

## Geology in State Service

William Lilley - NYS Department of Public Service<sup>1</sup>  
 Robert Fakundiny - NYS Geological Survey<sup>2</sup>  
 Kernan Davis - NYS Department of Environmental  
 Conservation<sup>3</sup>  
 George Toung - NYS Department of Transportation<sup>4</sup>  
 Frank Irving - NYS Department of Transportation<sup>4</sup>  
 Peter Buttner - NYS Department of Parks and Recreation<sup>5</sup>

## I. Introduction

The various agencies of New York State require diverse geologic investigations, reviews and research to carry out their legislated duties. Each agency must prepare environmental impact statements for all actions that significantly effect the environment under the new State Environmental Quality Review Act. State agencies are involved in review of various impact statements, safety analyses, reports and legislation of other State and federal agencies. Geologic investigations are needed before, during and after various State construction projects. Geologic research and data collection is a prime responsibility of the Geological Survey in cooperation and participation with other State and federal agencies.

## II. Legislation

The State legislature passes many laws requiring consideration of geology. These laws generally contain vague outlines of the information required to satisfy their intent. The designated agency must draft rules and regulations that comply with the law. The rules and regulations frequently detail the type and arrangement of information required in an application to the agency. The rules and regulations go through various internal reviews and public hearings. The final environmental regulations must be approved by the New York State Environmental Board which is composed of several State commissioners.

Several State agencies are required by law to contract construction projects that require geologic analysis.

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<sup>1</sup>Agency Building #3, Nelson A. Rockefeller Empire State Plaza, Albany, NY

<sup>2</sup>Cultural Education Center, Nelson A. Rockefeller Empire State Plaza, Albany, New York.

<sup>3</sup>50 Wolf Road, Albany, New York.

<sup>4</sup>Building 7A, State Campus, Albany, New York.

<sup>5</sup>Agency Building #1, Nelson A. Rockefeller Empire State Plaza, Albany, NY

### III. Implementation of Rules, Regulation and Projects

The final rules and regulation indicate the analysis and informational requirements of applications for various permits, licenses and projects. The geologic parts of the various applications sometime appears to be brief and deceiving. The real geology issues may be under groundwater, erosion and sedimentation controls or solid waste. Other areas such as terrestrial ecology and noise, and the environmental impact of a project can to some extent be dependent on geologic conditions. An integrated environmental analysis by all disciplines is the only successful approach for a complete analysis. The isolation of geology from other areas leads to missing important interdisciplinary issues. Therefore, the agency geologist has an important position - not only geologic analysis, but to see that geologic aspects of related areas are carefully considered.

Agency project responsibilities include highway, parks, water supplies, and housing construction. Each project and site has particular geologic impacts and assessments required. Safety of structures, cuts and fills are an important aspect of any geologic review.

Frequently any agency geologist is required to make an independent assessment of a project or problem relying on experience to make a rapid evaluation of the situation. In addition to the field inspections and reports, agency geologists are called on to provide expert testimony in public hearings. The geologist makes a professional assessment and frequently undergoes cross-examination by adversary parties. Projects involving millions of dollars may hang in the balance of these proceedings.

The State Geologic Survey provides the agency geologist with resource of information and a multi-talented staff who assist in analysis.

### IV. New York State Department of Public Service (DPS)

The staff of the Department of Public Service is also the staff of the Public Service Commission and the New York State Board on Electric Generation Siting and the Environment. The prime responsibility of the DPS geologist is the review and evaluation of proposed nuclear and coal-fired power plant sites under the 1972 Article VIII of the Public Service Law. The analysis of these applications for new power plants involves facilities' impact on the environment and the environment's impact on the facilities. The environmental impacts of the facility to assess are erosion, sedimentation, groundwater change and solid waste caused by the facilities. The environment's impact on the facilities to assess are earthquake hazard, erosion, sedimentation, slope stability and foundation stability. The analysis of these impacts is presented in testimony before the New York State Board on Electric Generation Siting and the Environment which must decide the site location and mode of generation. In seven power plant siting cases the DPA geologists have evaluated 15 different sites and 19

different facilities. Currently, the DPS staff is preparing the environmental impact statement for the Nuclear Regulatory Commission.

