

## COMPLIANCE INSPECTION REPORT

1. Name and address of licensee Nuclear Consultants Corporation Box 6172 Lambert Field St. Louis, Missouri 63145	2. Date of inspection July 26-28, 1965
	3. Type of inspection Reinspection
	4. 10 CFR Part(s) applicable 20 and 30

5. License number(s), issue and expiration dates, scope and conditions (including amendments)
- |                                       |         |          |                 |
|---------------------------------------|---------|----------|-----------------|
| 24-4206-1                             | 10-8-58 | 10-31-60 | Reinspection #7 |
| Amendment 16<br>(amended in entirety) | 7-23-65 | 10-31-66 |                 |

## 6. Inspection findings (and items of noncompliance)

The only items of noncompliance observed or otherwise noted are as follows:

- 10 CFR 20.101 - "Exposure of individuals to radiation in restricted areas."
- (a) in that an individual was allowed to exceed exposure limits as specified for the hands and forearms during the 2nd quarter of 1965. (See paragraph 61 for details.)
- (b)(1) - in that one individual in the 3rd and 4th quarters of 1964 and four individuals in the 1st and 2nd quarters of 1965 were allowed to exceed 3 rems of whole body exposure. (See paragraph 58 of details.)
- 10 CFR 20.201 - "Surveys"
- (b) in that surveys and/or evaluations were inadequate to prevent individuals from receiving whole body and extremity exposures in excess of the limits specified in 10 CFR 20.101. (See paragraph 66 for details.)
- (b) in that surveys of airborne radioactive material in restricted areas were inadequate to determine the concentrations to which individuals were exposed, as limited by 10 CFR 20.103. (See paragraph 69 for details.)

(continued)

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| 7. Date of last previous inspection<br>June 10, 1964 | 8. Is "Company Confidential" information contained in this report? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/><br>(Specify page(s) and paragraph(s)) |
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Approved by:

David L. Foster  
(Inspector)

Eugene J. Moretti, Radiation Specialist  
(Review), Region III  
(Operations office)

September 3, 1965

(Date report prepared)

additional space is required for any numbered item above, the continuation may be extended to the reverse of this form using foot to head mat, leaving sufficient margin at top for binding, identifying each item by number and noting "Continued" on the face of form under appropriate item.

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6. Inspection findings (and items of noncompliance), Continued

10 CFR 20.405 - "Reports of overexposures"

- (a) in that reports were not made to the Commission reporting the exposure of an individual to whole body radiation in excess of the limits specified in 10 CFR 20.101 during the 3rd and 4th quarters of 1964. (See paragraph 58 for details.)
- (b) in that reports were not furnished to an individual who received whole body exposure in excess of the limits specified in 10 CFR 20.101 during the 3rd and 4th quarters of 1964. (See paragraph 58 for details.)

License Condition 15 - "Referenced statements, representations and procedures"

in that experiments were not conducted to determine the collection efficiency of filters used for sampling of airborne radioactive materials as stated in a letter from W. R. Konneker dated December 14, 1964, referenced in this license condition. (See paragraph 68 for details.)

DETAILS

GENERAL INFORMATION

9. This was reinspection #7 and was conducted on an announced basis on July 26 through 28, 1965 with the licensee being notified by telephone on July 22, 1965 of the pending inspection.
10. Mr. Kenneth Miller of the Missouri State Health Department was notified by telephone of the pending inspection on July 22, 1965. This inspector was not accompanied by a representative of that office during the inspection.
11. The information in this report comes from the observation of this inspector or through interviews with the following individuals:

Dr. W. R. Koonaker, President  
Mr. George Ogier, Business Manager  
Mr. Ralph E. Nuelle, Senior Research Physicist, RSO  
Mr. Mike Unterweger, Assistant RSO  
Mr. James Brown, Supervisor of Laboratories & R&D

INSPECTION HISTORY

12. Initial inspection of licensee was conducted on March 19, 1957, at which time one item of noncompliance against 10 CFR 20.401(c), failure to maintain survey records as required, was noted. The first reinspection was conducted on August 21, 1958; the second reinspection was conducted on October 15, 1959; the third reinspection was conducted on November 9, 1960; and the fourth reinspection was conducted on April 26 and 27, 1961. These first four reinspections were clear inspections with no items of noncompliance noted. The fifth reinspection was conducted on May 14 through 17, 1962, at which time three items of noncompliance were noted. The licensee was cited against 10 CFR 20.203(f)(1), for failure to label two storage containers; against 10 CFR 20.401(b), for failure to maintain waste disposal records of materials going to the sanitary sewer system; and against 10 CFR 30.3, for the unauthorized transfer of materials to persons not licensed to receive them. The sixth reinspection was conducted on June 10, 1964, at which time no items of noncompliance were noted.

PROGRAM

13. At the time of this inspection the licensee had 1193.237 millicuries of material in active inventory in dispensing status. The licensee had 2890 millicuries of material in production status. The licensee had 16.5 millicuries of Cobium (Cobalt 60) wire in storage. The licensee had 21.328 millicuries of material as various isotopes for standard sources. This gave the licensee a total inventory of 20,604.565 millicuries of material on hand at the time of the inspection. A complete breakdown of the inventory is included with this report as Exhibit A.
14. As provided for in Item 9 of License No. 24-4206-1, byproduct material is used for research and development, testing of sealed sources for leakage and/or contamination, and for processing for redistribution to licensed users (the major use).
15. From information gathered during this inspection, the licensee appears to be in compliance with the byproduct material, form, quantity and use as specified in License No. 24-4206-1.

#### ORGANIZATION

16. Nuclear Consultants Corporation (NCC) specializes in processing and distributing medical radioisotopes to licensees and furnishes consultant services in the field of health physics and bio-physics. The corporation has a branch office in Cleveland, Ohio, and one in Glendale, California. The branch offices are separately licensed and function as separate radioisotope ordering offices and as repackaging and redistribution plants. They furnish consultant services to customers in their territories.
17. The licensed program constitutes the major portion of the licensee's business, and is directly supervised by the President, L. W. R. Konneker. He is in overall charge of all technical and business activities of the company. Dr. Konneker is assisted in his operational duties by Mr. George Ogier, Business Manager. Mr. Ralph E. Muelle, Senior Research Physicist and RSO, is in charge of the industrial applications of radioisotopes for NCC. Mr. Muelle is assisted in his work by Mr. Mike Unterwager. Mr. James Brown has been put in charge of all research and development activities. He has been relieved of his duties as supervisor of laboratories. The new supervisor of laboratories is Mr. Richard Curtin, and as such is in charge of all production activities.

18. The Isotope Committee for Nuclear Consultants is appointed by Dr. Konneker to serve for a one year period. The membership is as follows:

W. R. Konneker, Chairman, President of the Corporation  
Mr. Ralph Muelle, RSO, Senior Research Physicist  
Mr. Lloyd Strutsman, Secretary, Consulting Physicist  
Mr. James Brown, Senior Chemist in charge of R&D  
Mr. Donald Shumate, Consulting Physicist, in charge of new product development

This committee meets on a formal basis at least once quarterly, and written records of the meeting's business are maintained. As a normal procedure, frequent meetings of the group are held on an informal basis since these gentlemen direct the operations of Nuclear Consultants Corporation.

19. The Radiation Safety Officer for Nuclear Consultants Corporation is Mr. Ralph Muelle. Mr. Muelle's activities as radiation safety officer are in addition to his normally assigned duties of being in charge of all instrument calibration and assay procedures used in the laboratories, industrial activities, and standard sources production. Mr. Muelle is assisted in his job as RSO by Mr. Mike Unterwager. Mr. Muelle reports directly to Dr. Konneker, President of NCC.

#### RADIATION SAFETY PROCEDURES

20. Radiological safety procedures have been written and these are incorporated in the license by reference in License Condition No. 15 relating to application dated November 30, 1964. The licensee also has written operational procedures for work in the laboratories. All new personnel are required to read these procedures, review the radiation protection program, read Title 10, Part 20, and then work directly under the supervision of one of the more experienced individuals for a given period of time.
21. The licensee has available and maintains in the Conference Room-Library Room a complete set of Titles 10. This information is available to all employees of NCC. Licensee maintains on file and makes available, copies of their operating licenses.



## FACILITIES

22. The licensee's new facilities are located on a three acre plot in the Maryland Heights Industrial Court. This is a heavy industry zoned area with no homes, restaurants, stores or other such buildings or facilities in the general area. The facilities itself is of cement block construction. The north half of the building is a one story structure whereas the southern half is a two story building. The front half houses the general office, semi-private and private offices, and conference room, men's and women's rooms, darkroom, animal room, storage and quality control labs. No activity (except microcurie or millimicrocurie sources used for quality control in the Quality Control Lab) are stored, handled, or used in this front section. This portion of the facility is not considered a restricted area. There is essentially only one entrance to the laboratory or restricted area, and this is through a change area located approximately in the center of the building.
23. The restricted portion of the facility consists of an iodine tagging room, a bottle room, production laboratory, sterile room, dispensing laboratory, and a waste storage room. These rooms are all located on the main or upper floor of the facility. Located outside of the restricted area and adjacent to it are the order department and shipping rooms.
24. Located on the lower level of the facility is a restricted area research laboratory. Also located on this level are unrestricted areas consisting of a cafeteria, garage, and a storeroom. The Cobalt Room located by the garage is considered a restricted area.
25. Located in the iodine tagging room are three hoods, 2 six-foot Kewaunee hoods, and 1 four-foot hood. Also located within this facility is a standard metal bench topped with Kamresin, a natural stone base which is impregnated with epoxy resin. This bench is equipped with a stainless steel sink.
26. The production laboratory is equipped with two 6-foot Kewaunee hoods and 3 four-foot Kewaunee hoods. These hoods are all lined with transite and covered with a coating of white epoxy resin. Also located in this facility are four workbenches, all of which are topped with Kamresin. Located within these benches are two stainless steel sinks.
27. Located within the dispensing room area are three gloveboxed trains, four workbench areas, a refrigerator for storage of perishable drugs, and two pass-through windows. These pass-through windows go to the shipping area and to the order room.
28. The licensee has four separate, independent air supply systems in this building. One is a heating and air-conditioning system for the cold area, offices, etc. One is for the general lab area. One is for the iodine 131 tagging room. A separate heated air system has been installed to supply 80% of the air required by all hoods.
29. Licensee has two separate exhaust systems, one for the iodine-tagging room, and one for the production area. Each of these systems is equipped with day and night flow rates, with a normal reduction of  $\frac{1}{2}$  the day flow for night-time rates.
30. Detail description of the facilities and associated equipment can be found in Item 13 of the licensee's backup to the application dated November 30, 1964. These facilities were checked by this inspector against the descriptions as found in the backup, and no major differences or discrepancies from that described were noted.

