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برنامج تقدير موارد الثروة المعدنية والبترولية والمياه الجوفية
MINERALS, PETROLEUM & GROUNDWATER ASSESSMENT PROGRAM

AID Project 263-0105
Egyptian Academy of Scientific research and Technology
Desert Research Institute
Egyptian General Petroleum Corporation
Egyptian Geological Survey and Mining Authority
Remote Sensing Center

To: Project Officer, S. Arif

From: Project Coordinator, D. T. Snow

Subject: Bimonthly Report for period May 24, 1984 to July 23, 1984 re contract NEB-0105-S-00-3035-00, ID2

Your Ref. Our Ref. Date August 22, 1984

Attached bimonthly report is submitted.

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Task I Regional Mapping

The Ras Benas Metallogenic Map, long ready for printing, is still held up for lack of paper. Bendix Co. was told to procure the paper long since, but it flagged endlessly for lack of good communication over exact specifications the EGSMA cartographers were unprepared to give. Finally, Dr. Burger contacted Roger Schaff for advice. The paper is now on order, 2000 sheets by air, 5000 by surface. Hopefully, no snags will remain to complete it soon, as this is the only multi-colored map to be done wholly by Egyptian cartographers and geologists.

The Ras Benas and Wadi Kiffa sheets are now found no further along than they were six months ago, when it was said to be held up by Dr. El Ramly's delays in editing. They still have difficulties with stratigraphic decisions effecting the map legend.

The cartography staff and I have agitated almost continuously to maintain a training program for new cartographers. At last report, three were in training and three more expected to start. Recently, the emptiness of the room struck me as disturbing: my worst fears confirmed the loss of four of the five that had been trained by the U.S.G.S. Only Nadia remains, and she will marry in 6 months. Furthermore, there are but two trainees for upgrading, not new people. The additional ones expected were requested, but denied.

The organization responsible for feeding trainees to the departments requesting them has not produced, so the training so essential to continued competence of the unit has broken down. When the senior men get fat job offers in Saudi Arabia, they cannot be denied, and after a year of availability as instructors, they cannot be blamed for leaving if trainees were not supplied them.

AID's $1 million-plus investment in map-making capability has been largely wasted for the sake of a handful of maps. There have been plenty of warnings, by EGSMA geologists as well as by AID, that continuity is threatened by the brain drain unless an aggressive training program is maintained.

It is now said that 8 new trainees are being appointed, for work under Nadia's direction. I suggest that the TDY position for an American cartographer be re-scheduled to provide ongoing expertise. I suggest that the commodities planned for upgrading the cartography laboratory, namely a new large press camera, be postponed until the staff has been restored.

Task II Geophysical and Geochemical Studies

In May, Dr. William Hinze completed a week's visit to Cairo, where his advice was sought on many matters pertaining to the Aeroservice output. Several change-orders are believed necessary, which he will investigate for cost with the contractor. Dr. Hinze lectured to EGSMA on the application of Aeromagnetics to prospecting.

A sequel program of aeromagnetic surveys of the northern western desert, Sinai, Nile Delta and north end of the Red Sea has been proposed by Dr. Wafik Meshref. These are being considered for MPGAP funding and EGPC, contracting, according to a scheduled hearing of the EGPC Exploration Committee. These have potential benefits for regional mapping as well as petroleum exploration.

Task III Economic Viability and Estimation of Potential Resources

Potash drilling has stopped at 451 m in Ras El Behar 1, considered a technical success for the drilling department. But it is not known yet whether any potash has been cored. Three salt beds were cored between 398 m and the bottom, which was still in snow-white halite, at least 26 m thick, clearly having economic potential. The decision has been made to move the rig, but not the camp, to Ras El Behar NE, where a strong radioactive saline bed is shown on GP logs to be within 175 m. Ras El Behar 2 can probably be drilled in 2-3 months. Meanwhile, laboratory tests on the three salt beds at hole 1, and geophysical logging of the hole will reveal if potash has been cut; it may lie in the 451-500 m interval intended for drilling, but deemed beyond their mechanical limits. It can perhaps be deferred for contract drilling. Mr. Abdalla Wassef has laid out a program to be followed after his consulting term ends in June. There is optimism for this program, still.

The gypsum program is continuing. A report (in Arabic) by A. M. Kamel details results of the Gemsa drilling. Core splits from each bed in each hole were crushed, split and analyzed (DTA), revealing some in excess of 82% gypsum, certainly useful for agriculture application, though marginal for cement or lime manufacture.

