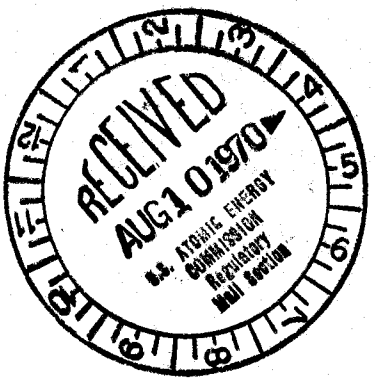
BEFORE THE UNITED STATES

ATOMIC ENERGY COMMISSION

In the Matter of	)	
	)	
Consolidated Edison Company of New York, Inc. (Indian Point Station, Unit No. 2)	)	Docket No. 50-247

Applicant's Environmental Report -

Operating License Stage



August 6, 1970

TABLE OF CONTENTS

Applicant's Environmental Report
Operating License Stage

I. General

The Atomic Energy Commission ("AEC"), in a letter of May 7, 1970, requested Consolidated Edison Company of New York, Inc. ("Con Edison") to supply certain information on environmental aspects of Indian Point Unit No. 2 ("Unit No. 2"), a nuclear-powered electric generating unit being constructed by Con Edison and now nearing completion. On June 3, 1970 the AEC published for comment in the Federal Register (35 Fed. Reg. 8594) a proposed Appendix D to 10 CFR Part 50, specifying in greater detail the information on environmental matters to be provided by license applicants to assist the AEC in preparing the detailed statements required by the National Environmental Policy Act of 1969. * This report is intended to be responsive both to the AEC's letter and to the proposed Appendix D.

Con Edison filed its Application for Licenses for Unit No. 2 with the AEC in December, 1965, and received a construction permit in October, 1966. The unit is designed to provide 873,000 net kilowatts of electric power for the Con Edison system. It is located on Con Edison's Indian Point site on the Hudson River, and is adjacent to and to the north of Unit No. 1, a nuclear generating unit of 285 megawatts net electrical capacity, which has been in operation since 1962. A third nuclear unit, also under construction at this site,

*The Notice of Proposed Rule Making states that the proposed Appendix D is to be used as interim guidance pending further action on the appendix.

is scheduled for completion in 1973. All three units utilize reactors of the pressurized water type.

Con Edison's request for an operating license for the second unit is now under review by the AEC, and it is in connection with that review that this report is submitted.

Some of the interpretations chosen in preparing this document (which it is believed are supported by the legislative history of the National Environmental Policy Act as well as the Interim Guidelines issued on April 30, 1970 by the Council on Environmental Quality) are summarized below:

1. The human environment includes that created by man for his subsistence, safety, and comfort as well as that provided by nature. For example, air-conditioners, artificial light and elevators in modern buildings are a part of the human environment as well as parks.

2. The geographical area considered is roughly the same as the "metropolitan area" of New York City which (as in the case of other large American cities) carries with it a connotation of close economic and social interdependence and ease of communication. In consequence, discussion of benefits to the inner-city dweller or worker through use of power (elevators, heating and rapid transit etc.) have been considered appropriate for this report.

3. "Long-term productivity" is presumed to mean productivity over an extended period toward an economic or other purpose generally accepted as a constructive use of some part of the natural environment.

In reviewing this report the reader should bear in mind that Unit No. 2 was licensed for construction by the AEC over three years before the National Environmental Policy Act of 1969 became law. The unit is approaching completion and is scheduled to go into commercial operation in June, 1971. As a result, unlike many later projects, the current AEC operating license review represents the first opportunity to submit such a report. Inevitably the character of the report differs in certain ways from one that would be typically filed at the construction permit stage. Particularly, (1) discussions of the environmental effects of construction must take into account the fact that most of the construction and its effects have already occurred, and (2) some alternatives are now precluded as a practical matter by the passage of time, the stage of completion, and the financial commitment now represented by Unit No. 2.

Consistent with the AEC's proposed Appendix D to 10 CFR Part 50, information is not included on water quality aspects of construction

or operation of the unit, except for a statement concerning the applicability of the certification requirement of the Federal Water Pollution Control Act as amended.

II. Characteristics of site and surrounding area

The 235-acre Indian Point site is located in Westchester County, New York on the east bank of the Hudson River, about 24 miles north of the New York City boundary line. Section VI.D. of this report contains a scale plot plan of the site and a map showing the general location of the site.

The site is surrounded on most sides by high ground ranging from 600 to 1,000 feet above sea level. The river at this point runs northeast to southwest but turns sharply northwest approximately two miles upstream of the plant. The west bank of the Hudson is flanked by the steep, heavily wooded slopes of the Dunderberg and West Mountains to the northwest (elevations 1,086 feet and 1,257 feet respectively) and Buckberg Mountain to the west-southwest (elevation 793 feet). To the east of the site, peaks are generally lower than those to the north and west. The river south of the site makes a sharp bend to the east and then widens.

The area immediately around and including Indian Point is zoned for heavy industry.* The surrounding area is generally residential with some large parks and military reservations. The

*Industries in the vicinity include Georgia Pacific Complex, New York Trap Rock Corporation, Fleishmann's Distillery, and Sanitas Company.

communities of Verplanck, Buchanan, and Peekskill lie within two miles of the site. West of the river the Palisades Interstate Park, and residential areas are the dominant land usage. Orange and Rockland Utilities' Lovett Generating Station is located on the west shore of the river across from Indian Point.

Based upon the 1960 census, approximately 53,000 people live within a 5-mile radius of the site, and this number is expected to increase to about 108,000 by 1980. The 1960 population within a 15-mile radius of the site was 326,930, whereas the estimated 1980 population is about 670,000. Within a 5-mile radius most of the population is located northeast of the site. Within the larger radius the majority of the people are located south of the site.

The site itself is hilly, rising from the Hudson River to elevations of about 150 feet. The dominant elevation is approximately 100 feet.

The northern part of the site includes an 80-acre forest and a fresh water lake. The south-central portion of the site contains Unit No. 1 and related structures, as well as Units 2 and 3 now under construction. The dominant features of Unit No. 1 are its containment dome and a stack (which serves primarily its oil-fired superheater). A considerable portion of this area has been cleared for construction, storage, parking, roads, or temporary

structures. This portion of the site is presently affected in a manner typical of large construction projects in progress. Access roads and electrical transmission lines run from Units No. 1 and 2 to the eastern site boundary. A major gas transmission line also traverses the property. A temporary visitors' center is located on a hill overlooking the generating station.

Adjoining the Indian Point site to the south is another tract owned by Con Edison, known as the Trap Rock site, which was purchased as a site for future nuclear generating units. The water-front portion of that site is separated from the Indian Point waterfront by the Georgia Pacific Complex. It contains a grassy area contained to the west by a curving ridge and to the north and east by a series of large earth mounds. The area is traversed by several electric transmission lines. An abandoned quarry, now a lake of about 30 acres, dominates this area. As discussed more fully below, plans are being developed for landscaping and enhancing the recreational value of both sites as a unified whole.

The plant life at the Indian Point site may best be described as an oak-maple-hemlock forest. These primary species occur throughout the site. However, a great variety of other species not part of the normal ecological succession has been introduced to previously cleared areas. These include wild cherry, dogwood, hickory, sumac, cottonwood and linden. The large block of natural maturing

untouched forest does not have these additional species.

The wildlife includes a typical group of North American species associated with a hardwood forest, such as porcupines, woodchucks, squirrels, opossums, insects, reptiles and a variety of bird life such as robins, thrushes, and occasional waterfowl.

The meterorology of the site is characterized by a prevalent north-south wind direction resulting from the orientation of the ridges in the Hudson Valley. The geological characteristics of the site have been evaluated and have been found suitable for location of the unit. The site is located in what may be described as a seismically inactive region and one in which severe natural phenomena such as tornados and flooding are uncommon.*

Flow in the Hudson River at Indian Point is affected more by the tides than by the runoff of the tributary watershed. Tide changes in this area of the Hudson are normally about three feet but run to seven feet in extreme storm conditions. The width of the river opposite the plant is approximately 5,000 feet with a depth of 55 to 75 feet within 1,000 feet of the shoreline. About 80 million gallons of water per minute flow past the plant during the peak tidal flow.