Other areas of responsibilities of the DPS are as follows:

- a. investigate problems and costs of underground transmission lines;
- b. review geologic research program of utilities, State and federal agencies and proposing changes and research needs;
- c. evaluate utilities investment proposals for uranium mine ventures;
- d. work with other agencies such as the State Geologist, DEC, OGS, Corp of Engineers, USGS and NRC to see that there is thorough review of all proposals;
- e. propose, review and comment on new legislation, policies, rules and regulations relating to geology, groundwater on solid waste; and
- f. advise and review proposals related to nuclear waste disposal.

The DPA geologist works closely with State Geologist's staff and Department of Environmental Conservation staff geologists in many of these evaluations.

#### V. New York State Geological Survey

The New York State Geological Survey is in its 142nd year of continuous service and has as its basic program a balance between (1) service to other State and federal agencies, industry, and the public and (2) geologic mapping and other basic research. Our advisory services and research efforts continue in three major areas: economic resources; environmental geology; regional mapping and data-collecting studies. Our attention during the next few months will be concentrated on moving to our new quarters in the Cultural Education Center of the Nelson A. Rockefeller, New York State Plaza in Albany. The following discussion highlights some of the new projects and significant results of the larger continuing projects.

Economic Resources - New York stands 28th among the states with \$439.5 million in mineral production. An estimated 7100 people produced 5 metals and 16 nonmetals. New York remained first in the production of garnet, ilmenite, and talc, and was the only producer of wallastonite. Crude oil production in 1977 was 813,000 barrels; natural gas production was 10.4 million cubic feet. With mineral production decreasing through time, the Geological Survey plans to help stimulate the State's production by intensifying its program of mineral resource studies.

As part of our desire to increase support for the development of the State's economic resources, the Geological Survey co-hosted the 14th Annual Forum on the Geology of Industrial Minerals. Other co-hosts were: Empire State Concrete and Aggregate Producers Associates, Inc., Dunn Geoscience Corp., Rensselaer Polytechnic Institute, State University of New York at Albany, New York State Department of Transportation and the New York State Department of Environmental Conservation. Publication of the proceedings is under way and should be available later this year.

Environmental Geology - Our Energy/Environmental Geology Section has been bolstered by the addition of two new staff members, Robert H. Fickies and Henry H. Bailey. The section will continue to review nuclear and fossil fueled power plants proposed or under construction in New York. At the time of this writing, we are still awaiting the minority decision from the U.S. Nuclear Regulatory Commission Appeals Board on New York State's request for a review of the Indian Point Nuclear Power Plants Seismic Hazard Evaluation. This hearing, for which we petitioned and participated in, probably influenced to some measure the NRC's decision to review and revise Appendix A to 10 CFR Part 100 of the federal regulations on nuclear power plant siting. Disposal of nuclear waste continues to be a major concern to us. Our research at the West Valley Nuclear Fuels Service Center in western New York is continuing with the discovery that gaseous emissions of  $^{14}\text{C}$  and tritium from the low-level nuclear waste burial trenches may be the most prominent radionuclide migration pathway. In cooperation with the U.S. Geological Survey, Water Resource Division and the State Health Department we have collected in-site cores of host material from beneath the burial trenches and are measuring radionuclide migration rates in them. A third part of the program is the continuation of an erosion-rate study. Our next efforts, if funding becomes available, will be the study of geologic and hydrologic conditions prevailing at the high-level waste storage tanks also situated at the Service Center. Another continuing project is our review of leasing for petroleum exploration on the Outer Continental Shelf by the U.S. Bureau of Land Management. We have just completed a massive study for the National Science Foundation of the impact of natural resource data on land-use decision making. The results indicate that data producers will have to design their information packages in closer cooperation with translators of the data and the ultimate data user, if the data are to have the impact desired toward forming more enlightened decisions.

