

U. S. ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS
REGION I

RO Inspection Report No.: 50-219/73-03

Docket No.: 50-219

Licensee: Jersey Central Power & Light Company

License No.: DPR-16

Madison Avenue at Punch Bowl Road

Priority: _____

Morristown, New Jersey 07960

Category: C

Location: Oyster Creek Nuclear Station (OC)
Forked River, New Jersey

Type of Licensee: 640 MWe-BWR (GE)

Type of Inspection: Special - Announced (Environmental Monitoring)

Dates of Inspection: February 28 - March 2, March 5 & 7, 1973

Dates of Previous Inspection: February 13 - 16, 1973

Reporting Inspector: Charles O. Gallina

4/19/73
Date

C. O. Gallina, Ph.D., Radiation Specialist

Accompanying Inspectors: J. P. Stohr

4/23/73
Date

M R. J. Everett, Radiation Specialist

Robert A. Friess

4/23/73
Date

R. A. Friess, Environmental Specialist

Other Accompanying Personnel: NONE

Reviewed by: J. P. Stohr

4/23/73
Date

J. P. Stohr, Senior Environmental Scientist

SUMMARY OF FINDINGS

Enforcement Action (Environmental Monitoring)

The following items were found to be in apparent violation of Section 4.6, B(3) of the Technical Specifications of the Oyster Creek Nuclear Station:

1. Film badges used to measure atmospheric radiation were not changed every four weeks as specified. (Paragraph 4)
2. Air particulate samplers were not operated continuously at all five sampling locations. (Paragraph 5)
3. When air particulate samplers were operated, air particulate sample filters, in certain instances, were not changed at the specified two week interval. (Paragraph 5)
4. When air particulate sample filters were changed, gross alpha analyses were not performed in all instances as specified. (Paragraph 5)
5. Soil samples in certain instances were not taken at the specified four week interval. (Paragraph 6)
6. Vegetation samples in certain instances were not taken at the specified four week interval. (Paragraph 7)
7. Rainwater samples in certain instances were not taken at the specified four week interval. (Paragraph 8)
8. Domestic water samples in certain instances were not taken at the specified four week interval. (Paragraph 9)
9. When taken, domestic water samples in certain instances were not analyzed for additional nuclides at the specified 12 week interval. (Paragraph 9)
10. Surface water samples in certain instances were not taken at the specified four week interval. (Paragraph 10)
11. Silt samples in certain instances were not taken at the specified 12 week interval. (Paragraph 11)

12. Clams in certain instances were not sampled at the specified four week interval. (Paragraph 12)
13. When sampled, clams in certain instances were not analyzed for additional nuclides at the specified 12 week interval. (Paragraph 12)

Licensee Action on Previously Identified Enforcement Items (Environmental Monitoring)

None

Design Changes

None

Unusual Occurrences

None

Other Significant Findings (Environmental Monitoring)

A. Current Findings

1. Thirteen items of noncompliance were found with respect to the licensee's environmental monitoring program as specified in Technical Specification Section 4.6, B(3). (Paragraphs 4 - 12)
2. The licensee has not adhered to the water quality monitoring program as described in Section 5.5.2.3 of the OC Environmental Report. (Paragraph 16)

B. Status of Previously Reported Unresolved Items (Environmental Monitoring)

None identified

Management Interview

A management meeting was held on March 6, 1973 at the Parsippany office of Jersey Central Power and Light Company (JCPL). The following individuals were in attendance:

Dr. C. O. Gallina, Radiation Specialist, AEC
Mr. R. A. Friess, Environmental Specialist, AEC
Mr. D. A. Ross, Manager, Nuclear Generating Stations, JCPL
Mr. T. M. Crimmins, Jr., Safety and Licensing Manager, GPU
Mr. N. G. Trikouras, Safety and Licensing Project Engineer, GPU

A management meeting was also held on March 7, 1973, at the Oyster Creek site at the conclusion of the inspection. The following individuals were in attendance:

Dr. C. O. Gallina, Radiation Specialist, AEC
Mr. T. J. McCluskey, Station Superintendent, OC
Mr. J. L. Sullivan, Technical Supervisor, OC

The areas discussed at these two meetings are as follows:

Management Interview

A. Atmospheric Radiation

The inspector stated that the measurement of atmospheric radiation (radiogas) in conjunction with the licensee's operational environmental monitoring program was in noncompliance with Section 4.6, B(3) of the OC Technical Specifications in that the film badges had not been changed from August 30, 1971 to October 26, 1971, a period of greater than four weeks. (Paragraph 4)

B. Air Particulate Sampling

The inspector stated that the sampling of air particulates in conjunction with the licensee's operational environmental monitoring program was in noncompliance with Section 4.6, B(3) of the OC Technical Specifications in that (a) air particulate samplers were not operated continuously at all five locations, (b) when operated, air particulate sample filters in certain instances were not changed at the specified two week interval and (c) in certain instances gross alpha analyses had not been performed as specified. The inspector also pointed out that in two instances, air particulate samplers had been inoperable for periods approaching ten months. (Paragraph 5)

C. Soiling Sampling

The inspector stated that the sampling of soil in conjunction with the licensee's operational environmental monitoring program was in noncompliance with Section 4.6, B(3) of the OC Technical Specifications in that soil samples had not been taken from October 11, 1969 to December 6, 1969 and from August 30, 1971 to October 25, 1971, both intervals being greater than four weeks. (Paragraph 6)

D. Vegetation Sampling

The inspector stated that the sampling of vegetation in conjunction with the licensee's operational environmental monitoring program was in noncompliance with Section 4.6, B(3) of the OC Technical Specifications in that vegetation samples had not been taken during the period from August 30, 1971 to October 25, 1971 an interval greater than four weeks. The inspector also stated that various vegetation samples had been omitted during the time period from September to December of 1969. (Paragraph 7)

E. Rainwater Sampling

The inspector stated that the sampling of rainwater in conjunction with the licensee's operational environmental monitoring program was in noncompliance with Section 4.6, B(3) of the OC Technical Specifications in that rainwater samples had not been taken from one location (RW-3) from April 12, 1971 through June 13, 1971, a period greater than four weeks. The inspector also stated that various rainwater samples had been omitted from the period of September 1969 through November 1970. (Paragraph 8)

F. Domestic Water Sampling

The inspector stated that the sampling of domestic water in conjunction with the licensee's operational environmental monitoring program was in noncompliance with Section 4.6, B(3) of the OC Technical Specifications in that domestic water samples had not been taken during extensive periods from May 1969 through December 1972 and for one location (WW-19), only one sample had been taken for the interval of 1971 - 1972. In addition, the inspector stated that when samples had been taken, the analysis for the specified nuclides had often been omitted, or if performed, performed at intervals exceeding 12 weeks. (Paragraph 9)

G. Surface Water Sampling

The inspector stated that the sampling of surface water in conjunction with the licensee's operational environmental monitoring program was in noncompliance with Section 4.6, B(3) of the OC Technical Specifications in that surface water samples had not been taken from locations SW-26 and SW-27 from August 30, 1971 to November 23, 1971 a period greater than four weeks. In addition, the inspector stated that various surface water samples had been omitted on several occasions during the period from August of 1969 to November of 1971. The inspector also stated that the concentrations of various nuclides were higher than normal for the analysis of July 9, 1969 and questioned the licensee as to whether an evaluation had been performed as to the cause of these higher than normal levels. The licensee stated that he was unaware of the higher concentrations for the above noted analysis but stated that since the facility was only in the startup phases of operation, the cause was probably due to either conditions of atmospheric fallout or a breakdown in OC consultants' analytical procedures. (Paragraph 10)

H. Silt Sampling

The inspector stated that the sampling of silt in conjunction with the licensee's operational environmental monitoring program was in noncompliance with Section 4.6, B(3) of the OC Technical Specifications in that silt samples had not been taken from any stations from June 12, 1969 to December 6, 1969 nor from stations SI-26 and SI-27 from July 7, 1971 to December 22, 1971, both periods greater than the specified 12 week interval. (Paragraph 11)

I. Clam Sampling

The inspector stated that the sampling of clams in conjunction with the licensee's operational environmental monitoring program was in noncompliance with Section 4.6, B(3) of the OC Technical Specifications in that clams had not been sampled from August 11, 1969 to October 11, 1969 and from October 11, 1969 to December 6, 1969, both periods greater than the specified 4 week interval. The inspector also stated that the analysis of specified nuclides had not been performed from June 12, 1969 to December 6, 1969, a period greater than the specified 12 week interval. (Paragraph 12)

J. Water Quality Monitoring Program

The inspector stated that the water quality monitoring program as described in Section 5.5.2.3 of the OC Environmental Report was not being followed in that (a) samples were not being taken when indicated and (b) when taken, the samples were not analyzed for all of the parameters specified in the above referenced section.

