THE EROS DATA CENTER

-ITS DESIGN AND CONSTRUCTION

U.S.
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
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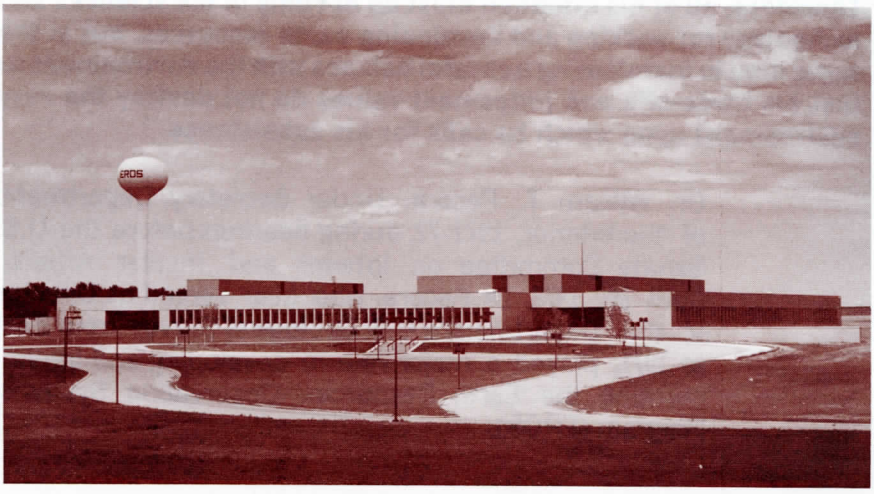
"One must look at the role of man on this earth; If he is to survive as a species, and a thriving species, he does in fact, need more resources. But, on the other hand, he must adopt good housekeeping. Therefore, all of his attention must be not only in the sciences and technology for seeking and developing earth resources, but at the same time to maintaining a careful balance with the environment so that his trade-offs and judgement values do not destroy the very environment upon which he calls for his subsistance."

Dr. William T. Pecora, Under Secretary, Department of the Interior, 1971–72, during hearings before the U.S. Senate Committee on Interior and Insular Affairs, April 30, 1971. Dr. Pecora, who also served as Director of the Department's U.S. Geological Survey from 1966 to 1971, played a major role in developing and implementing the Earth Resources Observation Systems Program (EROS).

In September 1966, the Department of the Interior announced plans for the Earth Resources Observation System (EROS) program to gather and use remotely sensed data collected by satellite and aircraft of natural and manmade features on the Earth's surface. The Department of the Interior, the National Aeronautics and Space Administration, the National Academy of Science, the Department of Agriculture, and many industrial organizations and universities began work on the program. As part of this program the Department of the Interior constructed the Earth Resources Observation Systems Data Center, a key installation in the use of remote-sensor data for resources management and environmental research and surveys. Under the management of the Interior's U.S. Geological Survey, the EROS Data Center is a central repository where remote-sensor data are received and processed. The Center also provides professional and instrumental assistance to governmental and private users of the data and serves to further the work of resources and environmental scientists throughout the world. Among the principal sources of remote-sensor data are: the National Aeronautics and Space Administration's (NASA) Earth Resources Technology Satellites (ERTS), the first of which was launched in July 1972; Geological Survey aerial photography; and NASA aircraft data.

This booklet describes the Center's physical design and construction. Information on the Center's products, services, and operations can be obtained from: EROS Data Center, Sioux Falls, South Dakota 57198.



SITE

SELECTION

As the EROS program progressed, a study was made to determine the areas suitable for the location of a Data Center. The study determined that the Data Center should be located within an area approximately elliptical in shape, about 350 miles long and 150 miles wide, extending from Topeka, Kansas, to slightly beyond Sioux Falls, South Dakota, in order to maintain line-of-sight communications with the 500-nautical-mile-altitude satellite while it was taking pictures over the conterminous United States. Within this area, satellite communications can be maintained with a minimum antenna elevation angle of 7½°.

Many other factors involving the Center's location were investigated, but the most critical ones called for areas which were electrically quiet, had an adequate water supply of good quality, and had soil conditions of sufficient stability to support 60- to 85-foot diameter antennas. Results of other investigations indicated that a staff of 300 or more persons and a substantial array of data and photo processing equipment would be required to operate the Center. To furnish employees with adequate community resources, the Data Center had to be near a central city. North and south of Sioux Falls, South Dakota, there were five tracts of land totalling 18 square miles which satisfied all criteria. After an exhaustive study of ground conditions, a 318-acre site was selected, located approximately 14 miles northeast of Sioux Falls, on the S½ of Section 8, Township 103 North, Range 48 West in Minnehaha County.