Mapping and Regional Studies - Several of our long-term, regional research projects are continuing and will be published eventually in our Bulletin, Map and Chart, or Circular Series. Bedrock mapping of the Taconic klippen is essentially complete and in preparation for publication. Research on the stratigraphy of Devonian black shales in the subsurface of central and western New York continues to reveal exciting new facts about the paleo-environments of the Catskill Delta. Glacial mapping and compilation continues in the Finger Lake region toward the eventual publication of the second sheet of the 1:250,000

scale map of the Quaternary Geology of New York. Investigation of the buried valleys of the Hudson River has now progressed from the Lake George area in the north to the Coxsackie and Catskill area in the south. Maps showing the brittle deformation and neotectonics of New York are being compiled and will be added to the State Tectonic Atlas. These will be accompanied by a statewide aeromagnetic map, now under compilation in cooperation with the U.S. Geological Survey, which should be available to the public by the end of the year.

Future Research - By combining outside funding sources for intermediate term research, we hope to be able to expand our study efforts in the areas of economic resource evaluation, hydrology and regional aquifer mapping, and geology of deposits under the navigable waters of New York. This last project would attempt to compile data already in existence and acquire new information on the Outer Continental Shelf, New York Bight, Long Island Sound, the Hudson River estuary, and the lakes within and bordering New York.

#### VI. The New York State Department of Environmental Conservation

The New York State Department of Environmental Conservation (DEC) presently employs five engineering geologists: four at the senior level and one at the associate level. In Civil Service parlance, the Associate is senior to the Senior. Another curious feature is that in the DEC organization, no geologist has a geologist as his supervisor nor is he supervisor to any other geologist.

Further, no bureau has more than one "geologist" assigned as a member, although people who have degrees in geology do work as "mined land reclamation specialist" or as "hydraulic engineer" or as "civil engineer" or even as "hearing officer", and to some greater or lesser extent, apply their science to the practice of government administration.

The bureaus to which the geologists are assigned are: Hazardous Wastes, Land Disposal (in the Division of Solid Waste Management), Reservoir Releases and Basin Management (in the Division of Water Resources), Mineral Resources (in the Division of Land Resources), and Energy (in the Division of Permit Coordination).

The Department is now (spring, 1979) undergoing a major reorganization so by the time you read this, the structure may be different.

Each geologist position has been created as a result of an urgent need for the application of geotechnical expertise to a management or regulatory responsibility assigned to the Commissioner by the Legislature.

The first geologist employed was hired in 1965 by the Division of Water Resources as a result of the drive to plan for coping with future droughts.

The second was hired a few years later, to help administer the Oil and Gas Laws.

The third was hired in 1973 to work on the environmental analysis of major construction projects, for which a myriad of DEC permits are required.

The fourth and fifth were hired within this past year, in response to the recognized need to cope with solid waste disposal problems.

No research is done. No nice publications are prepared. Difficult and specific problems regarding limited areas (often of deep concern) are handled, using the knowledge and techniques of the geosciences. The resultant products are advisory memoranda and conferences aimed at helping the appointed officials make rational decisions to protect the environment of the State.

#### VII. New York State Department of Transportation

The "soils" program of the Department of Transportation implements the Department's goals and objectives in the areas of earthwork and foundations for transportation and techniques of earth engineering. Earth engineering includes the broad subject areas of earthwork engineering and foundation engineering and utilizes various disciplines including soil and rock mechanics, engineering geology, geophysics and earth science.

The major work effort is involved with capital projects in the highway program. The soils program involves participation in all phases of project development from planning through construction and includes the maintenance phase. Complete soils services are also provided for most projects assigned to consulting engineers. The soils program also participates in airport projects under the Development Division.

The services of the soils program are also furnished to other State agencies after written approval of the Chief Engineer. Project investigation and reports are prepared for the Office of General Services (buildings, water supplies, etc.), Environmental Conservation (water supplies, dams, etc.) and Commerce (foundation and water supply at proposed industrial sites). Work is also done for authorities such as Atomic and Space, New York State Thruway, Niagara Frontier Development and others.

The soils program consists of a combined effort of the ten Regional Soils Sections and the Bureau of Soil Mechanics. The program includes explorations, testing, analysis and design, construction inspection and preparation of earth engineering specifications and standards. Geologists are engaged in all phases of the program to varying degrees.

Geologists employed by the Bureau conduct the geophysical portion of the exploration program. They use seismic and electrical techniques. They also use a bore hole T.V. camera to determine orientation of rock structures and reasons for core loss in drill holes. Under the exploration program they also prepare rock outcrop maps and work on the engineering soils maps of various projects.