#### INSTRUMENTATION

31. It was noted that the licensee had on hand at least 16 pieces of equipment utilized for the counting or assaying of materials and 9 pieces of survey equipment. In addition to this normally utilized equipment, the licensee had on hand several pieces of backup equipment of both types.
32. Survey instruments are checked for operation on at least a monthly basis and are fully calibrated at least once a quarter. The counting equipment is recalibrated after each incident of repair and on a frequent, generally daily, basis when in operation.
33. Complete details of all equipment and calibration methods and frequency are included in Items 10 and 11 of the backup material accompanying renewal application dated November 30, 1965.

#### POSTING AND LABELING

34. It was noted by this inspector that the entrances to the restricted area were posted with signs showing the conventional radiation symbol and the words "Caution Radioactive Material." It was further noted that these entrances were posted with signs showing the conventional radiation symbol and the words "Caution Radiation Area." It was further noted that all hoods were posted with signs showing the conventional radiation symbol and the words "Caution Radioactive Materials" and the entrance door to the waste storage room was posted with a sign showing the conventional radiation symbol and the words "Caution Radioactive Materials" and "Caution Radiation Area." The door to the refrigerator storage container was posted with a sign showing the conventional radiation symbol and the words "Caution Radioactive Material."
35. It was noted by this inspector that all containers in which radioactive material was stored or handled were labeled with signs bearing the conventional radiation symbol and the words "Caution Radioactive Material." It was further noted that these containers were labeled as to isotope, quantity, and date of assay.
36. It was noted that Forms AEC-3 were posted on the bulletin boards in the production area and in the cafeteria for the notice of all employees.

#### LEAK TESTS

37. When questioned as to the conducting of leak tests on their sealed sources the licensee stated that they had divested themselves of all sealed sources and as such are no longer required to make leak tests. The licensee further stated that when sources of radiation are required, their supply of radium needles are utilized.

#### WASTE DISPOSAL

38. To maintain records of all materials going to the sanitary sewer system, the licensee has initiated a program where spiral ring notebooks have been chained to each of the sinks to which radioactive material may be flushed. To date, only low levels, microcurie quantities, have gone to these sinks. Written records of these disposals have been made in those spiral ring notebooks.
39. All high level liquid waste generated in the program at NCC is held in polyethylene liter bottles and placed in one of the several walls constructed by the licensee in the floor of the waste storage room. There material is held for decay or for transfer to an authorized waste disposal firm.

WASTE DISPOSAL, Continued

40. All high level waste as generated by the licensee is sealed in plastic and put down in one of the walls in the floor of the waste disposal room and held for decay or for transfer to an authorized waste disposal firm.
41. All low level waste, such as unused iodine capsules or capsules returned from licensees, is placed in plastic bags, taped in cardboard boxes, and placed on a series of shelves located in the waste storage facility. This material is held for decay in that location. Each of the boxes is marked as to what is contained and at what date the decay should have the level down to background. At that time, the boxes are opened and the material contained is surveyed. That material which has a radiation level no higher than that of background is disposed of to the normal waste channels. Any material with levels above background is placed back on the shelf for further decay.
42. At the present time, the licensee does not have an incineration unit. The incineration clause was removed from their license when they moved to the new facility. The licensee stated it is their intention to build an incinerator at this location, but for the time being, no incineration would be done.
43. Since moving to the new facility in February of 1965, the licensee has made no shipments of waste to authorized waste disposal firms with the exception of the material generated in the cleanup of the old facility at 9842 Manchester Road, St. Louis, Missouri. The licensee has on file records of material transferred and the dates of shipment.

RECORDS

44. To maintain records of all materials handled and shipped, the licensee utilizes a prepared invoice form consisting of 9 attached sheets with carbons. This form is utilized for all sales from Nuclear Consultants Corporation. As the order is received by telephone or letter, the bottom portion of the sheet is filled-in by pencil, and then given to the dispensing clerk. All further information required on this is typed in. The order is then filled. This form includes the shipping tags and laboratory records so that all information required is on one single set of forms. This is utilized to reduce typing and handling time. One copy of this form is marked as AEC record and is maintained on file for inspection by the AEC. Other copies are filed in various cross-referenced files. A copy of this form is included with this report as Exhibit B.
45. The identification tag for material shipped to the licensee is typed on a 3 copy identification form. This form includes the conventional radiation symbol in magenta on yellow, and includes the identification of the material being shipped, lot number, volume, total curieage, specific activity, and date. The three copies of this form are utilized to identify the individual container, the lead shielding container it is shipped in, and the third copy is attached to the licensee's invoice. This form accompanies the material throughout the entire packaging and shipping preparations to eliminate chances of shipment mix-ups. A copy of this form is included with this report as Exhibit C.
46. To facilitate maintenance of records of surveys, the licensee has prepared a mimeographed form showing the physical layout of the facility with the numbered locations where smears and radiation surveys are taken. Results of these surveys are maintained on file by the licensee. A copy of this survey form is included with this report as Exhibit D. The counting of smears is done in the quality control laboratory and the records of these smears are maintained on a laboratory counting machine devised by the licensee. A copy of this counting sheet is included as Exhibit E.

RECORDS, Continued

47. The records of all personnel exposures, extremity exposures, bioassay results, thyroid count results, radiation surveys, smear surveys, air surveys, and fluid release records are maintained in loose leaf notebook form. These records are maintained by Mr. Ralph Nuallie and were immediately available for review by this inspector.
48. A weekly inventory of all materials on hand is made by the licensee for purposes of production control. Records of these are maintained by the production supervisor.
49. To maintain control over shipments of radioisotopes, the licensee maintains a kardex filing system in which the name, license number, expiration date, isotope authorized, and quantities of material authorized are entered. In addition to the kardex system, the licensee maintains a separate file for each purchaser in which is kept a copy of the license or a sworn statement as to the materials authorized. When an order is received by Nuclear Consultants, the receiving clerk immediately checks the kardex system to see that the materials requested are authorized. If the person requesting the material does not have a license filed with Nuclear Consultants, the purchaser is requested over the phone to give the license number, expiration date, and materials for which they are authorized. The material is then shipped to the purchaser on this phone information, and a letter accompanies the shipment stating that it will be necessary for that purchaser to forward a copy of their license or a sworn statement as to the material covered on their license prior to additional shipment from Nuclear Consultants. Dr. Konneker stated that they have recently changed their procedure such that if the purchaser does not forward a copy of the license or the sworn statement, when a second request for isotopes is received, it is shipped on the basis of the information received by telephone but a second letter is forwarded to that purchaser again requesting the copy of the license. Copies of these letters are maintained in the file of that purchaser by Nuclear Consultants.

SHIPPING RECORDS

50. A review of the licensee's shipping records was made and a random list of seventy-five shipments compiled. This list was then checked against Region III files to determine that these shipments were to authorized recipients. From the list of seventy-five, four apparent discrepancies were noted. When checked with the licensee, three of these were determined to be errors in transmission from the licensee's Cleveland office to the St. Louis office. The fourth was found to be an error in book-keeping in which a shipment was prepared but never shipped, and the AEC copy of the order was not marked VOID. Thus, no unauthorized shipments were noted during the random check of the licensee's shipping records.

PERSONNEL MONITORING

51. The licensee utilizes his own film badge service, Nuclear Consultants Corporation, for his personnel. The whole body film badges are changed on a weekly basis and the extremities' badges are changed on a bi-weekly basis. Records of the results of these badges are maintained by the licensee and Forms AEC-4 and AEC-5 are maintained on all personnel.
52. Indirect reading pocket dosimeters are utilized by the licensee and the results of the readings are maintained on a log-type sheet for the individuals. A check of these results show that the dosimeters generally show lower results than the film badge results for the individual concerned. The licensee stated that these are used as an indicator only and that the film badges are used officially to determine the person's exposure.

PERSONNEL MONITORING, Continued

53. A review of the licensee's film badge records showed that the licensee was using a thirteen, thirteen, thirteen week quarter interval for the whole body exposures, but a different quarter interval for the extremity badges. This was necessary since the two-week badges on the extremities cannot be fitted into the thirteen week interval quarters. In a letter to L&M dated July 30, 1965, the licensee reported the exposures noted during this inspection were on the 13 week basis. A copy of the above mentioned letter is included with this report as Exhibit F.
54. Dr. Konneker was contacted and it was explained to him that the above described quarters did not meet the criteria as defined in 10 CFR 20.3(a)(4) since the licensee must use only one system of quarters for all types of exposures for the year in which it is initiated. It was also pointed out that he should have been starting his quarters in January, not in the middle of December as he had been doing. In a letter addressed to this individual dated August 18, 1965, Dr. Konneker stated he revised his quarters going back to January 1965. But this was again incorrect since he used 3 month quarters for the whole body film badges. The weekly badge cannot be made to fit this configuration. Likewise, he set the extremity results up on a twelve, fourteen, twelve, fourteen week quarter configuration. A copy of the letter of August 18, 1965 is included with this report as Exhibit G.
55. Dr. Konneker was again contacted and it was explained why this could not be done. In a letter to this individual dated August 23, 1965, Dr. Konneker again revised his quarters and set them up on a fourteen, twelve, fourteen, twelve week basis starting in January 1965. This is the only correct configuration that the licensee's badge results will fit. A copy of this letter is included with this report as Exhibit H.
56. The film badge records as maintained by the licensee indicate that during the 3rd and 4th quarters of 1964, [redacted] received 3.162 and 3.145 Rems of whole body exposure, respectively. [redacted] is the shipping clerk who handles all of the material as it leaves the licensee's facilities. In checking the situation, it was noted that [redacted] has been provided what appears to be adequate shielding and extension tools to prevent over-exposures. The licensee stated that on several previous occasions, [redacted] has been told to use that equipment and stop pulling the boxes containing radioactive materials up against his stomach to hold them while sealing them with tape. The licensee stated that this procedure is most likely how these exposures were received.
57. The revised film badge results as reported in the letter dated August 23, 1965 and included with this report as Exhibit E shows that [redacted] whole body exposures for the 1st and 2nd quarters of 1965 are 2.93 and 2.515 Rems, respectively. These same results show that during the 1st quarter of 1965, [redacted] received 3.35 Rem whole body exposure. [redacted] was the supervisor of Laboratories and spent much of his time during that period working with the licensee's "Technetium", Mo<sup>99</sup>-Tc<sup>99</sup> source generators, containing from 100 to 300 mc of material. These results also show that during the 2nd quarter of 1965, [redacted] and [redacted] received whole body exposures of 3.56 and 3.75 Rems, respectively. [redacted] spent most of his time working with Iodine and [redacted] was a general lab chemist who worked with all materials. [redacted] was subsequently removed to a low level laboratory, the Quality Control Lab, for her permanent assignment.