*Nevertheless, Unit No. 2 is well protected from tornados by virtue of its design and by intervening existing structures and topographical features. The potential of the site for earthquakes and flooding has been analyzed in detail, and the Unit No. 2 design reflects the results of these studies with appropriate margins. The Final Safety Analysis Report for Unit No. 2 contains detailed information on these subjects.

The Hudson River at Indian Point may be described as a partially mixed estuary, with the salinity varying considerably depending upon tidal changes and fresh water runoff. The river is subjected to pollutants from municipal, industrial and agricultural sources, both upstream and downstream. By comparison with pollution occurring near population centers such as Albany, Poughkeepsie, and New York City, the quality of water reaching Indian Point, as well as the dissolved oxygen content, is fairly good and the river at that point supports a considerable variety and abundance of aquatic life.

Migratory fish in the area include striped bass, shad, alewife, blueback herring, smelt, and sturgeon. The principal resident fish are eels, catfish, white perch, minnows, tomcod, and sunfish. Both commercial and sport fishing are carried on in the area, although the amount of commercial fishing is declining. The shad and striped bass are the two most important for commercial fishing, while the striped bass is the most important for sport fishing. There is no commercial shellfish industry in the area, and there are no commercially harvested crustaceans. The river also contains various underwater plant life, small aquatic insects and small crustaceans in sufficient amount to support the fish life.

III. Environmental impact and effects

A. Construction of Unit No. 2

As described earlier some of the ground around Unit No. 2 has been disturbed as a result of construction. However, this will be restored and landscaped as described in Section III.B.2. below.

A limited amount of traffic congestion has occurred from time to time during construction, since there may be as many as a thousand persons working on site at a given time. However, this congestion is temporary and will not occur after completion of construction.

Construction of Unit No. 2 is creating no noise problem for off-site residents because of the size of the site. Construction noise and other disruption have resulted in the temporary relocation of wildlife which for the most part will be naturally reestablished after completion of construction.

Some combustion products are released to the atmosphere during construction as a result of operation of diesel-powered machinery. This has no significant effect upon the environment and does not differ from any other large construction job.

There have been discharges to the river of small amounts of chemicals used for cleaning during the construction

of the facility, and there will be further chemical discharges prior to completion of the facility. These discharges are made subject to prior approval by the New York State Department of Health. No adverse effect has been or is expected to be experienced with these discharges. As with other water quality matters, these discharges are covered by the Federal Water Pollution Control Act, as amended, and the considerations set forth in Section III.C.2. of this report also apply here.

Dredging and filling generally results in the destruction of benthic organisms in the area involved. Relatively little dredging and filling was required for the construction of Unit No. 2 intake and discharge structures, so that these effects have been minimal. Authorization has been obtained from the U.S. Army Corps of Engineers for this work as necessary.

B. Physical presence of Unit No. 2

1. Land use

As previously mentioned, the area immediately around and including Indian Point is industrially zoned. Also, the location of a second unit adjacent to one already in existence represents an efficient use of land compared with the selection of an undeveloped site.

A study of the population and land use, both existing and projected, within a 55-mile radius of Indian Point, has been compiled for Con Edison by the Regional Economic Development Institute, Inc., under the direction of Dr. Edward M. Hoover. It is Con Edison's opinion that Unit No. 2 represents a reasonable land use consistent with both the short and long-term development of the surrounding area.

2. Landscape and appearance

The structures of Unit No. 2 were architectually designed to present an attractive appearance and one that is cohesive with the existing facilities. An artist's rendition of the completed facility is found in Section VI.E. of this report.

Effort was exercised wherever possible to eliminate from view unsightly operating equipment. The screen well machinery at the shore front is located behind a masonry curtain with a planting box at its base to screen it from river traffic and the opposite shore. Attention has been given to the form, color and texture of the buildings so that the setting is enhanced and the feeling of intrusion is held to a minimum.

The area around the plant will be landscaped in an attractive manner. The landscaping is being developed

as a part of an overall plan to improve the aesthetic and recreational value of the complete site for the visiting public and others.

Transmission of electricity from Unit No. 2 to the load center will not require the use of new rights of way for overhead transmission lines. From Indian Point east to a north-south Con Edison right of way, a new 345 kV overhead circuit has been strung on existing towers. From the intersection with the north-south right of way south to a station just north of New York City, a double circuit 138 kV overhead transmission line has been rebuilt for operation at 345 kV.

Steel pole construction will be used to transmit Unit No. 2 power from the site to the Buchanan substation. Steel pole construction for transmission lines is a rather recent concept that is gaining acceptance in the utility industry for use in areas where aesthetic values are of prime concern. The tapered steel pole with upswept crossarms is more graceful than conventional latticed towers and the configuration coupled with the latest engineering knowledge as to insulator requirements and spacing of the conductors permits a narrower structure than a latticed tower.

3. Recreation and education

As previously mentioned, the northern part of Con Edison's Indian Point site includes an 80-acre forest with a

freshwater lake. This woodland is being maintained for use of the visiting public. Picnic tables and benches are located in shaded areas around the lake, which is available for fishing. A marked trail of approximately 2,000 feet starts at the lake and terminates at the Hudson River shoreline. Parking and toilet facilities are available to visitors in these areas.

A parcel of approximately 18 acres at the northwest corner of the site has been transferred by Con Edison to the Village of Buchanan, to be developed as a public marina.

The visitors' center now in use has been operating since September, 1959 and has served some 381,000 visitors. A tour of the Indian Point facilities begins at the information center where films, exhibits, and binoculars for viewing the site are available. Visitors then proceed by bus to the station, where they may tour the turbine hall and other portions of the station.

Con Edison is now in the process of developing a master plan for enhancing the educational, recreational and scenic value of the site for the visiting public, as well as providing facilities to accommodate a considerably larger number of visitors. To accomplish this Con Edison has engaged M. Paul Friedberg and Associates, a firm accomplished in the

fields of landscape architecture and urban planning, as a consultant in these matters. While the details have not as yet been determined, the following is an outline of what will be done:

1. A new visitors' center will be constructed to the south and east of the plant. This center will be considerably larger than the existing one and will include more sophisticated exhibits. Outdoor exhibit areas may also be provided. The exhibits themselves, which will be designed by Atkins and Merrill, will focus upon the peaceful uses of nuclear energy. Outdoor overlooks and expanded parking facilities will be provided. Vincent G. Kling and Associates has been retained to design the actual structure.

2. Picnic facilities, trails and other facilities will be improved and expanded. Facilities for nature study will be provided.

3. As mentioned previously, there will be extensive landscaping of areas of the site which have previously been cleared. This will be done in a manner that is attractive and consistent with the natural surroundings.

4. The plan includes the development of the Trap Rock site in a manner consistent with that of the Indian Point site.

These new facilities will improve the attractiveness and usefulness of the site to the general public.

The major recreational uses of the area surrounding the site are fishing, boating, and use of the various parks in the general vicinity. Neither these or any other recreational uses of the area will be foreclosed or impaired by Unit No. 2 (or the other units).

4. Historical preservation

There are some picturesque buildings and streets in neighboring communities. The nearest landmarks of consequence are St. Peter's Church and Cemetery in Verplanck, and St. Mary's Cemetery along the Broadway Road. Unit No. 2 will not infringe upon these or any other historical landmarks or areas.

5. Population and congestion

Unit No. 2 when completed will have no significant direct effect upon traffic or other congestion. An increase in the station staff of only about 25 persons will be required. The increase in visitor traffic due to the attraction offered by the new visitors' facilities will be accommodated by improvements in the site road network and parking

areas. Finally, the location of a second nuclear generating unit at Indian Point is not expected to affect the overall development or the population patterns of the surrounding area so as to aggravate traffic or other congestion.

6. Wildlife

While some relocation of wildlife has occurred as a result of construction, large areas of the site remain untouched and as such provide immediate refuge for wildlife movement. This has held to a minimum the actual distance of wildlife relocation. The areas disturbed during construction will be rehabilitated and resettlement of wildlife can be expected.