The second site, north of Zeit Bay, encountered gypsum above and below sea level (+10 to -20 m) in two holes, but deep alluvium or clay in two other holes. This deposit will not be explored further, unless laboratory results change the picture. I find the rock to be laminated and massive, probably impure, as judged by its hardness. A new drill site may be located near Abu Ghusun, but a prudent plan at this time may be to do some surface reconnaissance first, selecting thick massive beds that project to near sea level, where best opportunity for hydration may have occurred. The perfection of the Ras Malaab, Sinai deposit is not well enough understood to point to similar conditions on the African side of the Gulf.

A field trip conducted by P.C. to the above drill sites was extended also to the two active gold mine explorations near Marsa Alam. At Umm Rus, surface and subsurface mapping and sampling is being done to the first level. The lower levels will be de-watered and ventillated after Ramadan. Umm Rus drilling will follow Atud drilling.

At the Atud Mine, considerable progress has been made in defining the parallel ore vein recently discovered. A diamond drill is currently exploring for additional veins expected in the hanging well, and later, a second hole will drill the footwall, where ancient surface diggings indicate mineralization. Sampling and underground mapping as well as surface work is underway. The reserves in this mine may be so well established that EGSMA mining research should exploit it as an experimental project to recover the several million pounds worth of gold predicted.

The geological and geochemical evaluation of Talaat Gadalla and Dongash have moved to the laboratory, as the field work is completed. Sample preparation and some assaying is being done in Marsa Alam while the bulk of the assays will be done at Dokki.

Mr. Harry Godbe conducted school for 15 mining geologists at Atud and Marsa Alam, teaching underground mine mapping and mine evaluation techniques. The geologists expressed enthusiasm for the useful methods he gave them, which included mine evaluation. Gobde's final report is expected soon.

Editor Stout is embarking on study of industrial mineral prospects and value-added commodities to be added to our Mineral Commodity Summary.

Task IV Upgrading the Analytical Laboratories.

The intended upgrading of analytical equipment has been stalled for lack of re-solution of responsibility for $5 million of the Aeroservice Co. contract. Until EGSMA and EGPC come to agreement, no commodities can be purchased for EGSMA.

Meanwhile, two mineralogists have completed X-Ray, Fluoresenceand SCM training at Beloit College and other laboratories. The new tools, when obtained, will facilitate some improvements in quality of analytical work. It is suggested that a VIP tour of US laboratories would help direct the EGSMA development for years to come. Whereas I envision that EGSMA geochemical field programs will involve more field analysis to give current direction to sampling programs, the total sample load of the Dokki labs may not diminish much; new sampling schemes will permit better definition of mineralized regions over a broader area than was possible by regular grid-sampling schemes of years past. Investigation of diversification vs. centralization is needed. It will take some years to develop these changes, aided by some TDY experts, like Dr. L. James.

Task V Geologic Museum

It is understood that water and power is being installed in the Museum buildings, which make it possible to proceed with the erection of display cases and with specimen storage. It is not evident that the leadership crisis has been met, as yet, so progres is not expected to be swift, even when funds are available, The Director has not yet been restored to his former authority.

Task VI Mineral Commodity Program

Mineral exploration usually spotlights metallic deposits, because of the high intrinsic value of some ores, and because metals are prominent in world trade, EGSMA has devoted years to such searches in the E.D., and some rich ones in complex settings have been discovered. Consistent with observations on UN expert Dr. Daniel Harkin, that only small deposits have been found from Sinai to Saudi Arabia, Egypt, Sudan, Ethiopia and Central Africa, we can only identify deposits of small tonnage. Gold prospects may still prove economic, because small companies can launch low-cost operations to work veins. But big corporations can't ordinally be lured to small projects. Most modern techniques involve expensive underground development or complex surface plants often unavailable to small companies.

While the search for metals proceeds, other prospects seem viable, namely, the nonmetallic, or industrial minerals commodities. Also significant is the prospect of shorter development periods for minerals like bentonite, barite, sulfur, glass sand, etc,. than for base-metal sulfide mining that has to involve milling and smelting in addition to complex mine and infrastructure development.