PERSONNEL MONITORING, Continued

58. When questioned why these exposures had not been reported to the Commission, Dr. Konneker stated that he had not considered them to be overexposures since he had thought that they were allowed five rems per quarter. 10 CFR 20.101 was read to the licensee and he stated that he did not know where he got the five rem figure, but that he could see that he had been wrong. Therefore, the licensee is in noncompliance with 10 CFR 20.101(b)(1), in that four individuals were allowed to exceed three (3) rems exposure to the whole body during the 1st and 2nd quarters of 1965 and one individual during the 3rd and 4th quarters in 1964. The licensee is also in noncompliance with 10 CFR 20.405(a), in that the Commission was not notified of the overexposures that occurred to [redacted] during the 3rd and 4th quarters of 1964. The licensee is also in noncompliance with 10 CFR 20.405(b), in that this individual overexposed in the 3rd and 4th quarters of 1964 was not notified in writing of these exposures. Ex 6
59. A review of the licensee's records of wrist badge results showing extremity exposures revealed several unusual conditions. In the licensee's records, it was noted some bi-weekly results for Messrs. [redacted] and [redacted] were marked as "DU", for damaged by user, and "too dark to read." When questioned on these, the licensee stated that they have had difficulty with the wrist badges getting wet while the individual was working or cleaning up their work location. It was further stated that "Too dark to read" meant that the density of the film was greater than their equipment was calibrated to read. The licensee stated that these individuals' films would be pulled from the vault and re-evaluated. The results of this re-evaluation are shown in the letter from Mr. Konneker dated August 23, 1965 and included in this report as Exhibit H. The damaged films could not be read, but the "too dark to read" films were checked against films exposed to 50% Co-60 gammas and 50% 250 Kev X-Rays. The licensee states that he feels that this sets a condition worse than that to which the individuals' films were exposed.
60. During the period when [redacted] had two films "too dark to read", 3/1/65 - 3/15/65 and 3/15/65 - 3/29/65, the licensee stated that they were still unable to get a net density reading on those films. When questioned as to what work he was doing during that period, [redacted] stated that this was about the time when he was doing a complete inventory on the licensee's stock of Cobalt, Co-60 wire, and Radium. The licensee stated in his letter (See Exhibit H) of August 23, 1965, that these films could have been damaged film or readings in excess of 10,000 mr. Ex 6
61. During the periods between 5/24/65 and 7/4/65 when [redacted] wrist exposures were "too dark to read", he was reported to have been working most of his time on the licensee's "Technikon" Mo<sup>99</sup>-Tc<sup>99</sup> source generators. These films were re-evaluated in the manner described in item 59 above, and two of these were listed to read 6000 to 7000 mr and one was listed to read 5000 to 6000 mr. Totalling these figures using the lower limits listed gives Mr. Brown a total of 27,900 mrem for the wrist badges during the 2nd quarter of 1965. Therefore, the licensee is in noncompliance with 10 CFR 20.101(a), in that an individual was allowed to exceed exposure limits as specified for the hands and forearms during the 2nd quarter of 1965. Ex 6
62. The licensee performs thyroid counts on his employees using a NRD scaler equipped with a crystal probe. This equipment was designed by Dr. Konneker when he was affiliated with the NRD Company. Dr. Konneker stated these counts are made under the supervision of Mr. Lloyd G. Struttman, NCC's Medical Consulting Physicist. Dr. Konneker stated that a background count of the individual made in an area like the forearm or thigh is not subtracted from the count derived from the thyroid. He stated that only an air background count is used for background. Dr. Konneker stated that he felt that with this background in the employees' lunchroom where the counts are made, a calculated thyroid dose of 0.14 microcuries could just as easily be 0.10 microcuries or 0.20 microcuries. It was suggested to Dr.

PERSONNEL MONITORING, Continued

62. Continued

Konneker that if he did not have faith in his counting he might wish to have some of his people counted by an outsider. He said that he thought that he would do that, at least for those individuals who appear to be running high in their thyroid counts.

63. A review of the licensee's records for thyroid counts was made and the results noted for the six (6) highest individuals were abstracted. These results are included with this report as Exhibit I. It should be noted that these results show [redacted] as averaging over the 0.14 microcuries of I-131 limit in the thyroid every quarter since these counts were started in July of 1964. These records also show that [redacted] averaged 0.14 microcuries of I-131 in the thyroid during the 4th quarter of 1964 and 0.16 microcuries during the 1st quarter of 1965; [redacted] averaged 0.147 microcuries during the first quarter of 1965 and 0.215 microcuries during the 2nd quarter of 1965; [redacted] averaged 0.158 microcuries during the 1st quarter of 1965 and 0.47 microcuries during the 2nd quarter of 1965; [redacted] averaged 0.158 microcuries during the 2nd quarter of 1965 and [redacted] averaged 0.258 microcuries during the 2nd quarter of 1965. So far into the 3rd quarter of 1965, [redacted] and [redacted] are both averaging 0.143 microcuries of I-131 in their thyroids. In discussions with Dr. Konneker, it was stated that he felt these thyroid burdens were calculating higher than they really were, but that they might be getting some absorption through the skin.
64. A summary sheet of the thyroid counts, extremity and whole body exposures for those people who appear to be over the specified limits is included with this report as Exhibit J.

Ex 6

SURVEYS

65. The licensee maintains records showing the results of weekly radiation and contamination surveys. The licensee utilizes a line drawing of the facility plus an associated counting sheet to show these results. Copies of these forms are included with this report as Exhibits D and E.
66. Survey instruments are located throughout the licensee's facility for the use of the individuals in determining their working rates and time. It was observed by this inspector that these instruments were being utilized by the employees, but that little attention was being paid to extremity exposures. Dr. Konneker stated that these people were expected to use the instruments to spot high level conditions and then change or correct that condition immediately. The weekly survey, it was stated, was not expected to spot these situations unless the individuals had not done a good job in surveying their work location. The records as maintained by the licensee of the weekly surveys did not point out any unusual conditions. Based on the foregoing information, the licensee's surveys and/or evaluations were inadequate to preclude individuals from receiving whole body and extremity exposures in excess of the limits specified in 10 CFR 20.101, the licensee is in noncompliance with 10 CFR 20.201(b).
67. The licensee stated that the work areas, table tops and floors are cleaned daily to prevent the spread of contamination and to maintain clean conditions for the production of medical isotopes. The equipment used for this cleaning stays in the restricted area and is not used in the clean areas of the facility.



PERSONNEL MONITORING, Continued

68. When questioned about how the licensee sampled for iodine in the air, the inspector was informed that a mat-type air filter was used in a Staplex air sampler. A section of this mat was cut out and counted in a well counter. When asked what the efficiency that mat had for the collection of iodine, the licensee stated that they did not know, so they assumed 100% efficiency. In a letter to DML dated December 14, 1964, Dr. Koneker stated that a series of experiments would be run to determine the efficiency of these filters. This letter was incorporated into the license and referenced in License Condition 15. Therefore, the licensee is in noncompliance with License Condition 15, in that the experiments to determine the efficiency of the filters used in air sampling programs for the collection of iodine were not conducted as prescribed.
69. When questioned how the air samples were taken in the restricted areas, this inspector was informed that they were taken at various times, including during evening hours when production work was not in progress. It was explained that this was done because the noise of the sampler bothered the workers. It was also explained that the sampler was often set on the floor because the vibration of the Staplex caused it to "walk" off of the bench or table it was placed on. Although the licensee's records do not show high air concentrations, especially in the Iodine Production Room, these practices, the unknown efficiency of the sampler, and the high thyroid counts noted previously discussed, indicate inadequate surveys have been made to determine concentrations of airborne radioactive material. Therefore, the licensee is in noncompliance with 10 CFR 20.201(b), in that the surveys of airborne radioactive material in restricted areas were inadequate to determine the concentrations to which individuals were exposed to assure compliance with 10 CFR 20.103.
70. The licensee's records of concentrations in effluents leaving the two stacks are summarized on a graph included with this report as Exhibit K. The information for the Production Lab Stack is drawn from 20 samples taken in 126 days and the information for the Iodine Lab Stack is taken from 28 samples taken in 136 days. This covers the samples taken at the new facilities in Maryland Heights, Missouri. The samples from the Production Lab Stack average  $8.9 \times 10^{-10}$  uc/ml and the samples from the Iodine Lab Stack average  $4.8 \times 10^{-10}$  uc/ml. That material coming from the Production Lab Stack is assumed to be a mixture of all the materials worked within that section of the facility, including some I-131, and that material coming from the Iodine Lab Stack is assumed to be all I-131. Paragraph 3 of page 4, Item #13 "Facilities and Equipment" of the application dated November 30, 1964, referenced in License Condition 15 of this license, describes the output of the exhaust systems and states that the licensee's calculations show a probable dilution of approximately  $10^3$  to  $10^4$  before reaching ground level. This dilution factor, when applied to the licensee's sampling data, places the concentration of radioactive material in the unrestricted areas to be within the permissible limits of 10 CFR 20.

