EXHIBIT A

PRELIMINARY REPORT

I am a resident of Groton, Massachusetts and am legally competent to provide this Affidavit. I have personal knowledge of the facts set forth herein and if called upon to testify under oath, I would testify to the matters set forth in this affidavit. All of the opinions expressed in this declaration have been made to a reasonable degree of scientific certainty. My conclusions are preliminary in nature and subject to change based on future review of additional information.

In this matter, I am serving as an expert consultant. I have experience as the

- Radiation Safety Officer at Harvard University
- Lecturer on Radiological Health in the department of Environmental Health at the Harvard School of Public Health

I have over twenty-five years of experience in the health physics profession. I began my career in environmental monitoring in the nuclear power industry and am now responsible for one of the largest academic radiation protection programs in the country covering all aspects of the control and monitoring of ionizing and nonionizing radiation sources.

As Lecturer in Health Physics at the Harvard School of Public Health and an Adjunct Professor of Radiological Sciences at the University of Massachusetts at Lowell, I direct and advise graduate level students working on projects and theses through an internship program with Harvard University and the University of Massachusetts Radiological Sciences Program. I hold the MS degree in Radiological Sciences and Protection and the Ph.D. degree in Physics/Radiological Sciences from the University of Massachusetts at Lowell.

I am certified by the American Board of Health Physics and am a member and past chair of the American National Standard Institute (ANSI) Committee N13 on Radiation Protection and ANSI N42 on Nuclear Instrumentation. I am then Associate Editor for the Journal Health Physics and have published numerous articles on radiation protection. Moreover, I was a member of the National Council on Radiation Protection (NCRP) Scientific Committee 2-1 that prepared "Radiation Protection Recommendations for First Responders." I served as chair of the ANSI Working Group for Surface Radioactivity Guides for Materials, Equipment, and Facilities to be Released for Uncontrolled Use (ANSI N13.12), and served on many ANSI Working Groups. Finally, I have served on the Massachusetts Low Level Radioactive Waste Management Board for seven years and three as the chairman.

I am providing my expert opinion concerning NUMEC's operations of nuclear fuel facilities in Apollo, Pennsylvania and in Parks Township, Pennsylvania. In my opinion, after a review of documents and testimony made available in this case, both the Apollo facility and the Parks facility failed to meet the minimum standards of safety for a nuclear facility. In violation of federal law, each of these facilities regularly emitted large amounts of radioactive material into the surrounding environment through airborne stack emissions, unfiltered stack emissions, ventilation problems, unsecured material handling, fugitive dust, and multiple explosions and failed to properly monitor and report its radioactive emissions to the appropriate regulatory agencies. Specifically, my opinions are:

- The NUMEC facilities, operating under Special Nuclear Material licenses from the Atomic Energy Commission (SNM-145, Source Material Licensee C-3762, and SNM-

414), were conducting operations with radioactive materials including plutonium, highly enriched uranium, strontium-90, cesium-137, thorium, and americium.

- Each of these elements emits ionizing radiation, a well recognized carcinogen. It is the presence of ionizing radiation that makes this material suitable for use in nuclear reactions. Furthermore, it is the presence of ionizing radiation that subjects this material to oversight and regulation by the Nuclear Regulatory Commission, formerly the Atomic Energy Commission.
- Ionizing radiation was recognized as a public health and safety hazard during the entire period of the life of the operations of the two NUMEC facilities (1958-1983, 1961-1980).
- NUMEC's operational, health, and safety practices were well below industry standards during much of the operational life of these two facilities as reported in a November 23, 1966 memo from the Nuclear Energy Liability Insurance Association (NELIA) (refer to Appendix 1). This document identified NUMEC as "one of the hottest risks on our books". The memo continues with "the method of reporting the MPC hours does not accord with any published procedure, and I have therefore not been able to interpret it with any degree of confidence."
- NUMEC erred in the operation of the Apollo facility by failing to design or construct a plant that could contain or control the radioactive materials it used. As a result, excessive amounts of ionizing radiation were regularly released into the air.
- NUMEC's radiation protection program at both of these facilities was insufficient and inadequate to effectively monitor for the radioactive materials used at the facility. In Attachment 1, NELIA raises concern about the loss of 30 kg of uranium down the river

and continues with "I cannot but wonder where the health physicist and his monitoring program where all of this time." To further confirm the concerns about the reliable operation and compliance of the facility, a July 9th, 1974 NUMEC memo (see Appendix 2) says "we are guilty of gross irresponsibility in continuing to operate our uranium facilities."

- A review of the compliance record of these facilities reveals numerous large scale releases of ionizing radiation into the neighboring environment resulting from institutional and widespread violations of safety regulations and procedures at the facilities. As shown in Appendix 3, an August 7, 1969 memo that shows environmental contamination in water samples of over 4 million disintegrations per liter of beta contamination in the Apollo drain that leads to the river. The same document continues that the Uranium limit 66 dpm/ml for Uranium. The same document ends with "we believe there is a moral consideration that these high concentrations might produce undesirable environmental effects. Also, there is the more immediate concern that, if the AEC realized the extent of the problem, they might impose an annual total discharge limit…"
- The Atomic Energy Commission, and later the Nuclear Regulatory Commission, cited the NUMEC facilities for violations of federal regulations on a regular basis. NUMEC was often in noncompliance with orders from the AEC/ NRC on regulatory matters relating to the health and safety programs at these facilities. These trends are clearly indicated in a November 29, 1972 Babcock and Wilcox memo about a meeting with AEC compliance inspectors (refer to Appendix 4). In this memo, AEC expressed concern about the "recurring nature and seriousness of the next violations." NUMEC further

reports that AEC opened the meeting by stating that "NUMEC has been the worst offender AEC regulations over the years."