DEVELOPMENT

The facility was constructed for the U.S. Government under a 20-year lease-purchase agreement by the Sioux Falls Development Foundation, Inc. The Foundation purchased the site and donated it to the U.S. Government and after 20 years the Government will also own the buildings and other improvements. The facilities were built by the Lueder Construction Company, Omaha, Nebraska.

PLANNING

The U.S. Geological Survey commissioned two architectural-engineering firms, The Spitznagel Partners, Inc. and Fritzel, Kroeger,

Griffin & Berg, both of Sioux Falls, to design a master site-development plan. The environment of the site and surrounding areas were carefully studied, and plans were made for preventing adverse impacts on the site's environment through its development. Later studies suggested that the undeveloped portions of the site be used for wild game habitat and protection, and the site Center's landscaping was developed accordingly.

FACILITIES

The Center's principle structure, the Karl E. Mundt Federal Building (the Data Handling Building), is the nucleus of the facility. Support facilities consist of a Sewage Treatment Control Building, five ponds and a dam, which constitute a waste treatment system; a water line from Sioux Falls; a 250,000-gallon water tower; a Maintenance, Garage and Substation Building; and parking areas and roadways. Ultimately the Center will have a large, dish-type antenna for direct satellite communications. Electric power is furnished through 4½ miles of underground conduit terminating in the Maintenance, Garage and Substation Building.

DATA HANDLING BUILDING

In the Data Handling Building, images are processed from ERTS orbiting satellites. The building covers approximately 107,000 square feet and forms a rectangle, 314 feet by 342 feet. It is a one-story building with two penthouses which house fan rooms, a computer condenser room and a tank room for storage of photographic processing chemicals. Below a portion of the first floor is basement space 9 feet high which houses a reclamation tank room, pump room and electrical room. The equipment in the tank room is used for salvaging silver and processing chemicals. Excavated space under the entire first floor permits ready access to all utility lines.

The main floor of the Data Handling Building is the workday home of many EROS administrators, scientists, technicians and the clerical staff. An entrance lobby connects with the administrative offices, conference rooms, brousing area, library and cafeteria; these areas are open to the public. Also on the main floor, but not open to the public, are the production area and attendant facilities

which include the chemical laboratory, processing room, dark rooms, computer and tape storage room, archives, cataloging and microfilm facilities, together with support and service areas such as shops, mailing and receiving, storage, mechanical and electrical equipment control rooms.