INDEPENDENT MEASUREMENTS

71. Independent measurements throughout the facility were conducted by this inspector utilizing an Eberline E-500B GM survey meter. General room body rates throughout the regulated areas averaged one mr/hr or less. Body working rates at the face of the various hoods ranged up to 10 mr/hr with hand rates inside of the hoods up to 3000 mr/hr. Working rates at the face of the glovebox in the dispensing laboratory ranged up to 28 mr/hr with hand rates in the gloveboxes up to 40 mr/hr. Detailed results of this survey are included with this report as Exhibit L.

INDEPENDENT MEASUREMENTS, Continued

72. An independent smear survey was conducted by this inspector utilizing dry HV-70 filter papers. Twelve smears were taken throughout the facility. The maximum contamination detected was on a working benchtop in the iodine-tagging room where 65,000 dpm per foot<sup>2</sup> was noted. Licensee informed this inspector that all working bench surfaces and floor surfaces are mopped on a daily basis. Average floor surfaces throughout the regulated facility areas were less than 3000 dpm per foot<sup>2</sup>. Wipes taken in the clean areas of the licensee's building ranged up to 656 dpm per foot<sup>2</sup>. Detailed results of these smears are included with this report as Exhibit M.
73. Measurements of the air flows in the hoods of the licensee were conducted by this inspector utilizing an Elmer Jr. Velometer. When first checked, the flows in the various hoods was found to vary from 100 linear feet per minute down to less than 25 linear feet per minute. When this was pointed out to Dr. Konneker, surprise was expressed. Dr. Konneker stated that he had just completed having the air flows throughout the building balanced by a commercial air-conditioning firm. Utilizing the inspector's velometer, Dr. Konneker went back to the hood area and within a two-hour period had balanced the air flow rates on the hoods personally. When rechecked by this inspector, flows averaged 100 linear feet per minute or greater across the face of all of the hoods. Dr. Konneker stated that it was his intention to purchase a velometer for use in the production areas and that periodic hood checks would be made in the future.

LICENSE CONDITIONS

74. The conditions of this license were checked by this inspector and reviewed with the licensee, and with the exception of the citation against License Condition 15 described in paragraph 67 of this report, no other differences or discrepancies were noted.

MANAGEMENT DISCUSSION

75. At the completion of this inspection, the inspection results were reviewed with Dr. W. R. Konneker, President, and Mr. George Ogier, Business Manager. These gentlemen were informed that the licensee appeared to be in noncompliance for allowing the MCC employees to receive whole body and extremity exposures in excess of those limits specified in 10 CFR 20.101; for not reporting certain of those exposures to the Commission and also to the employee concerned, and for inadequate surveys, 10 CFR 20.201(c), to prevent these exposures. Dr. Konneker stated that he had thought that five (5) rem was allowed each quarter for whole body exposure. He further stated that he had not reviewed the results of wrist badges and had not realized they were being assigned those exposures. He stated that he did not feel that they were receiving that much exposure, but that further calibration of the film badges appeared to be in order. Dr. Konneker stated that starting immediately, all personnel in the production area would wear, in addition to their weekly badges, a daily badge. These personnel would in addition wear pocket dosimeters which they would be required to read hourly and record the results twice daily. The personnel would also be required to maintain a log of their work locations and jobs on an hourly basis. In this way, the licensee hoped to spot those jobs and locations that are contributing the majority of the exposure. In addition, new portable shielding using lead bricks would be constructed and individual lead shields for the "Techneks<sup>TM</sup>" would be installed. With this increased shielding and the enforced use of remote handling equipment, already available, the licensee hoped to immediately reduce the extremity exposures.

MANAGEMENT DISCUSSION, Continued

76. These gentlemen were informed that the licensee appeared to be in noncompliance with 10 CFR 20.201(b) and License Condition 15 in that the air sampling equipment had not been calibrated to show the sampling efficiencies for the filters being used, and that the manner and time the samples were being taken did not give a representative sample of the air to which the employees were being exposed. Dr. Konneker admitted that these tests for the sampling efficiency had not been run as yet, but that they would be soon. He further stated that the manner and time of the samples would be changed immediately to give a more representative sample of air in the production areas.
77. These gentlemen were informed that since the licensee did not know the efficiency of the air sampling equipment, especially for I-131, it appeared that they were unable to show what concentrations were being discharged from the stacks. Dr. Konneker pointed out that their license allowed them a  $10^3$  to  $10^4$  dilution factor from the exit of the stack to the ground. Dr. Konneker stated that since this information was in the backup procedures which had been incorporated into License Condition 15 and it had not been questioned by DML, he considered this to be approval for its use. He further stated that even if the efficiency of the sampling equipment is much less than the assumed 100%, it would still be well below the Part 20 MPC limits when the dilution factor was applied. Dr. Konneker did state that they would immediately start trying to find just where in their production system the bulk of the airborne material was coming from, and the use of different types of filters for their exhaust system would be investigated.
78. It was pointed out to the licensee that they appeared to be allowing certain employees to assimilate I-131 in quantities such that the thyroid was maintaining an average concentration in excess of 0.14 microcuries (when averaged over a period of one quarter). The licensee stated that they did not feel that the individuals actually were receiving that much iodine since the background in the area where the counts were taken varied and was somewhat high. Dr. Konneker did say that a thigh or arm count, for body background, was not being taken to subtract from the thyroid count, but that if it were done, he felt that the thyroid count would be below the 0.14 microcurie level. It was suggested to Dr. Konneker that if he did not believe his own counting results, he should have an independent third party do the counting. He stated that he would have some of the persons who were running high counted at one of the local hospitals to compare their results with his own counts. The licensee stated that they were also taking a quarterly urinalysis sample, but that they had so little information on what it really means, that it appears that it is a waste of time and effort. It was suggested to Dr. Konneker that if he would take the urinalysis sample on the same day as the thyroid count, some correlation might be found.
79. It was suggested to Dr. Konneker that since he seemed to be unaware of many of these problems as they developed, he might have his RSO or his assistant correlate all of this information, film badge results, thyroid counts, extremity exposures, air samples, etc., onto a master sheet where the totals could be seen. The film badge result sheets as prepared by NCC do not show running totals. They only show the totals for that particular badge period. The licensee stated that some system of totaling out the results will be conceived so that better administrative and operational control can be exercised.
80. Dr. Konneker was informed that he could expect to receive some correspondence concerning this inspection either from the Region III office or Headquarters. Dr. Konneker stated that he fully expected to hear from the Commission, but that he would not wait for that correspondence to start implementing his radiation protection program changes.

Enclosures:  
Exhibits A thru M

INVENTORY - 7/27/65

Metallic Co-60 (cobium)

Approximately 16.5 curies

ACTIVITY INVENTORY - DISPENSING - 7/27/65

I-131	411 mc
I-125	3 mc
P-32	75 mc
Hg-203	523 mc
Hg-197	38 mc
Cr-51	37 mc
Fe-59	8 mc
Au-198	68 mc
Co-57	0.127
Co-60	0.181
Sr-85	1 mc
Lot 1-65	
Zn-65	
7/27/65	21.1 mc
Lot 2-5	
Ca-45	7.79 mc
Lot 1-5	
Cs-131	0.39 mc

EXHIBIT A  
NCC pg. 1

ACTIVITY INVENTORY - PRODUCTION - 7/27/65

I-131

Bulk 264 mc

Diagnostic Caps

Bulk 250 mc

15Y 384 mc

15G 440 mc

150 165 mc

1. Thyroxine 13 mc

TOTAL 1516 mc

TOTAL - 1516 mc

I-125

Bulk 113 mc

TOTAL - 113 mc

Mo99-Tc99m

Bulk 800 mc

Kcws 20 77 mc

20 154 mc

20 230 mc

TOTAL 1261 mc

TOTAL - 1261 mc

ISOTOPES FOR STANDARD SOURCES - 7/27/65

Mn-54	8 uc
Na-22	75 uc
MFP	185 uc
Ba-133	50 uc
Co-60	100 uc
Zn-65	60 uc
Po-210 (Ra D)	0.85 mc
Tl-204	4.3 mc
Cs-137	11.7 mc
C-14	4.0 mc
U-Nat.	95 gms (Uranyl Nitrate)



NUCLEAR CONSULTANT CORPORATION

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314 - PERSHING 9-8927

INVOICE

TERMS: NET

PLEASE MAKE REMITTANCE TO:

BOX 6172 (LAMBERT FIELD)  
ST. LOUIS, MISSOURI 63145  
314 - PERSHING 9-8927

BRANCH LABORATORIES

17907 Detroit Avenue  
Cleveland, Ohio 44107  
216 - LAkewood 1-2221

1717 Victory Boulevard  
Glendale, California 91201  
213 - CHapman 5-3965

SHIPPED TO

ATTENTION:

				General	
Invoice Date	Customer Ord. No.	Date Entered	Routing		
			prepaid		

Quantity	Catalog	Strength	Isotope	Chemical and Physical Form	Prescalibration Date and Time	Unit Price	Amount
# 265	10	mc I-131 TBI Kit					
# 267	1	mc I-131 TBI Vials					
# 100		mc I-131 NaI CAPSULES +		STANDARD	8AM		
# 100		mc I-131 NaI CAPSULES +		STANDARD	8AM		
						Shipping	
						Tax %	
						TOTAL \$	

CHARGED TO

INVOICE

EXHIBIT B  
NCC pg 1



# NUCLEAR CONSULTANTS CORPORATION

1717 Victory Blvd.  
Glendale, Calif. 91201  
213 - CHapman 5-3965

Box 6172 (Lambert Field)  
St. Louis, Missouri 63145  
314 - PErshing 9-8927

1717 Victory Blvd.  
Glendale, Calif. 91201  
213 - CHapman 5-3965

## EMERGENCY MEDICINE

**HANDLE CAREFULLY**  
**RADIOACTIVE MATERIAL**  
**CLASS-B POISON**  
Group I or II  
No person shall remain within 3 feet of this container unnecessarily  
Do not place undeveloped film within 15 feet of this container  
Principal radioactive content  
Activity of contents  
Number of contents  
Not more than 40 units shall be loaded in one car or one motor vehicle or held at one location  
This is to certify that the contents of this package are properly described by name and are packed and marked and are in proper condition for transportation according to the Regulations prescribed by the Interstate Commerce Commission and the Federal Aviation Agency.

