

**THE NEED FOR AND THE FEASIBILITY OF ESTABLISHING
A MINERAL RESEARCH LABORATORY**

**REPORT OF THE
VIRGINIA ADVISORY LEGISLATIVE COUNCIL
to
THE GOVERNOR
and
THE GENERAL ASSEMBLY OF VIRGINIA**



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COMMONWEALTH OF VIRGINIA
Department of Purchases and Supply
RICHMOND
1965

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Richmond, Virginia, November 12, 1965

To:

HONORABLE A. S. HARRISON, JR., *Governor of Virginia*

THE GENERAL ASSEMBLY OF VIRGINIA

Virginia is fortunate in having large and varied mineral resources. Coal is the major mineral product produced. It is well known that those areas of the State in which the coal mines are located have been undergoing severe economic strains due to changes in the method of producing coal. This, together with a recognition of the fact that expansion of the uses of our mineral resources and the development of new uses will lead to more employment and a better economic climate in Virginia, has caused many individuals to look for ways in which our mineral resources might be further developed and new uses found for them. It has, therefore, been proposed that the State establish a mineral research laboratory with a view to expanding the use of our present mineral resources and thereby generating additional employment and income.

The General Assembly of 1964, therefore, adopted Senate Joint Resolution No. 19 directing the Virginia Advisory Legislative Council to make a study and report upon the need for, and feasibility of, establishing a mineral research laboratory. The resolution follows:

SENATE JOINT RESOLUTION NO. 19

*Directing the Virginia Advisory Legislative Council to make a study
and report upon a mineral research laboratory.*

Whereas, competent geologists believe that the economic and industrial development of Virginia would be materially aided by the acquisition of greater knowledge as to the chemical and physical content of the coal and other minerals of Virginia; and

Whereas, other states have established major laboratories to study the development and additional uses of minerals within these states; and

Whereas, these laboratories have materially aided the economy of these states by the discovery and development of new uses for minerals within said states; now, therefore, be it

Resolved by the Senate, the House of Delegates concurring, That the Virginia Advisory Legislative Council is hereby directed to make a study of the need for, and the feasibility of establishing, a mineral research laboratory that will have as its prime objective the utilization of Virginia materials and the development of new uses for coal and other Virginia mineral substances. If the Council determines that

such a laboratory is feasible, then the Council shall make recommendations as to location, cost of construction, method of staffing, cost of operation, and other pertinent matters concerning the laboratory.

All agencies of the State shall assist the Council in its study. The Council shall conclude its study and make its report to the Governor and the General Assembly not later than October one, nineteen hundred and sixty-five.

The Council selected Charles D. Price, Stanley, Virginia, member of the House of Delegates and of the Council to serve as Chairman of the Committee to make the initial study and report to it. The following were chosen to serve with Mr. Price on this Committee: E. H. Hines, Jr., Clarksville; Harry A. Klester, Manager, Engineering Services, Norfolk and Western Railway, Roanoke; M. M. Long, member of the Senate, St. Paul; J. Maynard Magruder, Arlington; Dr. Huston St. Clair, President, Jewel Ridge Coal Corporation, Tazewell; William A. Stuart, Attorney, Abingdon; M. M. Sutherland, Director, Department of Conservation and Economic Development and Wesley Wright, Jr., Vice-President, Southern Materials Company, Richmond. Senator Long was elected Vice-Chairman. John B. Boatwright, Jr. and Frank R. Dunham served as Secretary and Recording Secretary, respectively, to the Committee.

A review was made of the advantages and disadvantages of such a laboratory, the need, if any, for same, and how the objectives might be accomplished by other means. Public hearings were held in Roanoke and Richmond after full publicity was given thereto. The views of all interested persons were sought and given in detail. The Committee carefully considered the information and suggestions presented to it, and made its report to the Council.

The Council has reviewed the report of the Committee, and now reports as follows:

RECOMMENDATIONS

1. A mineral research program should be undertaken by the State.
2. \$50,000 should be appropriated to the office of the Governor by the 1966 General Assembly for the following purposes:

(a) A portion of this sum to be used to employ consultants for the purpose of determining: whether the State should establish its own research laboratory; if so, the best location, and the approximate cost of establishment and operation; whether instead of establishing a laboratory, existing facilities should be used for such research.