C. Operation of Unit No. 2

1. Radiological effects of operation

Under normal operating conditions small amounts of radioactive wastes will be released from Unit No. 2 into the atmosphere and into the cooling water discharge to the Hudson River. These releases will be in compliance with Part 20 of the regulations of the AEC. For the purpose of determining compliance with these regulations Indian Point Units 1, 2 and 3 will be treated as a single facility. The combined releases from all three units are expected to be far below the regulatory limits.

The following tables contain the quantities of liquid and gaseous effluents which are expected as a result of facility operation. It must be emphasized, however, that these estimates are based upon predicted performance of fuel and certain plant components and systems; actual releases may be higher or lower than those predicted.

ESTIMATED LIQUID EFFLUENTS

	Indian Point Unit No. 2		Units 1, 2 and 3 Combined (a)	
	All Others	Tritium	All Others	Tritium
Curies Per Year	.0252	4238	36.95	9228
Concentration Curies/cc	$.2 \times 10^{-14}$	283×10^{-14}	6.5×10^{-14}	691×10^{-14}
Fraction of Maximum Permissible Concentrations at Point of Discharge	0.00002	0.00090	0.039	0.0022

(a) With Indian Point Unit No. 1 Average 1967-1969

The numbers above for Units 2 and 3 are for 1% failed fuel. With no failed fuel, the numbers are approximately equivalent to those for tritium alone.

ESTIMATED GASEOUS EFFLUENTS

	Indian Point Unit No. 2	Units 1, 2 and 3 Combined (b)
Curies Per Year	9850	19876
Concentration Curies/cc	0.9×10^{-14}	2.1×10^{-14}
Fraction of Maximum Permissible Concentrations at Site Boundary	0.015	0.035

(b) With Indian Point No. 1 Average 1967-1969

The numbers above for Units No. 2 and 3 are for 1% failed fuel.

The above estimates do not take into account a reduction in the height of the Unit No. 1 stack from elevation 470 feet above sea level to the elevation 390 feet above sea level.* This modification, which is subject to AEC approval, will be accomplished as a result of seismic considerations in the Unit No. 2 design. The effect of this change upon the concentration figures listed above has not yet been calculated in detail but is certain to be insubstantial.

Based on the estimates presented above, the radiation levels to which a person on the site boundary would be exposed as a result of plant operation are only a fraction compared to that which he normally receives from background radiation.

*The general terrain around the plant varies from approximately elevation 15 feet to elevation 70 feet above sea level.

Equipment is provided for processing of radioactive wastes in order to reduce to a minimum the amount required to be released to the environment. This equipment is described in Section VI.B.1. below, as is the instrumentation provided to insure compliance with regulatory requirements and to protect against and warn of inadvertent or accidental releases.

Administrative procedures will control the manner in which gaseous and liquid effluents are released. As provided by current AEC regulations Con Edison will keep such releases as far below regulatory limits as practicable.

A comprehensive environmental monitoring program has been conducted in connection with the operation of Unit No. 1. Results of this program to date have shown that operation of Unit No. 1 has had no adverse radiological effect on the environment.

This program will continue as Units No. 2 and 3 become operational and throughout their operating lifetime. Operation of Unit No. 2 (as well as Unit No. 3) is likewise expected to have no adverse radiological effect upon the environment. The environmental monitoring program and other programs and studies are described in Section VI.A.2. below.

Solid radioactive wastes will be packaged and transported to an authorized disposal area in accordance with applicable governmental regulations.

Great attention has been devoted in the design and construction of Unit No. 2, by Con Edison and its contractors and by the Atomic Energy Commission, to the prevention of accidental releases of radioactive materials to the environment. Much of the cost and design effort of the unit is devoted to structures and equipment for the prevention of accidents and the limiting of the consequences of an accident should one occur. Numerous postulated equipment failures, abnormal operating conditions, and operator errors have been analyzed to assure that the health and safety of the public will be protected. A comprehensive quality assurance program is carried out during design and construction to assure that the unit as constructed will meet its design objectives. Operator training, detailed operating and emergency procedures, and periodic tests and inspections over the lifetime of the unit will assure the safe operation of the facility. The Final Safety Analysis Report for Unit No. 2 filed by Con Edison with the Atomic Energy Commission covers these subjects in detail.

The construction permit which Con Edison now holds for Unit No. 2 was issued after intensive review by the AEC Regulatory Staff and the Advisory Committee on Reactor Safeguards, of Con Edison's preliminary design, site studies and safety analysis, and after a public hearing conducted by an Atomic Safety and

Licensing Board appointed by the Commission. An operating license will be issued for Unit No. 2 only after the AEC has conducted another comprehensive safety review and has found that public health and safety have been assured.

2. Water quality

Unit No. 2 will discharge considerable quantities of warm water to the Hudson River. Also, small amounts of certain chemicals used for cleaning and water purification will be released to the river during operation. These discharges will be made in accordance with applicable water quality standards, and are subject to the certification requirement of Section 21(b) of the Federal Water Pollution Control Act as amended. In the case of Unit No. 2 certification is required to be submitted to the Atomic Energy Commission by April 1973. As provided by § 21(b)(7) of that Act, such certification is not required prior to issuance by the Atomic Energy Commission of an operating license, since construction of Unit No. 2 was lawfully commenced long before April 3, 1970 (the date of enactment of the Water Quality Improvement Act of 1970). Nevertheless, Con Edison has already made application to the New York State Department of Environmental Conservation for such certification and will take all necessary steps to obtain certification on a timely basis.

3. Air quality

Unit No. 2, like other nuclear power plants, will release no combustion products to the atmosphere as a result of

reactor operation. It will, however, have two "package boilers," fueled by #6 fuel oil (.37% sulphur), to produce auxiliary service steam for plant startup and service heating. The exhaust from these boilers will be discharged through the Unit No. 1 superheater stack. The amount of combustion products released per year resulting from the addition of these boilers will be insignificant. The contribution to air pollution of the reduction in Unit No. 1 stack height previously mentioned will not lead to a significant increase in air pollution.

However, if the Indian Point No. 2 nuclear station had been planned and constructed as a fossil-fuel plant, the contribution to the air pollution would not be negligible. For an 873 MWE fossil unit operated for 6500 hours per year, the following pollutants would be released to the atmosphere each year, using different types of fuel.

Estimated Millions of Pounds of Pollutants Per Year Based on 6500 Hour Operation/Year/Fuel.

Item	Coal (1% Sulphur)	Oil (1% Sulphur)	Gas
Particulate	2.56	0.86	-
SO_2	75.97	54.57	-
NO_2	32.34	19.07	11.24
CO	1.99	-	-

R_a-226	(Fly Ash Removal)	(Fly Ash Removal)
	99%	0%
	6 m Ci	5.2 m Ci
R_a-228	3.8 m Ci	12.2 m Ci

In terms of air pollution, the advantages of a nuclear unit such as Unit No. 2 over a fossil-fired unit of equivalent size are considerable. It should be noted that the use of a nuclear generating unit such as Unit No. 2 may result in reduction of air pollution considerably greater than the percentage of the system generating capacity which the unit represents, for two reasons. First, the use of such units will permit the retirement of old and inefficient fossil-fired units located in heavily populated areas. Second, it is generally desirable to use the nuclear units for base load and fossil-fired units (with their higher unit fueled costs) for peaking where possible, thus concentrating idle time and operation at less than capacity in the fossil-fired units.

4. Water use; aquatic life

(a) Fish Protection

Unit No. 1 at Indian Point went into full operation in 1963. Unit No. 2 is adjacent and to the north and will go into service in 1971. Cooling water from the river passes through intake screen structures directly in front of each unit, and after condensing the stream returns to the river, via a discharge canal, at a point approximately 950 feet downstream from the centerline of Unit No. 1.

Intake screens serve the necessary function of "screening" the cooling water of anything large enough to plug the water passages in the plant equipment and thus render the plant inoperative. At the entrance is a trash rack - heavy bar members on wide spacing - designed to restrain logs and other large debris as well as floating ice in wintertime. Behind this is a traveling screen of relatively fine mesh to prevent entry of smaller material. This is made up of a number of screen sections, fastened top to bottom, to form an endless belt of screens. The addition of top and bottom rotating wheels results in a screen which continuously moves vertically upward through the cooling water, over the top and then, before it enters the water on its downward pass, is sprayed with high pressure water to wash off any material picked up on the up pass. Provisions are also made for placing fine

mesh stationary screens in front of the traveling screens, generally to permit the removal of the traveling screen for repairs or inspection.