Nuclear Consultants  
Corporation

SECTION:

Customer Ord. No.	Date Entered	Routing
-------------------	--------------	---------

Isotope	Strength	Isotope	Chemical and Physical Form	Precalibration Date and Time
---------	----------	---------	----------------------------	------------------------------

# 265	10	MC I-131 TBI Kit	
# 267	1	MC I-131 TBI Vials	
# 100		MC I-131 NaI CAPSULES +	STANDARD
# 100		MC I-131 NaI CAPSULES +	STANDARD

8AM  
8AM

PACKING SLIPS  
For AEC RECORDS

NUCLEAR CONSULTANTS CORPORATION  
BOX 6172 (LAMBERT FIELD) • ST. LOUIS, MO. 63145  
314 - PERSHING 9-8927

17907 DETROIT AVENUE  
CLEVELAND 7, OHIO  
216 - LAKEWOOD 1-2221

1717 VICTORY BOULEVARD  
GLENDALE 1, CALIFORNIA  
213 - CHAPMAN 5-3965

EXHIBIT B  
NCC pg 2



## NUCLEAR CONSULTANT CORPORATION

BOX 6172 (LAMBERT FIELD) • ST. LOUIS, MO. 63148  
314 - PERSHING 9-8927

## INVOICE

TERMS: NET

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BOX 6172 (LAMBERT FIELD)  
ST. LOUIS, MISSOURI 63145  
314 - PERSHING 9-8927S  
H  
I  
P  
P  
E  
D  
  
T  
O

ATTENTION:

## BRANCH LABORATORIES

17907 Detroit Avenue  
Cleveland, Ohio 44107  
216 - LAKEWOOD 1-22211717 Victory Boulevard  
Glendale, California 91201  
213 - CHAPMAN 5-3965

Invoice Date	Customer Ord. No.	Date Entered	Routing	General			
				prepaid			
Quantity	Catalog	Strength	Isotope	Chemical and Physical Form	Precalibration Date and Time	Unit Price	Amount

# 265 10 mc I-131 TBI Kit  
# 267 1 mc I-131 TBI Vials  
# 100 mc I-131 NaI CAPSULES + STANDARD  
# 100 mc I-131 NaI CAPSULES + STANDARD

8AM  
8AM

Shipping

Tax %

TOTAL \$

CHARGED TO

## REPORT

AIR EXP	RR EXP	P.P.	A/M	SP DEL	UPS	S	OURS BY	OTHER	NO.
------------	-----------	------	-----	-----------	-----	---	---------	-------	-----

DATE TO SHIP	LICENSE	CUST. ORD. NO.
DATE ENTERED	TIME	SPECIAL INSTRUCTIONS - SHIPPING
REQ. BY:	CODE	400 401 OTHER
SPECIAL INSTRUCTIONS - BILLING	SPECIAL INSTRUCTIONS - DISPENSING	

QTY	CATALOG	STRENGTH/ VOLUME	ISOPE	CHEMICAL/ PHYSICAL FORM	PRECALIBRATED FOR
		mc/ uc/	ml	Liquid Oral	Caps I.V. M T W T F S Date:
		mc/ uc/	ml	Liquid Oral	Caps I.V. M T W T F S Date:
		mc/ uc/	ml	Liquid Oral	Caps I.V. M T W T F S Date:
		mc/ uc/	ml	Liquid Oral	Caps I.V. M T W T F S Date:

READY BY

SHIPPED

TIME

am  
pm

CALCULATED BY

DRAWN BY

ASSAYED BY

CHECKED BY

SCALER

1 MINUTE BACKGROUND CHECK

NOTIFY LAB. MGR. IF OVER 20% VARIANCE

ISOTOPE \_\_\_\_\_ TO LABEL  
CHEM. FORM \_\_\_\_\_

PHYSICAL FORM

LOT # \_\_\_\_\_ TC LABEL  
PRECAL DAY \_\_\_\_\_ HR.

MINUS PRESENT DAY \_\_\_\_\_ HR. 1200

EQUALS DECAY DAY \_\_\_\_\_ HR.

INV. ACTIVITY \_\_\_\_\_ UC MC

DIVIDED BY  
FACTOR

EQUALS \_\_\_\_\_ UC TO  
AMT. TO REMOVE \_\_\_\_\_ MC DISP.

\*ENTER SPEC. ACTIVITY TO LABEL

DIVIDED BY \_\_\_\_\_ UC / ml  
PRESENT CONC. \_\_\_\_\_ MC / ml

EQUALS VOLUME TO REMOVE \_\_\_\_\_ ml TO DISP.

PLUS DILUENT \_\_\_\_\_ ml

EQUALS TOTAL VOLUME \_\_\_\_\_ ml TO LABEL

LABEL INFORMATION#

LOT NO. \_\_\_\_\_

VOL. \_\_\_\_\_ ml LABELED BY

TOTAL ASSAY \_\_\_\_\_ UC MC

IN \_\_\_\_\_ CAPS

CONC. ASSAY \_\_\_\_\_ UC / ml  
SPEC. ACTIVITY \_\_\_\_\_ MC / mg

PRECAL. ACTIVITY \_\_\_\_\_ MC / mg

PRECAL. \_\_\_\_\_

DAY \_\_\_\_\_

HR.

EXPIRATION DATE

## ELECTROSCOPE

DAY \_\_\_\_\_ HOUR \_\_\_\_\_ TO DISP.

DISTANCE \_\_\_\_\_ cm  
TIME FOR 40 DIVISIONS (2.0 TO 4.0)

\_\_\_\_\_ SECONDS  
\_\_\_\_\_ SECONDS  
\_\_\_\_\_ SECONDS  
TOTAL \_\_\_\_\_ SECONDS  
÷ 3

EQUALS AVERAGE \_\_\_\_\_ SEC. / 40 DIV.

40

÷ \_\_\_\_\_ SEC. / 40 DIV.

EQUALS \_\_\_\_\_ GROSS DIV. / SEC.

MINUS BACKGROUND \* \_\_\_\_\_ DIV. / SEC.

EQUALS NET \_\_\_\_\_ DIV. / SEC.

TIMES ELECTROSCOPE FACTOR

EQUALS PRESENT ACTIVITY \_\_\_\_\_ MC TO DISP.

PRECAL DAY \_\_\_\_\_ HR.  
MINUS

PRESENT DAY \_\_\_\_\_ HR.  
EQUALS

DECAY DAY \_\_\_\_\_ HR.

TIMES DECAY FACTOR

EQUALS PRECAL. ACTIVITY \_\_\_\_\_ MC TO LABEL

DAY \_\_\_\_\_ HOUR \_\_\_\_\_ TO DISP.

GROSS \_\_\_\_\_ RC

GROSS \_\_\_\_\_ RC

GROSS \_\_\_\_\_ RC

TOTAL GR \_\_\_\_\_ RC

EQUALS AVERAGE GROSS \_\_\_\_\_ RC

÷ TIMER MINUTE  
SETTING \_\_\_\_\_ MIN.

EQUALS AVERAGE GROSS \_\_\_\_\_ RC / M

MINUS BACKGROUND (LOG) \_\_\_\_\_ RC / M

EQUALS NET AVERAGE \_\_\_\_\_ RC / M

TIMES FACTOR \_\_\_\_\_ UC / NET R

EQUALS PRESENT ACT. \_\_\_\_\_ UC

PRECAL DAY \_\_\_\_\_ HR.

LESS PRESENT DAY \_\_\_\_\_ HR.

EQUALS DAY \_\_\_\_\_ HR.

TIMES DECAY FACTOR

EQUALS PRECAL. ACTIVITY \_\_\_\_\_ UC TO LABEL  
OR \_\_\_\_\_

÷ 1000 EQUALS \_\_\_\_\_ MC

SHIP:

SHIP

AIR EXP RR EXP P.P. A/M SP DEL UPS S OURS BY OTHER NO.

DATE TO SHIP

LICENSE

CUST. ORD. NO.

DATE ENTERED

TIME

SPECIAL INSTRUCTIONS - SHIPPING

ATTENTION:

REQ. BY:

CODE

400

401

OTHER

SPECIAL INSTRUCTIONS - BILLING

SPECIAL INSTRUCTIONS - DISPENSING

QUANTITY	CATALOG	STRENGTH/ VOLUME	ISOTOPE	CHEMICAL/ PHYSICAL FORM	PRECALIBRATED FOR
		mc/ ml		Liquid Caps	M T W T F S am n pm
		uc/ ml		Oral I.V.	Date: pm
		mc/ ml		Liquid Caps	M T W T F S am n pm
		uc/ ml		Oral I.V.	Date: pm
		mc/ ml		Liquid Caps	M T W T F S am n pm
		uc/ ml		Oral I.V.	Date: pm
		mc/ ml		Liquid Caps	M T W T F S am n pm
		uc/ ml		Oral I.V.	Date: pm