(b) A portion of the appropriation should be used by the Governor for contracting with private corporations, and State agencies and institutions, as the case may be, to conduct mineral research. These contracts shall be entered into by the Governor upon the advice of a Committee composed of members from industry, education and the Department of Conservation and Economic Development. This Committee should advise the Governor as to what projects of research should be undertaken, under what conditions, and also what parties are best able to conduct the research with a view to probable beneficial results.

REASONS FOR RECOMMENDATIONS

The importance of the mineral industry to the State can be seen from the 1963 Mineral Industry Surveys, Bureau of Mines, U. S. Department of the Interior.

THE MINERAL INDUSTRY OF VIRGINIA IN 1963

According to the U. S. Bureau of Mines value of mineral production in 1963 totaled \$229 million, 3 per cent greater than in 1962 and only 1 per cent less than in 1957, the previous record year. Production and value of stone, sand and gravel, and kyanite rose to new highs. New highs also were established in tonnage of coal mined and in value of clay produced. Moderate increases in quantity were made by lime, masonry cement, gypsum, and titanium concentrates, while decreases were reported in output of clay, portland cement, feldspar, and lead and zinc. Accelerated highway and other construction was a prime influence in the 7 per cent increase in tonnage for stone, sand and gravel, and gypsum, and the 6 per cent rise in shipments of masonry cement. Output of clays and portland cement were only slightly under 1962. Coal, stone, sand and gravel, portland cement, lime, and zinc led in value of production. Fuels comprised 53 per cent of the total value of mineral production in the State, the same percentage as in 1962. The value of nonmetals rose to 44 per cent of the total value, while the value of metals declined to 3 per cent.

We now set forth some illustrations where research has aided the development of minerals.

List of a few Illustrations

Ilmenite: With the development of paint pigment manufactured from titanium dioxide, a large industry was established in Amherst and Nelson Counties in 1931. This industry had benefit of the geological work conducted 20 years earlier and reported in 1913.

Aplite: This ceramic raw material was a coproduct of the ilmenite industry established in the Piney River area. This feldspar material has been established as a standard ceramic raw material following research that was conducted by John W. Whittemore about 25 years ago.

Perlite: In 1940, perlite was expanded experimentally in a kiln at Las Vegas, Nevada. About 1941, crude perlite was flash-popped in an experimental gas-fired furnace. This was the start of a series of commercial plants to produce lightweight aggregate and changed what was a curiosity in 1940 into an important building material.

Lightweight Aggregate: Expanded shale has been recognized as a high-grade building material since 1920. Stephen J. Hayde determined, in 1917, that certain clays, shales, slates, and related materials expanded upon reaching insipient fusion and developed into lightweight aggregate of high structural strength and insulating value. Several of these plants are located in Virginia.

Coke: The Illinois Geological Survey Research Program, to develop new and better uses of Illinois coal, resulted in a commercial process to make coke from coal, once believed unsuited for this use. During the past few years, more than 1,000,000 tons of Illinois coal have been mined annually for manufacture into metallurgical coke.

Coal: Recent research by the U. S. Bureau of Mines has developed a process to produce ash-free coal. This is done by liquefying coal under high pressure in an atmosphere of hydrogen. The combustible portion of the coal is changed into a liquid form that may be separated from the mineral matter that produces the ash. After separation, the liquid is converted into a solid state. This ash-free coal may be used in gas turbines that turn electrical generators, and thus eliminates the use of conventional steel processes. (For this and other uses, Virginia coals should be investi-

gated for composition of plant materials, petrographic composition, mineralogy and chemistry of ash-forming constituents, chemistry of organic compounds, evaluation of coking properties, improved cleaning techniques, methods of evaluation of the physical composition of coal, and other research activities not presently being undertaken.)

Phosphate: The phosphate industry of eastern North Carolina, recently established, utilized the laboratory techniques for recovery of phosphate that were developed in the mineral laboratory located at Asheville.

Mica: The scrap mica industry that recovers fine particles of mica utilizes recovery methods that were developed in the Asheville mineral laboratory. There are two or three companies in the eastern United States that manufacture synthetic mica after a process that had been developed at the U. S. Bureau of Mines Laboratory in Norris, Tennessee.

Iron Ore: Laboratory research made possible the recovery of iron concentrate from low-grade siliceous rocks called taconite. The low-grade iron ores of Virginia need additional study to reduce costs of crushing and concentration. Certainly the iron content of these rocks could be used. New low-cost methods and techniques need to be developed which would enable profitable exploitation of these deposits.