The cooling water intake of Unit No. 1 has experienced problems with fish being impinged on the screens from time to time since it went into full operation in 1963. Much effort has been expended both to determine why the problem exists and to solve it by design modifications. The intake structure and screening of Unit No. 1 were modified a number of times to improve the protective devices and to enable fish to avoid the intake more easily. Because it was felt that warm water from the Unit No. 1 discharge might be attracting the fish, the outflow has been moved downstream on two occasions and is now more than 950 feet from the centerline of the Unit No. 1 intake and more than 1200 feet from the centerline of the Unit No. 2 intake. Other methods such as air bubble, accoustical, electrical and lighting devices have been investigated without success.

Nevertheless, operating experience during the winter months of 1970 indicated that the problem was not completely solved. Considerable numbers of fish were removed from the screens on occasions during December 1969 through March of this year. An analysis of the species removed from the screens on one of these occasions showed that 92% were white perch, 4% were striped bass,

and the remainder were divided among five other species. The average weight of the fish collected was less than 1/2 ounce and the average length was under three inches. Evidence indicates that the swimming performance of the fish, particularly white perch, is impaired in cold water temperatures, preventing them from escaping impingement even by relatively low intake flow velocities.

Because of Con Edison's recent problems this past season, several changes will be made to the Unit No. 1 fish protective system before this coming winter season. The major change consists of introducing a throttling procedure during the operation which will reduce the intake velocity substantially. This will be done by partially closing the condenser outlet valves or by other means. Tests run in April, 1970 on Unit No. 1 (when the intake water temperature was 40°F) indicate that this throttling procedure was highly effective in lowering the amount of fish brought up on the traveling screens.

Investigations indicate that chemical and radioactive discharges from the plant are not contributing factors in harming fish, nor are thermal discharges (except to the extent that the warm water might attract fish to the area of the intake).

Unit No. 2 will draw about 900,000 gallons of water per minute from the Hudson River for cooling purposes. This

water will be drawn in through a concrete intake structure on the river edge. There are eight inlets flush with the river edge, six for the main circulating pumps and the other two for the auxiliary service pumps. Eight channels, separated by concrete walls, lead inland from the openings. Each channel includes a trash rack, a vertical traveling screen (except for one of the auxiliary service pumps which serves as backup and has only a fixed screen), provision for outer fish protective screens, and associated equipment for cleaning of the screens. The pumps are directly behind the traveling screens. The structure is designed to provide an intake water flow velocity approaching all of the screens of less than one foot per second. Construction of the intake is now substantially complete.

The location of the Unit No. 2 intake, unlike that of the Unit No. 1 intake, is not behind the existing loading wharf, a possible attraction for fish. Therefore, there is reason for belief that the problem will not exist to the same degree for Unit No. 2. Nevertheless, because of experience with Unit No. 1, Con Edison recognizes that there may be a fish protective problem with the current design of the Unit No. 2 intake.

Because of this, tests will be run prior to plant startup with the Unit No. 2 circulating water pumps to determine whether fish will be attracted to the intake and how they

will react to the operation of the screens and pumps. Fish density tests will also be run up and down the shoreline at Indian Point to establish if fish are attracted any more (or less) to the Unit No. 2 intake area than to any other location, particularly to the Unit No. 1 intake area.

As an interim measure, fish protective screens will be installed prior to the commercial operation of Unit No. 2. The protective screens will be installed at the outer face of the intake structure in guides already provided in the walls. Based on Unit No. 1 operating experience, a throttling capability will be incorporated to substantially reduce the intake velocities during the colder parts of the year.

During the throttling operation, the average approach velocity to the protective screens will be lowered from about 0.85 feet per second to about 0.6 feet per second. This will result in a reduction of flow through the plant condensers from 840,000 gallons per minute to 600,000 gallons per minute. The cooling water temperature will be increased approximately 23°F during its passage through the condenser, which is a rise of 7°F over that expected with 100% flow. Since it is expected that the throttling procedure will be needed only in the colder part of the year (river temperatures less than 50°F), plant discharges will be well within the allowable limits set forth in the Thermal

Discharge Criteria of the New York State Water Quality Standards. Tests will be run on the above throttling procedure for Unit No. 2 during the winter of 1970-71 to confirm its effectiveness prior to commercial operation.

As an additional measure, Con Edison has decided to change the motors of the circulating water pumps to include a two-speed capability. This will allow the intake velocity to be lowered below 0.5 feet per second when needed. This change, however, cannot possibly be made prior to the startup of Unit No. 2 (late spring, 1971) but every effort will be made to have the new motors installed for the winter season of 1971-72.

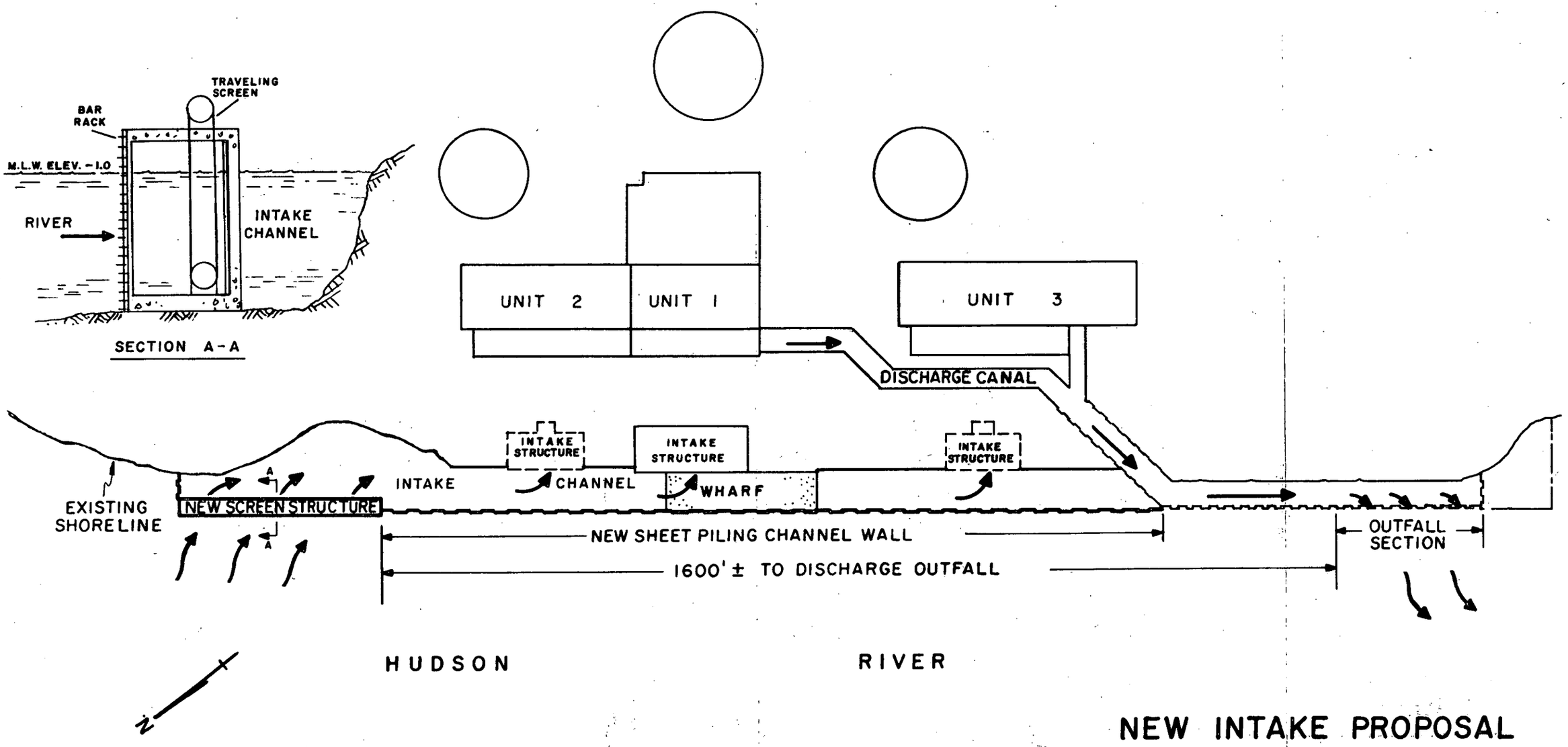
From recent experience, Con Edison knows that regardless of the anticipated effectiveness of a fish protection system, the possibility exists that it will require further improvement. As a result, in addition to implementing the design modification mentioned above, Con Edison is engaged in a program of ecological and engineering studies in the area of fish protection. This program is described in Section VI.A. 3 below.

