copy until the base sheets themselves have been produced (see III 1.2 above).
- (b) Interpretive results of GERA project geophysical investigations are being prepared in a timely manner. The offshore depth to basement map (Project Report IR-LI-33) and the gravity anomaly map of the Monrovia region (IR-LI-37) released in early 1969 were instrumental in obtaining favorable offshore exploration concessions for the GOL. Additional materials are currently in preparation and are expected to be released in late 1970.

D. Evaluation of the mineral resources of Liberia and preparation of documented recommendations for future mineral exploration development:

An inventory and evaluation of all known or discovered mineral deposits with documentation of the results in the form of maps and reports so that favorable deposits can be brought to attention of developers and producers is a stated target objective of the GERA project. Specific progress has been made as follows:

1. Mineral occurrence data:

Mineral occurrence maps based on available information are being compiled in conjunction with preparation of other geologic map data. As an interim product, a general mineral resource locality map was prepared and released by the Liberian Geological Survey in September 1968.

2. Mineral Investigations:

Specific investigations have been undertaken to study a number of localities where mineralization was known or discovered during the course of investigations. The results of these investigations have been documented in official reports prepared by the GERA project.

Among the more significant investigations are the following:

- (a) Darite - IGS Bull. 1, 1967. Resulted in an exploration and development concession being granted in 1968. Exploration concession fees in the amount of \$5200 per year are being paid to the GOL. Exploration is still in progress.
- (b) Kyanite - IGS Bull. 2, 1968. As a direct result of GERA activity one of the major U.S. producers of kyanite-based refractory products has expressed an interest in the deposit and is currently making laboratory tests on samples from the principal deposit. If results of the tests are favorable it is anticipated that a development concession will be requested.
- (c) Petroleum - The current high interest in petroleum exploration along Liberia's continental shelf has come about as a direct result of GERA project activities. Following project identification of oil-bearing carbonaceous cobbles at places along the coast of Liberia, analyses were made of bituminous residue frequently found on the beaches. Upon determination that the material was probably a crude oil (rather than a mixed residue of refined products), specifications of the proposed geophysical survey of Liberia were written to include offshore extensions of some of the geophysical traverses. On the basis of preliminary analyses of initial geophysical survey data indicating a possibly significant offshore section of sedimentary rocks, it was suggested to the GOL that they should appropriately define GOL rights to the continental shelf area. This was speedily done in early 1968.

Analyses of preliminary maps received from the geophysical survey contractor confirmed previous spot interpretations of field data. GOL promotion of offshore prospects commenced when industry scouts received GOL permission to obtain the geophysical data. Reconnaissance seismic exploration was permitted, but all attempts to obtain concessions were forestalled until the applicable petroleum code was enacted and a competitive bid procedure established.

Two interpretive GERA map reports (IR-LI-31 and IR-LI-37) completed and released during the bidding period were important factors in creating additional industry interest and establishing a basis for truly competitive bids. As a result, the exploration concession agreements obtained by the GOL are exceptionally favorable to the GOL in terms of potential return to government if petroleum is developed. In the meantime, the cash to be received during the first 2-year period by the GOL from signature bonus and rentals (even if oil is not found) will amount to approximately \$350,000 and thus substantially exceeds the GOL cost for the entire LGS over the period of the first 3 years of the GERA project. Because of its higher prospective value, one of the blocks yet to be released for bid conceivably could result in even greater immediate cash return to the GOL.

The amount already spent by industry in actual offshore exploration activity is estimated to exceed 1.5 million dollars. The resource input for exploration will step up very rapidly over the next 2 years and private sector exploration expenditures may substantially exceed the minimums scheduled by the existing concession agreements and comparable amounts estimated for the two remaining blocks to be released to concessionaires (minimum total estimated at six million dollars).

On the basis of above, it is obvious that the GERA project has contributed to an increase in private sector investment in Liberia and in the economic viability of the nation.

- (d) Phosphate - The investigation of the fertilizer potential of the phosphate deposits at Bomi Hills has resulted in the finding that this phosphate can be converted to fertilizer material with simple heat treatment. This discovery may prove to be the basis for the development of a local phosphate fertilizer industry which could have a significant impact on the agricultural sector in Liberia.

- (e) Other minerals - Investigations have been made of clay and silica sand deposits in the Monrovia area relative to the materials being utilized in local industry. The study results are encouraging and reports are currently being prepared for release.

Data collected in the course of other mineral investigations have been documented in reports already released or now in preparation.

3. Mineral commodity inventory:

Mineral commodity files have been established and applicable mineral locality maps are being compiled. These materials will form the basis for individual commodity reports when sufficient data are available.

4. Airborne Geophysical Survey (AID Loan No. 669-II-014):

On the basis of a feasibility study completed in June 1966, the GOL and AID concluded a loan agreement that financed a geophysical survey for which flying was completed in February 1968. All data was compiled and made available in 1969.

C. Development of the Liberian Geological Survey Organization:

- 1. Professional competence of the Liberian staff has been improved by direct counterpart contact in project operations. As was reported previously, poor personnel and management practices impeded the project. Though some of these difficulties still persist, there have been marked improvements. Work attitude, attendance, and standards of productions and achievement have improved. Also, more effective management and administrative practices are becoming evident in the BIR&S as the result of the management training course attended by the Assistant Director as a USAID participant.
- 2. GOL financial support of the Liberian Geological Survey has substantially exceeded initial estimates. The percentage by which the amounts allotted has exceeded initial estimates since 1965 as follows:

1965	25%
1966	23%
1967	30%
1968	0%
1969	14%
1970	70%

This is evidence of the extent to which the GOL has recognized the need for the services of a geological survey organization.