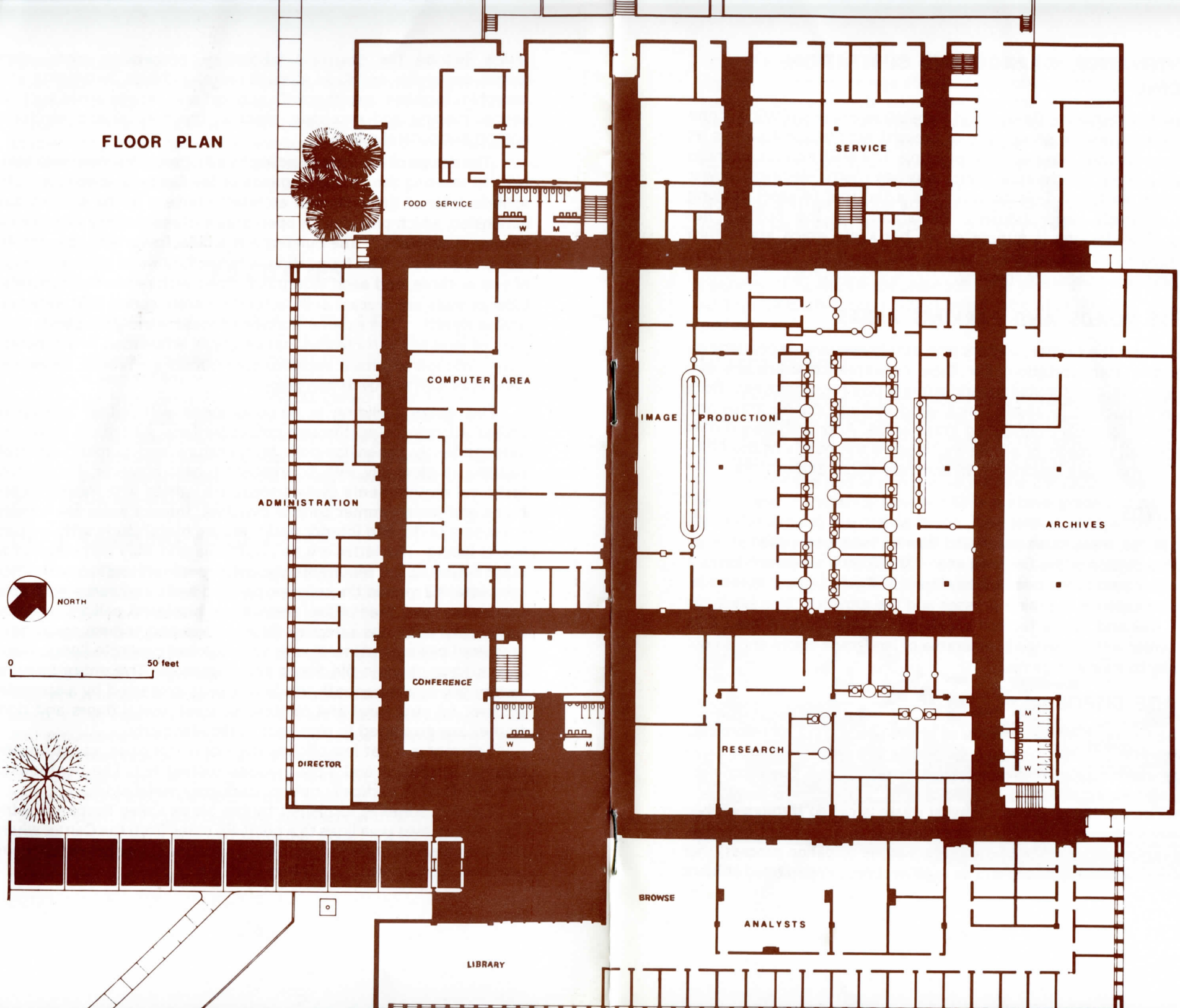
The design of the Data Handling Building provides maximum flexibility in meeting the changing needs of the Center's scientists. To achieve interior flexibility the architect chose a 40-by 40-foot bay dimension, which provides an open area exclusive of any intervening structural supports. The building has a steel frame with columns 40 feet on centers. The foundation is formed by wood piles in clumps of two or three, and each clump is capped with reinforced concrete. Exterior walls are precast architectural concrete panels that were fabricated locally. The exterior surface of these warm-gray panels consists of exposed vari-colored, native gravel embedded in a concrete base. Window and main entrance door frames are bronze, anondized aluminum with bronze-tinted glass.

The entire builiding is air-conditioned with either heated or chilled air conducted through celing troffers. All critical areas are independently zoned for both temperature and humidity control. Lighting is generally with flourescent tubes; however, because of technical requirements certain areas are lighted with incandescent bulbs and have dimmer control switches. Interior walls are cement masonary units, and interior partitions are metal studs with gypsum board facing. The latter are demountable and may be relocated to meet future space requirements. Interior administrative and office space have acoustic tile ceilings, painted walls and carpeted floors. Laboratory and production areas have plastered ceilngs, painted walls, vinyl asbestos or epoxy floors. Shop and service areas have plastered ceilings, painted walls and exposed concrete floors. Wash rooms have ceramic tile floors and wainscote. The entire building except the space beneath the first floor is protected by a sprinkler system. All structural and reinforcing steel, metal doors and door frames are grounded to eliminate static electricity.

The roof is a flat low-pitched deck of metal pans, vapor barrier, tapered insulation and 3-ply mopped roofing felt. The penthouses are sheathed in vertically ribbed, dark-gray metal siding.

Electric power is furnished by the Sioux Valley Empire Electric Association over pole lines to a point 4½ miles from the Center where the lines then go underground to the substation located in the Maintenance, Garage and Substation Building.

FLOOR PLAN


FOOD SERVICE
W
M
SERVICE
COMPUTER AREA
IMAGE PRODUCTION
ADMINISTRATION
ARCHIVES
NORTH
0
50 feet
CONFERENCE
W
M
DIRECTOR
RESEARCH
M
W
BROWSE
ANALYSTS
LIBRARY

MAINTENANCE, GARAGE AND SUBSTATION BUILDING

The Maintenance, Garage and Substation Building (MGS) is one story faced with the same type of precast architectural panels as those used in the Data Handling Building. The MGS houses a garage and shop area, mechanical room, storage room, electrical power substation and hall. This building has a flat roof of steel decking which supports vapor barriers, insulation, and the built-up flat roofing. The decking is supported on bar joists which are in turn supported by structural steel beams and columns. The structural steel rests on a concrete framing.