As a long term solution in the area of fish protection for Unit No. 2 as well as for the other units at Indian Point, Con Edison engineers are developing a new intake water concept which appears very promising. This scheme will include a new screen structure built farther out from the shore (75' - 100')

and more into the main longitudinal flow of the river. This structure would screen water for all three Units at Indian Point and would be designed to permit intake velocities below 0.5 feet per second during the colder parts of the year. The attached sketch (Figure 1) shows a plan of the proposed scheme. The main advantages of the proposed structures are:

1. To minimize recirculation effects to the intake point from the discharge outfall which is an attraction mechanism.
2. To deny access under the unloading wharf to fish, thereby eliminating the probability that the wharf is acting as an attraction.
3. To place the traveling screens out where the river's stronger currents can longitudinally wash the face of the screens.
4. To achieve low intake velocities.
5. To provide other operational benefits not directly related to fish protection such as greater unit efficiency with reduced recirculation, and removal of the existing eddying conditions which lead to greater accumulation of river debris in front of the individual units.

Engineering design and associated research and



NEW INTAKE PROPOSAL
INDIAN POINT STATION
FIGURE 1

development have already begun on this project and it is hoped that the work will be completed and in operation by the spring of 1973. Further work on this project will take fully into account the ecological and engineering studies referred to in Section VI.A. 3.

A technical task force has been formed within the Company, headed by the Company's Chief Civil Engineer and including its Environmental Engineer and the General Superintendent of the Indian Point Station. The purpose of the task force is to concentrate and coordinate Con Edison's efforts in implementing the plans and studies on fish protection. To assist the Task Force, an Indian Point Fish Advisory Board consisting of expert biologists and engineers from the United States and Great Britain has been brought together by Con Edison. The Board has been requested to provide advice to Con Edison on how to protect fish from damage from the operation of Indian Point power plant cooling systems. The Board has held a number of meetings with the Task Force and with other individuals and organizations outside of Con Edison.

Con Edison has reviewed with the Indian Point Fish Advisory Board the overall program described above for fish protection in connection with operation of the Indian Point plants. The Board is of the opinion that, in light of present knowledge, the program provides the best immediate approach to the fish

protection problems at Unit No. 2 and the most promising longer range solution to these problems for all units at Indian Point. The Board further believes that additional studies are needed to expand present knowledge in this area and that the planned program of studies is adequate to provide the design parameters for future plant modifications.

In view of the studies undertaken and design modifications planned, Con Edison does not expect that the Hudson River fishery will be adversely affected by the operation of Unit No. 2.

(b) Other aquatic life

Aquatic life which is small enough to pass through debris screens and which does not possess sufficient mobility to avoid the intake flow will be carried through the cooling water condensers of Unit No. 2. Phytoplankton, zooplankton, eggs and larvae of various organisms will be the types most commonly withdrawn. In passing through the condenser these organisms will be exposed to a rapid temperature increase followed by a gradual return to ambient temperature. The effects of this passage on these various organisms is presently under active investigation by Con Edison consultants and other investigators. As a part of the Raytheon and the New York University studies described in Section VI.A. below, the variety and abundance of these organisms and ecological effects are being determined. Thermal shock

bioassays will be conducted on various organisms. The effects of the operation of the plant on benthic organisms in the vicinity are also included in the studies mentioned above.

On the basis of the investigations and studies conducted to date, it is considered that the effect of the operation of Unit No. 2 on small aquatic life is not likely to have a significant adverse impact on the ecology of the Hudson River.

5. Noise

No noise problem will be created by the operation of Unit No. 2.

D. Utilization of Unit No. 2

In reviewing the environmental effects of a facility such as Unit No. 2, certain beneficial effects on the human environment should not be overlooked. The unit will supply a substantial part of the energy needs of hundreds of thousands of people. Many of the uses of electric energy take the form of improving, by means of heating, lighting, and cooling of homes and places of work, a part of the environment where people spend a large portion of their time. In a broader sense, other uses of electricity such as cooking, street lighting, elevators, and refrigeration are essential if life in urban areas is to be socially productive or even tolerable. A feature of electric

energy particularly important in urban areas is that it is pollution-free at the point of use.

IV. Alternatives to the proposed action

Alternatives to the completion and operation of Unit No. 2 will be discussed both in the context of 1965, when the decision to construct the unit was made, and in the context of the present.

Prior to the 1965 decision Con Edison, in determining how best to provide base load capacity to meet the projected demand for electricity in its service area, considered both alternative power sources and alternative sites. Urban sites in Brooklyn, Queens and Staten Island were considered for fossil units, and other suburban sites for a nuclear unit were considered.

The decision to build a second nuclear unit at Indian Point rested primarily on the following factors:

1. The difficulties relating to air pollution of a new, close-in, fossil-fueled unit.

2. The unacceptability of a new, close-in nuclear unit because of uncertainties in obtaining various regulatory approvals for such a unit within a schedule when the unit would be needed.

3. The fact that the Indian Point site had already been approved for a nuclear unit by the U. S. Atomic Energy Commission and the apparent unavailability of other sites within the Con Edison service area which might be approved by the AEC and also win public acceptance.

4. The relative overall economic advantage of a nuclear unit at the 1965 price at Indian Point in comparison with a close-in fossil-fueled unit, even after taking into account the cost of transmitting power from Indian Point to the City.

At the time of the 1965 decision, gas turbines had not been developed to the point of being seriously considered as an alternative base load source of power. (In the judgment of Con Edison they are still not suitable for such load.)

Indian Point No. 2 is now almost completed and subject to obtaining necessary regulatory approvals is expected to go into commercial operation in 1971. Thus, the only question which can be realistically asked at this time is whether there are now reasonable alternatives to the completion and operation of that unit in 1971 or 1972.

The shortage of generating facilities in the Northeast, in New York State and specifically in New York City are so well known that it would seem unnecessary to give detailed statistics on system capacity and expected reserves for the period through 1972. Even if it were conceded that because of the use of gas turbines and an unusually high availability of old fossil-fueled units a serious situation would not arise in 1971, the adequacy of system reserves would certainly be a major problem by 1972. Therefore, it seems reasonable to discuss the present alternatives in relation to that

year, ignoring for such purpose the very large investment already made in Unit No. 2 which is non-recoverable and most of it not useable at some other site, and the related problem of financing the very large cost of any alternative.

Fossil-fueled units require an estimated 4 1/2 years to complete, even on an existing site, and so they are not a reasonable alternative for 1971 or 1972.

A nuclear unit could not possibly be designed and constructed for operation at another site in 1971 or 1972, even if, which is improbable in the extreme, another site could be found which would be more appealing from the standpoint of preservation of environmental values.

It is not anticipated that Con Edison will be able to contract for the purchase of additional capacity from other utility systems beyond that which is already included in its planned capacity schedule. A review of the installed reserves of neighboring utilities indicates that they cannot be expected to have additional capacity available for sale.

The only possible alternative would be gas turbines, and from the standpoint of environmental values and conservation of resources, the balance favors the nuclear unit. Gas turbines are fueled either by high grade oil (the supply of which is uncertain since most has to be imported) or gas (in the case of natural gas, a regular use

of a large quantity in the winter would be hard to obtain due to the large demand by Con Edison's gas customers) and these are resources which will be more exhausted over 40 years, the anticipated operating life of Unit No. 2, than will be the supply of nuclear fuel.