Manganese Ores: The manganese ores of Virginia are relatively high in silica; consequently, they are not sought after by the steel industry. There is a great tonnage of this low-grade ore and research is needed to develop beneficiation and concentration processes to provide metallurgical manganese.

Lime and Limestone: Lime is one of the important materials used by industry and it enters into more than 7,000 industrial processes and uses. These uses range through the agricultural industry, the construction industry, and the chemical industry, and include agricultural lime, soil stabilization, brick, calcium carbide, glue, paint, paper, synthetic rubber, industrial waste treatment, water purification, and many others. New industrial and chemical uses and processes that utilize lime should be sought. Detailed studies into the limestone raw material should be undertaken. Determination of the physical and chemical characteristics of the raw materials would be useful in developing new sources of lime manufacture. Since lime is a relatively low-value bulk commodity, proximity to markets and freight rates are important economic factors in its utilization.

PROBLEMS CONFRONTING COAL

The coal industry in Virginia today does not have the advantage of State mineral research such as is provided so successfully by other states, with substantial benefits to industry and the state. If the coal industry in Virginia is to maintain its position and to increase its production both the study of coal resources and the development of new uses are essential. Coal research must begin now.

Other states are undertaking mineral research and the two most cited examples are the mineral research laboratories at Pennsylvania State University and at the University of Illinois. A brief analysis and survey of each of these will follow.

ILLINOIS GEOLOGICAL SURVEY

The Illinois Geological Survey is the largest state geological survey in the United States. This is true from the standpoint of annual appropriation as well as aggregate size and value of physical facilities and equipment, number of full-time employees, and number and scope of publications.

Its range of research and extension cover the entire field of activities connected with the discovery, analytical and experimental testing, determining of physical properties, overall evaluation and industrial promotion of the state's resources. It is the only state geological survey with a completely integrated operation comparable in scientific scope with the work of the United States Geological Survey. The Illinois Geological Survey has a distinguished record of achievement in helping industry solve its geological and mineralogical problems. Its functions include also the additional fields of educational extension work and public service.

The Illinois Survey, for example, has pioneered in the field of research in fluorine chemistry out of concern for the welfare of the Illinois fluorspar industry which mines, processes, and sells 60 per cent of the domestic fluorspar produced in the United States. In mineral technology, the Survey has led the way in research on beneficiation and pelletizing of Illinois fluorspar with the objective of increasing use of domestic fluorspar.

It has correctly anticipated most of the trends in mineral and fossil-fuel utilization and has accumulated and kept up to date an enormous amount of technical data on the physical constitution, chemical composition and grade, and the properties of Illinois resources. No matter where one turns in the enormous volume of Geological Survey reports, basic data are available in full array of specific detail for the prospective users. A generation ago, investigation of its subsurface geology led to development of the state's tremendously successful oil production. Now in a new age with greatly changed conditions the Illinois Geological Survey has re-evaluated its subsurface geological structures and has fostered amazing use of even the "dry" structures for underground storage of pipeline and LP gas close to the Chicago area. Similarly, its researches on methods of mining and processing of silica sands have sustained the steady growth of the state's glass industry.

Coal is an extremely important Illinois resource. Of all the States Illinois has the largest reserves of bituminous coal. Research on Illinois "soft" coals has led to their increased use, especially as the major blend ingredient in metallurgical coke. The coking properties of Illinois coals have been evaluated thoroughly by the Survey's coal research laboratory. Whereas in 1945 no Illinois coal was used in manufacture of metallurgical coke, subsequently the Survey's experimental work on Illinois coals has led to successful substitution of Illinois coal for nearly 80 per cent of the input coking coals used in Illinois. The Survey's coal chemistry section has done equally outstanding work leading to greater utilization of Illinois coal in by-product chemical industries, and some of these researches have even involved collaboration with medical researches.

Because of its large and growing state population, Illinois uses enormous quantities of sand, gravel and crushed stone. The fact that the Illinois Geological Survey pioneered in clay-minerals research has resulted in steady increases in utilization of Illinois clays and shales in manufacture of clay products. Among the Survey's recent achievements are major discoveries of methods for controlling long-term expansion of bricks produced in the Midwest. Also technological experimentation has led to perfection of a method for making a strong light-weight clay block in which the matrix is expanded clay instead of cement.