EXHIBIT B


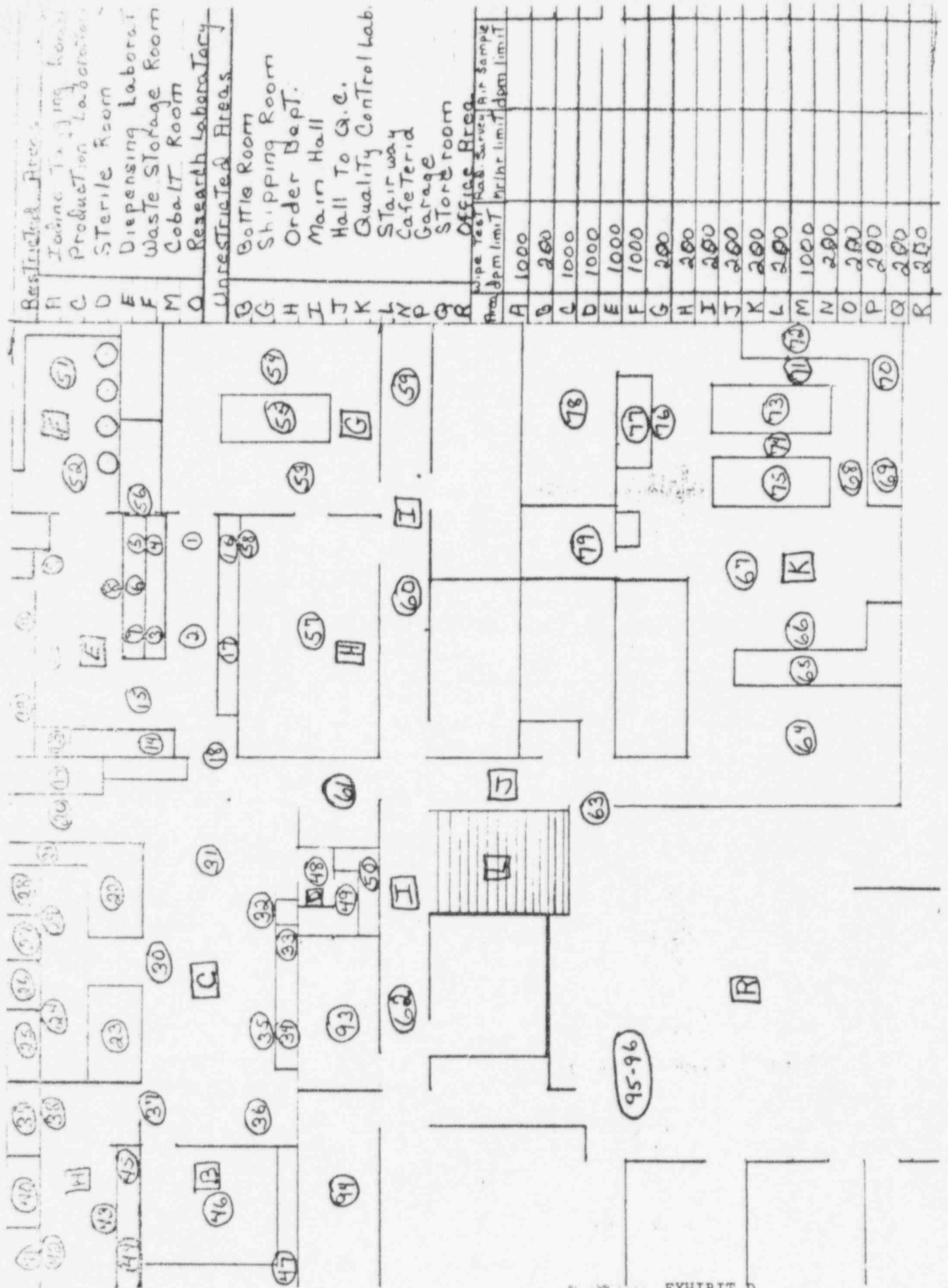
<p><b>CAUTION</b></p>  <p><b>RADIOACTIVE MATERIAL</b></p> <p>Contains 0.75 millicuries hydrochloride</p> <p><b>FOR ORAL ADMINISTRATION ONLY</b></p> <p><b>CAUTION:</b> Federal law prohibits dispensing without prescription.</p>	<p><b>NUCLEAR</b></p> <p>Pharmaceutical Division  <b>NUCLEAR CONSULTANTS CORPORATION</b>          St. Louis 15, Mo.</p>		<p>Net Weight</p>	
	<p><b>SODIUM RADIO IODIDE SOLUTION (I-131)</b>          U.S.P. XVI DIAGNOSTIC</p>		<p>Lot #</p>	
			<p>Vol. 10 ml</p>	
			<p>Total</p>	
			<p>Sp. Act. Cf</p>	
		<p>Date 9-20-54</p>		
		<p>See insert for dosage.</p>		

EXHIBIT C  
NCC





DATE PERFORMED: \_\_\_\_\_

DATE COUNTED: \_\_\_\_\_ TYPE OF COUNT: \_\_\_\_\_ COUNTER: \_\_\_\_\_

AREA	NO.	NCPM		DPM/DM		COMMENTS	AREA	NO.	NCPM		DPM/DM		COMMENTS
		1st	2nd	1st	2nd				1st	2nd	1st	2nd	
Disp. Lab (E)	1						Prod. Lab (C)	33					
	2							34					
	3							35					
	4							36					
	5							37					
	7						I 131 Rm. (A)	38					
	8							42					
	9							43					
	10							44					
	13							45					
	14						Btle. Room (B)	46					
	15							47					
	16						Stle. Room (D)	48					
	17							49					
	18							50					
Prod. Lab (C)	19						W.S. Room (F)	51					
	20							52					
	21						Shpg. Room (G)	53					
	22							54					
	23							55					
	24							56					
	29						Order Dept. (H)	57					
	30							58					
	31						Hall	59					
	32							60	EXHIBIT E NCC pg 1				



AREA	NO.	NCPM		DPM/DM		COMMENTS	AREA	NO.	NCPM		DPM/DM		COMMENTS
		1st	2nd	1st	2nd				1st	2nd	1st	2nd	
Halls (I&J)	61						Co <sup>60</sup> Room (M)	85					
	62							86					
	63							87					
	64							88					
	65							89					
Q.C. Room (K)	66						Esch. Lab (O)	91					
	67							92					
	68						Off Area (R)	93					
	69							94					
	70							95					
	71							96					
	72						Hoods	25					
	73							26					
	74							27					
	75							28					
	76							39					
	78							40					
	79							41					
Str.- way (L)	80							77					
	81							90					
Cafe (N)	82						Dry Box	6					
	83							11					
Gar. (P)	84							12					
									EXHIBIT E NCC pg 2				



# NUCLEAR CONSULTANTS CORPORATION

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LABORATORIES IN ST. LOUIS,  
LOS ANGELES AND CLEVELAND  
OFFICES IN MAJOR CITIES

July 30, 1965

Director, Division of Licensing  
and Regulation  
U. S. Atomic Energy Commission  
Washington 25, D. C.

Dear Sir:

The problem of overexposures for total body and/or extremities for the following listed personnel were thoroughly discussed with your inspector, Mr. D. Foster, during his recent inspection of our facility.

Since both film badges and pocket dosimeter records are kept on all personnel we are listing both measurements for total exposures. It might be noted that the dosimeter records indicate a somewhat lower exposure than the film badges, but the film badge record is considered to be our official record.

Ek 6

1) [REDACTED] - (3/22 to 6/21/65)

Total body - Film badge = 3.638 rem  
Dosimeter = 3.115 rem

Extremities - 13.352 rem (This does not include four badges which were damaged and, therefore, could not be evaluated).

This individual's dosage was mainly because of production techniques and working habits which involved the radionuclides: I-131, Hg-197, and Hg-203.

2) [REDACTED] - (3/22 to 6/21/65)

Total body - Film badge = .329 rem  
Dosimeter = .450 rem

July 30, 1965

2) [REDACTED] . . . (Cont.)

This individual's dosage was mainly because of working habits. This exposure involved: I-131, Hg-197, Hg-203, Mo-99 and Tc99m. Physical removal from the lab area to a low level area has been effected, pending retraining of work habits.

3) [REDACTED] - (3/22 to 6/21/65)

Total body - Film badge = 3.642 rem  
Dosimeter = 3.250 rem

Extremities - 18.400 rem (This does not include two badges which were damaged).

This individual's dosage was because of production techniques during the development of a new product involving Mo-99 and Tc99m (TechnoKow).

4) [REDACTED] (3/22 to 6/21/65)

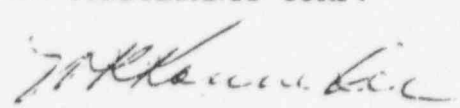
Total body - Film badge = 3.042 rem  
Dosimeter = 2.510 rem

This individual's dosage was because of poor work habits in the packaging for shipment of our catalog items which involved primarily: I-131, Hg-197, Hg-203, Tc99m, and P-32.

More adequate shielding and remote handling equipment is already in actual use or planned for immediate installation. An extensive study of work habits of individuals and production techniques is being undertaken from which additional control of radiation exposure will be effected.

Very truly yours,

NUCLEAR CONSULTANTS CORP.

  
W. R. Konneker, Ph.D.  
President

WRK/js

EXHIBIT F  
NCC pg 2



## NUCLEAR CONSULTANTS CORPORATION

BOX 6172, LAMBERT FIELD • ST. LOUIS, MISSOURI 63146 • 314 PErshing 9-8927

LABORATORIES IN ST. LOUIS,  
LOS ANGELES AND CLEVELAND  
OFFICES IN MAJOR CITIES

August 18, 1965

Mr. David Foster  
U. S. Atomic Energy Commission  
Region III  
Oakbrook Professional Building  
Oak Brook, Illinois

Dear Mr. Foster:

May I again apologize for the delay in getting this information to you as promised last week.

First, you wanted to know just what periods we used for both the first and second quarters of 1965. Our records, as you saw them, consisted of twelve weeks starting December 28, 1964 and ending March 22, 1965 for the first quarter; and thirteen weeks starting March 22, 1965 and ending June 21, 1965.

We have re-evaluated these on a straight calendar quarter. The first quarter includes dates from January 4, 1965 through March 29, 1965; and the second quarter from March 29, 1965 through June 28, 1965. For total body doses the only appreciable changes are for Mr. Hubert Sliepen and it makes the following changes:

<u>PREVIOUS QUARTERS</u>	<u>NEW QUARTERS</u>
First - 2.10	2.49
Second - 3.04	2.78

As you can see this removes him from a reportable over exposure at 3.04 to under the 3.0 at 2.78.

He was over in the fourth quarter so this does not change that position. [REDACTED] total dose was reduced from 3.64 to 3.32 and [REDACTED] from 3.64 to 3.55 -- both still over. It did not throw them over in the fourth quarter. [REDACTED] remained essentially the same at 4.45.