Also, gas turbines have not yet been developed (and could not be developed for use in 1972) to the point that they can be operated in sizes which can provide a base load source of power, although they now appear to be desirable for use for peaking power. They therefore cannot be considered equivalent to a base load unit, such as Unit No. 2.

V. Environmental perspective; commitments of resources; long-term productivity

Unit No. 2 will consume a certain amount of nuclear fuel in the form of uranium 235 in the process of generating electricity. The amount so consumed does not represent a threat to the supply of uranium in this country and will not foreclose military or other uses of nuclear materials. Unit No. 2 will also utilize a certain amount of land and water during its lifetime.

An adequate and reliable supply of electric power is essential to the welfare, health and safety of persons residing in the New York area. The electric power generated by Unit No. 2 will be beneficial to the long-term productivity of the area. The commitments of resources referred to above are reasonable, both in the absolute sense and in comparison with the commitments of resources which would be involved in the generation of an equivalent amount of electrical power by other means. They do not represent an expedient use of resources at the expense of some more important long-range benefit which could be otherwise obtained.

VI. Supplemental information

A. Environmental studies

1. Ecological studies

A detailed study of the ecology of the Hudson River in the general vicinity of Indian Point is now being performed by the Raytheon Company. This study is being financed by Con Edison but is being carried out under the sole direction of the Hudson River Policy Committee, an independent body made up of representatives of the New York State Department of Environmental Conservation, the New Jersey Department of Conservation and Economic Development, the Connecticut Department of Conservation, the U. S. Bureau of Sport Fisheries and Wildlife and the U. S. Bureau of Commercial Fisheries.

The study is oriented toward determining the effect of plant operation generally on the biota of the Hudson River, whether thermal, chemical or mechanical. Under this study:

(a) The seasonal distribution of fish and key organisms which might be affected by environmental changes attributable to plant operation at Indian Point is being studied, both within and outside of areas subject to withdrawal of cooling water for all three units. Extensive sampling of small organisms in the river is being taken at intervals along a 13-mile stretch of the river, including Indian Point. Their presence will be determined by employing surface, mid-water and bottom nets of

appropriate mesh size and benthos samplers. Small organisms entering the plant through the intake will also be sampled. The presence of large fish throughout the same area is being determined by employment of anchored and towed nets. Larger striped bass and sturgeon found in Haverstraw Bay in late winter are being marked with sonic tags and their movements traced during spring. Key zooplankters are being separated to genera and species. All other material and plankton samples will be identified at least to family. Fish in net collections are separated by species, enumerated and measured. Specimens of each species are being retained. Data from routine sampling is being entered on coded reports for automatic data processing. This phase of the program will provide much valuable baseline information against which the effect of operation of Units No. 2 and 3 can be measured.

(b) Organism survival studies are being conducted for nonscreenable fish and other key organisms to determine the synergistic effects of temperature rise and chemical additives on their survival and development following their passage through the plant. Equipment is operated in the discharge canal to collect those organisms that have either passed through the plant or entered directly from the river. Key organisms will also be maintained in a laboratory where their survival or tolerance on exposure to temperature and chemical changes equivalent to those of plant operation will be determined.

(c) The physical and chemical characteristics of the river associated with observed change in the biota (i.e. temperature, salinity, conductivity, dissolved solids, suspended solids, dissolved oxygen, additives, and physical alterations) is being studied. Continuous monitoring by instrumentation is being used where practical.

In 1968 New York University Institute of Environmental Medicine began a program of investigation of the ecology of the Hudson River for Con Edison. The present study is a continuation and expansion of a previous ecology study of the river conducted by the University and supported by the U. S. Public Health Service and the New York State Department of Public Health.

The New York University ecological survey encompasses physical, chemical, biological, and radiological investigations of the aquatic habitat at Indian Point. Temperature, salinity, and turbidity are the physical characteristics being investigated. Nutrients and trace elements are chemical features being investigated. Phosphate and nitrate concentrations as well as cadmium, cobalt, chromium, copper, iron, manganese, nickel, lead and zinc were monitored through 1969.

Phytoplankton, zooplankton and fish are being sampled as part of the biological work. The plankton sampling

will identify the species present and the seasonal cycles of abundance for this area. The fish sampling consists of shore seining at a single station on each side of the river at Indian Point. This sampling will provide data on the species composition and relative abundance of fish in the shore areas.

Samples of water, mud, fish, and vegetation are being analyzed for natural and man-made radionuclides. Previous and concurrent studies of Hudson River ecology have provided comparative data for the Indian Point survey.

2. Radiological studies

Numerous studies have been conducted by Con Edison and its consultants to insure the suitability of the Indian Point site for the location of Unit No. 2 and the other two nuclear units. These include studies of the geology, seismology, meterology, hydrology and demography of the site. The Final Safety Analysis Report for Unit No. 2 contains detailed information on these studies.

Con Edison's environmental monitoring program, referred to in Section III.C.1. of this report, includes measurements of radioactivity in fresh water, river water, river sediments, fish, aquatic vegetation, vegetation, soil and air in the vicinity of the Indian Point station. This program began with a survey instituted in 1958 (four years prior to operation of Unit No. 1) to determine the radioactivity in the environment in the vicinity

of the Indian Point station. The purpose of this survey was to determine the natural background radioactivity and to show the variations in the activities that may be expected from natural sources, fallout from bomb tests, and other sources in the vicinity. The program has been continued to the present so that changes in the environment resulting from operation of Unit No. 1 could be accounted for, and will be continued throughout the operating lifetime of all three units.

As a part of this program, rain is collected at the Indian Point station and at a point fifteen miles south of the station. This is a continuous collection which is sampled monthly and analyzed. Air samples are collected at two points on site by means of fixed-membrane filters followed by charcoal filters. Air collections will also be made off site at selected points with similar equipment.

Drinking water is sampled from nearby reservoirs and from the taps supplying water to the Indian Point station. Hudson River water is sampled at the inlet to the Indian Point Plant and at the plant discharge canal. This is a continuous collection which is sampled and measured weekly. The lake on site, the Trap Rock Lake and other lakes in the vicinity are sampled monthly and measured for gross beta and tritium. Two wells, one on site and one in Verplanck, are sampled monthly and analyzed.

Aquatic vegetation from the lake on site and other nearby lakes is sampled periodically and analyzed for gross beta, and a gamma spectrum is also run. Aquatic vegetation is collected from the Hudson River at points at the discharge canal, one-half, one and two miles downstream from the plant. This vegetation is analyzed in the same manner as the lake aquatic vegetation. Bottom sediment is taken from the Hudson River in the vicinity of the plant and at points one-half, one and two miles downstream. This sediment is measured for gross beta activity and is also analyzed for gamma activity and radionuclide content.

River fish caught in the vicinity of the plant are measured for gross beta and a gamma spectrum analysis made. Land vegetation is sampled primarily in the downwind direction from the plant at points one-quarter, one-half, one and two miles south of the plant.

The direct gamma background is monitored along principal roads within a five-mile radius of the plant, at approximately .10 mile intervals. Direct gamma measurement is made continuously at selected locations in Buchanan, Verplanck, Montrose, Peekskill and at a number of points on site. This measurement is made with low-level ionization chambers and film

badges, and thermal luminescent dosimetry may be utilized in the future.

The monitoring program supplies data supplementing the primary control at the source of the effluents, to insure compliance with the requirement of 10 CFR Part 20. The results of the program are reported to the AEC on a semi-annual basis. Reports containing the results of the surveys conducted thus far have been reported to the AEC under Docket No. 50-3. In addition, 10 CFR Part 20 provides for rapid reporting of any unusually high releases. The results of the monitoring program are also reported to the New York State Department of Health if the monthly discharges exceed certain levels.

New York State through its Department of Health has been conducting its own monitoring program in the vicinity of the site since 1958. In 1965 and 1966, the Department reported its findings in the vicinity of the Indian Point Station in two special reports. Since that time, its reporting has been on a statewide basis in quarterly bulletins and in annual reports. Both Con Edison's and New York State's programs are geared to provide greater intensity of surveillance, as the need requires, in the event of significant increase in radioactive discharges.

The New York University Institute of Environmental Medicine study described above includes some radio-ecological studies and the Raytheon studies may yield useful information in the radiological area.