The inspector stated that although this matter did not constitute an item of noncompliance with OC Technical Specifications, clarification would be required as to the status of the monitoring program. The licensee stated that the entire non-radiological monitoring program was being re-evaluated at present and that the results of this re-evaluation would be made known to the AEC when completed. (Paragraph 16)

K. Programmatic Deficiencies

The inspector and licensee discussed the overall status of the environmental monitoring program and the aforementioned items of noncompliance from the standpoint of programmatic deficiencies. The licensee stated that the need for upgrading the OC environmental monitoring program had been realized for some time and that a commitment had been made to this goal to the AEC. (Paragraph 18)

L. Sampling and Analytical Procedures

The inspector stated that the sampling and analytical procedures evaluated during the course of the inspection were too superficial to enable an adequate review. The licensee stated that additional descriptions were available as contained in the contract with Teledyne/Isotopes. The inspector briefly reviewed these procedures but requested that the licensee make available complete sampling and analytical procedures from its contractor if possible. The licensee stated that the contractor would be contacted and arrangements would be made to have these procedures made available to the AEC. (Paragraph 14)

M. Fish Kills

The inspector reviewed the details of the recent (January 1972; January 1973 and February 1973) fish kills with the licensee and inquired if any further information was available as to the cause of the latest fish kill (February 16, 1973). The licensee stated that the evaluation was still in progress and that no further details were available at this time other than those already provided the AEC. (Paragraph 19)

N. Meeting with Marina Owners

The inspector reviewed the comments made by three marina owners along the OC discharge canal with the licensee. Although these

interviews were held by the inspector with the marina owners in connection with past fish kills, these individuals made various allegations pertaining to silting and shipworm problems. The licensee stated that he was aware of these allegations but that no statements would be made to AEC at this time, due to the fact that JCPL was in litigation over the matter and answers to the allegations were being prepared by corporate attorneys. (Paragraph 22)

DETAILS

1. Personnel Contacted

Mr. T. J. McCluskey, Station Superintendent, OC
Mr. J. L. Sullivan, Technical Supervisor, OC
Mr. D. L. Reeves, Technical Engineer, OC
Mr. D. E. Kaulback, Radiation Protection Supervisor, OC
Mr. D. A. Ross, Manager, Nuclear Generating Stations, JPCL
Mr. T. M. Crimmins, Jr., Safety and Licensing Manager, GPU
Mr. N. G. Trikouras, Safety and Licensing Engineer, GPU
Dr. J. B. Pearce, Director, Sandy Hook Marine Laboratory
Mr. J. Young, Aquatic Biologist, Sandy Hook Marine Laboratory
Mr. P. E. Hamer, Director, Nacote Creek Research Station,
New Jersey Division of Fish, Game and Shellfish
Mr. H. Kurtz, Oyster Creek Marina
Mr. C. B. Mallie, Briarwood Yacht Basin
Mr. J. DiPaolo, Briarwood Yacht Basin
Mr. H. Baumgardt, Sands Point Marina

2. General

The inspection was conducted in two phases as delineated below:

Phase I: Environmental Monitoring Program

This phase of the inspection effort was a review of the licensee's operational environmental monitoring program as delineated in Section 4.6, B(3) of the Oyster Creek Technical Specifications*, conducted to determine the licensee's compliance therewith. The inspection included a detailed review of all environmental monitoring records from May of 1969 through December of 1972, inclusively. Records subsequent to December 1972 were not available at the time of

*The detailed description of the operational environmental monitoring program is contained in Table B-II-1 of Section B.II.6 of Amendment 65 of the Application for a Reactor License. Section B.II.6 is referenced by the aforementioned Section of the OC Technical Specifications.

the inspection. The environmental monitoring program at the site was initiated in February of 1966 and the operational (as opposed to pre-operational) program was taken to have been initiated at the time of initial criticality which occurred on May 3, 1969. The plant began to produce power on a commercial basis on December 22, 1969. The operational environmental monitoring program was designed to measure environmental radiation and radioactivity in air, fallout, surface water, marine life and foodstuffs. The monitoring of fallout includes radioactivity measurements of soil, vegetation and rainwater. Surface water monitoring encompasses water and silt from Barnegat Bay, Oyster Creek, and the South Branch of Forked River. Clams were selected as the key indicator of marine life and are also sampled. Since milk production is not considered significant within the immediate influence of the plant, milk sampling is not undertaken and foodstuff monitoring is limited to crops.

Hydrological and Biological programs at the OC site were also reviewed in conjunction with statements presented in the Oyster Creek Environmental Report. The hydrological program, initiated in 1971, monitors various chemical characteristics of the plant intake and discharge. The purpose of this program was to provide data for the evaluation of possible effects of chemical discharges on the biota of Barnegat Bay. The biological program was initiated in 1965 and has continued, with some modification to date. The principal objectives of the program were to monitor and interpret changes in species, in species abundance and in physiological parameters. The broad categories of aquatic biota examined are: macro-algae, phytoplankton, zooplankton, benthos and fish.

During the course of the overall inspection effort, two sampling stations (one on-site and one off-site) were inspected.

The results of the overall inspection effort in these areas are covered in Paragraphs 4 through 18.

Phase II: Fish Kills and Other Ecological Problem Areas

This phase of the inspection effort was a review of recent fish kills which have occurred at the OC plant commencing with the fish kill of January 28, 1972 and including the most recent fish kill which commenced on or about February 16, 1973. As

part of this review, interviews were held with representatives of the Sandy Hook Marine Laboratory and the Nacote Creek Research Station as to the possible causes of these kills and potential corrective actions (if any) which might be taken to avoid further fish kills at OC. In addition to the interviews held with members of the scientific community, interviews were held with representatives of the three marinas located along the OC discharge canal. In addition to the problems relating to the recent fish kills, the representatives of the marinas expressed concern over the operation of the OC plant, namely, radiation, temperature, silting and shipworm problems. The results of these interviews with both the scientific and non-scientific communities are covered in Paragraphs 19 through 22.

3. Organization and Administration

The Oyster Creek Nuclear Generating Station (OC) was constructed and is operated by Jersey Central Power and Light Company (JCPL). JCPL along with Pennsylvania Electric Company, Metropolitan Edison Company and New Jersey Power and Light Company is an operating subsidiary company of the General Public Utilities Corporation (GPU). Along with another subsidiary company, the GPU Service Corporation, the aforementioned organizations comprise the GPU system.

The operational environmental monitoring program at the OC site is an extension of the pre-operational program, parts of which were initiated as early as 1965. The OC plant became critical in May of 1969 with commercial operation commencing in December of 1969. According to the licensee, sampling responsibilities in connection with the operational environmental monitoring program are handled by site employees of JCPL with the exception of clams which are obtained for JCPL via contract with a local fisherman. Samples requiring radiological analyses are sent to Teledyne Isotopes in Westwood, New Jersey. The Teledyne contact for the OC site is Mr. Lewis F. Casabona, Head, Radiochemistry Section. Film badges utilized to measure ambient radiation are sent to Radiation Detection Company (RDC) of Sunnyvale, California. The RDC contact for the OC site is Mr. R. Johns, Manager of the Radiation Dosimetry Section. Non-radiological analyses are performed by GPU service laboratories and the facilities of Gilbert Associates (GA) in Reading, Pennsylvania. The GA contact for the OC site is Mr. W. T. Delp, Chief Chemist.