ACCESS ROADS AND PARKING AREAS

To reach the Center, visitors and employees are dependent on automotive transportation. For their convenience there are two parking areas, one for visitors and a larger one for employees. Both areas are reached by roads which wind through prairie grass and other more formally maintained grass areas. Approximately a mile and one-half of roads of ample width serve the needs of the complex. The roads are blacktop with concrete curbs and gutters.

GROUNDS

Shrubs, trees, lawn areas and flowers have been used in landscaping a portion of the Center's site. This formal treatment forms a distinct contrast to the informal treatment of the remainder of the site. The large expanse of prairie grasses and the growth of tree seedlings of ash, oak and maple furnish employees and visitors at the EROS Data Center with a changing panorama of landscape colors and an opportunity to view wild game.

SEWAGE DISPOSAL

The Center's waste consists of photo processing and domestic wastes. The sewage disposal system is designed to exceed discharge water-quality standards established by the Environmental Protection Agency.

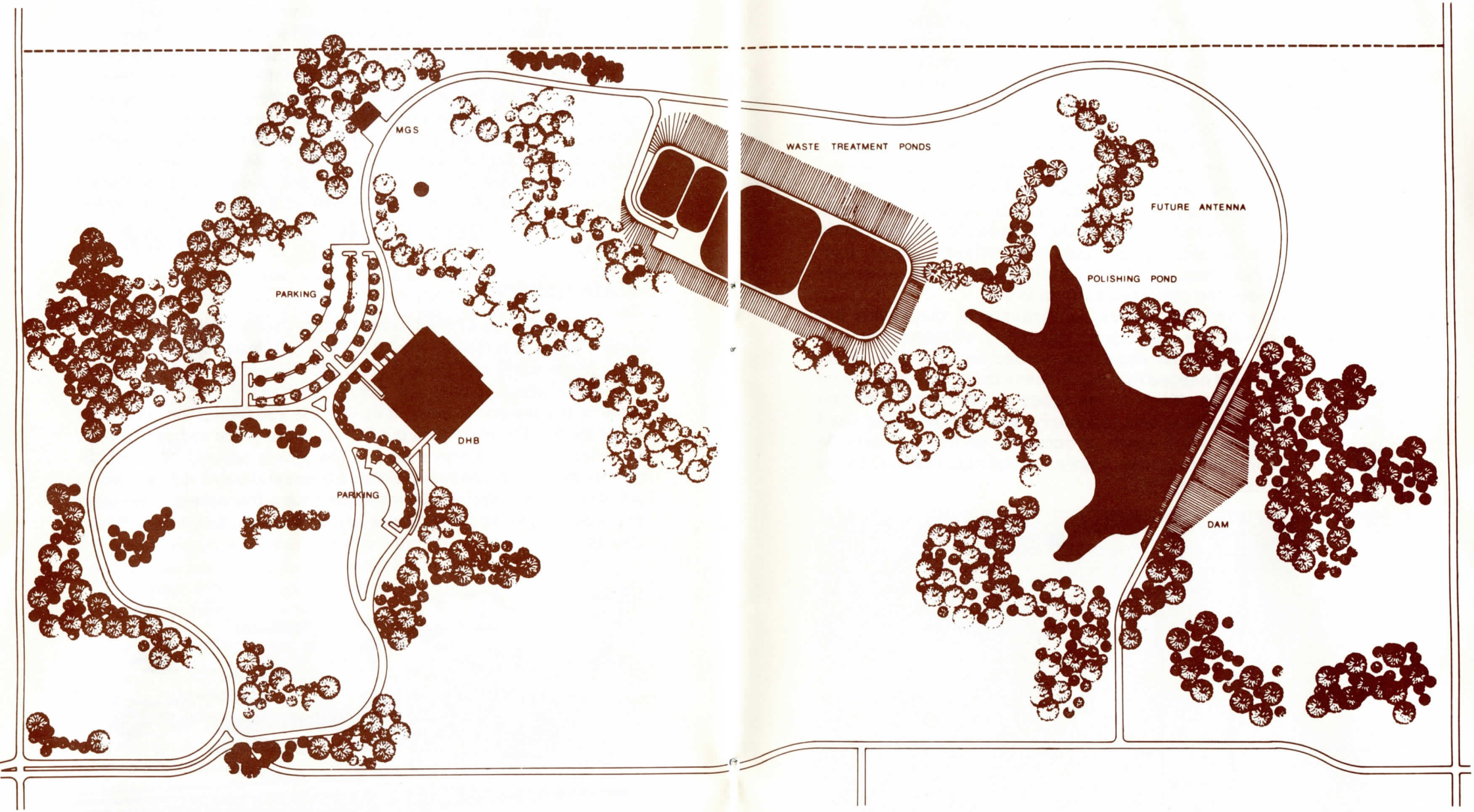
All concentrated photo chemical waste is cycled through a silver recovery system (electrolysis process), which is 95 percent effective, and a regeneration/destruction system (ozone oxidation process) that permits 100-percent bleach and fix regeneration. Precipitated effluent