The Bureau maintains both a soil mechanics laboratory and a general soils laboratory for the testing phase of its program. Geologists have access to the services of these laboratories whenever they have a need to know such things as strength and durability of rock specimens or grain size distribution of well samples.

Geologists work on the design of rock cut slopes and structure foundations in rock for the analysis and design phase of the program. They are responsible for meeting the design requirements of hazard free, low maintenance rock cut slopes and for determining allowable pressures for structures founded on or in rock. This work includes the analysis and/or design of mechanical systems for stabilization of rock cuts and rock anchorage systems for tie-back walls and buried structures subject to uplift.

Geologists provide inspection services to the project engineers on problems that come under the Bureau's responsibility. They evaluate the contractors blasting program and make sure that the State's pre-splitting requirements are being complied with. They evaluate the stability of the finished cut slope and determine the location of any mechanical support or additional scaling that may be necessary. They inspect exposed rock at foundation sites for its ability to support design loads. They inspect and approve stockpiles for stone filling items. Under this phase of the program Geologists also provide technical assistance on rock or ice removal projects undertaken by maintenance personnel or by local governments under the Department's Local Assistance Program. They monitor construction generated vibrations on projects adjacent to sensitive structures.

Geologists also work on the preparation of specifications and standards for such items as stone filling, rock anchorage systems, allowable vibration limits, and controlled blasting.

The Geology Section of the Materials Bureau is responsible for the evaluation and acceptance of all aggregates used by the New York State Department of Transportation for RR ballast, bridges, portland cement concrete pavements, and bituminous concrete pavements. The operation of this program is comprised of the following parts:

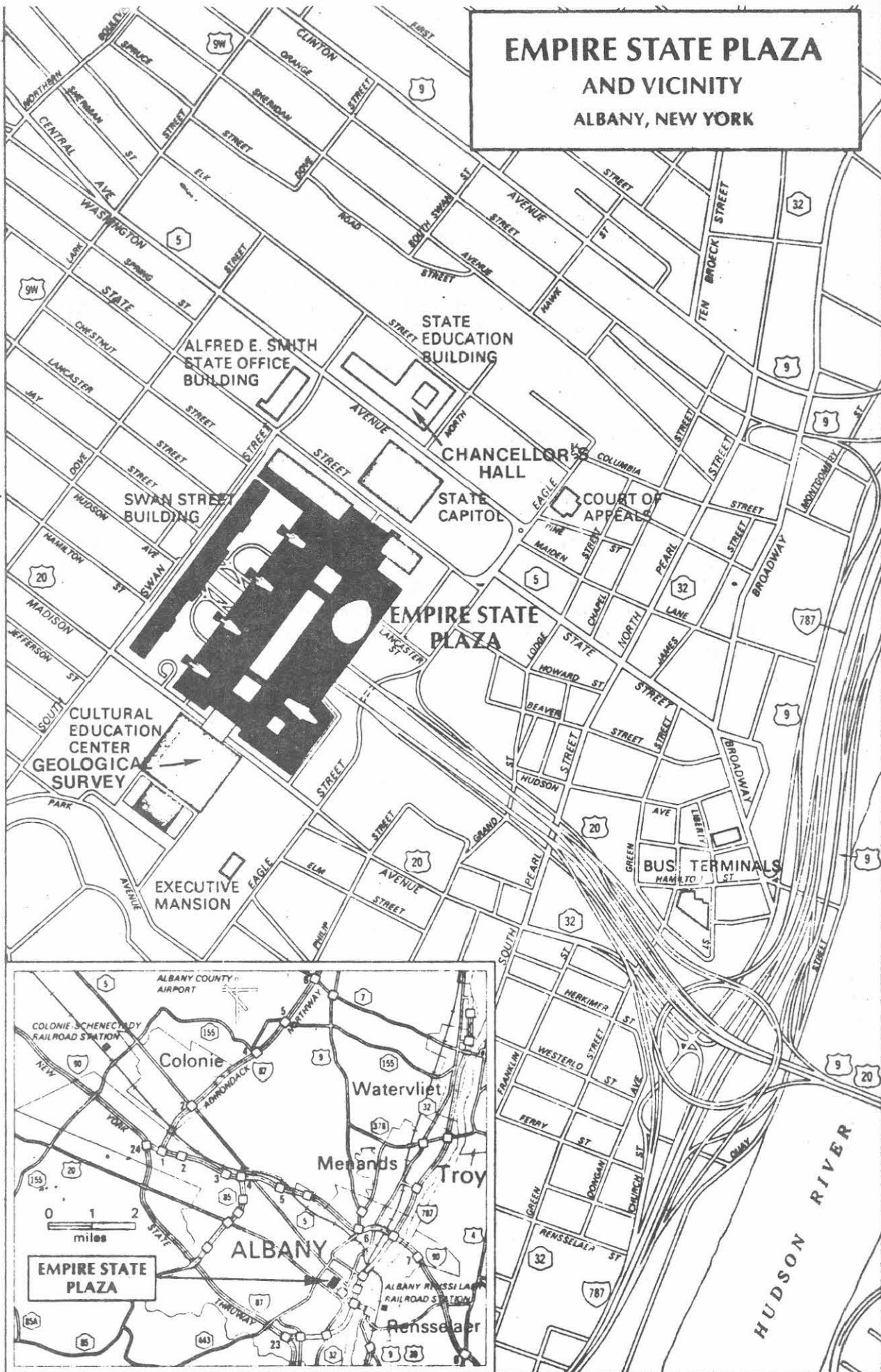
- (a) Preparation of aggregate specifications
- (b) Evaluation of physical tests performed by our laboratory on aggregates:

1. Magnesium Sulphate Soundness
  2. Freeze-Thaw
  3. Los Angeles Abrasion
- (c) Review and analysis of the Geological Source Reports which are prepared by independent consulting geologists hired by each aggregate producer
- (d) Petrographic inspection of quality assurance samples received during the construction season
- (e) Field inspections of aggregate sources and changing the area of operations when required

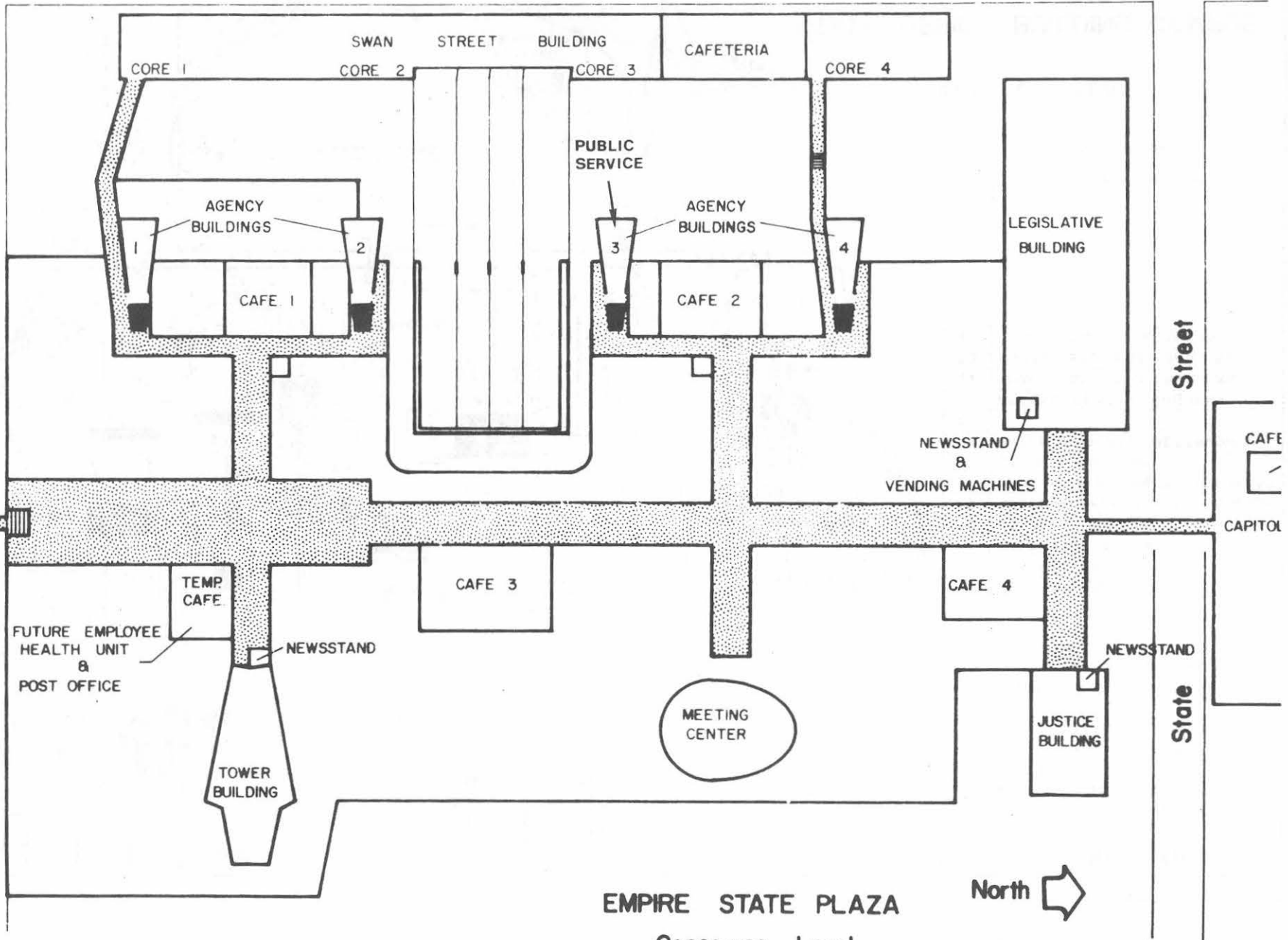
The Geology Sections for the New York State Department of Transportation are a portion of the Division of Design and Construction as has been indicated under the titles for each of our summaries. The Technical Services Subdivision is comprised of three Bureaus; the Bureau of Soil Mechanics, the Bureau of Materials, and the Engineering Research and Development Bureau. Only the Bureau of Soil Mechanics is primarily concerned with all materials beneath the surface of a finished pavement section.