When questioned by the inspector as to the nature of the review given the sampling results, the licensee stated that results of all radiological analyses are sent directly to Mr. D. E. Kaulback, Radiation Protection Supervisor at the OC site. The licensee also stated that these results are

transferred to record books but without any evaluation by other members of the OC staff or members of the GPU service organization. Non-radio-logical analyses are reported to Mr. D. Ballengee of GPU where the environmental data is coordinated but according to a GPU representative, no routine review of this data is provided. Other environmental matters such as biological studies are handled by consultants to GPU but not by GPU personnel themselves.

4. Atmospheric Radiation

The OC Technical Specifications (TS) require that atmospheric radiation be monitored at 17 sites, one station on-site and sixteen stations at various directions and distances within 20 miles of the plant. Three additional locations are maintained by the licensee and designated T₁ (on meteorology tower), C₁ and C₂ (control dosimeters located at the Toms River residence of Mr. D. E. Kaulback, OC Radiation Protection Supervisor). The control location is approximately 15 miles from the OC site. The monitoring method utilizes film badges and the TS require that they be changed every four weeks.

The film badges utilized to monitor ambient radiation levels are provided by Radiation Detection Company of Sunnyvale, California, and consist of Kodak Type III film which is utilized in the conventional dental size pack and placed in a conventional film badge holder from which the standard clip has been removed. This later assembly is de-humidified and placed in an aluminized plastic bag which is covered in paper to allow identification. As packaged, the film badges are capable of indicating an exposure down to 4 mR. During the inspection of the on-site sampling station, it was observed that two film badges were taped to the north side of the meteorological building at a height of approximately 5 feet. A review of dosimetry records indicated that the film badges for this station had, in general, not shown any values above background for external exposure. The licensee's Environmental Report (ER) (Page 5.5-4), indicated that a direct radiation survey was conducted in September of 1971 utilizing a pressurized ionization chamber and a gamma spectrometer. Direct (shine) radiation exposure rate measurements along the fence line extending east-west about 275 feet south of the turbine

building indicated levels up to a maximum of 125 mrem/year above background. The film badges located on-site did not detect these above background radiation levels.

During the inspection of the off-site monitoring station (Station 5 along the Garden State Parkway), the inspector noted that the film badges had been covered with what appeared to be a piece of hard rubber approximately 3/8" in thickness. The inspector questioned the licensee as to the rationale behind the rubber cover and the licensee stated that the actual reason was unknown since this practice was started at the onset of the pre-operational program. The licensee believed, however, that the rubber was used for protection of the film badges against the elements. When the inspector asked if any evaluation had been performed with respect to the effect of this cover on the film badge exposures, the licensee stated that he was unaware of any such evaluation but personally believed the effect to be minimal.

In reviewing the film badge records for environmental radiation measurement, the inspector noted that an exposure labelled "background" was subtracted from the results. The inspector inquired as to where this background was measured. The licensee stated this value was measured by the Radiation Detection Company in California and subtracted by them. The licensee stated that this is why two "control" dosimeters are located in Toms River at the residence of Mr. D. E. Kaulback.

The inspector also noted that only one set of dosimeters (film badges) had been set out from August 30, 1971 to October 26, 1971, a period in excess of 4 weeks and stated that this was in noncompliance with the TS. The licensee stated that the reactor had been shut down during this period and therefore felt no need to change the film badges. The inspector stated that the TS were not waived during shutdown periods and that the licensee was obligated to continue monitoring even during shutdown periods. The licensee stated that this was difficult at times due to the shortage of manpower, but that every effort would be made to continue the program in the future. The licensee also stated that the entire environmental monitoring was to be reviewed in the near future, and that consideration would be given to replacing film badges with thermoluminescent dosimeters.

5. Air Particulate Sampling

The TS require that air particulate sampling be conducted at 5 locations, one station on-site and 4 stations within several miles of the plant. The 5 air samplers are to be operated continuously with the filter being changed on a two week interval. The filters are all to be analyzed for gross beta activity with one set of filters also being analyzed for gross alpha activity every 12 weeks.

In reviewing the OC monitoring records for air particulate sampling, the inspector noted several items of noncompliance with the TS (see Table I). These items included failure to change and analyze filters for beta activity at the required 2 week interval and failures to analyze for gross alpha activity at the required 12 week interval. The inspector pointed out that in two instances air particulate samplers (AP-3 and AP-5) had been inoperable for periods approaching 10 months. The licensee stated he was unaware of this specific lapse in sampling but that great difficulty had been encountered with respect to the pumps utilized for air particulate sampling. The licensee stated that after a certain operational lifetime all pumps seemed to deteriorate rapidly. The licensee stated that since these pumps were visited only once every two weeks, they had no way of knowing if the pump had failed once they left it. The inspector discussed with the licensee the need to monitor the pumps more closely or upgrade the type of pump being utilized.

The inspector observed and discussed with the licensee the fact that the air samplers were not located in areas where one would expect to find the highest off-site ground level concentrations. The inspector pointed out that the licensee's ER delineated the areas where the highest ground level concentrations would be expected to occur and that a comparison with existing air particulate sampling locations indicated a very poor correlation. The licensee stated that the entire environmental monitoring program would soon be re-evaluated and the matter of relocating and upgrading the air particulate samplers would be taken into consideration at that time.

The inspector visited one off-site and the single on-site air particulate sampler during the course of this inspection. The off-site sampler (AP-5) was observed to be operating normally. Upon visiting the on-site air particulate sampler (AP-1), the sampler was found to be inoperative due to a recent motor failure. The motor was still hot when observed and the licensee stated that repair operation on the pump would be initiated immediately. The inspector also observed that charcoal cartridges had not been provided for the measurement of airborne iodine.

6. Soil Sampling

The TS require that soil samples be taken at 5 locations, one station on-site and 4 stations within several miles of the plant. These 5 soil samples are to be taken as grab samples every 4 weeks and analyzed for gross beta activity.

In reviewing the OC records for soil sampling, the inspector noted several items of noncompliance with the TS (see Table II). These items generally involved the failure of the licensee to take soil samples at the prescribed 4 week interval. The licensee stated that soil samples were not taken from August 30, 1971 through October 25, 1971, because the plant had been shut down and the licensee felt that (a) soil samples during the outage were unnecessary and (b) manpower was needed more for responsibilities at the plant than for the taking of soil samples. Again, the inspector reiterated that TS requirements were not waived during periods of reactor shutdown and that all the failures to take required soil samples were in noncompliance with the TS. From the standpoint of manpower, the inspector stated that it was the licensee's responsibility to see that sufficient manpower was available at the site to meet all AEC requirements.

7. Vegetation Sampling

The TS require that vegetation samples be taken at 5 locations, one station on-site and 4 stations within several miles of the plant. The 5 vegetation samples are to be taken as grab samples every 4 weeks and analyzed for gross beta activity.

In reviewing the OC records for vegetation sampling, the inspector noted several items of noncompliance with the TS (see Table III). These items generally involved the failure of the licensee to take the vegetation samples at the prescribed 4 week interval. The licensee stated that the failure to maintain the proper sampling schedules was due to the shortage of manpower. The licensee stated that the time interval involved was basically during the final stages of power ascension and that in the licensee's judgement, men were more necessary within the plant. Again, the inspector stated that it was the licensee's responsibility to provide sufficient manpower to meet all AEC requirements.

8. Rainwater Sampling

The TS require that rainwater samples be taken at 5 locations, one station on-site and 4 stations within several miles of the plant. The 5 rainwater samples are taken continuously with sampling containers changed every 4 weeks. Each sample is to be analyzed for gross beta activity.

In reviewing the OC records for rainwater sampling, the inspector noted several items of noncompliance with the TS (Table-IV). These items generally involved the failure of the licensee to take or analyze the rainwater samples at the prescribed 4 week interval. The licensee stated that in some cases samples were not taken due to manpower shortages but in most cases there wasn't any sample to be analyzed. The

licensee stated that for certain periods, no rain had fallen over various sampling stations for the 4 week period and in other periods, rainfall early in a four week period had evaporated. The inspector stated that based on his earlier observation of sampling stations, protection had been provided against excessive evaporation, but should this condition occur, or should no rainwater be collected in the sampler, the record logs should so indicate by "sample lost through evaporation," "no rainfall to sample", etc. In this way, the inspector stated, one would know that the sampling regime was still being followed even though there were no samples to collect. The inspector stated that as written, "no samples" indicated more a failure on the part of the licensee to actually attempt to take the sample. The licensee stated that considerations would be given to modify the recording procedures so as to avoid this confusion in the future.