It is regretable to observe stalemated negotiations for sulfur exploration/extraction, since the Agrico agreement, two years in the making, is looked upon as a model for many other foreign investors to follow. In the same geographical area, the west shore of the Gulf of Suez and Red Sea, there exist in close proximity most of the raw materials needed for a complex chemical/fertillizer industry. These include: potash, phosphates, rock salt, gypsum, anhydrite, sulfur, limestone, dolomite, silica, plus magnesium, iodine, bromine, etc., from an abnormally briney sea, then atmospheric nitrogen, and natural gas and petroleum. Fresh water may even be found (next year's DRI program), Solar evaporation potential is high, and cheap sea transport offers competetive advantages for export from fine seaports.

Renewed efforts by EGSMA to find means of offering attractive contract terms to foreigners can be counted upon to eventually stimulate the mining area, so deficient in Egypt's industrial structure. At the same time, the private sector may be ripe for investment in mining, which can also serve the MPGAP aims of improving trade imbalance,

since import substitution is as good as exportation.

The resident editor, Larry Stout, and the P.C. have been actively collecting information on industrial mineral markets and Egyptian resources. The help of returning trainees from US is also anticipated, since they have witnessed many of the mines and processing plants for value-added industrial mineral products in USA.

Task VII Publication and Documentation Center

The Minister has approved EGSMA's plan to release mineral information in the form of packages accessable to any interested investors. Following work of an ad-hoc MPGAP committee, EGSMA has detailed the content of such packages, including all internal reports as well as published literature, maps of pertinent geology, topography, existing claims and all data describing the mineral content, For each package, a summary is to be written by the EGSMA staff, assisted by editor Larry Stout and others. The assembled material will be physically held in cabinets in the MPGAP office, where it can be inspected and selected for reproduction, at cost to the interested party.

EGSMA has appointed 2-5 geologists to each group, charged with package assembly: gold, the 1st priority, limestone, dolomite, kaolin, glass sand, polymetallic deposits, gypsum; others will follow when the first packages are done. No timetable has been set, but the urgency has been translated into full-time commitment of about 10 persons.

Desert Research Institute

Task I Groundwater Exploration

During the first year of field investigations, the plan was to concentrate all efforts on the Red Sea Hills mineral area, measuring about 300 km between Marsa Himiera and Qusseir (23° 35' to 26° 10' N) and about 100 km from Qusseir to Fowakheir and from Marsa Hemiera (35° 30' E), west to 33° 30' E.

The status of this project has been summarized by M. M. El Shazly[1]. Some of the objectives are being met on or ahead of schedule, such as a literature search (to be included in their preliminary year's project report), and an inventory of 74 water points In addition to a physical description of each well, depth soundings have been taken periodically to register seasonal changes of the water table. Chemical analysis have been completed to classify the waters, which range from a few 100 ppm in fractured granite to over 10,000 ppm in Miocene clastic rocks and seaward parts of some wadis. Pumping tests conducted were completed in a few key wells, (mostly large diameter dug wells of some antiquity) revealing small drawdowns in some cases, including faulted bedrock, and wadi alluvium. Large well yields may therefore be possible in certain circumstances.

Electrical resistivity soundings are proving diagnostic of groundwater occurrences in wadi alluvium, since it can routinely (though approximately) disclose the depths to the water table and bedrock. Most of these tests have been completed by May 31, 1984, though additional electrical soundings are to be done. In future explorations, these will prove valuable in search of the thalweg of the alluviated wadis, the best well sites.

Reconnaissance work on all the major wadis, and more detailed study of wadis most likely to be tapped for mineral operations has already given insights that are important to the MPGAP objectives: 1) high on the watersheds, it is likely to find only meager supplies suitable for domestic needs, whereas 2) in the middle 75% (most wadis are 50-60 km long), water occurs below a few 10's of meters in valleys typically a 100 m or more in depth. Thus, 3) larger reservoirs may subsequently be proven, possibly sufficient for mineral processing even if no recharge is assumed, 4) Brackish water in the coastal reaches of wadis crossing Miocene evaporites may be found to limit the usefulness of those aquifers. Salt water intrusion is not a problem if fresh water does not exist to be pumpe

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1. El Shazly, M. M., 21 May, 1984, MPGAP management overview, MPGAP semi-annual meeting proceedings, 9 pages and map.