from these systems meets or betters the Environmental Protection Agency's sewer discharge standards for toxic content. This effluent, together with the photo wash water and domestic waste, is discharged into the aeration pond where it is aerated for a period of 20 days. It is then transferred to an adjacent sediment section pond for a detention period of 10 days. Following the sedimentation period chlorine is introduced into the effluent as it is transferred to polishing pond No. 1 for a 40-day period and then to polishing pond No. 2 where it is retained for another 40 days. It is then stored in polishing pond No. 3 for retention until it can be released one to two times annually.

Polishing ponds No. 1 and No. 2 are designed for a storage capacity of 25,000,000 gallons each. The minimal retention period of 40 days for each pond is based on an estimated flow of 57,500 gallons per day.

WATER SUPPLY

The operation of the Center requires substantial quantities of water. Water is furnished from the Sioux Falls water system, 14 miles away to the south and some distance to the west. Two pumps are required at about midpoint of the 8-inch transmission line to move water to the site and to pump it up into the 250,000-gallon spheroidal water tank. The white tank is 136 feet above grade and can be seen for miles around the prairie land. The tank is secured by 2-inch diameter bolts anchored in a circular foundation and is designed to withstand winds of up to 100 miles per hour. The water transmission line was designed by R. F. Sayre and Associates, Sioux Falls, South Dakota.


MGS
WASTE TREATMENT PONDS
FUTURE ANTENNA
POLISHING POND
PARKING
DHB
PARKING
DAM
NORTH
0
500 feet

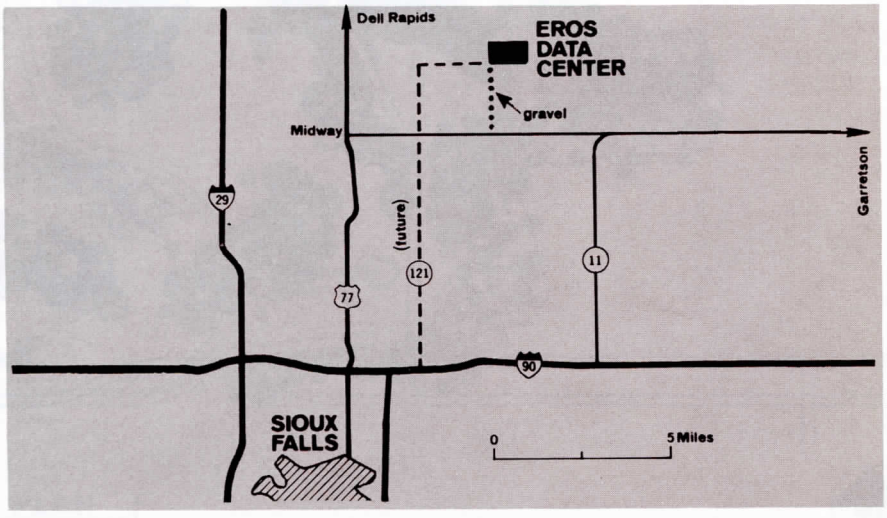
SITE PLAN

FUTURE PLANS

Presently, the Center does not have the capability for direct reception of satellite telemetry or the conversion of telemetry data into photographic image data. The conversion capability, however, will be added in the future, while direct reception capability has been planned into the Center's design.

Demands for imagery are expected to increase from 1973 weekly outputs of about 30,000 images to an estimated 150,000 to 200,000 images in 1978. Several experimental data extraction processes are expected to become production processes by 1978. The Center is designed, therefore, to provide for at least the functions of image generation from magnetic tape, photo reproduction, cartographic quality and special processing, library and archive services, user training and assistance, and for accommodation of the personnel needed to achieve the projected outputs in 1978.

The basic utility and service components of the facility are designed to handle the much larger laboratory, photographic, and computer capabilities that should be needed by 1978. The equipment and personnel needed to perform these tasks will be added on an incremental basis. Much of the space in the Center's design allotted for the technical and laboratory area is now being used instead for general office space. If demands for imagery data do not exceed estimated projections, only internal modifications to the Center are envisioned by 1978.



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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.