9. Domestic Water Sampling

The TS require that domestic water samples be taken from 6 locations, one station on-site and five stations within several miles of the plant. These domestic water samples are taken as grab samples from wells at the various locations. Taken every 4 weeks, each sample is to be analyzed for gross beta and gross alpha activity. Every 12 weeks, these samples are also to be analyzed for K-40, Ra-226, Ra-228, Uranium and Tritium activity.

In reviewing the GC records for domestic water sampling, the inspector noted several items of noncompliance with the TS (Table-V). These items involved the failure of the licensee to take and analyze domestic water samples at the prescribed 4 week interval and in one case (Station WW-19), only one sample had been taken for the entire 1971-72 time period. In addition to the failure to take the samples at the prescribed sampling interval, it was noted that in several instances when samples were collected, the analyses for the additional nuclides (K-40, Ra-226, Ra-228, Uranium and Tritium) had been omitted, or if performed, were performed at intervals exceeding the prescribed 12 weeks. The licensee stated that the failure to sample the on-site station (WW-1) was due to the reactor outage and shortage of manpower. The licensee also stated that the failure to sample the other locations was due to the fact that these samples were taken from the drinking water taps of residents in the area utilizing wells. Frequently these homes are closed for the winter and access to the sampling point prohibited. The inspector stated that in certain cases the time interval where the licensee failed to take the prescribed samples did coincide with the time interval normally considered the "winter closing period" (October through April of the following year) but other instances could not be explained in this manner. The inspector also pointed out that the TS did not contain provisions for not sampling during the "winter closing period." The licensee stated

that this matter would be taken under consideration. The licensee also stated that the reason why the additional analyses had not been performed was unknown at this time but that every effort would be made to see that these analyses were performed in a timely manner in the future.

10. Surface Water Sampling

The TS require that surface water samples be taken from 5 locations. Three of these locations are in Barnegat Bay where samples are taken from an area north of the plant discharge, in the vicinity of the plant discharge and an area south of the plant discharge. The other two sampling locations are in Oyster Creek and the South Branch of Forked River respectively. These surface water samples are to be taken every 4 weeks and each sample is to be analyzed for gross beta, gross alpha, K-40, Ra-226, Ra-228, Uranium, Sr-90, I-131, Tritium, Cs-137, Co-58, Co-60 and Zn-65 activity.

In reviewing the OC records for surface water sampling, the inspector noted several items of noncompliance with the TS (Table-VI). These items involved the failure of the licensee to take and analyze surface water samples at the prescribed 4 week interval. In one case, two locations (SW-26 and SW-27) had not been sampled from August 30, 1971 through November 23, 1971. The licensee stated that SW-26 and SW-27 had not been sampled due to the fact that the reactor had been shut-down during this period. According to the licensee, the earlier failures were again due to a shortage of manpower and a belief on the part of the licensee that, since the reactor was still in its power ascension phases, measureable amounts of radioactivity would in all probability not be present in the discharge water. The inspector stated that the operational environmental program was not predicated upon a release rate or power level and that it should have been conducted in the manner prescribed in the TS regardless of these factors. The licensee stated that every effort would be made to have surface water samples taken in a timely manner in the future.

The inspector also noted that analyses for samples taken on July 9, 1969, were measurably higher than normal* (Iodine-131 = 54 pCi/l; Cobalt-60 = 123 pCi/l; Zinc-65 = 35 pCi/l and Cesium-137 = 49 pCi/l and asked the licensee whether any evaluation had been undertaken as to the cause of these

*Based on typical OC quarterly averages of I-131 = 6.0 pCi/l; Co-60 = 7.0 pCi/l; Zn-65 = 9.0 pCi/l and Cs-137 = 7.0 pCi/l

higher levels of radioactivity in surface water. The licensee stated that he was unaware of these higher levels but that at the time the sample was taken the reactor was not yet at full power and therefore the licensee believed it was not reactor related. The licensee stated that it was his belief that either (a) the radioactivity resulted from atmospheric fallout or (b) there was some breakdown in the analytical procedures at Teledyne. The inspector noted that all levels for the cited nuclides returned to normal during subsequent sampling intervals.

11. Silt Sampling

The TS require that silt (bottom material) be taken from 5 locations. The location of these sampling points coincides with those utilized for surface water samples (See Paragraph 10). The samples are grab samples and taken at a frequency of one set every 12 weeks. Each of these samples are to be analyzed for gross beta and gross alpha activity.

In reviewing the OC records for silt sampling, the inspector noted various items of noncompliance with the TS (Table-VII). These items involved the failure of the licensee to take and analyze various silt samples at the prescribed 12 week interval. The licensee stated that again the failure to sample was outage related or due to a shortage of manpower during the early power ascension phases of the OC plant. The licensee stated that every effort would be made to see that all samples were taken in a timely manner in the future.

12. Clam Sampling

The TS require that marine life (clams) be sampled from 3 locations. These sampling points are located north, south and in the vicinity of the plant discharge, respectively. The samples of clams are grab samples and are to be taken once every four weeks. Each of these samples are to be analyzed for gross beta and gross alpha activity. An analysis of additional nuclides is required to be performed every 12 weeks. These nuclides include K-40, Sr-90, I-131, Cs-127, Co-58, Co-60, and Zn-65.

In reviewing the OC records for clam sampling, the inspector noted various items of noncompliance with the TS (Table-VIII). These items involved the failure of the licensee to take and analyze various clam samples at the prescribed 4 week interval and in certain instances where clams were sampled, the analyses for the additional radionuclides were not performed at the prescribed 12 week interval. The licensee stated that during the initial phases of this aspect of the program, OC personnel were unfamiliar with sampling techniques and experienced difficulty in sampling during

periods of inclement weather. The licensee stated that a professional fisherman had since been contracted to perform the sampling, thereby eliminating the sampling difficulties. The licensee stated that every effort would be made to see that samples would continue to be taken in a timely manner in the future. The inspector stated that some positive Zinc-65 results had been noted* but the licensee stated that similar results had been observed on occasion during the pre-operational environmental program.

13. Crops Sampling

The TS require that foodstuffs (crops) be sampled when available from 3 sample locations. These sampling points are located at a JCPL farm east of the plant site, Lacey Road near the Garden State Parkway and on Route 534 at the Garden State Parkway. Samples taken once every 12 weeks are to be analyzed for gross beta and Sr-90 activity. During the inspector's review of the OC records for crops sampling, although no items of noncompliance with the TS were observed, it was noted that when sampled, higher than average levels of Sr-90 were detected on various occasions (Table-IX). The inspector observed that due to the long sampling intervals (12 weeks) and the "when available" condition of the TS, trends were difficult to detect. The inspector inquired as to whether any evaluation had been undertaken by the licensee as to the cause of these levels of Sr-90. The licensee stated that he was unaware of these higher levels and did not know their cause. The inspector stated that in this case, and in fact, every phase of the sampling program, results should be analyzed by the licensee and not merely recorded for record-keeping purposes alone. In addition, the inspector stated that when higher than normal levels of radionuclides are detected in any sample or series of samples, a careful evaluation should be undertaken by the licensee in order to determine the origin of these levels. If this evaluation indicates that the plant was the cause of the levels, then further action to limit the levels should be taken as appropriate. If other than reactor causes (e.g., fallout, etc.) are determined to have caused the higher levels, then these causes and details of the evaluation should be documented. The licensee stated that this matter would be taken into consideration for possible further action at a later date.

14. Sampling and Analytical Procedures

A review was made of the methods of sampling and analysis utilized by the licensee as part of the operational environmental monitoring program at the OC site. A brief description of these procedures were provided as part of the record books for the environmental data. These descriptions were found to be too general and devoid of sufficient detail to allow an adequate evaluation to be made.

*Levels greater than the lower limit of detection of 0.09 pCi/gram but not greater than 0.48 pCi/gram

The licensee presented the inspector with a copy of the contract between the facility and Teledyne/Isotopes. This contract contained additional detail with respect to the aforementioned procedures. Following a brief review of these procedures, the inspector requested that the licensee acquire a set of detailed sampling and analytical procedures (including QC procedures if available) from its contractor for review by the AEC. The licensee stated that Teledyne/Isotopes would be contacted and arrangements made to have a detailed copy of the contractor's sampling and analytical procedures forwarded to the inspector for review.