Meteorological data collection is behind schedule: DRI has found no data available except Ras Behas and Qusseir, though public and private-sector population centers have existed throughout the region for many years. Testimony from the Bedouin people has not been sought, though it has been suggested already that it would be qualitatively useful . The usual answer is that it has not rained in several years, though mud in wadis pooled at road crossings shows that at least the coastal strip N. of Wadi Alam has received enough in the 1983-84 winter to cause flow. Vegetation can be interpreted qualitatively to make important distinctions between various areas. Lack of acacia trees suggests that a prominent rain-shadow exists west of the Red Sea-Nile divide. South of Marsa Alam, east-draining wadis show more frequent acacia trees than do more northerly wadis. Tamarisk and edge springs in some, such as wadi Gamal and wadi Dubur, indicate shallow water tables.

Because meteorology plays an important role in predicting reacharge, necessary for projecting long-term pumping rates, it is suggested that novel methods of data-collection be implemented. DRI has announced that it will extend its Area I studies another year, affording opportunity to collect meteorologic data. Bedouin testimony is one inexpensive method. Another is to furnish all desert installations with a simple (a plastic graduated cone) rain-gage and give instructions on its use. A last suggestion is to acquire a Swedish tree-coring device, used in dendrochronologic studies, to attempt to reconstruct meteorologic history from acacia-tree growth-rings in all major wadis. Other qualitative substanciation of vegetation distribution should be attempted: it should relate to rainfall testimony, to water table position and to wadi soils. Rate of alluviation may have influenced the occurrence of acacia trees.

It is said that geomorphic and geologic studies have been initiated. Important insights can be expected from such investigations, and we look forward to such results of MPGAP, even if they take years to completion. For example, we lack a chronology of wet and dry periods over the last 250,000 years, such as we have for the Western Desert, yet the character of wadi alluvium should directly reflect such environmental influences: clean pervious gravels in the subsurface could become important targets for drilling, and they could also signal gold-placers. The botanical and meteorological history can also be enlightening for groundwater knowledge. Of immediate importance are projects relating to the influence of fault zones on the occurrence of water. It usually requires subsurface data to discriminate pervious faults from impervious ones, and to relate the differences to age or lithology. Another vital concern is the development of groundwater discharge estimates, essential for projecting long-term well yields. Basic data on permeability (from well tests), saturated wadi cross-sections (from electrical soundings) and water table slopes (from wadi profiling and well soundings) can be used to characterize watershed runoff, an estimate of potential well yields.

I suggest that reasonably attainable objectives be included in the Area I studies for

1984-1985, to include:

1. Completion and testing of about 7 wells (average depths may be 40-50 m, not 30) totalling about 350 m, located to evaluate critical wadi environments. These may be generic studies, not especially directed at a particular mine since specific searches can be done by investors.

2. Describe chemical attributes of the water, related as fully as possible to the geological environment and possible sources of recharge.

3. Using well soundings, geophysical soundings, well tests, slope data, vegetation and available meteorology, characterize each major drainage according to a quantitative scheme of water resource evaluation. It may be necessary to concentrate detailed efforts on only two or three wadis, as examples to be followed in neglected drainages where need arises. Descriptions of the groundwater levels, the reservoirs, the supply available without precipitation recharge and the obtainable well yields fall into the category of minimum engineering results needed for MPGAP.

Wonderful insights may be gained ultimately from meteorology, but not in time of MPGAP. Yet, if it is ever to become available, DRI should institute a data collection system, by placing rain gages at about 50 sites of occupation in the Area, and by placing about two full-scale meteorological stations at such sites as Marsa Alam and Fowakheir, The permanence of Geological Survey occupation suggests that EGSMA assume long-term responsibility for data-collection, in collaboration with DRI.

Long-term academic projects not essential but highly desireable include:

1. Geomorphology of E.D. wadis (possibly including structural control).
2. Climatologic history of E.D. (possibly by dendrochronology or radio-carbon dating of sediments).
3. Stratigraphy of wadi alluvium (from analysis of well cuttings).
4. Archeological evidence of climatic changes in E.D.

Extention of Area I studies to a second year reflects the inevitable logistical problems and conceptual evolution of a new type of study for DRI. No such work has been done before in the E.D. Lacking fully-developed self-sufficient equipment, DRI has made good use of the availability of base camp and drilling equipment generously provided by EGSMA at Marsa Alam. It is anticipated that hydrological data-collection dependant upon drilling will continue in Area I until New Year. Well-testing, leveling and meteorology might continue well into 1985. A completed preliminary report may be done by March.