EXHIBIT G

NCC pg 1

RADIOPHARMACEUTICALS • RADIOISOTOPES • MEDICAL PHYSICS CONSULTATION • INDUSTRIAL RADIOISOTOPE APPLICATIONS

AUG 19 1965

August 18, 1965

As for wrist badges, you took a 14 week period for the first quarter, I believe. We have recalculated these using a 12 week quarter for the first quarter from January 11, 1965 to March 29, 1965 and a 14 week quarter for the second, from March 29, 1965 through July 5, 1965. For those in question here are the revised figures:

1/11 - 1/18	750	190	330
1/18 - 2/1	1100	1800	4000
2/1 - 2/15	3500	DU	1300
2/15 - 3/1	DU	1100	1100
3/1 - 3/15	2000	340	Too dark to read
3/15 - 3/29	DU	2500	Too dark to read
	8350+	5930+	6730+
3/29 - 4/12	5000	5000	
4/12 - 4/26	3500	2400	
4/26 - 5/10	4000	2500	
5/10 - 5/24	DU	6000	
5/24 - 6/7	6000 or 7000*	6000 or 7000*	
6/7 - 6/21	DU	6000 or 7000*	
6/21 - 7/5	1200	5000 or 6000*	

The term DU means "damaged by user". This means the film was splashed with water or was contaminated which resulted in a film which could not be read to give meaningful information. Most of the DU film were water damaged. Steps have been taken to make sure the frequency of such accidents are much reduced.

The badges which had been listed as "too dark to read" were taken from the files and re-evaluated. All of these had net densities of greater than 250. For hard gammas this would represent an exposure of 8000 or 9000 mr, for a medium energy (say 250 KV) this would represent an exposure of only 800 to 900 mr.

We attempted to reconstruct a field worse than we think is present by using 50% gammas from Co-60 and 50% gammas or X-ray of about 250 KEV. Based on this mixture the "too dark to read" films were evaluated as shown by the asterisk (\*). Only two film, those for Unterweger for 3/1 - 3/15 and 3/15 to 3/29, were so dark no net density reading could be obtained with our equipment. These could have been damaged film or readings in excess

Mr. David Foster  
Page 3

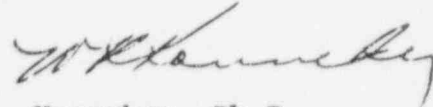
August 18, 1965

Considerable work is underway to better determine the spectrum of the gamma fields to which our wrist badges are exposed and hence better calibrate these. It is presently my firm conviction from data already gathered that many of these have been estimated at twice to three times their actual values. Both Brown and Rodrian may indeed have received over doses in the second quarter, I now doubt this, and if it is over I am sure it is much less than reported.

Thank you for your patience and assistance in this matter and I shall keep you posted on our future findings.

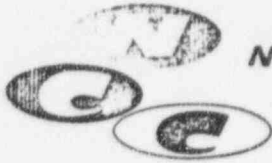
Very truly yours,

NUCLEAR CONSULTANTS CORP.



W. R. Konneker, Ph.D.  
President

WRK/js



# NUCLEAR CONSULTANTS CORPORATION

BOX 6172, LAMBERT FIELD • ST. LOUIS, MISSOURI 63146 • 314 PERching 9-8927

LABORATORIES IN ST. LOUIS,  
LOS ANGELES AND CLEVELAND  
OFFICES IN MAJOR CITIES

August 23, 1965

LICENSE FILE ROUTING	
DLF	

Mr. David Foster  
U. S. Atomic Energy Commission  
Region III  
Oakbrook Professional Building  
Oak Brook, Illinois

Dear Mr. Foster:

As per our phone conversation last Friday, we have re-evaluated all our personnel exposure records for the past three quarters and have recalculated these based on a 14-12-14 week quarter basis.

Ex 6

The first quarter of this year has been recalculated based on a 14-week quarter, starting January 4, 1965 running through April 11, 1965. The second quarter includes the dates from April 12, 1965 through July 4, 1965.

Based on these periods, the whole body dose received by those persons in question are listed below:





	PREVIOUS QUARTERS	NEW QUARTERS
	- 1st - 2.10	2.93
	2nd - 3.04	2.515
	- 1st - 2.05	3.35
	2nd - 3.64	2.665
	- 1st - 2.025	2.68
	2nd - 3.638	3.56
	- 1st - -0-	.92
	2nd - 4.53	3.75

EXHIBIT H  
NCC pg 1



August 23, 1965

As can be seen from this data, [REDACTED] exposure, spread in this manner, would result in a nonreportable amount for both quarters.

In the case of the other three, it spreads the exposure, but results in slight over-exposures for all three for this period.

As for wrist badges, using the same periods, the following data was obtained:

**12/28 - 1/11	650	1760	5000
1/11 - 1/18	750	190	330
1/18 - 2/1	1100	1800	4000
21/ - 2/15	3500	DU	1300
2/15 - 3/1	DU	1100	1100
3/1 - 3/15	2000	340	Too dark to read
3/15 - 3/29	DU	2500	Too dark to read
3/29 - 4/11	5000	5000	3500
	14,000+	12,690+	15,230+

4/12 - 4/26	3500	2400
4/26 - 5/10	4000	2500
5/10 - 5/24	DU	6000
5/24 - 6/7	6000 or 7000*	6000 to 7000*
6/7 - 6/21	DU	6000 to 7000*
6/21 - 7/4	1200	5000 to 6000*

\*\*(This is a 3-week rather than a 2-week period. This came during the period that we were moving our laboratories and represents as close as we can come to the 14-week first quarter).

The term DU means "damaged by user". This means the film was splashed with water or was contaminated which resulted in a film which could not be read to give meaningful information. Most of the DU film were water damaged. Steps have been taken to make sure the frequency of such accidents are much reduced.

The badges which had been listed as "too dark to read" were taken from the files and re-evaluated. All of these had net densities of greater than 250. For hard gammas this would represent an exposure of 8000 or 9000 mr, for a medium energy (say 250 KV) this would represent an exposure of only 800 to 900 mr.

Mr. David Foster  
Page Three

August 23, 1965

We attempted to reconstruct a field worse than we think is present by using 50% gammas from Co-60 and 50% gammas or X-ray of about 250 KEV. Based on this mixture the "too dark to read" films were evaluated as shown by the asterisk (\*). Only two film, those for Unterweger for 3/1 - 3/15 and 3/15 to 3/29, were so dark no net density reading could be obtained with our equipment. These could have been damaged film or readings in excess of 10,000 mr.

Considerable work is underway to better determine the spectrum of the gamma fields to which our wrist badges are exposed and, hence, better evaluate the actual exposures.

Thank you for your patience and assistance in this matter and I shall keep you posted on our future findings.

Very truly yours,

NUCLEAR CONSULTANTS CORP.



W. R. Konneker, Ph.D.  
President

WRK/js

EXHIBIT H  
NCC pg 3

THYROID COUNTS IN MICROCURIES IN THE THYROID OF I-131

DATE	[REDACTED]					
<u>1964</u>						
7/27	0.40					
8/24	0.30					
9/4			0.14			0.00
9/18		0.01				
10/5	0.19					
10/6	0.30					
10/7	0.25					
12/2	0.00	0.14				
<u>1965</u>						
1/8			0.22			0.20
1/20		0.08				
1/27	0.067	0.104				
1/28			0.18			0.064
2/5	0.091	0.138	0.13			
2/15			0.05			0.144
2/16	0.137					
2/17		0.159				
3/8		0.077				
3/9	0.16		0.14			0.16
3/12	0.22					
3/17		0.147	0.19			0.16
3/22	0.17					0.16
3/26	0.20			0.21		0.14
4/8	0.14	0.15	0.202	0.164		0.15
4/16				0.10		
4/27	0.20	0.21	0.10	0.50	0.165	
4/30				0.46		
5/17			0.14	0.50		
5/18	0.18	0.138			0.31	0.20
6/4	0.16		0.137	0.75	0.30	
7/1	0.18	0.13	0.02	0.13		0.23
7/6	0.19			0.22		0.22
7/16				0.137		
7/23	0.10		0.04	0.04	0.08	0.07

Ex 6

EXHIBIT I  
NCC

Quarters	1964				1965			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th
					1/4-4/11	4/12-7/4	7/5-10/10	10/11-1/2

THYROID COUNTS - I-131 in  $\mu$ c in Thyroid

[REDACTED]			0.40	0.21	0.148	0.180	0.145
[REDACTED]				0.085	0.122	0.159	
[REDACTED]				0.14	0.16	0.095	0.04
[REDACTED]					0.158	0.47	0.132
[REDACTED]						0.258	0.08
[REDACTED]				0.00	0.147	0.215	0.145

Ex 6

EXTREMITY EXPOSURES - Rem/Qtr.

[REDACTED]				15.230+		
[REDACTED]				12.690	27.900	

WHOLE BODY EXPOSURES - Rem/Qtr.