15. Meteorology

The meteorology program currently employed at the OC site was reviewed during the course of this inspection. The meteorology monitoring program at the site has been undertaken since February of 1966, and is scheduled to be continued for the life of the plant. The licensee stated that the primary purpose of the meteorological monitoring program was to maintain a continuous record of pertinent meteorological parameters for use in atmospheric dilution calculations. These same parameters also provided an estimate of an atmospheric dispersion inventory of the released effluent gases.

The inspector visited the meteorological tower which is 400 feet in height and located approximately 1300 feet west of the plant. The equipment located at the tower was found to be in proper operation. The inspector noted that various critical parameters (wind speed, direction, etc.) were being permanently recorded at this location and asked the licensee if similar information was being recorded in the reactor control room for purposes of evaluation in the case of radioactive releases under emergency conditions. The licensee stated that although a readout of these parameters is provided to control room personnel on an instantaneous basis, no provisions had been provided for recording this information at that location, only at the meteorology tower itself. The licensee stated that this matter had been discussed at length at some earlier time, but that the matter would again be taken into consideration.

16. Water Quality Monitoring Program

The OC Environmental Report (Section 5.5.2.3) describes the hydrological monitoring program being undertaken at the OC site. Initiated in 1971, this program monitors the chemical characteristics of the plant discharge in order to (a) insure compliance with standards set in accordance with the Refuse Act of 1899, compiling data for a U.S. Corps of Engineer's Permit and (b) to provide data for the evaluation of possible effects of chemical discharges on the biota of Barnegat Bay. Samples are taken three times yearly during March, July and November and are analyzed by the Chemistry section of JCPL and Gilbert Associates. The analyses examine the following parameters: phosphorous, nitrate, total keldgahl nitrogen, ammonia, chlorine, sulfate, zinc, chromium, iron, solids (insoluble, soluble, volatile) hardness, turbidity, DO and BOD.

In reviewing the OC records for the aforementioned analyses, the inspector noted the licensee was not performing this program as stated in the ER, namely, not taking samples in the prescribed months as stated above, or when sampling was performed, omitting various analyses. The inspectors observations are summarized in Table-X. The inspector inquired as to the status of this program and specifically whether the program would be discontinued now that the application for the Corps of Engineer's Permit had been made.

The licensee stated that the sampling of these parameters in March, July and November had no particular significance other than this sampling schedule fit in with the sampling schedules being followed at other (fossil) plants. From the standpoint of the program itself, the licensee stated that some modifications were expected in the program but that the exact nature of these modifications had not yet been definitively decided. The inspector discussed with the licensee the monitoring of various parameters (DO, pH, turbidity, salinity, etc.) on a more frequent basis than 3 times per year. The licensee again stated that these items would be taken under consideration and that the entire non-radiological program was due for re-evaluation in the near future. The licensee stated that the results of this re-evaluation would be made known to the AEC upon its completion.

17. Biological Monitoring Program

The OC Environmental Report (Section 5.5.2.4) describes the biological monitoring program being conducted at the OC site. Initiated in 1965, this program monitors and interprets changes in species, in species abundance, and in various physiological parameters. The broad categories of aquatic biota examined include macro-algae, phytoplankton, zooplankton, benthos, and fish. According to the ER, the studies are funded by JCPL and most of them have been conducted by a team from Rutgers University. A five-member board is responsible for overseeing the studies and is composed of two State representatives, one university member (Dr. Haskin), and two JCPL consultants (Dr. Charles Wurtz and Dr. James Carpenter). JCPL consultants also contribute studies of their own in addition to the Rutgers University work. Studies that have largely been completed to date include:

- (a) Determination of lethal and avoidance temperatures during summer of 11 species of fish and two species of invertebrates common to the Bay;
- (b) Baseline studies of species types and abundance of macro-algae, plankton, benthos, and fish;
- (c) Studies of change in photosynthesis and species composition of phytoplankton going through the condenser system and;
- (d) Studies determining the effect on fish eggs of passage through the condenser.

The inspectors reviewed the above studies and in particular a study entitled, "The Qualitative and Quantitative Analysis of Benthic Flora and Fauna of Barnegat Bay Before and After the Onset of Thermal Addition." This ongoing study, which began in late 1965, is being conducted by a group from Rutgers University consisting of the following personnel:

- R. E. Loveland, Department of Zoology
- K. Mountford, Department of Botany
- D. A. Busch, Department of Zoology
- P. H. Sandine, Department of Zoology
- M. Moskowitz, Department of Zoology
- E. T. Moul, Consulting Algologist

The aforementioned Rutgers group sends annual progress reports to the licensee.

Several reports of Dr. Charles B. Wurtz, the licensee's consultant from LaSalle College in Philadelphia, Pennsylvania were also reviewed. Dr. Wurtz has sent the licensee a number of papers concerning fish population and their behavior in Barnegat Bay, as well as the effect of plant (OC) operations on the fish population in the area. In examining these and other aforementioned reports, the inspectors were able to determine that the licensee was following the biological monitoring program as described in Section 5.5.2.4 of the ER.

18. Programmatic Deficiencies

The inspectors reviewed with the licensee the overall operational environmental monitoring program at the OC site. The inspectors pointed out the various inadequacies of the program currently being conducted at the OC site (See Paragraphs 4 through 18), stating that those inadequacies stemmed primarily from one or more of the following programmatic deficiencies:

- a. Failure of the licensee to provide adequate manpower to conduct the program.
- b. Failure of the licensee to provide an adequate review of environmental data.
- c. Failure of the licensee to evaluate the possible need for modification of the operational monitoring program based on the results of the pre-operational program.
- d. Failure of the licensee to modify the environmental program based on advances in state-of-the-art environmental monitoring techniques.
- e. Failure of the licensee to provide meaningful monitoring of non-radiological parameters (e.g., routine measurements of DO, pH, salinity, chlorine, etc.).

The licensee acknowledged the various shortcomings of the operational environmental monitoring program (radiological and non-radiological) as noted by the inspectors. The licensee stated that although these shortcomings had been known for some time, they (the licensee) were awaiting for some form of official guidance before conducting an overall review and upgrading of the program for OC. The licensee also stated that monitoring requirements would be reviewed from the standpoint of the pre-operational environmental monitoring

program for the Forked River Nuclear Station which is planned for construction on the same site as the OC plant. The licensee stated that with the receipt of USAEC Regulatory Guide 4.1 entitled, "Measuring and Reporting of Radioactivity in the Environs of Nuclear Power Plants," a more meaningful review could be initiated. The inspectors noted that this guide (USAEC-RG 4.1) was only a guide and that a series of guides were under development along the lines of "Environmental and Siting Guides." The inspectors stated that other guides have been available for some time which would have allowed a review of the program at OC (e.g., EPA's "Environmental Radioactivity Surveillance Guide," ORP/SID 72-2). In response to the inspector's observation, the licensee stated that non-radiological matters would be included in the pending re-evaluation.

19. Fish Kills

A review was made of the recent fish kills which have occurred at the OC site. Although the review commenced with the fish kill on January 28, 1972, particular attention was given to the more recent fish kills including the one which commenced on or about February 16, 1973. With respect to the January 1972 fish kill, the inspectors inquired of the licensee if any further information had become available or if any further review had been undertaken. The licensee stated that the entire fish kill problem was currently being evaluated and various reports had either been submitted by various personnel on the subject or were in various stages of preparation. The licensee stated that the details of the January 1972 fish kill had been presented in Section 5.1.5 of the licensee's ER. Additional details have been documented in RO Inquiry Report No. 50-219/72-03Q.

In reviewing the recent fish kills of January 9, 1973, and February 16, 1973, the inspectors reviewed all temperature and discharge data (radiological and non-radiological) for the period from January through February of 1973. Results of this review indicated no abnormal conditions with respect to these parameters other than the rapidly dropping discharge temperatures preceding the fish kill of January 9, 1973. Additional details of these fish kills have been documented in RO Inquiry Report Nos. 50-219/73-01Q, 73-02Q and 73-03Q.