Although the Illinois state Geological Survey is located on the University of Illinois campus and its physical plant (approximately 200,000 square feet of floor space) is heated and maintained as a university building, there is no other direct connection between the geological Survey and the University except that the Chief enjoys professorial status in the

geology department. Many informal connections are maintained, and university geology students are employed on a part-time basis by the Survey for nontechnical work. The Survey has its own library and about 95 per cent of the equipment it needs for operation. Spectrographic work and electron microscopy, involving very expensive research tools, are handled on a contractual basis, mainly with the University of Illinois.

In Illinois, mineral development does not languish for want of specific data. Illinois has set an example in developing technical information in depth on all its resources and communicating this information to industry in order to produce the maximum benefit to the state's industrial economy.

About 50 per cent of the Illinois Geological Survey's activities are in the broad field of fundamental research, about 25 per cent in applied research, and about 25 per cent in extension services. Because of its mounting stockpile of scientific and technical data obtained through fundamental research, the Illinois Geological Survey will continue to enjoy a very favorable advantage in promoting and guiding the future industrial utilization of the state's mineral resources.

THE PENNSYLVANIA STATE UNIVERSITY'S COLLEGE OF MINERAL INDUSTRIES AND MINERAL INDUSTRIES EXPERIMENT STATION

It was the beginning of Pennsylvania's decline as a coal-producing state in the early 'thirties which led to public interest in mineral research. Basic geological work investigating Pennsylvania's mineral resources was initiated and carried on by the Pennsylvania Geological Survey, which had its beginnings in the early years of the nineteenth century. Like most other State Geological Surveys, the Pennsylvania Survey confined its geologic investigations largely to field mapping, description of the rock formations and general study of its mineral and ground-water deposits. Not until Penn State's mineral research laboratory and mineral industries education programs were developed did experimental mineral research get started. This land-grant college's effort in the mineral sciences and engineering prospered because it filled an existing need which was not being met by activities of the State Geological Survey.

As the facilities at Penn State were gradually improved and enlarged during the 'forties, much of the financial support was supplied by industry and the rest by the University itself. The emergence of the College of Mineral Industries and Mineral Industries Experiment Station parallels the evolution of Pennsylvania State into a topflight technical university. In 1948, the annual budget of the Mineral Industries Experiment Station was slightly less than \$1,000,000 of which one-third was derived from federal sources (largely contractual money), one-third from state appropriations, and one-third from University financing. This division of three-way support was maintained until about 1960 when a strong increase in federal support to 50 per cent of operating revenues took place. Since 1948 the Experiment Station's annual budget has gradually increased to its present level of \$2,100,000. Physical facilities were doubled in 1950 with addition of the Mineral Sciences Building next to the Mineral Industries Building. Another smaller building largely for experimental research purposes was erected seven years ago, and another large new geology building is now under construction; this will raise the total aggregate space for mineral research to well over 250,000 square feet.

Mineral research at Pennsylvania State University is conducted by the staff of the College of Mineral Industries and is organized under the aegis of the Mineral Industries Experiment Station. Most of the staff researchers are part-time teachers as well.

Students are also employed as hourly workers on various research projects. Including research assistants, research associates, fellows and untitled employees, the supporting group of graduate-student workers totals nearly 300 persons, who work with and are supervised by the staff with professorial rank, which now totals 106 scientists, engineers, senior technicians and others. In contrast to the Illinois Geological Survey which is a major publications medium, most of the research contributions by the staff of the College of Mineral Industries are published in scientific journals and periodicals and not in local publications. However, large numbers of reprints of these papers are purchased and distributed by the Mineral Industries Experiment Station.

Coal research in Pennsylvania is financed to a large extent by the Coal Research Board of the Pennsylvania Department of Mines and Mineral Industries. During 1964 a grant of \$147,000 supported six research projects on coal in the Mineral Industries Experiment Station. Also in 1964, the Mineral Industries Experiment Station received \$210,970 for coal refuse research from the U. S. Department of Health, Education and Welfare. Some coal research is financed by the University Research Fund.

The total operations of the College of Mineral Industries through its Mineral Industries Experiment Station is the largest and most comprehensive university-centered mineral research organization in the United States.