# EMPIRE STATE PLAZA AND VICINITY ALBANY, NEW YORK



Upper Swan Street



319

CULTURAL CENTER GEOLOGICAL SURVEY

Avenue

Madison

Street

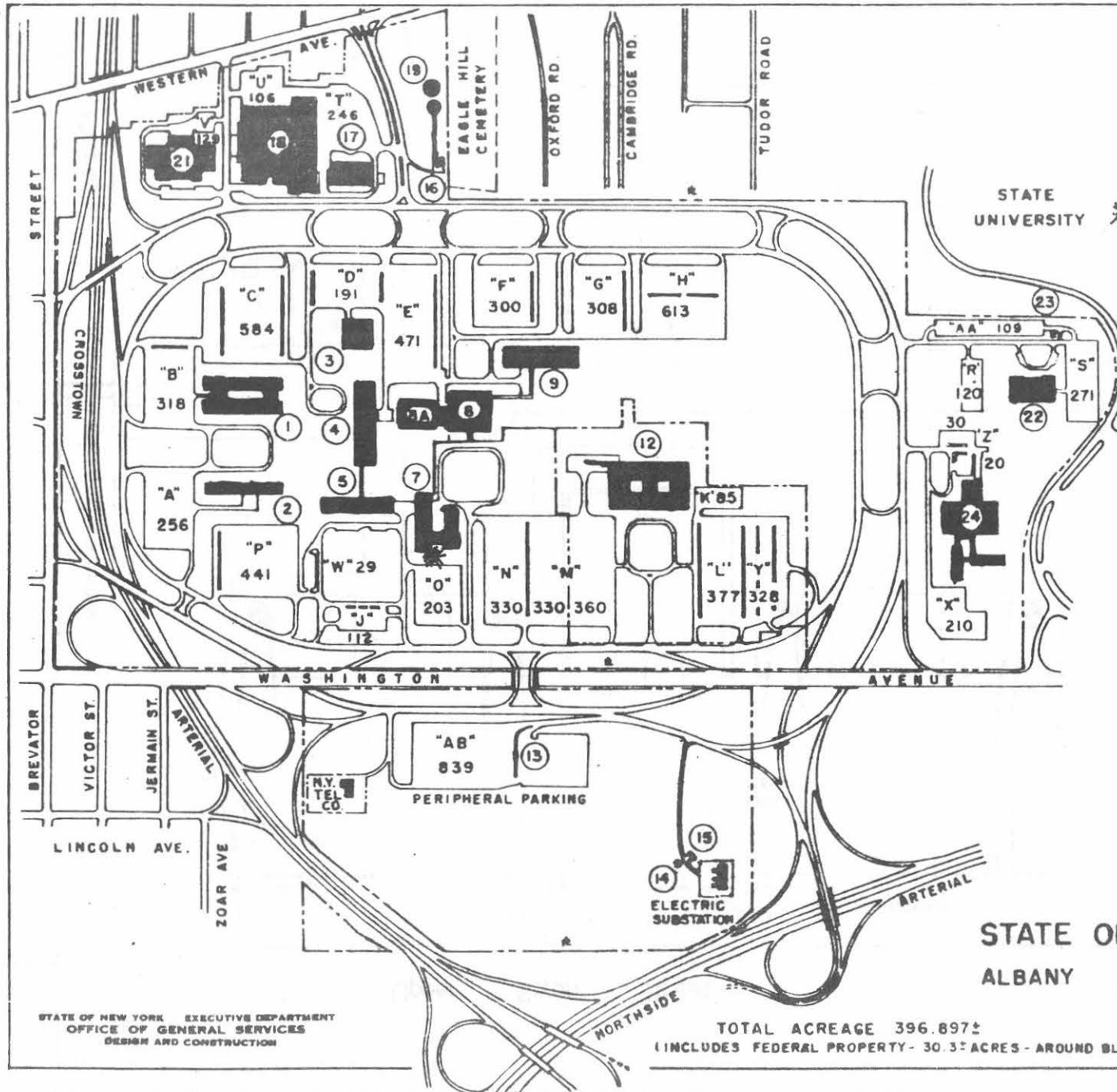
State

CAFE  
CAPITOL

EMPIRE STATE PLAZA



Concourse Level  
2-19-76



BUILDING INDEX	
NO.	NAME
1	CIVIL SERVICE BUILDING
2	MULTI-AGENCY BUILDING
3	CAFETERIA
4	O.G.S. - DESIGN & CONSTRUCTION
5	TRANSPORTATION, ADM. & ENG.
6	
7	LABORATORIES - TRANSP. - AG & MAR.
8-8A	INCOME TAX BUREAU BUILDING
9	TAXATION & FINANCE BUILDING
10	
11	
12	DEPT. OF LABOR
13	BUS SHELTER
14	SALT STORAGE BUILDING
15	STORAGE BUILDING
16	WATER SUPPLY PUMPING STATION
17	HEATING & REFRIGERATION PLANT
18	SERVICE BUILDING
19	WATER STORAGE RESERVOIRS
20	
21	RECORD CENTER BUILDING
22	PUBLIC SECURITY BUILDING
23	WASTE STORAGE BUILDING
24	STATE POLICE ACADEMY



KEY PLOT PLAN

STATE OFFICE BUILDING CAMPUS  
ALBANY

NEW YORK  
PT 50 (5-73)

STATE OF NEW YORK EXECUTIVE DEPARTMENT  
OFFICE OF GENERAL SERVICES  
DESIGN AND CONSTRUCTION

TOTAL ACREAGE 396.897±  
(INCLUDES FEDERAL PROPERTY - 30.3± ACRES - AROUND BLDG 12)

MAY 1973

v.i.

TRIP B-5 (b)

The Building Stones of the Nelson A. Rockefeller Empire State Plaza

Leaders: R. H. Fickies and R. J. Dineen, N.Y. State Geological Survey

The construction of the Nelson A. Rockefeller Empire State Plaza, on 98 acres of land adjacent to the New York State Capitol Building represents the largest single-project use of a variety of industrial mineral products in the Northeastern U.S. in recent years. The project drew heavily on the Capital District's sand and gravel resources and provided a ready market for Portland Cement produced in the Hudson Valley. At least one Vermont marble quarry was depleted of reserves and closed down after supplying large quantities of stone to the project.