The licensee stated that the second fish kill (February 16, 1973) apparently was initiated by causes other than cold shock since the plant had been operating normally prior to the initiation of the

kill. The licensee stated that it was his opinion that the fish had died of a disease which was accelerated by cold shock but that conclusive evidence was doubtful due to the time which had elapsed before the fish were analyzed.

The licensee stated that one unusual aspect of the second fish kill (February 16, 1973) was the fact that a significant number of Atlantic menhaden were available to be killed. According to the licensee, following the initial fish kill of January 9, 1973, the temperature of Barnegat Bay decreased to 33°F as measured at the intake to the OC plant. Theoretically, according to the licensee, all of the menhaden should have been killed since the probability of survival for these fish is very low below 39 - 40°F. The licensee stated that further evaluation of all aspects of the fish kills was still required and being conducted at the present time. The inspector asked if any consideration had been given to the recommendations made to JCPL by Mr. John W. Reintjes of the National Marine Fisheries Service in a report entitled, "Compilation and Correlation Analyses of Published and Unpublished Environmental Data with Distribution, Abundance, and Movements of Young Menhaden in Mid-Atlantic Estuaries." The licensee stated that he was aware of the report and the recommendations contained therein but that any comment on these recommendations at this time would be premature without a detailed evaluation.

20. Meeting at Sandy Hook Marine Laboratory

As part of the review of the recent fish kill problems at the OC site, the inspectors met with Dr. John B. Pearce, Director of the Sandy Hook Marine Laboratory* (SHML) on March 1, 1973. The inspectors asked Dr. Pearce of the efforts which had been undertaken as part of SHML's investigation of the most recent fish kill at OC (February 16, 1973). Dr. Pearce stated that SHML had been notified of the fish kill indirectly by articles appearing in the local newspaper. SHML dispatched a team of biologists to the scene (OC) to further investigate the incident and obtain samples of the fish for further analysis. Skin divers were utilized to obtain first hand information on the conditions within the OC discharge canal. Dr. Pearce stated that the skin divers found the kill to be monospecific to Atlantic menhaden. Other species in the canal (flounder, etc.) were observed to be in excellent condition and feeding

*Sandy Hook Marine Laboratory is part of the Mid-Atlantic Coastal Fisheries Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

on the dead menhaden. Dr. Pearce stated that although samples of the dead menhaden were being analyzed for heavy metals at the New Milford, Connecticut laboratory, he personally believed that the results would be negative. Dr. Pearce stated that skin divers from SHML had observed a variety of other aquatic organisms in the discharge canal which were highly sensitive to heavy metals. It was highly improbable therefore, that these organisms would have survived had the menhaden been killed by heavy metals. Dr. Pearce stated that some concern had been expressed in the newspapers relating to the possibility that a release of chromated water from OC might have contributed to the fish kill but he personally believed that this was not the case. (NOTE: AEC inspectors had reviewed the problem of chromated water at the OC site at an earlier date. Details of this problem are documented in RO Inspection Report No. 50-219/73-02 with an update included in Paragraph 23b of this report).

Dr. Pearce stated that samples of the dead manhaden had also been sent to the Atlantic Estuarine Fisheries Center in Beaufort, North Carolina where analyses for radionuclides were being performed. Dr. Pearce stated that the results of these analyses were not as yet complete but again, Dr. Pearce stated that he believed that the results would be negative. The inspectors stated that they had been notified by Dr. David E. McCurdy of the New Jersey State Department of Environmental Protection that samples of menhaden analyzed by the State laboratories indicated no abnormal levels of radioactivity.

Dr. Pearce stated that due to the point in time at which the SHML became involved with the OC fish kill, the possible cause of the fish kill could only be arrived at by the process of elimination of other possible causes. It appeared that the fish kill had not been caused by radioactivity or heavy metals, and although cold shock may have contributed to the kill, the kill apparently had been initiated prior to the unscheduled shutdown of OC on February 16, 1973. Dr. Pearce stated that the possibility existed of infectious agents causing the kill but that this could not be confirmed conclusively due to the fact that specimens would have had to be examined in the process of dying. The late notification of the incident had precluded this examination. Dr. Pearce stated that early notification of such incidents would enable biologists from SHML to provide a more thorough investigation of these fish kills should they occur in the future. Dr. Pearce stated that similar incidents were being studied at another non-nuclear power plant.

21. Meeting with New Jersey Division of Fish, Game and Shellfish

As part of the review of the recent fish kill problems at the OC site, the inspectors met with Mr. Paul E. Hamer, Director of Nacote Creek Research Station (NCRS) of the New Jersey Division of Fish, Game and Shellfish on March 1, 1973. The inspectors asked Mr. Hamer of the efforts which had been undertaken as part of NCRS's investigation of the recent fish kill at OC (February 16, 1973). Mr. Hamer stated that he had been notified of the fish kill late on February 17, 1973 and visited the site on February 18, 1973. By this time, the fish kill had been in progress for some time. Mr. Hamer stated that it would have been desirable to have been notified sooner so that representatives of the NCRS could have been dispatched to the scene earlier. Mr. Hamer stated he had noticed an unusual amount of foam present in Oyster Creek upon his arrival. Although foaming per se is not unusual in Oyster Creek due to the fact that the water from swamps and cedar bogs ("cedar water") drains into Oyster Creek and the impurities therein cause foaming upon agitation (by circulating water pumps among other sources), Mr. Hamer stated that the foaming appeared much more extensive than normal. He also stated that the water was extremely turbid and murky in appearance. Mr. Hamer was aware of the analyses being performed by the National Marine Fisheries Service and stated that samples had been taken for analysis by New Jersey laboratories. Mr. Hamer stated that he was also aware of the possibility that the recent kill (February 16, 1973) at OC may have been infectious in nature but stated that confirming this possibility would be difficult due to the fact that the fish had not been caught in the actual process of dying.

The inspectors asked Mr. Hamer if he had any additional information on a possible shipworm problem at Oyster Creek (See Paragraph 22b). Mr. Hamer stated that he knew that shipworm problems did exist in New Jersey and that a bridge had been completely destroyed by shipworms in Manasquan, New Jersey, but had no specific knowledge relating to the Oyster Creek problem other than its existence. Mr. Hamer did state, however, that the problem could be related to salinity and temperature of the water. Mr. Hamer stated that the shipworm did require a salt water environment and their activity (boring into wood) was increased at higher temperatures.

22. Meeting with Oyster Creek Marina Owners

As part of the inspector's review of the recent fish kills which occurred at OC plant site, interviews were held on March 2, 1973, with representatives of the three marinas which are located along the part of Oyster Creek which serves as an extension of the OC discharge canal. These marinas include the Oyster Creek Marina (OCM) the Briarwood Yacht Basin (BYB) and the Sands Point Marina

(SPM). The marina representatives stated that past and recent fish kills were causing an economical impact on the marinas which apparently was getting worse with each successive fish kill. The marina representatives stated that potential customers were being driven away by the publicity being given these fish kills and although none of the marinas were operating with several empty slips, waiting lists had dwindled drastically and many "preferred" customers had already left these marinas.

Although the marina representatives were quite annoyed with the continuing problems associated with the fish kills, they were even more concerned about other conditions which they attributed to OC plant operations. These other conditions included problems with radiation, shipworms, high water temperatures, and silting. Each of these problems will be covered separately below.

a. Radiation

The marina representatives stated that they had concern for their health and safety from the standpoint of radioactive releases from the OC plant. Mr. H. Kurtz of OCM stated that he had recently read a newspaper article from a Philadelphia newspaper* which had connected reactor operation with increased infant mortality. Mr. Kurtz also stated that the general population in the area around OC was also concerned over this matter. The other marina owners concurred with Mr. Kurtz. The inspector attempted to alleviate the concern of these marina representatives by pointing out apparent fallacies of the claims reported in the original newspaper article and by reviewing with these representatives various reactor operating principles, AEC inspection and monitoring programs, and the State of New Jersey Environmental Monitoring Program. The marina representatives stated that their concern could have been alleviated sooner had JCPL taken the time to discuss this matter with them. The marina representatives did state, however, that they had little faith in JCPL because of statements made in the past which they (marina representatives) believed had been made in bad faith. The marinas are currently in litigation with JCPL over other environmental matters. (See Paragraphs 22b - 22d below)

b. Shipworms

Shipworms (Teredo navalis or Bankia gouldi) are actually

* "Nuclear Plant in State is Killing Babies, Physicist Charges," article by Rod Nordland which appeared in Philadelphia Inquirer on February 6, 1973, Article discusses allegations by Dr. E. Sternglass that releases from Shippingport Reactor have led to increased infant mortality.

boring clams. These clams exist in saltwater bodies and are generally resistant to anaerobic conditions. The clams spawn in temperatures of from 80 to 82.5°F and are carried freely in their planktonic form by water currents. The time spent in this planktonic form varies with temperature (shorter planktonic form at higher temperatures) and as they leave this form they begin to settle and attach to wooden structures where they bore into the wood. The diameter of the bore may range from 1 to 10 mm and the length of their burrow may extend up to 150 mm.