Meanwhile, Area II work in the vicinity of Ras Gharib may begin by August. It will require base camp facilities, probably available from GPC. Flying camp equipment would

speed work in remote areas. The new drill rig must be available in Fall, 1984. Methods developed in Area I, and independent means will speed the work, so that Area II can be completed on schedule by June, 1985. It may require additional manpower to have multiple areas under study, though data-collection, such as geophysics, can be done in sequence.

Area III, Bahariya Oasis, is also to get underway this year, with the objective of collecting data on water levels in the Nubia as distant as Farafra Oasis, in order to design a long-term monitoring program that can predict the changes in supply in this vital mining area. Infrastructure support of El Gedida Mine may be taxed, in future, if wet ore processing is undertaken to remove salt detremental to the Helwan furnaces. Also, wet beneficiation of barite ore underlying the iron ore would require water in unknown amount. Other resources are possible water-users in Bahariya Oasis. A comprehensive plan will be a valuable contribution of DRI.

Task II Data Organization and Analysis

There is no plan to commence work in this task until the second year. But a library specialist is in process of being hired.

The upgrading of the library was to begin upon arrival of a library expert, whose role will be to organize the holdings, institute better cataloging, computer storage and retrieval, improve storage, organization and other areas of librarianship. However, the content of the library requires the attention of professional staff, in the selection of additional texts and periodicals needed to practice and teach their respective subject areas. Each professor, researcher and student involved in the MPGAP work has been instructed to nominate acquisitions appropriate and needed, so that a panel within DRI can make selections for purchase by the project. Bendix may subsequently buy them, within budget. Computer equipment acquisition is to be completed this year, starting in June, 1984, and assisted by the GIT staff. A meeting has been called to plan the organizational steps needed to make computer acquisition meaningful. The process of computerization should be nearly completed during the year.

Remote Sensing Center

Task I Data Organization and Analysis

There have been no changes in this area, because of further delays in the Wimvex procurement process.

Task II Production of Atlas

Two trainees sent to Ann Arbor for training have returned to Cairo after receiving instruction in MDAS operation and Landsat processing. They completed seven of the 1:250,000 scenes, as planned, and are ready for production. Unfortunately, the hardware and software are not yet available to them.

Task III Remote Sensing Workshops

The next two trainees are to depart for Ann Arbor during September, to begin to design the workshop curricula and to collect training materials.

Task IV Aerial Photography

No progress in this area.

a. Aeromagnetic study in the Eastern Desert

Having received preliminary basement interpretation for Area IB, Drs. William Hinze and Wafik Meshref have studied the quality of evidence related to the hypothetical deep basin SE to Cairo. It has become evident that: 1) not one, but several smaller basins exist, probably not exceeding 10,000 ft vs. 15000 ft depths, 2) the gravity anomaly may have been caused by a low-density pluton underlying the sediments, not by a deep basin, 3) the geophysicists distrust the Hanover seismic refraction work, which remains undocumented, save for 2 illustrations, and 4) two (out of four) old wildcat wells in the area penetrated basement, and in each case at more shallow depths than expected (7,000 f vs 10,000 ft). The conclusion reached is that a stratigraphic test well is a poor investment; GUPCO will undertake basement modelling studies of the aeromagnetic data, in an effort to sharpen the interpretations. Unless new favorable data is presented, no decision for drilling, nor confirmation seismic work can be undertaken, so the E.D. stratigraphic test project may be considered abandonned. Meanwhile, new priorities for the petroleum sector are being weighed, possibly to include additional aeromagnetics, enhanced oil recovery studies, and information and exploration data-base training. A stratigraphic test well at an alternative site in the Gulf of Suez is under advisement.

Data processing and map compillation has advanced rapidly. In Area IA, 100% have been completed, and final interpretive maps are to be delivered by July. In area IB, essentially 100% are completed, whereas interpretive maps in progress are 75-80% completed. Area II has about 85% of the magnetic and radiometric mapping completed, and about 50% of the interpretation. Area III in the Western Desert is 100% compiled but only 10% interpreted. Area IV, El Oweinat, is 100% completed.