[REDACTED]	1.935	3.000	3.162	3.145	2.93	2.515
[REDACTED]	1.535	2.115	2.400	2.725	3.35	2.665
[REDACTED]	1.485	2.350	2.440	2.515	2.68	3.56
[REDACTED]					0.92	3/75

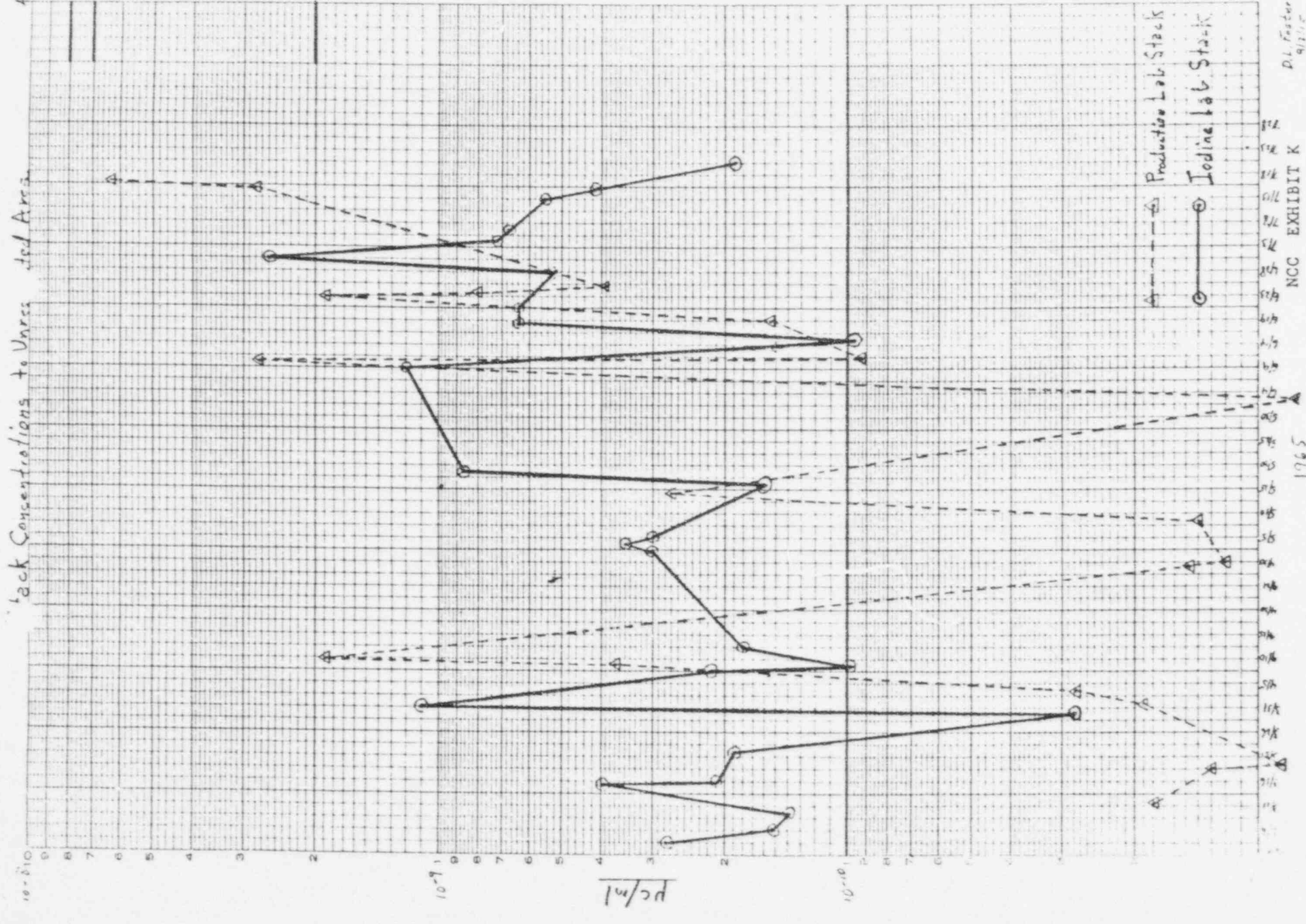
EXHIBIT J  
NCC

MPC  
I-131  
MPC  
I-131  
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MPC  
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I-131

Back Concentrations to Unres. sed Area



D.L. Foster  
9/2/65

NCC EXHIBIT K

1965

## RADIATION SURVEY RESULTS

### Iodine Tagging Room

Face of capsule hood	40 mr/hr
Body rate at capsule hood	10 mr/hr
Face of high level dilution hood	70 mr/hr
Body rate at high level dilution hood	10 mr/hr
Face of low level dilution hood	8 mr/hr
General body rate in room	1 mr/hr

### Production Laboratory

Face of mercury hood	6 mr/hr
Face of Mo-Tc 99 hood	10 mr/hr
Rate at top of shield in Mo-Tc 99 hood	1000 mr/hr
Hand rate inside Mo-Tc 99 hood	3000 mr/hr
Face of dilution hood	8 mr/hr
Hand rate inside dilution hood	175 mr/hr
Face of gold hood	2 mr/hr
Face of P-32 hood	0.7 mr/hr
General room rate	0.8 mr/hr

### Dispensing Laboratory

West glovebox working rate	28 mr/hr
Hand rate in west glovebox	40 mr/hr
East glovebox working rate	2.5 mr/hr
Hand rate in east glovebox	7 mr/hr
Working rate at east benchtop	1.5 mr/hr
Face of storage refrigerator	9 mr/hr
Working rate at dispensing clerk's desk	1 mr/hr

### Waste Storage Room

Rate at face of entrance door	7 mr/hr
Max body rate in room	17 mr/hr

### Cobalt Room

Rate at face of entrance door	1.5 mr/hr
Body rate at loading station	7 mr/hr

### Cafeteria

General room rate	0.03 mr/hr
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EXHIBIT L  
NCC

SMEAR SURVEY RESULTS

<u>Location</u>	<u>Results in D/M/Ft<sup>2</sup></u>
<u>Iodine Tagging Room</u>	
Floor at entrance door	5,281
Floor in front of dilution hoods	4,958
Floor in front of capsule hood	14,571
Bench top at eat wall	65,131
<u>Production Laboratory</u>	
Floor in front of P-32 hood	3,721
Floor in front of Mo-Tc 99 hood	5,961
<u>Dispensing Laboratory</u>	
East bench top	4,117
Floor in front of east glovebox	4,416
<u>Change Area</u>	
Floor in clothing change area	5,574
<u>Clean Areas</u>	
Floor outside of change area	513
Floor in Quality Control Laboratory	656
Floor in general office area	252

EXHIBIT M  
NCC



*Hold with license ?  
Scott*

Region III Files

August 9, 1965

J. M. Allan, Senior Radiation Specialist  
Region III

COMPLIANCE INQUIRY MEMORANDUM  
NUCLEAR CONSULTANTS CORPORATION, ST. LOUIS MISSOURI  
LICENSE NO. 24-4206-1  
REPORT OF PERSONNEL OVEREXPOSURES

Reference a letter dated July 30, 1965 from subject licensee in which a report is made of whole body exposures to two individuals and whole body and extremity exposures to two additional individuals in excess of or near allowable limits. These exposures were reviewed during a routine inspection of subject licensee during the week of July 26, 1965. The results of the inspection will be transmitted in a Form AEC-417 report since other matters of health and safety were noted.

cc: Enforcement Branch, SL&R:HQ  
Division of Compliance, HQ



*143-65*

SIA:EM

AUG 5 1965

Nuclear Consultants Corporation  
Box 6172, Lambert Field  
St. Louis, Missouri 63145

Attention: Dr. W. R. Kammner  
President

Gentlemen:

Thank you for your letter of July 30, 1965, informing us of the exposure of four individuals to radiation.

As you perhaps know, reports of this type are required by our regulation 10 CFR 9, "Public Records," to be placed in the Commission's public records. A copy of 10 CFR 9 is enclosed. However, names of persons who are exposed to radiation or radioactive materials are not to be included in the public records. Therefore, we have deleted the names of the exposed individuals from the copy of your report which we have placed in our Public Document Room.

You will note that Section 20.405 of 10 CFR 20, "Standards for Protection Against Radiation," includes the following paragraph:

"(c) Any report filed with the Commission pursuant to this section shall be prepared so that names of individuals who have received exposure to radiation will be stated in a separate part of the report."

Accordingly, any subsequent report of this kind should be submitted in compliance with the foregoing paragraph.

Very truly yours,

cc: Compliance Div., HQ )  
Compliance Div., III )  
Public Document Room) w/cpy ltr 7-30-65  
Isotopes Branch, BNL )  
Incident File )  
Enclosure: )  
10 CFR 9

W. R. Price, Director  
Division of State and  
Licensee Relations

SIA:EM  
RM:lrm:EGP

SIA  
WRPrice

8-3-65



## NUCLEAR CONSULTANTS CORPORATION

BOX 6172, LAMBERT FIELD • ST. LOUIS, MISSOURI 63145 • 314 PErching 9-8927

LABORATORIES IN ST. LOUIS  
LOS ANGELES AND CLEVELAND  
OFFICES IN MAJOR CITIES

July 30, 1965

Director, Division of Licensing  
and Regulation  
U. S. Atomic Energy Commission  
Washington 25, D. C.

Dear Sir:

The problem of overexposures for total body and/or extremities for the following listed personnel were thoroughly discussed with your inspector, Mr. D. Foster, during his recent inspection of our facility.

Since both film badges and pocket dosimeter records are kept on all personnel we are listing both measurements for total exposures. It might be noted that the dosimeter records indicate a somewhat lower exposure than the film badges, but the film badge record is considered to be our official record.

1) [REDACTED] - (3/22 to 6/21/65)

Total body - Film badge = 3.638 rem  
Dosimeter = 3.115 rem

Extremities - 13.352 rem (This does not include four badges which were damaged and, therefore, could not be evaluated).

This individual's dosage was mainly because of production techniques and working habits which involved the radionuclides: I-131, Hg-197, and Hg-203.

2) [REDACTED] - (3/22 to 6/21/65)

Total body - Film badge = 4.529 rem  
Dosimeter = 4.450 rem

2) [REDACTED] . . . (Cont.)

This individual's dosage was mainly because of working habits. This exposure involved: I-131, Hg-197, Hg-203, Mo-99 and Tc99m. Physical removal from the lab area to a low level area has been effected, pending retraining of work habits.

3) [REDACTED] - (3/22 to 6/21/65)

Total body - Film badge = 3.642 rem  
Dosimeter = 3.250 rem

Extremities - 18.400 rem (This does not include two badges which were damaged).

Ex 6

This individual's dosage was because of production techniques during the development of a new product involving Mo-99 and Tc99m (Technecium).

4) [REDACTED] (3/22 to 6/21/65)

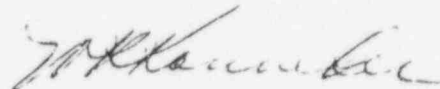
Total body - Film badge = 3.042 rem  
Dosimeter = 2.510 rem

This individual's dosage was because of poor work habits in the packaging for shipment of our catalog items which involved primarily: I-131, Hg-197, Hg-203, Tc99m, and P-32.

More adequate shielding and remote handling equipment is already in actual use or planned for immediate installation. An extensive study of work habits of individuals and production techniques is being undertaken from which additional control of radiation exposure will be effected.

Very truly yours,

NUCLEAR CONSULTANTS CORP.



W. R. Konneker, Ph.D.  
President

WRK/js