Facades of the Plaza present both rough and polished surfaces of several types of dimension stone selected from various parts of the United States, Europe, and South America for both exterior and interior facing on the walls of 10 of the 11 buildings in the complex. This walking tour will begin in the lobby of the Cultural Education Center (State Museum), whose walls are faced with polished creamy, white Alabama marble. From there the tour will proceed in a general clockwise direction around the Plaza (see Plaza map Fig. 1).

A listing of the various industrial minerals, their locations and uses in the Plaza is provided to aid the reader in taking a "self guided" tour of the Plaza.

TABLE 1

Building Stones and Other Industrial Minerals  
Used in Construction of the Empire State Plaza

## DIMENSION STONES

<u>Metamorphic Rock</u>	<u>Location</u>
Cherokee White Marble; Tate, Georgia - early Paleozoic	Exterior facing of Cultural Education Center
White Pearl Marble; West Rutland Vermont-Ordovician Sherburne Fm.	Exterior facing of Tower Building and the four Agency Buildings
Creamy White Marble; Sylacauga, Alabama - early Paleozoic	Interior facing of Cultural Education Center
Cherokee Melange Marble; Tate, Georgia - early Paleozoic	Exterior facing of Justice, Swan Street, and Legislative Buildings
Vert Tinos; Serpentinite, Isle of Tinos, Greece	Interior facing of portions of the Legislative Office Building lobby
Pavanazzo Marble; West Rutland Vermont, - Ordovician Shelburne Fm. (3" to 9" thick layer)	Interior Facing of portions of the Legislative Office Building lobby, all elevator lobbies in that building
Danby-Montclair Marble; Danby Vermont, -Ordovician Shelburne Fm.	Legislative Office Building, main entrance floor
Bluetone Marble; West Rutland, Vermont-Ordovician Shelburne Fm.	Walkways around reflecting pools on the outdoor plaza.

<u>Sedimentary rock</u>	<u>Location</u>
Travertine; Tivoli area, Italy	Interior facing of Grand Concourse, Elevator Lobbies in Tower and Agency Buildings
Indiana limestone	Paving stones on the Health Department Courtyard
Lenrock Stone; Greywacke Sandstone and Siltstone - Devonian Sonyea Group, Ithaca, New York	Exterior facing of the Main platform (The "great wall")

<u>Igneous rock</u>	<u>Location</u>
Lake Placid Blue "Granite"; Light Adirondack Anorthosite, Upper Jay, New York	Outside amphitheater adjacent to the Cultural Education Center, Legislative Building entrance steps, curbing and various fixtures on the plaza
Cold Springs Green "Granite"; Dark Adirondack Anorthosite, Upper Jay, New York	Ornamental stone fountain in the Legislative lobby. Water spouts on the Great Wall and elsewhere on the Plaza
Mount Airy "Granite"; North Carolina	Curbing - Swan Street & Madison Avenue
Uba Tuba "Granite"; Brown Monzonitic Stone from Brazil	The cornerstone - north end of outdoor plaza

CONCRETE

<p><u>Portland Cement</u></p> <p>Several producers in the Hudson and Mohawk Valleys (Helderberg Limestone)</p>	<p>Over 900,000 yd<sup>3</sup> of concrete used in the Plaza. The Meeting Center is the only building with a concrete exterior facing.</p>
<p><u>Concrete Sands</u></p> <p>Cow Bay, Long Island, New York, and numerous local sources</p>	
<p><u>Concrete Gravels</u> (crushed stone)</p> <p>Hudson Valley dolomites</p>	
<p><u>Mortar Sand</u></p> <p>Corinth, New York</p>	

OTHER INDUSTRIAL MINERALS

<p><u>Red Natural Gravel</u></p> <p>Vermont river gravels composed of Cambrian Monkton Quartzite</p>	<p>Walkways on the Plaza</p>
<p><u>Buff Natural Gravel</u></p> <p>Cape May, New Jersey</p>	<p>Labyrinth area</p>
<p><u>Red Paving Bricks</u></p> <p>Ohio</p>	<p>Walkways on the Plaza</p>
<p><u>Buff Brick</u></p> <p>Ohio</p>	<p>Various Parapet Walls</p>

FIGURE 1  
NELSON A. ROCKEFELLER - EMPIRE STATE PLAZA  
OUTDOOR PLAZA LEVEL