Additional AM study areas have been proposed by Drs. Meshref and Hinze, including the Mediterranean coastal area from El Alamein to Libya, the Nile Delta and N. Sinai, all including offshore areas to some predetermined water depth. In addition, the north end of the Red Sea, in the triple-junction with the gulfs of Suez and Aqaba has been proposed, also a coastal area near the Sudan. A review of the purposes to be served by these studies, and a survey of oil company interest will be completed before an RFB is published. In general, AM is favored as the cheapest means of acquiring basement structure information that can lead to traps in the sedimentary overburden, ideal for pristine exploration areas. Because the Aeroservice Co. products have been called "state-of-the-art" and "a national treasure", there is enthusiasm for additional work of the same calibre.

b. Seismic study in the Eastern Desert

h. Stratigraphic study (drilling) in the Eastern Desert

Passage of the stratigraphic well into obscurity implies that the seismic refraction work is also a dead issue.

c. Seismic Data Storage System and Data Library

An information expert from GUPCO's data-processing facility has been nominated for a year's contract with EGPC, to train and implement an exploration data storage system. Training of the staff, as described in the previous report, is proceeding, and programs are being assimilated.

d. Source Rocks/Oil migration in the Western Desert

e. Sedimentary/Petrographic Study in the W.D and G. of S.

These projects are not being considered at this time.

f. Estimation of Existing and Potential Oil and Gas Resources in the Gulf of Suez

Robertson Research won this contract, which included the burden of finding funding They have succeeded in finding 30 subscribers for their report, 200% of requirements. Thus the project is well launched and assured of collaboration in data availability. No AID funding is requested. This project should also be dropped from the agreement.

g. R & D Feasibility of Tertiary Enhanced Oil Recovery

GPC and the P.C. have completed preparation for, and AID has published, a prequalifications package to select those eligible to bid on a feasibility study. At this writing, seven companies have responded, but many more are expected. Project description, statement of work and selection criteria are being drafted.

i. Training Equipment, Ras Gharib Training Center

Digitran, Inc. of Lafatette, CA, and Simitran, Inc. of Medway, MA are selected as responsive to the RFTP for a rig-floor simulator, and an IFB is ready to be issued to them.

Project Coordinator Activities

May 30-June 8, a multi-purpose field trip was taken to the Eastern Desert, to inspect the projects of the Geological Survey and Desert Research Institute.

The Gypsum exploration camp at Zeit Bay was visited. Four boreholes and the evaporite cores from them were inspected. The stratigraphy and apparent hardness were factors discouraging further work there. The search for economic deposits on the west side of the Gulf will probably be discontinued, not because the concept of exploration is wrong, but because the tools being used are deficient. EGSMA's drill parties are not designed for rapid reconnaissance, taking a whole season to drill ten shallow (25-30m) core holes. Failure at only two sites is therefore discouraging. Such drilling equipment might be made more mobile without a huge support camp of 40 men in 30 tents, so that 100 holes could be drilled per season, testing 25 sites. With present overhead, a search for gypsum has to be organized more intelligently, based on geologic reasoning, field mapping and hypothesis-checking with the drill rig. Criteria for test-site selection include 1) massive bedded anhydrite, so that clay interbeds do not impede uniform hydration, nor destroy continuity for mining, 2) topographic conditions, during Pleistocene or Recent times, should favor a high water table. Study the Ras Malaab, Sinai, deposit for controls that can guide explorations. Test hypotheses by drilling, then plan a program based on regional reconnaissance of Zeit Formation occurrences.

The drill camp Ras El Behar 1 was visited, and the UBC 500 and core produced from the 451 m hole was inspected. They penetrated three salt beds, up to 25 m thick, two gray and impure, the lowest snowy-white. No potash was recognized, but laboratory testing could reveal minerals other than halite. The drill hole was being logged geophysically, then capped for possible re-occupation, since the 451-500m interval was the main target. The supply of mud materials is adequate for at least one other hole, and plans for moving the rig to Ras El Behar 2 site have been made. The projected oil-well geology suggests radioactive beds at less than 300m, so the crew, now well versed in evaporite problems, can complete it in 2 months. There is optimism for the potash program: discovery is likely, and industrial interest can be assured. Egypt needs potash for fertillizer, and export conditions are good.

The gold prospecting camp at Umm Rus was visited, but underground access was not possible. At that time, the 1st level workings were being mapped, together with surface geologic work. A pump is to be installed after Ramadan, to clean the 2nd and 3rd levels. Drilling and ventillating equipment are on hand.