- The history and culture of these facilities along with the documentary evidence of the operations of the plants leads me to believe that the releases that were documented were a fraction of the total number of releases that had occurred over the life of these two facilities.
- NUMEC's environmental monitoring program was also insufficient and inadequately designed and operated and, as a result, the data available concerning the amount of radioactive material emitted from the Apollo and Parks facilities does not adequately account for the extent of the environmental releases from the facility;
- Serious questions are raised about desire of the plant operators at both of these facilities to identify and detect radioactive contamination into the neighboring environment through airborne emissions. These questions are raised by the pattern and timing of the failure of NUMEC to follow well recognized legal and industrial monitoring practices.
- Because of its failure to adequately monitor and report levels of radiation in the facilities and being discharged outside of the facilities, NUMEC's employees at both Apollo and Parks have been designated as part of a special exposure cohort by the United States Department of Health and Human Services. This designation reflects the widespread exposure of individuals at these facilities and the complete failure of NUMEC to monitor for releases of ionizing radiation.

- NUMEC's improper operation of these facilities resulted in unlawful dumping of radioactive material into the soil and water near the Apollo facility, as well as excessive emissions of radioactive materials from the plant stacks into unrestricted areas.
- To the extent the releases of ionizing radiation from the NUMEC facilities were monitored, the data demonstrates numerous releases well in excess of federal regulatory limits in unrestricted areas of the facilities. As an example refer to Appendix 5, which is a NUMEC internal memo from March 22, 196?, That reports stack releases 1350 times the allowable limit (MPC), releases into unmonitored sewer drains, and identifies that "in the present plant exhaust system just is not doing the job it was intent to do." This document continues to say "attempting to comply to the stack regulation is like attempting to eliminate an ant hill one ant at a time."
- To the extent that the releases of ionizing radiation from the NUMEC facilities were monitored, the data demonstrates that these releases were frequent in nature and exceeded federal regulatory limits by many orders of magnitude.
- The documentary evidence suggests that NUMEC was more concerned about losing its license than maintaining the integrity of their special nuclear materials inventory and as a result, NUMEC made affirmative efforts to hide the nature and extent of violations of health and safety regulations. This is evidenced by the NUMEC 'Company Confidential' memo of March 29, 1960 (Appendix 7) that discusses liquid discharges that are well in excess of the permissible radiation exposure limit in areas of the members of the general public up to 20 mR per hour. The document continues with "Imaginary dilution is not satisfactory. We will be found out and could subsequently lose our license."

- The amount of radioactive material that was unaccounted for ("Materials Unaccounted For" or "MUF") at the NUMEC facility was so large that the AEC and Department of Energy (DOE) investigated.
- Based on the inadequate monitoring system, large number if unmonitored release points and cases of significant quantities of radioactive material deposited in the ventilation system, it is likely much of this MUF was released into the communities surrounding these facilities. Appendix 8 contains an April 20, 1964 NUMEC memo to AEC that says "While we are in agreement with you that the frequency of surveys may be inadequate, we would like to point out that a very through survey is a monumental task since we have a total of 88 stacks that could discharge radioactive airborne material into the general environment."

Appendix 1

P-12

Nuclear Energy Liability Insurance Association

85 John Street, New York, N. Y. 10038

Francis X. Boylan
General Manager

William Hicks
Secretary Treasurer

James B. Donovan
General Counsel

Roger T. Waite,
Engineering Consultant
42 Middlebrook Rd.
West Hartford, Conn. 06119

November 23, 1966

Mr. Joe Marrone
NELIA
85 John Street
New York, New York

Re: NUMEC - Report of Overexposure to Employees

Dear Joe:

As indicated in my letter of June 29, a copy of which should be in your files, I have been quite concerned with some of this outfit's operations. In addition to the "technical" overexposures described in the AEH of November 21 (and also referred to in a prior issue) a minor explosion occurred in the Apollo plant on January 16 of this year.

Also this concern has requested an increase in the permissible mass limit to 10 Kg which might be open to question.

The submitting company has asked to be relieved of further service on this risk and has recommended the compensation carrier. I know nothing as to the qualifications of the engineer referred to.

For these reasons I expect to participate in the next inspection sometime after the first of the year, probably with Roman. I have been in correspondence with him on the subject and we will probably pick this up when we visit the Saxton.

This is one of the "hottest" risks on our books.

Now as to your specific questions, I am sorry to say that it is impossible to evaluate the exposures from a physiological standpoint for several reasons.

The method of reporting the "MPC hours" does not accord with any published procedure, and I have therefore not been able to interpret it with any degree of confidence. This is one of the points that I want to investigate.