3. A more serviceable physical plant, providing suitable space for laboratories, research offices, report preparation facilities, technical data files, and field equipment storage has been organized.
4. The participant training program has begun to yield dividends in the LGS organization. TABLE B shows AID sponsored participant training related to geology and mineral industry activities in Liberia. Of the total of 18 participants,
  - 11 are currently actively employed within the BUREAU (the original GOL sponsoring agency),
  - 3 are currently in school in the USA as participants,
  - 1 is a school teacher at LAMBO/Nimba, and
  - 1 is a surveyor in Bong County.

In the terms of total 370 participant-training-months provided, the recipients of:

269 months (73%) are currently applying their efforts in the BUREAU.

Of these, 171 months (46%) are actually within the LGS organization.

77 months (21%) are currently in school, but expected to return to LGS employment at completion of school.

24 months (6%) are in outside semi-technical employment within Liberia.

Of the USAID-sponsored 193 months of participant training provided, the recipients of:

121 months (61%) are currently LGS employees, and

77 months (39%) are currently in school but expected to return to LGS employment upon completion of academic training.

All of the USAID-sponsored participants and all but the first two AID-sponsored participants (the two participants now employed outside the GOL) have worked in counterpart relationship with one or more USGS staff technicians.

**Attachments**

Table 1, pg A-1 & A-2

Table 2, pg B-1

WESTERFIELD



TABLE A-1

Table 1  
 Page 1 of 2  
 COUNTRY: LIBERIA  
 Project Title: Geological Survey & Appraisal  
 PROP DATE: Mo/Day/Yr  
 Original Rev. No.  
 Project No. 669-51-210-071

Fiscal Years	Ap	L/C	Total	Cont <sup>1/</sup>	Personnel		Serv.	Participants		Commodities		Other Costs	
					AID	PLSA	COIT	U.S. Agencies	COIT	Dir U.S. Ag	COIT	Dir & U.S. Ag	COIT
Prior through Act. FY 70	TC	G	2785	(34)	1577		24	185		339		650	10
Oper. FY 71	TC	G	786		709					12		65	
Edg. FY 72	TC	G	710		645					6		59	
B + 1 FY ____													
B + 2 FY ____													
B + 3 FY ____													
ALL Subs.													
Total Life	TC	G	4281	(34)	2931		24	185		357		774	10

<sup>1/</sup> Memorandum (nonadd) column

MEMORANDUM

UNCLASSIFIED

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Table 1

Page 2 of 2

Exchg rate \$1- 2/

Project No. 669-51-210-071

Fiscal Years	AID-controlled		Other Cash Contribution Cooperating Country 4/	Other Donor Funds 5/ (\$ Equiv.)	Food for Freedom Commodities 6/		
	Local U/S.- owned	Currency Country- owned 3/			Metric Tons (000)	OCC Value & Freight (\$000)	World Market Price (\$000)
Prior through Act. FY 70			652				
Oper. FY 71			160				
Budg. FY 72			170				
B + 1 FY							
B + 2 FY							
B + 3 FY							
All Subs.							
Total Life			982				

BOTSWANA FOOD A  
 UNCLASSIFIED  
 A2  
 2



## PROJECT AUTHORIZATION

1. PROJECT NUMBER <b>669-51-210-071</b>	3. COUNTRY <b>Liberia</b>	4. AUTHORIZATION NUMBER <b>0124-R-1</b>
2. PROJECT TITLE <b>Geological Survey and Appraisal</b>		5. AUTHORIZATION DATE <b>July 20, 1971</b>
7. LIFE OF PROJECT		6. PROP DATED <b>June 25, 1971</b>

a. Number of Years of Funding: 12  
 Starting FY 1961; Terminal FY 1972

b. Estimated Duration of Physical Work  
 After Last Year of Funding (in Months): 0

FUNDING BY FISCAL YEAR (in U.S. \$ or \$ equivalent)	DOLLARS (000)		P.L. 480 CCC + FREIGHT	LOCAL CURRENCY			
	GRANT	LOAN		Exchange Rate: \$1 = \$1		HOST COUNTRY	
				U.S. OWNED	OTHER		
			GRANT	LOAN	JOINTLY PROGRAMMED		
Prior through Actual FY 70	2,785	901					652
Operational FY 71	607						160
Budget FY 72	729						170
B + 1 FY							
B + 2 FY							
B + 3 FY							
All Subsequent FY's							
<b>TOTAL</b>	<b>4,121</b>	<b>901</b>					<b>982</b>

9. DESCRIBE SPECIAL FUNDING CONDITIONS OR RECOMMENDATIONS FOR IMPLEMENTATION, AND LIST KINDS AND QUANTITIES OF ANY P.L. 480 COMMODITIES

## 10. CONDITIONS OF APPROVAL OF PROJECT

(Use continuation sheet if necessary)

Approved in substance for the life of the project as described in the PROP, subject to the conditions cited in Block 10 above, and the availability of funds. Detailed planning with cooperating country and drafting of implementation documents is authorized.

This authorization is contingent upon timely completion of the self-help and other conditions listed in the PROP or attached thereto.

This authorization will be reviewed at such time as the objectives, scope and nature of the project and/or the magnitudes and scheduling of any inputs or outputs deviate so significantly from the project as originally authorized as to warrant submission of a new or revised PROP.

A.I.D. APPROVAL	CLEARANCES	DATE
Samuel C. Adams, Jr. SIGNATURE AA AFR Assistant Administrator for Africa	AFR/CWA: SChristmas	7/15/71
	AFR/CDF: JSloan	7/16/71
	AFR/MGT: FHahne	7/16/71
	AFR/DP: EHogan	7/16/71
	DAI/AFR: RBirnbach	7/16/71