3. Fish protection studies

The following is a summary of current studies underway which are geared toward a better understanding of the behavior of the fish species found in the river at Indian Point and possible ways of improving our protective devices.

(a) The ecological study, already mentioned, conducted by the Institute of Environmental Medicine of New York University will yield important information on the distribution and abundance of fish species, and on the biology of the white perch in the river.

(b) The Raytheon study, also described above, will yield information on fish distribution, population and behavior, particularly as it may be affected by the warm water discharge.

(c) Dr. Edward C. Raney of Ichthyological Associates has been retained by Con Edison to study the swimming performance, temperature avoidance, attraction and preference

of white perch and striped bass at different temperatures and flows, including the very low temperatures found in winter.

(d) Bechtel Corporation has been retained to conduct a complete review of all possible fish protective schemes which could be applied at Indian Point.

(e) Norman Porter Associates has been retained to do velocity studies for the intakes of the Indian Point units, as well as the natural water movements near the intakes.

B. Pollution control measures

1. Radioactive waste disposal facilities

Unit No. 2 contains a number of facilities for disposal of liquid, gaseous, and solid radioactive wastes. These facilities are designed to insure that the discharge of effluents and offsite shipments are in accordance with applicable governmental regulations.

The bulk of the radioactive liquids discharged from the Reactor Coolant System are processed and retained inside the plant by the Chemical and Volume Control System recycle train. This minimizes liquid input to the waste disposal system which processes relatively small quantities of generally low-activity level wastes.

Radioactive fluids from this and other sources entering the waste disposal system are collected in sumps and tanks until determination of subsequent treatment can be made. They are sampled and analyzed to determine the quantity of radioactivity, with an isotopic breakdown if necessary. They are then processed as required before release to the condenser cooling water.

Processing is done on a batch basis, with the liquid being evaporated and the solid residue removed for drumming and shipment offsite. The condensate is held in tanks and is again sampled before it is released under controlled conditions to the cooling water discharge. Provision is made for recirculation of the condensate if further reduction of activity is required. The discharge lines are monitored and activity recorded. If for any reason the effluent exceeds specific levels an automatic cutoff is provided as well as an alarm. From the point where waste processing begins to the point of discharge to the river, activity reduction by a factor of about one million is achieved.

Radioactive gases from various sources are collected and pumped by compressors to decay tanks where they are held until their activity is low enough for release. This

is determined by sampling the tanks. There is also a continuous indication in the control room of the activity in these tanks, as well as an alarm for high activity. Discharge is made through the plant vent. There are three continuous monitors in the discharge line - two for radioactive gases and one for particulates. There is also an automatic cutoff on this system to prevent inadvertent releases, as well as an alarm in the control room. The decontamination factor for this system is also about one million.

The atmosphere in the primary auxiliary building is continuously exhausted through the plant vent by way of the monitors mentioned above. If necessary this exhaust can be rerouted into the containment, which has its own ventilation system. The containment system has filters, demineralizers and recirculating fans which reduce the activity reaching the gas holdup system from the containment.

A drumming area is provided within the auxiliary building, with appropriate equipment for the preparation of solid wastes for disposal offsite. The spent resins from the demineralizers, the filter cartridges, the concentrates from the evaporators and other solid wastes are packaged and stored onsite until

shipped offsite for disposal. Suitable containers are used to package these solids, which is done at the highest practical concentrations to minimize the number of containers shipped for burial.

Area monitors are provided throughout the plant to warn of conditions which might lead to release of radioactivity to the environment and to permit appropriate operator action.

Detailed information on the design of the waste disposal system and associated monitoring equipment is found in the Unit No. 2 Final Safety Analysis Report.

2. Sanitary waste facilities

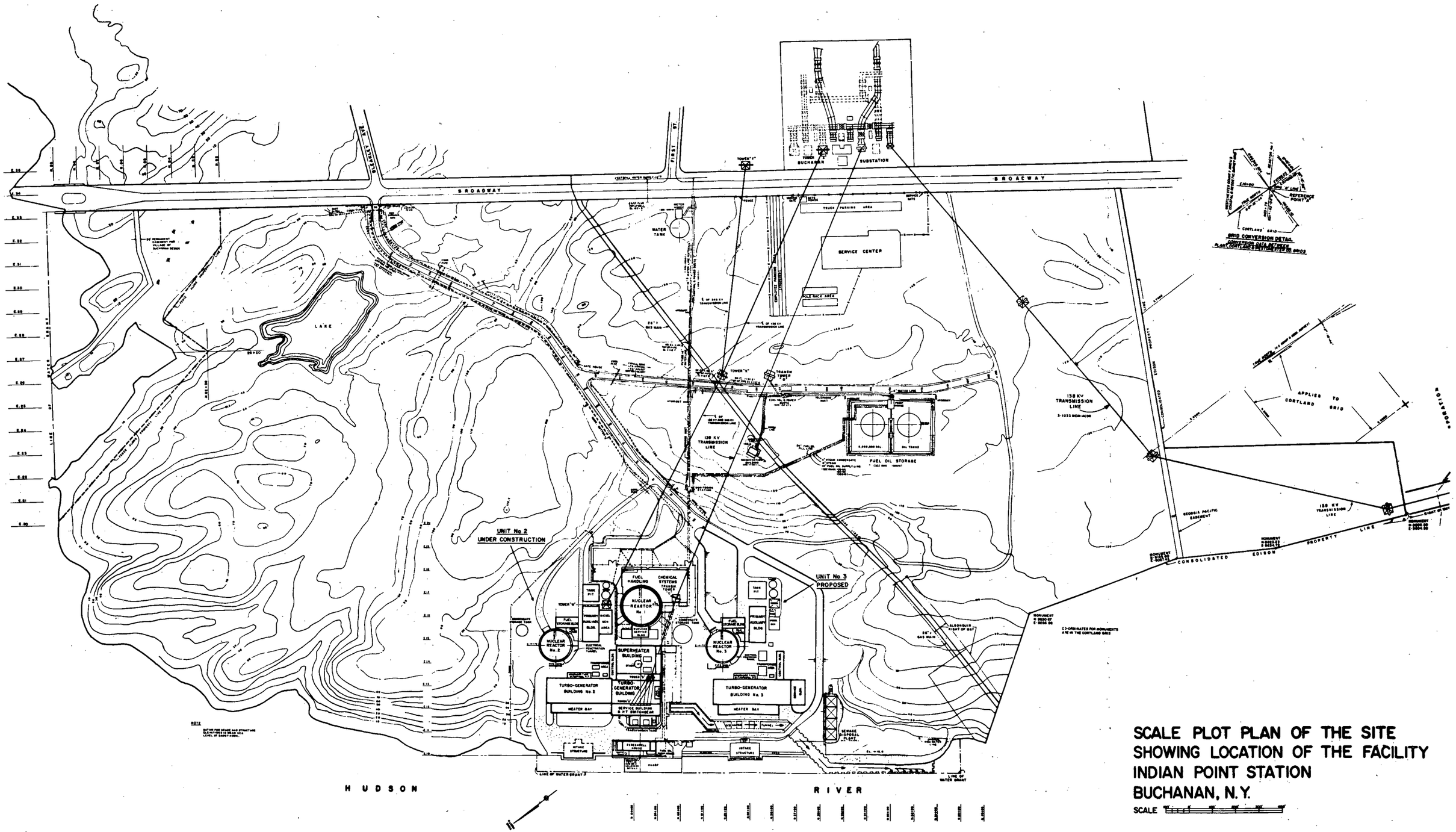
Sanitary wastes from Unit No. 2 will be treated via an existing onsite sewage disposal plant. This plant consists of comminutors, septic tanks, and sand filter beds. This system now serves Unit No. 1 and was originally designed to take into account future expansion of the generating station. The design and operation of this plant has been approved by both the New York State Department of Health and the Westchester County Department of Health. Based on original design parameters and the results of soil percolation tests, the existing disposal

plant will be adequate without modification to serve the Station when Unit No. 2 becomes operational.