Also I believe that the employees in question were wearing respirators. Heretofore no credit has been given for the protection provided by respirators so that the calculated exposure is based on the air concentration with no reduction for the possible benefits accruing from the use of respirators. It is for this reason that the insured has asked for recognition of respirators. I have seen some prior correspondence on this point although I cannot find it in any of the AECH reports to which I now have access.

It may therefore be considered that the actual exposures were less than the potential environmental exposure by some indeterminate factor. This is why the insured refers to them as "potential" overexposures.

BW-231-0844

BWM-00020090

As a further complicating factor the exposures reported must be calculated according to the AEC on the basis of a 24 hour average with the published limits as the maximum average for the 24 hours. Actually, the exposures could be averaged over a much longer period, possibly in the order of weeks, for moderate cumulative exposures. If the employees are exposed to very low and safe concentrations for periods before and following the overexposure, the actual average may not be in excess of the permissible for that period.

So you see a quantitative evaluation of the physiological exposure is impossible on the basis of the limited information available to us, but I am inclined to believe that it is not serious. The only accurate measure would probably be by bioassay - a "whole body" count would not show the alpha burden.

Actually I was far more disturbed by the loss of some 30 Kg (if the figure quoted is correct) down river. This is no insignificant amount of uranium. At a value in the order of $16 per gram this would come to almost half a million dollars. Not peanuts!

Apparently and fortunately this material was effectively washed downstream with nobody being the wiser. Of course I cannot but wonder where the health physicist and his monitoring program were all of this time.

I would say that the less publicity given to these incidents at this time the better. They would make quite startling tabloid headlines.

We will dig into the situation as far as we can at the forthcoming visit during the early part of the coming year, and in the meantime I suggest that you sit on this information, recognizing that any individual can develop "symptoms" at any time based on normal or allegedly abnormal exposures.

If there are any questions, please get in touch with me.

Yours very truly,

RTW

RTW/mc

R. T. Waite

Attachment 2

- Plaintiffs' Exhibit No. 2 July 9th, 1974
    - "we are guilty of gross irresponsibility in continuing to operate our uranium facilities."

J-847A

INTERNAL CORRESPONDENCE ONLY

Babcock & Wilcox — Nuclear Materials & Equipment Corp., Apollo, Pa. 15613

TO	DISTRIBUTION	DISTRIBUTION: A. Blum WAC; C. M. Fink JJH; W. F. Heer WFH
FROM	W. A. CAMERON	File No. or Ref.
SUBJECT	STACK AND LIQUID DISCARDS	Date July 9, 1974

This letter to cover one customer and one subject only.

SUSPENSE DATE: MEETING WEEK OF JULY 15

Mr. Blum and I have recently exchanged informal correspondence on the subject of control of stack and liquid discards of SNM from the Apollo Plant. Mr. Blum has provided me with copies of Mr. Hoynacki's May 7 memo regarding pro formas and Mr. delSignore's May 3 memo regarding burials.

If the information contained in these memos is accurate, we are guilty of gross irresponsibility in continuing to operate our uranium facilities. Mr. Hoynacki's memo indicates that over and above the "allowable losses" on May 7 we hade a MUF of 1,946 Kgs of uranium. That represents a dollar value of $500-600,000 and means that for every kilogram of product shipped we had a material loss of $2-3 per kilogram. On the face of it and ignoring environmental problems, it would appear that it was ridiculous to continue operations.

I had suggested to Mr. Blum that we needed to establish some control limits. He points out that we are out of control. All the more reason to establish intermediate unscientific controls. This performance is unacceptable.

The addressees are to schedule a meeting with me during the week of July 15 to demonstrate absolutely that they have a method of controlling the Apollo operations with respect to discards and losses. In the absence of such a demonstration, I will discontinue operation of the facility. In developing your system, please note the following criteria:

(a) The "allowable loss" is zero. Anything in excess of zero must be explained.

(b) Your control system must be simple and understandable and provide for the immediate and automatic shutdown of the facility whenever the controls are exceeded.

(c) I do not accept the necessity of continuing to bury and discharge the quantities of material indicated in the referenced memo. Alternative economic solutions must be developed.

W. A. Cameron

WAC/lkp

Attachment 3

P-104 Roger

DEPOSITION EXHIBIT Williams 4

MEMO

TO: S. Weber
C. Meyers
T. Morton

FROM: R. Caldwell
R. Williams

SUBJECT: River Bank and Bottom Contamination from NUMEC Drains

DATE: August 7, 1969

Several river samples were taken in June and again in July at the four NUMEC discharge points: NDC, Apollo, Metals and Plutonium. In each instance an undisturbed water sample was taken, and then the river bottom was stirred and another water sample taken. The data is given below:

DATE	SAMPLE SIZE	LOCATION	AGITATION?	ALPHA DPM/L	BETA DPM/L
20 Jun 69	500 ml	Metals Drain	No	0.8	72.8
20 Jun 69	500 ml	Metals Drain	Yes	37.6	562.5
20 Jun 69	500 ml	Plutonium Drain	No	2695.2	14858.8
20 Jun 69	500 ml	Plutonium Drain	Yes	393.6	860.8
11 Jun 69	500 ml	NDC Drain	No	342.4	5080.0
11 Jun 69	500 ml	NDC Drain	Yes	64.0	6232.8
11 Jun 69	500 ml	Apollo Drain	No	2515.2	15,672.0
11 Jun 69	500 ml	Apollo Drain	Yes	4460.8	404,292.0
24 Jul 69	500 ml	Metals Drain	No	12.4	1354.8
24 Jul 69	500 ml	Metals Drain	Yes	249.2	6997.2
24 Jul 69	500 ml	Plutonium Drain	No	313.2	789.0
24 Jul 69	500 ml	Plutonium Drain	Yes	588.4	2136.0
24 Jul 69	500 ml	NDC Drain	No	2752.4	14,384.4
24 Jul 69	500 ml	NDC Drain	Yes	61.2	13,434.8
24 Jul 69	500 ml	Apollo Drain	No	2634.0	486,096
24 Jul 69	500 ml	Apollo Drain	Yes	2588	4,273,632

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BW3-02219-01290

BWM-00020936

When the June results were obtained, we were concerned about the high levels, especially at the Apollo and Plutonium drains. So we repeated the sampling on July 24. The results showed even higher levels (for the most part). 11 dpm/ml is the MPCw for plutonium and 66 dpm/ml is the MPCw for uranium.

Weekly concentrations measured at the Vandergrift and Leechburg bridges have not been unusually high, nor have they been detectably different than those at the Apollo bridges.

At the time of sampling only the Apollo plant drain was discharging. Since this drain is also the Apollo city sewer, it's not likely that a tank was being discharged at the Apollo (NUMEC) plant. We think the radioactivity represents an accumulation, which is occurring. In past years we've sampled the river bottom close to the NUMEC drains and found high levels in the mud. All of our discharge records show permissible average concentrations, but the radioactivity being discharged is not effectively dispersed.

Because each discharge is located part way up the river bank, the bank itself becomes contaminated. For example, the bank below the Apollo discharge reads 60 mr/hr beta-gamma. Only 0.6 mr/hr is permissible in unrestricted areas. The NDC drain also has high beta-gamma levels. The difficulty with the bank contamination is that it is a neon light to the whole problem of accumulation of NUMEC radioactive waste in the river. State inspectors have already made surveys, but we've heard of no consequences yet. Part of the reason is they misunderstood the location of the Apollo drain and monitored in the wrong place. Also, we think the NDC drain might still have been extended into the river at that time. Another reason could be that we monitored during low water periods.

Some time ago Plant Services extended some of the NUMEC drains. However, these extensions were improperly constructed and washed away during high water. A buried drain with a standpipe discharge should be installed for each drain. Some consideration should be given to constructing an Apollo plant drain independent of the city sewer system.

Some immediate action is required to remove the high bank levels. We discussed the problem with R. Corridoni and D. Gabrielli. Washing down the bank with high pressure hoses appears to be the simplest solution. Digging up and drumming the contaminated mud is an alternate.

Health and Safety will conduct a river bottom survey when time is available to determine the levels and extent of bottom contamination.

The two major reasons for concern on NUMEC's part revolve around the fact that actinide elements don't disperse in the chemical environment of the river. Precipitates form and settle on the river bottom. We have had evidence in the past of sorption on the hard river bottom shale. Because of these problems, NUMEC should not only take the above recommended actions, but also the Corporate Hazards Committee should consider the problems.

-2-

BW0000448445

BW3-02219-01291

In the first place, we believe there is the moral consideration that these high concentrations might produce undesirable environmental effects. Also, there is the more immediate concern that, if the AEC realized the extent of the problem, that they might impose an annual total discharge limit in addition to the existing concentration limit. This could likely necessitate waste treatment plants at each facility.

-3-

BW0000448446

BW3-02219-01292

Appendix 4

P.31

DEPOSITION EXHIBIT 19

— CORRESPONDENCE ONLY —

E C. Morrison

Babcock & Wilcox Nuclear Materials & Equipment Corp Apollo, Pa. 15613 E. C. MONLKILL

TO: DISTRIBUTION NOV 30 1972

FROM: E.K. Reitler, Jr. EKR

File No. or Ref.

SUBJECT: NUMEC Meeting with AEC Compliance

Date: November 29, 1972

This letter to cover case customer and case subject only.

W.A. Cameron, W.F. Heer and E.K. Reitler, Jr. represented NUMEC in a meeting with AEC Compliance personnel on November 27, 1972. The following AEC personnel were involved: B. Crocker, E. Epstein, W. Kinney, P. Nelson and R. Smith.

P. Nelson opened by explaining the purpose of the meeting. He stated that Compliance was concerned about the recurring nature and seriousness of NUMEC violations. He explained that the AEC could now impose civil penalties for those types of violations. NUMEC was invited to the meeting to outline a course of action to minimize future problems. NUMEC's input would then permit the AEC to determine a course of action regarding disciplinary actions if deemed proper.

W. Cameron suggested that E. Reitler begin the meeting by reporting two incidents which occurred on November 22, 1972, and November 24, 1972. E. Reitler then gave summaries of the two incidents, indicated causes and gave corrective actions. Details are given in Attachments I and II.