Subsequently, the Atud Mine was visited. More advanced work there includes multi-level investigations, active diamond drilling for wall-rock tenor and in search of other veins believed to exist. The amount of ore established and the underground conditions make Atud the most attractive of any for small-scale gold mining.

A glass-sand deposit at Wadi Dakhl, Zaafarana area, was visited, and a reconnaissance was made of exposures extending about 1X½ km. Where being hard-mined at three sites, the lowest interval of about 30 m of massive white sand has only rare ferruginous streaks. An overlying unit of more flaggy bedding has higher iron content. Depth of the white sand below wadi-level is unknown. Extent along strike and downdip is no more than 1/2 X 1/4 km. Thus reserves of $10X10^6$T with stripping ratio 1:1 may exist.

The main purpose of the trip was to confer with the DRI field personnel and to see the hydrological conditions in essentially all the wadis of their Study Area No.1, adjacent to Marsa Alam. Many of the water points, including ancient wells, were inspected. The drilling, testing and resistivity sounding work was witnessed.

DRI, under Dr. R. Misak, runs a very active field camp, and they are producing data at a high rate, especially geophysics. The soundings are generally useful for locating the water table as well as the basement rock, thus defining a saturated prism in most wadis. Pumping tests in the existing wells cannot provide much of the information necessary for evaluating subsurface wadi discharge nor potential resource development from well fields. That is because most wells penetrate shallow unsaturated alluvium and bedrock with groundwater flow only through bedrock. Because the drilling program (2 holes) has largely failed, the collection of meaningful permeability data will have to await new holes and tests after DRI receives its own rig.

While on leave to USA, June 30-July 15, P.C. visited the Grand Junction office of Bendix, to see how it is organized and staffed. My observations are subject of a separate memo. A visit to AMAX's offices in Golden, Colorado rekindled interest in an Egyptian visit and a potential investor in Potash, but initially in gold mining, which they hope to develop at small cost as a means of learning Egyptian business practices. We need to give AMAX prime consideration and priority treatment, especially regarding the gold information package. I suggest, again, that Barramiya Mine be rehabilitated for a visit when they come to inspect it.

Problem areas

One of P.C.'s main objectives in visiting Grand Junction was to evaluate the abnormal ratio of overhead/training costs by Bendix, which is about unity. I concluded that staff reduction is not feasible nor desirable, but rather, that the functions of the office be widened, within the contract terms, to include a great deal of effort aimed at developing investor interest and markets for Egyptian minerals. Dr. Burger has drawn up a plan to promote Donna Cording to cover many administrative matters now handled by Don Kooker, to employ him at least part-time in developing contacts in the mineral industry and in collecting commodity data. Dr. Burger will take on collateral duties as contact person with such companies. Another may to improve the ratio is to spend a larger amount (now running behind budget any way) on training, which will fit the need for more training in Egypt occasioned by language problems for U.S.-bound trainees.

I consider the lack of investor response, to date, to be a major problem symptomatic of 1) depressed minerals industry, 2) ignorance of Egyptian resources, and mainly 3) a poor climate for business demonstrated by lack of success in negotiating concession or joint-venture contracts. We can offer examples and advice from disinterested sources, like UN experts, or foreign developing-country governments. We can invite participation at MPGAP meetings, or provide opportunities for EGSMA leaders to visit successful foreign businesses in any country.

The RSC schedule has been postponed many months by failure in executing the ERIM contract, as well as the Wimvex procurement contract. The remote sensing training courses will be correspondingly delayed, and the Landsat Atlas will not be done until after the end of the MPGAP.

Contractor Performance

The organization and conduct of the Semi-Annual Meeting was a credit to Dr. Lepley, Mr. Stout, Mr. Riskalla and Mrs. Salama, and the attendees were duly impressed with the meeting. We look forward to the proceedings, and subsequent meetings.

Newsletter coverage of the Remote Sensing Center provided a good summary of their past work and capabilities. It is hoped that all agencies will be providing newsworthy results of MPGAP discoveries and developments.

Dr. Lepley is progressing with the elements of some avantgard metallic-deposit explorations in the E.D., using training areas for application of color photography, multi-spectral scanner, thematic mapper and ground spectrometry to supplement the Landsat and black-and-white photography plus aeromagnetics and radiometry data soon to be available.

The training logistics and planning are running well, and could proceed better if the supply of trainees were to be improved.