C. State and local licensing agencies

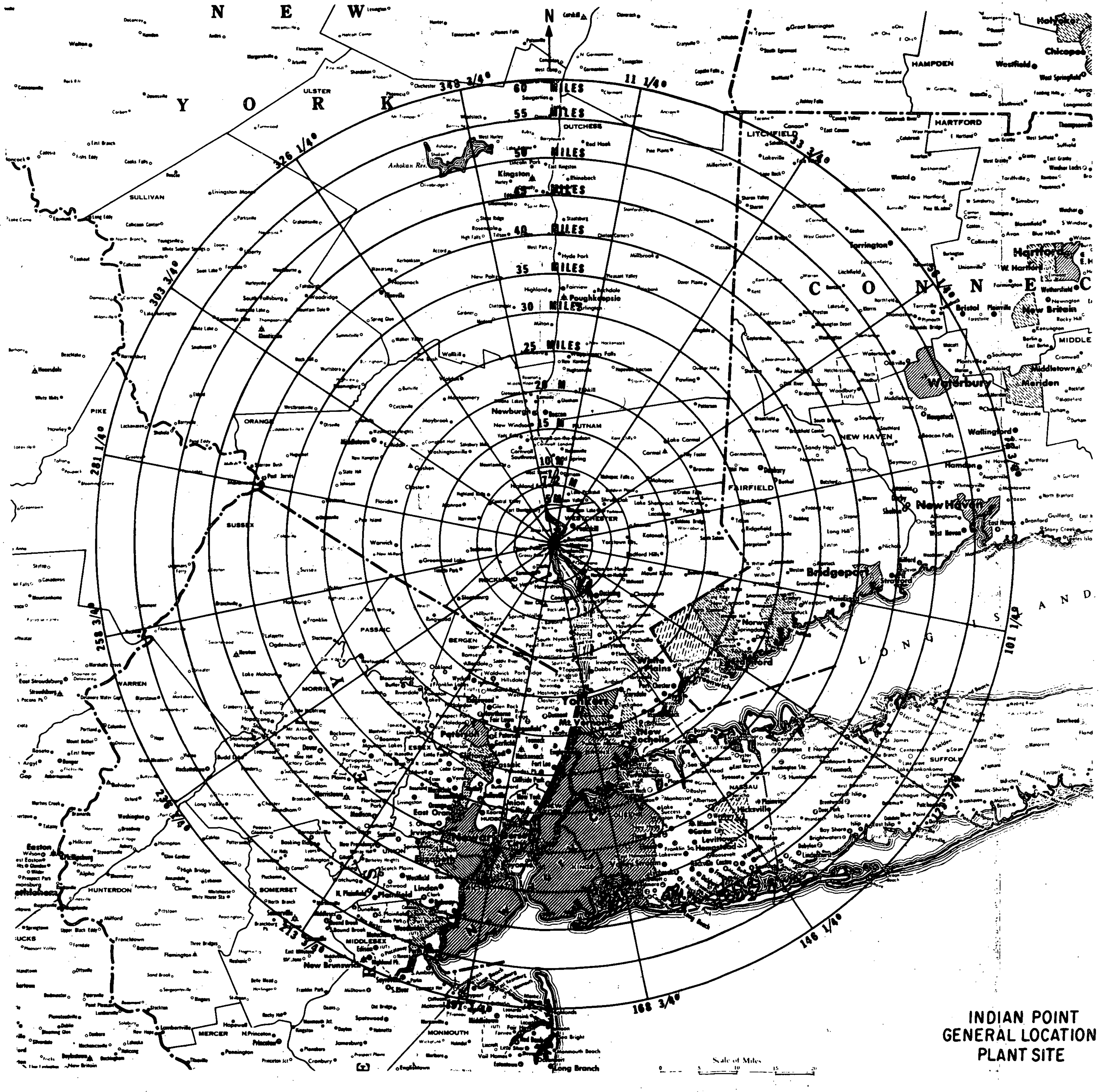
The following is a list of state and local agencies from which licensing permits or other approvals relating to environmental matters must be obtained before operation of the facility may begin.

1. New York State Department of Environmental Conservation
2. Westchester County Health Department
3. New York State - Office of General Services
4. Village of Buchanan (Town of Cortlandt) Building Department

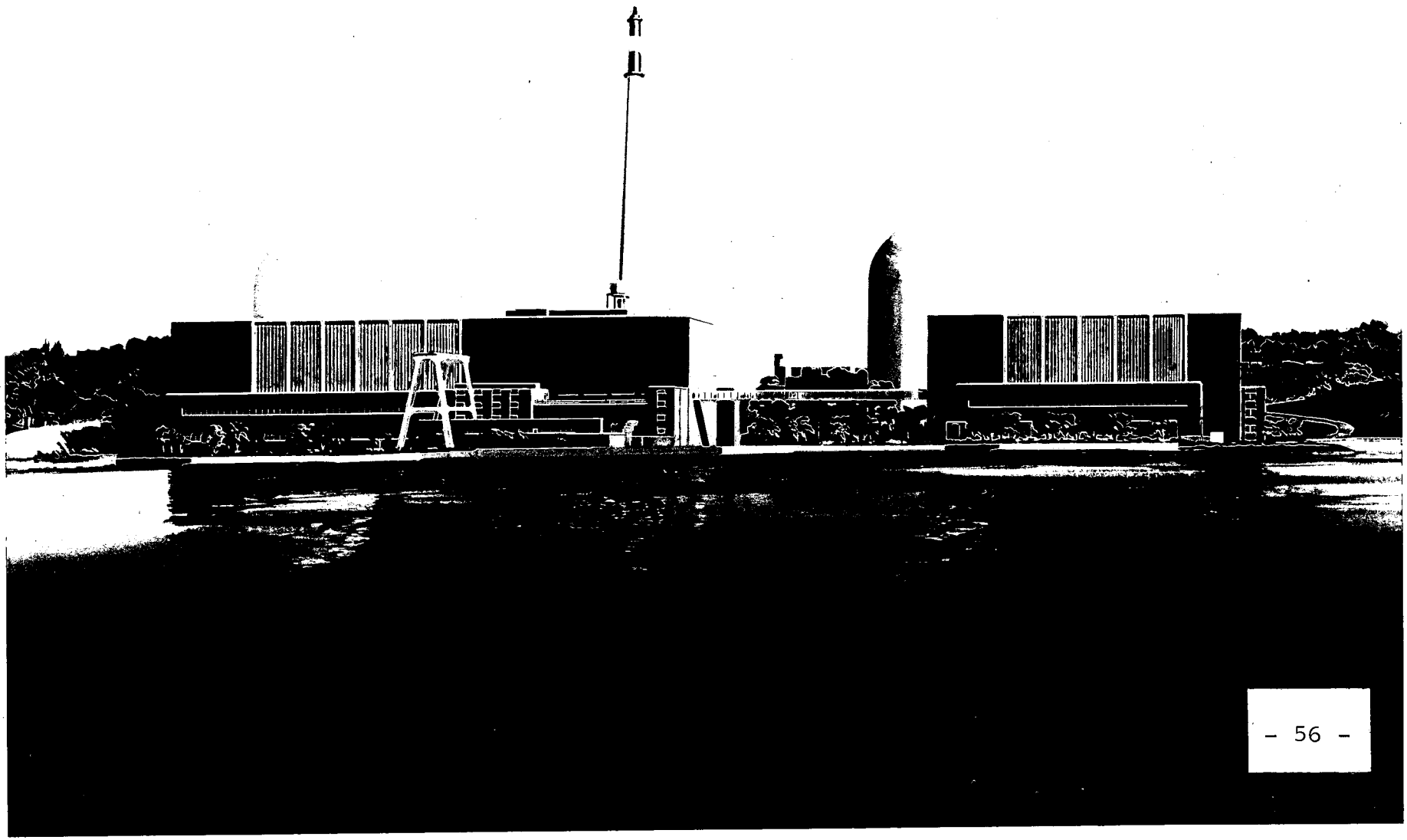


SCALE PLOT PLAN OF THE SITE
SHOWING LOCATION OF THE FACILITY
INDIAN POINT STATION
BUCHANAN, N.Y.

SCALE



INDIAN POINT
GENERAL LOCATION
PLANT SITE



17-5A

17-5A