In Pennsylvania the Geological Survey, with offices in Harrisburg, conducts field investigations on mineral deposits, continues its survey of the geology of the state and issues a variety of technical reports. These studies provide basic data on occurrence, distribution and composition of rock and mineral deposits. It handles topographic mapping cooperatively with the U. S. Geological Survey and also conducts ground-water investigations. All these are conventional services such as are usually conducted by geological surveys. From all indications, the consummate research activities of the Pennsylvania State University's Mineral Industries Experiment Station and of the Pennsylvania Geological Survey perform approximately the same function that the activities of the Illinois Geological Survey do. The Pennsylvania Mineral Industries Experiment Station is largely though not wholly confined to laboratory-based research, whereas the Pennsylvania Geological Survey is largely concerned with field-based research activities.

Pennsylvania mineral production in 1962 was valued at \$823,152,000 compared to \$588,335,000 for the same period for Illinois. Based on the ratio of value of annual mineral production to amount appropriated for geological research and administration, Illinois and Pennsylvania are providing a roughly comparable amount of public support for comparable activities.

COMPARISON OF ILLINOIS AND PENNSYLVANIA APPROACHES

The high level of competence of mineral research in each state indicates that the actual aegis of experimental research albeit university-based or geological-survey-based is not a fundamental factor in determining the excellence of research effort and accomplishment. The three factors that seem to be common to both the Illinois Geological Survey approach to mineral study and experimentation and the Pennsylvania approach which includes the Geological Survey at Harrisburg and the Mineral Industries Experiment Station at Penn State are:

- (1) distinguished personnel with records of high scientific-productivity;

- (2) excellent facilities for experimental research; and
- (3) a record of determined effort to maintain a fairly equal balance between pure, basic research and applied or developmental research.

The two contrasting procedures for handling mineral research in Illinois and Pennsylvania have been highly successful and these accepted facts are proof that no one procedure or administrative organization or aegis for conducting state-supported mineral research is necessary to insure success.

A MINERAL RESEARCH PROGRAM FOR VIRGINIA?

Does Virginia need a mineral research program? The overwhelming opinion expressed at the public hearings was that the answer to this should be an unequivocal "yes". A close analysis of American mineral industries shows very clearly that rapid technological change and automation and mechanization continues to require even-greater understanding of the composition and properties of raw materials. Knowledge of composition of raw materials and possible uses therefor requires fundamental scientific study, exhaustive analysis and elaborate experimentation. Developmental research on minerals pointed towards specific practical objectives including the promotion of the increased use of certain raw materials within a given area requires facilities and experienced researchers.

In the past, mineral production in the United States has centered traditionally around utilization of mineral deposits of direct shipping grade. More recently, technological invention of labor-saving devices has already wrought great changes in the mineral industries and appears to be destined to continue an accelerating revolution in mining, processing and consumption of raw materials. In many industrial fields the grade of raw material, formerly the determining factor in utilization, has become secondary to the amenability of a deposit to mechanized mining, to highly automatized beneficiation, and to even more highly instrumental smelting or calcining, size gradation and packaging for shipment. Today, in fact, many newer techniques of mineral utilization depend more on the large size of a deposit than on the grade of the raw material, which beneficiation can improve at low cost.

Most industrial changes are forcing the mineral sciences to make a complete re-evaluation of raw materials in terms of new criteria dictated by new technologies. And, the rate of acceleration of these changes is so swift that one wave of new industrial procedures piles upon others ever to heighten the sweeping tide of change. Highly complicated questions relating to internal constitution, composition and properties of raw materials are being raised; many of the questions can be answered only through time-consuming research into the atomic and crystalline structure of matter itself. The chemistry of raw materials in all its complexities, including precise analysis, locus of trace elements, interrelation of polymorphic phases and of the ambient conditions of temperature and pressure under which each phase is stable or unstable becomes a major consideration in mineral use. The physical behavior of raw materials in all stages of mining, crushing, grinding, sintering, smelting and refining becomes a controlling factor in dictating the direction of further technological advancements. These are all compelling reasons why it is absolutely necessary for a state to support a vigorous mineral research program if it is to secure its future mineral economy.

Minerals produced from the earth are "new wealth". The most desirable industrial use of a mineral is realized when minerals are produced and

consumed within the same state to manufacture some widely marketed product. Promotion of such industries demands a correlation and coordination of many kinds of mineral research-beneficiation and processing studies and economic investigations, including regional market studies. Very little of this type of work is now being done in Virginia. No amount of conventional business promotion will create new mineral industries unless we know more about our raw materials and have organized specific data into reports that industry can use.