The marina representatives stated that prior to the operation of the OC plant, shipworms had never been a significant problem at the OC marinas. These representatives stated that Oyster Creek was at one time a fresh water creek and the shipworms were kept from entering the Creek by the natural flow of fresh water into Barnegat Bay and by the shipworms dislike of fresh water itself. The marina representatives stated that since the OC plant has been in operation, the shipworm problem has been greatly aggravated. They stated that the shipworms are drawn into the plant intake canal from Barnegat Bay and then discharged into Oyster Creek. The marina representatives stated this is how the shipworms reach Oyster Creek. The plant operation now provides them (shipworms) with a favorable environment since the OC discharge has increased the salinity of the Creek so that it is no longer a fresh water creek past the discharge point. To add to the problem, the higher temperature of the canal increases the shipworms destructive activity.

The marina representatives stated that they had called upon Dr. Ruth D. Turner of Harvard University, a noted expert on shipworms, to investigate the matter further. The inspector was shown the keel of a yacht and a piling from the BYB which had to be replaced due to shipworm damage. Mr. DiPaolo of BYB stated that the piling had been in place for over 15 years but that the damage had only occurred recently. The inspector observed a white calcareous layer along the shipworm borings which reportedly indicates that the damage was within the last few years. (The calcareous layer is secreted by the shipworm as it bores into the wood.)

c. High Water Temperatures

The marina representatives stated that another problem

which has resulted from the operation of the OC plant was the presence of high temperature discharge water in Oyster Creek. The marina representatives stated that although the State of New Jersey required the discharge temperatures to remain below 95°F at a temperature buoy located in Barnegat Bay between the intake and discharge canal, this did not prevent OC from discharging water in excess of 95°F into the upper part of Oyster Creek where the marinas were located. The marina representatives stated that water temperatures of as high as 104°F had been measured and recorded during July of 1972. (See RO Inquiry Report No. 50-219/72-21Q). The effect of these high water temperatures, in addition to the discomfort of marina patrons during the hot summer months, is increased damage caused to ship interiors by mildew. The high temperatures accompanied by cooler air temperatures causes excessive condensation within the interiors of the yachts, a condition ideal for the formation of mildew. Mr. Kurtz of the OCM stated that in several cases the mildew was so bad that ship interiors had to be literally hosed down.

Mr. C. Mallie of the BYB stated that in addition to mildew problems, the elevated temperatures of Oyster Creek due to OC discharges had caused severe problems with fogging conditions. Mr. Mallie stated that although fogging in the area was not new, since OC went into operation fogging has become a much more frequent and a seriously more intense problem. The marina representatives stated that not only did this intense fog affect marina operations but also the safety of motorists utilizing U.S. Route 9 which runs by the OC plant. Mr. Mallie stated that on several occasions, accidents had been narrowly averted on the bridge which crosses the discharge canal (U.S. Rt. 9) as motorists driving along at 50 mph suddenly found themselves immersed in a dense thick fog.

d. Silting

Mr. H. Kurtz of the OCM stated that the rapid movement of water in the OC discharge canal was causing a serious problem with respect to silting within the marinas. Although the main channel was kept deep by this water flow, Mr. Kurtz stated that certain slips in the marinas would soon be unusable due to the buildup of bottom sediment. Mr. Kurtz illustrated the problem to the inspector by taking

a long boat pole and placing it vertically into the water near the dock until this layer of "ooze" was reached. When additional force was applied, the boat pole penetrated this layer, stopping at the harder sand level below. The inspector observed that the pole penetrated approximately 3.5 to 4 feet into the soft layer. Mr. Kurtz stated that the presence of this layer is not unique to Oyster Creek nor to Barnegat Bay. The unique feature is that the layer is nearly 4 feet thick as opposed to a normal thickness of 6 - 12 inches. The inspector observed the material which adhered to the boat pole once it was removed from the bottom layer. The material was a black gel-like slime. The color, texture and odor of the material appeared to indicate the presence of decaying organic material. Mr. Kurtz stated that a sample of this material had been analyzed informally by a geologist friend of his, and he (Kurtz) stated that a preliminary report indicated that the material was anaerobic and approximately 50% of it was composed of decaying organic material.

The marina representatives stated that the marinas were dredged in the past but ever since the plant (OC) had been in operation, the necessity for dredging occurred much more frequently. This silting problem had grown to such a proportion that, in the opinion of the marina representatives, normal maintenance of the marina facilities would soon become economically devastating.

23. Other Environmental Areas

The inspectors reviewed several additional non-radiological areas during the course of the overall inspection effort. These areas are summarized below along with pertinent details:

a. Impingement

Although no impingement studies are currently being performed at the OC site, the inspectors reviewed impingement data obtained by both the Rutgers group (See Paragraph 17) and by Dr. C. Wurtz, the licensee's consultant. The conclusions of the licensee's consultants was that the plant's operation could be compared to the fishing of two competent anglers per day and as such, no significant impingement problem appeared to exist at OC.

b. Chromated Water Storage

A detailed review of the problems at the OC site relating to the storage of large quantities of chromated water was performed by RO personnel on February 14, 1973 and documented in RO Inspection Report No. 50-219/73-02. As part of this inspection effort, the status of the problem was again reviewed. The licensee stated that no further action had been taken as of the time of the inspection but plans were still being considered to concentrate the chromate so that the effluent, after concentration and removal of excess chromates, would have a concentration of less than 0.005 ppm.

c. Condenser Tube Leak Sealant

The inspectors investigated the use of a compound which is employed as a sealant for condenser tube leaks at the OC site. This compound, which is sold commercially under the brand name of "Wizard", is a sawdust-like material which swells in water. Placed in the plant intake, the material will plug any small holes that have developed in the condenser tubes. The licensee stated that approximately 1100 pounds per year of "Wizard" was being utilized at the OC plant. The inspectors inquired as to the frequency of use of this material but the licensee stated that it was used only on a non-routine basis and that he was not sure as to whether records had been kept of its use in the past. The inspectors stated that the matter was being reviewed due to the fact that unused material which passes through the condenser is discharged into the discharge canal where its potential effect on fish was unknown at present.

e. Thermal Standards

The OC Environmental Report states that the temperature at the reference buoy in Barnegat Bay is not to exceed 95°F. The inspectors reviewed temperature data for the entire year of 1972 and found that at no time was the above stated criteria exceeded. The inspectors noted, however, that the method of recording temperatures at the intake and discharge of the OC plant consisted of recording the date, ambient air temperature, and the intake and discharge temperature hourly at the half-hour. (See also Paragraph 19). The inspector noted that ambient

air temperatures were not recorded in certain instances and in one instance an error had apparently been made in recording an intake temperature. The licensee confirmed the apparent error and also noted that the ambient air temperature recorded in most cases represented the maximum air temperature for that day (i.e., taken in mid-afternoon). The licensee stated that this practice of recording maximum air temperatures originated from the fact that initial concern with respect to discharge temperatures was related to not exceeding the summer maximum temperature at the temperature buoy. The inspector stated that recording errors should be avoided and that as recorded (i.e., recording maximum ambient air temperatures) the data would preclude a thorough evaluation of temperature conditions during potential cold-shock fish episodes, where minimum temperatures are critical. The licensee stated that every effort would be made to avoid recorded errors in the future and that continuously recording temperature monitors for the intake and discharge would be taken under consideration.