W. Cameron explained that the new Health, Safety and Licensing reporting arrangement would facilitate corrective actions by placing this responsibility in a department which is not directly responsible for production. In addition, the Facilities and Health and Safety Department is responsible for providing emphasis on engineered safeguards to provide in-plant safety.

R. Smith reviewed the violation and safety items from the last AEC Compliance inspection. He indicated that the AEC would like to see follow-up bio-assay data which is accumulated following an incident, and the licensee's evaluation of that data. After considerable discussion, NUMEC agreed to provide this information.

B. Crocker commented on W. Kinney's investigation of the recent PC-2 incident. He emphasized the following points:

(1) There appeared to be insufficient or inadequate on-the-job training of operators responsible for performing the work.

(2) NUMEC failed to adequately check out equipment which had not been operational for a prolonged period of time.

(3) The Manufacturing Instructions covering the operation did not take into account the safety considerations of the work.

P. Nelson encouraged the use of Press Releases following incidents to discourage false rumors concerning the incident.

The group then met with J.P. O'Reilly to continue the discussion. He opened the meeting by stating that NUMEC has been the worst offender of AEC regulations over the years. He indicated that the AEC had given NUMEC a grace period after the B&W

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BWM-00020381

takeover, but that little improvement was evident. The AEC is strongly considering imposing civil penalties against NUMEC.

In addition to civil penalties, several other options are available to the AEC including the following:

(1) A group of inspectors could be assigned full time to NUMEC until the problems were resolved.

(2) The frequency of inspections could be increased.

NUMEC then outlined the types of corrective actions which were being implemented in the following areas:

(1) Liquid Waste Management Program
(2) Building Ventilation and Surveillance Program
(3) Materials Control Program
(4) Preventive Maintenance Program
(5) Chest Count Program
(6) Recurring Problems

The AEC will send to NUMEC the minutes of the meeting. NUMEC will then reply with a thorough discussion of the above subjects, corrective actions to be implemented and target dates for completion.

EKR/dld
attachments

DISTRIBUTION: Breuer, A.T.
Cameron, W.A.
Corridoni, R.O.
Crow, W.T.
Eck, J.E.
Foster, F.T.
Heer, W.F.
Kosiancic, E.J.
LaPier, G.
Lukehart, J.H.
McGinnis, B.R.
Moncrief, E.C.
Moore, R.H.
Munns, H.E.
Schnell, E.A.
Smay, D.R.
Vondra, B.L.
Williams, R.A.
Woods, C.R.

BW1500052971

BW3-31001-00403

BWM-00020382

Attachment 5

P.9

TO: G. Burton

FROM: E. Bennett

SUBJECT: Apollo Plant Stacks

DATE: March 22, 1960

CLASS CHGD. BY TR

Seventy-three percent of the 41 stacks sampled on March 17, 1960 were above the MPC by a factor of 5 or more. (This is the total above the MPC.)

Nineteen percent of the 41 stacks sampled and above MPC were laboratory stacks. (CH 1-2-3-3-2)

The present Apollo plant stack situation is impossible.

AEC Regulations (NMA-185) State

1. Every unfiltered exhaust will be sampled at least weekly. When the concentration exceeds MPC (2.8 dpm/m³) the stack will be sampled on 3 consecutive days to establish the average concentration.

2. Every filtered exhaust will be sampled at least monthly, when the concentration exceeds MPC the stack will be sampled on 3 consecutive days to establish the average concentration.

3. If the average concentration is above the MPC (2.8 dpm/m³) the filter will be changed. When a new filter is installed the stack has to be resampled within 16 hours of the filter change.

Health and Safety Requirement

Anytime the manometer on the filter box is greater than 6" the filters are changed. This results in a vicious circle with perpetual sampling the only present solution.

The following will attempt to verify the above statement. There are over 100 stacks, presently about 50 are operational. This number will be back up to 100 after the first of the year. During a stack sampling program, 50 stacks will be sampled and past data shows that 70 to 80 percent of the stacks sampled will be above the MPC. According to the present regulation, we now have to resample 30 to 40 stacks for 3 consecutive days and any stack that averages greater than 2.8 dpm/m³ is required to have it's filter changed. This usually will be 30 to 40 stacks (the same number that was above MPC after the first sample) that have to be resampled within 16 hours after a filter change. Most often the stack is above the MPC after a filter change and the resampling program starts all over.

Attempting to comply to the stack regulation is like attempting to eliminate an ant hill one ant at a time.

Summary

The uranium plant exhaust system needs revamping. Filter boxes need improved. (This could be done one system at a time.) Scrubbers in place of some new filter systems. Reduce number of stacks by exhausting several systems into a larger stack.

CC: [illegible]

1529-002704

BWM-00020085

Stack #99
CP-1 calciner, feed end scrubber

4-8-68 - 12,127 dpm/m^3 = 1350 times the MPC

4-8-68 - 3050 dpm/m^3 = 350 times the MPC

Stack #99 is still throwing solution out onto the roof.

Sludge is 8,500 dpm per gram and the liquid is 1160 dpm per ml.