The mineral production in Virginia in dollars and cents has been analyzed and presented to us. In 1915 there were produced eight million one hundred twenty-three thousand tons of coal whose dollar value was \$7,963,000; the value of other minerals produced was \$9,032,000; and the total value was \$16,995,000. In 1963 the tonnage of coal was thirty million five hundred and thirty-one thousand with a dollar value of \$120,972,000. Also in 1963 the value of other mineral commodities was \$108,094,000, and the total value was \$229,066,000. From 1953 to 1963 the value of minerals produced in Virginia exceeds that of all the preceding years.

From the foregoing figures on mineral production in Virginia and from the analysis of research conducted in Pennsylvania and Illinois and results thereof, it is obvious that the economy of Virginia will be greatly expanded by research into our mineral resources. The potentialities of many minerals in Virginia have scarcely been explored. Coal research is necessary to allow the coal industry to remain competitive with other energy sources. An important consideration in the expenditure of tax dollars for research has to be the resulting benefit to the economic well-being of the State as a whole. Accordingly, all of Virginia's mineral resources should be considered in determining priorities for research projects. Research is the only hope and before it is too late, Virginia must act.

The coming years will see an increasing number of entrants into the job market. To help provide them with employment, production of our mineral resources must be expanded. Research into new uses for our minerals is the best approach to this task.

We are not in a position to determine the kind of facility which should be established in the State to conduct the needed research. The question has arisen as to whether or not a facility should be established at an existing institution or elsewhere. Further questions are: the geographical location of such an institution (i.e., whether it should be established near the mining fields or near the commercial centers) and coordination with existing federal and State agencies, such as the U. S. Department of the Interior and the State Division of Mineral Resources. Other questions arise as to what type of research should be conducted. In view of these problems and others, we deem it vital that consultants be retained to explore this matter and provide answers thereon. We therefore recommend that this study be continued through the 1966-68 biennium and a sufficient amount appropriated for the employment of consultants to advise the study group.

But Virginia cannot wait for the study to be completed before undertaking a research program. It is therefore recommended that of the appropriation of \$50,000 an amount of perhaps \$25,000 be expended for the conduct of mineral research on a contract basis by either existing private institutions, or State agencies and institutions. Such a program will give Virginia a view of the capabilities of its existing facilities and also a start on a program of mineral research. In addition, it will show what minerals should be studied, the type of inquiry to be made, and establish a timetable for future inquiry. We recommend that these contracts be let by the

Governor upon the advice and consent of a Committee composed of eminent technological persons including the Department of Conservation and Economic Development.

Enabling legislation to effect our recommendations is attached.

ACKNOWLEDGMENTS

We acknowledge the assistance rendered the Committee by all those who gave it the benefit of their interest, experience and knowledge. We further express our appreciation to the members of the Committee for their contribution of their time and thought toward the completion of this study.

Respectfully submitted,

EDWARD E. WILLEY, *Chairman*

TOM FROST, *Vice-Chairman*

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BUDGET ITEM

BIENNIUM 1966-1968

EXECUTIVE DEPARTMENT

Governor

Item——

For research into new and expanded uses of Virginia minerals and related purposes. Such research to be by contract with either private institutions, State agencies or institutions. The Governor may award contracts upon the advice of a Committee of five persons designated by him and chosen from the public, industry and Department of Conservation and Economic Development. Part of this appropriation may be expended for investigation into the feasibility of a mineral research laboratory:..... \$50,000

HOUSE JOINT RESOLUTION NO.

Directing the Virginia Advisory Legislative Council to continue its study of the feasibility of establishing a mineral research laboratory.

Resolved by the House of Delegates, the Senate concurring, That the Virginia Advisory Legislative Council is directed to continue the study of the feasibility of establishing a mineral research laboratory in the State, which study was begun in 1964 pursuant to Senate Joint Resolution No. 19. The Council may employ consultants in order to determine whether the State should establish such a laboratory, its location, and the type of research it should undertake.

All agencies of the State shall assist the Council in its study. The Council shall conclude its study and make its report containing its findings to the Governor and the General Assembly not later than October one, nineteen hundred sixty-seven.