TABLE-I: Air Particulate Sampling - Items of Noncompliance

<u>Sample Location</u>	<u>Time Interval</u>	<u>Nature of Noncompliance</u>
AP-1	9/8/69 - 10/21/69	Time interval greater than 2 weeks
"	10/21/69 - 11/14/69	"
"	5/21/70 - 8/6/70	No samples taken
"	2/1/71 - 3/16/71	"
"	5/12/72 - 6/13/72	"
"	no gross alpha from 1/1/70 to 5/12/70	Time interval greater than 12 weeks
AP-2	9/11/69 - 10/21/69	No samples taken
"	10/21/69 - 11/14/69	Time interval greater than 2 weeks
"	1/26/70 - 3/9/70	"
"	4/27/70 - 5/25/70	"
"	10/13/70 - 12/7/70	"
"	1/4/71 - 3/17/71	"
"	2/28/72 - 4/26/72	"
"	5/12/72 - 6/14/72	"
"	10/24/72 - 11/21/72	"
"	8/6/70 - only gross alpha for 1970	Time interval greater than 12 weeks
	no gross alpha from 12/22/71 to 7/6/72	"
AP-3	8/7/69 - 11/13/69	No samples taken
"	4/27/70 - 6/8/70	Time interval greater than 2 weeks
"	2/22/71 - 3/16/71	No samples taken
"	9/28/71 - 8/3/72*	"
	no gross alpha in 1969	Time interval greater than 12 weeks
	no gross alpha in 1970 until 8/5/70	"

*Period approaches 10 months with sampler inoperable

TABLE-I: (CONTINUED)

AP-4	9/11/69 - 10/21/69	No samples taken
"	1/26/70 - 3/17/70	"
"	2/22/71 - 3/16/71	"
"	2/16/72 - 4/26/72	"
"	5/12/72 - 6/13/72	Time interval greater than 2 weeks
"	no gross alpha in 1970 until 5/11/70	Time interval greater than 12 weeks
"	no gross alpha from 12/21/71 to 7/6/72	"
AP-5	9/11/69 - 10/21/69	Time interval greater than 2 weeks
"	3/30/70 - 6/8/70	No samples taken
"	2/23/71 - 3/16/71	"
"	9/14/71 - 7/18/72*	"
"	10/10/72 - 11/6/72	"
"	no gross alpha in 1970 until 8/6/70	Time interval greater than 12 weeks
"	no gross alpha for 1971 and 1972	

*Period approaches 10 months with sampler inoperable

TABLE II: Soil Sampling - Items of Noncompliance

<u>Sample Location</u>	<u>Time Interval</u>	<u>Nature of Noncompliance</u>
SO-1	10/11/69 - 12/6/69 8/30/71 - 10/25/71	No samples taken "
SO-2	9/11/69 - 10/21/69 8/30/71 - 10/25/71	No samples taken "
SO-3	9/5/69 - 10/21/69 8/30/71 - 10/25/71	No samples taken "
SO-4	9/11/69 - 10/21/69 8/30/71 - 10/25/71	No samples taken "
SO-5	9/11/69 - 10/21/69 8/30/71 - 10/25/71	No samples taken "

TABLE III: Vegetation Sampling - Items of Noncompliance

<u>Sample Location</u>	<u>Time Interval</u>	<u>Nature of Noncompliance</u>
VG-1	10/11/69 - 12/6/69 8/30/71 - 10/25/71	Time interval greater than 4 weeks No samples taken
VG-3	9/5/69 - 10/21/69 10/21/69 - 12/1/69	Time interval greater than 4 weeks "
VG-4	9/5/69 - 10/21/69 10/21/69 - 12/1/69	Time interval greater than 4 weeks "
VG-5	9/5/69 - 10/21/69 10/21/69 - 12/1/69	Time interval greater than 4 weeks "

TABLE-IV: Rainwater Sampling - Items of Noncompliance

<u>Sample Location</u>	<u>Time Interval</u>	<u>Nature of Noncompliance</u>
RW-1	4/14/69 - 7/8/69*	No samples taken
	8/6/70 - 10/27/69	"
RW-3	9/5/69 - 10/21/69	No samples taken
	4/12/71 - 6/13/71	"
	7/6/71 - 8/31/71	"
RW-4	9/11/69 - 10/21/69	No samples taken
	9/28/70 - 11/24/70	"
RW-5	9/11/69 - 10/21/69	No samples taken

*Time period begins before reactor criticality

TABLE-V: Domestic Water - Items of Noncompliance

<u>Sample Location</u>	<u>Time Interval</u>	<u>Nature of Noncompliance</u>	
WW-18	10/23/69 - 4/13/70	Time interval greater than 4 weeks	
		No samples	
	10/27/70 - 4/13/71	"	
	8/30/71 - 6/13/72	"	
	Last K-40, etc., analysis for 1969 on 6/10/69	Time interval greater than 12 weeks	
WW-19	1/26/70 - 4/13/70	No samples taken	
	4/13/70 - 6/8/70	"	
	7/7/70 - 10/27/70	"	
		Only samples for 1971-72 taken on 8/3/71	Time interval greater than 4 weeks
	Last K-40, etc., analysis for 1969 taken on 6/10/69	Time interval greater than 4 weeks	
WW-20	8/30/71 - 11/23/71	No samples taken	
		K-40, etc., analysis on 6/12/69 and 12/29/69	Time interval greater than 4 weeks
WW-21	8/30/71 - 11/23/71	No samples taken	
		No samples reported after 5/12/72	Time interval greater than 4 weeks
		K-40, etc., analysis on 6/12/69 and 12/29/69	Time interval greater than 12 weeks
		K-40, etc., analysis on 7/7/71 and 12/22/71	Time interval greater than 12 weeks
WW-22	12/2/69 - 5/12/70	No samples taken	
		No samples after 9/28/70 for 1970	"
	8/30/71 - 2/16/72	"	
	2/16/72 - 4/12/72	"	
	4/12/72 - 6/13/72	"	

TABLE-V: (CONTINUED)

	K-40, etc., analysis on 6/16/69 and 12/2/69	Time interval greater than 12 weeks
	K-40, etc., analysis on 7/7/71 and 12/2/69	"
WW-1	8/30/71 - 11/23/71	No samples taken

TABLE-VI: Surface Water Sampling - Items of Noncompliance

<u>Sample Location</u>	<u>Time Interval</u>	<u>Nature of Noncompliance</u>
SW-23	8/6/69 - 10/11/69	No samples taken
	10/11/69 - 12/6/69	"
	9/29/70 - 11/25/70	"
SW-24	8/6/69 - 10/11/69	No samples taken
SW-25	8/6/69 - 10/11/69	No samples taken
SW-26	8/6/69 - 10/11/69	No samples taken
	8/30/71 - 11/23/71	"
SW-27	8/6/69 - 10/11/69	No samples taken
	8/30/71 - 11/23/71	"

TABLE-VII: Silt Sampling - Items of Noncompliance

<u>Sample Location</u>	<u>Time Interval</u>	<u>Nature of Noncompliance</u>
SI-23	6/12/69 - 12/6/69	Time interval greater than 12 weeks
SI-24	Same as SI-23 above	
SI-26	7/7/71 - 12/22/71	Time interval greater than 12 weeks
SI-27	Same as SI-23 and SI-26 above	

TABLE-VIII: Clam Sampling - Items of Noncompliance

<u>Sample Location</u>	<u>Time Interval</u>	<u>Nature of Noncompliance</u>
CM-23	8/11/69 - 10/11/69	No samples taken
	10/11/69 - 12/6/69	"
	K-40, etc., analyses on 6/12/69 and 12/6/69	Interval greater than 12 weeks
CM-24	Same as above for CM-23	
CM-25	Same as above for CM-23	

TABLE-IX: Concentrations of Sr-90 in Crops Samples

<u>Sample Location</u>	<u>Sampling Date</u>	<u>Concentration of Sr-90 (pCi/gram)</u>
CP-28	1/19/71	80.0 ± 8.0
CP-29	7/6/71	67.2 ± 6.5
CP-30	7/2/71	91.2 ± 9.0

NOTE: Quarterly Averages for 1971 and 1972 range from 8.55 to 49.8 pCi/gram.