This solution drains into an unmonitored sewer drain.

The filters for Stacks #18 and 32 were changed on 4-5-68.

The present plant exhaust system just is not doing the job that it was intended to do. With the present exhaust system we can not comply with our NRC-145 regulation.

1. Changing filters on Stack #18 and 32 will present a personnal overexposure problem to the filter changers as well as anyone in the area.

2. Changing the filters on Stack #18 and 32, as well as any other exhaust system, might result in high concentrations of uranium being discharged than what we presently have.

The plant exhaust system, expecially for the high enriched area, needs re-engineering

CC: RCaldwell
CMeyers
JStoner

μ29-002705

BWM-00020086

Attachment 6

P-10

70-135

Nuclear Materials and Equipment Corporation Apollo, Pennsylvania 15613 Telephone GRover 2-9411 Cable N

April 20, 1966

Mr. Dale Smith
Source and Special Nuclear Materials Branch
Division of Materials Licensing
United States Atomic Energy Commission
Washington, D.C. 20545

Subject: SNM-145 License - Out-of-plant Air Surveillance Program

Dear Mr. Smith:

This is to confirm our recent phone conversation regarding the need of experimental data for our proposed out-of-plant air surveillance program. The Apollo plant exhaust system does not land itself readily to conventional diffusion models for analysis of off-site air sample data. The proposed study (Ref. letter dated February 22, 1966) should enable us to establish the optimum location and frequency of off-site sampling, as well as enable us to interpret our data. Since it will take approximately six months to complete the study, I am presenting below a schedule of stack sampling which we will carry out during this time to assure compliance with Part 20:

1. Every unfiltered exhaust will be sampled at least weekly. When the concentration exceeds MPCa, the stack will be sampled on three (3) consecutive days to establish the average concentration.

2. Every filtered exhaust will be sampled at least monthly, when the concentration exceeds MPCa, the stack will be sample on three (3) consecutive days to establish the average concentration.

3. Whenever a new filter is installed the stack will be sampled no later than sixteen hours after installation of the filter.

Whenever MPCa is exceeded in the plant exhausted air, corrective action will be taken to reduce the concentration. We will maintain the yearly averaged concentration in the total volume of air exhausted from the plant below 5 x 10-12 uc/ml.

Sincerely,

Roger Caldwell

Roger Caldwell
Supervisor, Health Physics

Copy Provided Correspondence (2)
PDR

RC/ahb

DOCKETED USAEC APR 22 1966

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PDR ADOCK 07000135
C PDR

8601020217

P0004812

BWM-00020087

April 20 1966 3 Things

Bull Shit

Ck ck Flow Sensing Device

Month
Weekly

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A0098580

BWM-00020088

Appendix 7

P-77

COMPANY CONFIDENTIAL

MEMO TO: F. Cain, Jr. DATE: March 29, 1950

FROM: R. Caldwell CC: Z.Shapiro C.Rogers
S.Wise T.Potter
K.Puechl R.Caldwell

SUBJECT: HOT Health Problems

The health and safety problems are becoming critical for the laundry. One of these is exposure of personnel to airborne contamination during drum unloading. The other is the discharge of liquid waste.

The exposure problem is serious. C. Rupert has had an uptake of plutonium and possibly mixed fission products. He is excreting plutonium above guide levels. We plan to have him whole body counted at an early date.

We had recommended a hood for drum unloading and at your request had written a work order to Engineering. Action by Engineering on the drum unload ventilation seems slow. Could you lend your weight towards getting the engineering design completed.

High plutonium levels in the laundry means someone is being exposed at the plutonium plant. I instructed T. Potter to begin surveillance on plutonium laundry. He will continue the practice of bagging clothes that are highly contaminated. Laundry operators should not open sealed bags without health and safety coverage. Apollo Health and Safety will segregate bagged clothing. Clothing reading above 50,000 c/m alpha will not be washed. This will minimize the high plutonium levels in the laundry waste.

The liquid discharge problem is more difficult to solve. There are high levels of plutonium and mixed fission products in the laundry waste water. Evidence of our high discharge is easy to find. Some dose levels are as high as 20 mr/hour on the river bank. Plutonium peaks can be seen in the gamma spectrum of soil samples. If the dilution recommended by our technicians were truly carried out, we would be meeting AEC requirements. However, I am informed that pumps necessary for providing dilution are missing. Inadequate dilution is not satisfactory. We will be found out and could subsequently lose our license.

The State Regional Sanitary Engineer and the State Sanitary Water Board are not happy with our proposed identification and dilution treatment. They maintain that all discharge should be below permissible concentration. Our practice has been to manage high tanks with low and attempt an arithmetically averaged permissible concentration. This is consistant with 10 CFR 20.

We could fight the Sanitary Water Board on its incompatibility with Federal Regulations. However, both the State and the AEC limit our daily discharge. This arises mainly from the public health standpoint, since the possible biological effects depend on long term accumulation and not temporary high concentrations. We must daily limit on total discharge, so will have to limit the laundry waste to reduce the responsibility in it.

A0031272

BWM-00020860

COMPANY CONFIDENTIAL

I reviewed past efforts on cleaning laundry waste and have identified the problem areas:

1. Most of the radioactivity is non-particulate and straight filtration consequently never worked.

2. Flocculation was given up because filtration was used to remove the floc and, of course, it clogged the filters.

3. Chemical treatment is complicated because of the complexing agents used in the laundry waste.

4. None of the studies were systematic. The literature shows that successful treatment is specific for different nuclides and for different physical or chemical forms of a given nuclide.

I propose a laboratory study to determine the best treatment method for HDC waste. Flocculation and sedimentation appears to be the most promising approach. This has been used by ABC laundries. Health and Safety personnel can be used for the study. We need a work request from you to do the work. If you prefer, the study could be carried out by R & D personnel. As soon as a workable method is found you should request an Engineering Design and build a treatment facility.

In summary, I believe that we must provide treatment for HDC waste. The delaying actions carried out for years are not going to pacify State and Federal authorities any longer. Health and Safety has thoroughly studied the discharge problem in a search to justify untreated release of HDC waste. We can no longer, in good conscience, support this view. HDC and [illegible] management should understand that continued discharge of untreated HDC waste is in violation of state and federal regulations.

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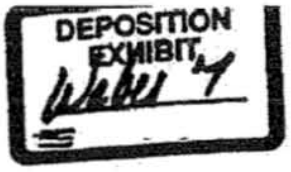
BWM-00020861

Appendix 8



40-1193

NUMEC

Nuclear Materials and Equipment Corporation Apollo, Pennsylvania Telephone GRover 2-8411 Cable NUMEC

1561)

April 20, 1964

Mr. Eber R. Price, Ass't Director
Division of Licensing and Regulation
United States Atomic Energy Commission
Washington 25, D. C.

Ref: LR:GWK
37-[illegible]6-1,-4,5
70-135
40-1193

Dear Mr. Price:

In reply to your letter of March 27, 1964, to Dr. Zalman Shapiro, in which you state "surveys were inadequate to determine compliance with 10 CFR 20-106 (b) with respect to airborne concentrations of radioactive materials released to unrestricted areas, contrary to 10 CFR 20-201 (b) "Surveys", we wish to make the following statement:

While we are in agreement with you that the frequency of surveys may be inadequate, we would like to point out that a very thorough survey is a monumental task since we have a total of 88 stacks that could discharge radioactive airborne material into the general environment.

We have, however, resorted to diffusion equations and meteorological conditions to determine concentrations at our property line. (See attached drawing NUMEC L-1040). Bosanquet's axial plume concentration equation was used to determine the concentration of radioactive material at our property line. The equation is:

$$C_a = \frac{Q}{4\pi x^2 p^2 u} \times 35.3$$

where Q = Emission rate, curies/second or d/m/sec
p = diffusion coefficient
x = distance from stack to point of measurement
u = wind speed
C_a = axial plume concentration, uc/ml

We chose as Q a value of 4.25 x 10^{-11} curies per second or 94.4 d/m/second. This is based on a stack concentration of 9 x 10^{-11} uc/ml or 200 d/m/M^3 and a stack flow of 1000 cubic feet per minute. The maximum permissible concentration for airborne uranium released into unrestricted areas ranges from 4 x 10^{-11} uc/ml for U-238 to 5 x 10^{-12} uc/ml for U-235 and U-235. This stack concentration of 9 x 10^{-11} uc/ml is based on the average yearly concentration of 240 d/m/M^3 of all stack samples collected in 1963 assuming 168 hours per week operation. Correcting for a 120 hour week operation, the average yearly concentration discharged is 170 d/m/M^3. An additional 30 d/m/M^3 was included to compensate for an occasional week-end operation in some of the production departments.

We also assumed that all exhaust systems are in continual 5-day operation. This is a conservative assumption since some of our production facilities are not in operation for significant periods of time.

For p, the diffusion coefficient, we chose a value of 0.05 which assumes conditions of average turbulence.

For the wind velocity, we used values for speed and frequency of direction as reported by the Weather Bureau for the Pittsburgh area for the years 1942-1950 (see Table I). We then proceeded to calculate axial plume concentrations and averaged these concentrations on a yearly basis.

Since our building is approximately 400 feet in a north-south direction, we considered the axial plume concentrations in 50 foot sections to be additive when having winds more or less perpendicular to the long axis of the building. For winds more or less parallel to long axis, we divided the building lengthwise into two sections for winds from the north because of the high concentrations of stacks in the southern end of the building; while for winds from the south we considered the building as a single unit. The results of the analyses are as follows:

1. Direction of winds - west quadrant (WWS, W, WNW, NW)

Wind speed, average - 11.5 mph
Frequency of winds - 31.9%

Section	Average yearly concentration at property line, uc/ml
1	0 (no stacks)
2	0.80 x 10^{-12}
3	1.36 x 10^{-12}
4	1.36 x 10^{-12}
5	1.26 x 10^{-12}
6	0.42 x 10^{-12}
7	0.30 x 10^{-12}
8	0.23 x 10^{-12}
9	0.30 x 10^{-12}
10	0.43 x 10^{-12}

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2. Direction of winds - north quadrant (NNW, N, NNE, NE)

Wind speed, average - 9.46 mph
Frequency of winds - 16.6%

Section	Average yearly concentration at property line, uc/ml
West	2.70 x 10^{-12}
East	2.46 x 10^{-12}

3. Direction of winds - east quadrant (ENE, E, ESE, SE)

Wind speed, average - 8.39 mph
Frequency of wind : 14.3%

Section	Average yearly concentration at property line, uc/ml
1	0 (no stacks)
2	10.9 x 10^{-12}
3	18.x x 10^{-12}
4	20.9 x 10^{-12}
5	11.3 x 10^{-12}
6	3.3 x 10^{-12}
7	2.4 x 10^{-12}
8	1.57 x 10^{-12}
9	1.61 x 10^{-12}
10	0.96 x 10^{-12}

4. Direction of winds - south quadrant (SSE, S, SSW, SW)

Wind speed, average - 10.0 mph
Frequency of winds - 37.4%

Average yearly concentration at property line, uc/ml
22.4

Thus, the average yearly concentrations at our property line when the winds are from the west and north quadrant are below the concentrations permitted in unrestricted areas.

The average yearly concentrations at our property line when the winds are from the east quadrant are at or below the permissible concentrations in unrestricted areas in six of the ten sections, while the concentrations in the remaining four sections exceed the permissible concentration in unrestricted area by factors as high as 5. The area to the west of our property line, while in the legal sense is an unrestricte area, it is somewhat restricted since this area is almost entirely rooftop area owned by the Raychord Corporation. The rooftop width to the west ranges from 120 fee to 225 feet.

The average yearly concentrations at our property line when the winds are from the south quadrant exceed the concentration for an unrestricted area by a factor of approximately 4.5 with 3.7 being caused by 3 stacks. The immediate area to the north of our property line and in line with 3 of our stacks at the north end consists of a dead end alley and the Raychord office building, part of which has two stories and part, one story.

These 3 stacks and the systems they serve, however, were non-existent in 1963. Two of these stacks service a decontamination table where wet cleaning and occasionally some dry cleaning of contaminated equipment will be done. The purpose of the exhaust system for the decontamination booth is to remove halogenated hydrocarbon vapors. It is highly unlikely that concentrations in these two stacks will exceed the permiss ble concentration for unrestricted areas. The decontamination table has been used on the average of a few hours per week. The third stack services an incinerator scrubbing system for which we are seeking license approval. Should the stack concentration from this third stack be such that the general population be over-exposed, we will do one or both of the following steps:

The first step would be to add more air cleaning equipment or modify the existing air cleaning equipment.

The second step would be to relocate the stack further upwind from the north edge of the roof to a location which makes the activity released into the unrestricted area less than 4×10^{-12} uc/ml.

Summarizing, if we assume that each stack is discharging uranium at a concentration of 9×10^{-11} uc/ml, a factor of 20 higher than the permissible for unrestricted areas, we find that the yearly average concentration at our east and south property line does not exceed the concentration permitted in unrestricted areas. The area to the east is a truly unrestricted area. Further, although the area to the west is legally an unrestricted area, we feel that in reality, it is a restricted area because of the large roof area.

The Raychord office building immediately to the north poses the only serious potential hazard; but with knowledge of plant operations, the hazard at our northern property line is minimal.

Eber R. Price
nited States Atomic Energy Commission Page 2 April 20, 1960

Our present policy regarding stack sampling is that the Health and Safety Department shall collect stack samples upon the installation of a new exhaust system or the modification of filters into an existing system in addition to sampling all stacks discharging radioactive materials on a quarterly basis.

We feel that our approach to the survey problem is a justifiable one and indicates that we are in fact complying with the intent of 10 CFR Part 20. We are, of course, open to any recommendation that the Division of Licensing and Regulation can make.

Very truly yours,

E V. Barry

E. V. Barry
Manager, Health and Safety

EVB/ir

Encl.

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P0025001

TABLE I

Percentage Frequency of Surface Hourly Wind Observation by Direction and Seasons and Average Wind Speed by Direction (Pittsburgh, Pa. WBAS 1942-1950)

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Winter D-J-F	7.6%	2.7%	2.7%	2.4%	3.2%	3.9%	2.8%	5.4%	8.5%	13.4%	7.8%	11.7%	9.3%	11.5%	8.2%	3.4%
Spring M-A-M	4.7	3.4	2.9	2.2	3.1	4.2	3.7	6.6	9.2	11.2	7.6	7.9	7.7	9.3	9.8	6.3
Summer J-J-A	5.8	4.0	3.4	2.6	3.2	4.0	4.0	6.4	11.7	15.4	8.4	5.8	5.5	5.9	7.0	5.9
Fall S-O-N	4.1	3.3	3.5	3.5	4.1	5.4	4.7	7.6	11.1	12.8	7.2	7.3	6.0	8.0	6.7	4.3
Average %	4.3	3.2	4.1	2.9	3.4	4.2	3.8	6.5	10.1	13.1	7.7	8.2	7.1	8.7	7.9	5.0
Average Annual Velocity (mph)	7.98	7.93	7.92	8.34	7.74	8.69	8.45	8.79	8.77	10.75	11.38	12.38	11.57	12.29	10.55	9.68