PDR 70-820

8005120047
C

UNC RECOVERY SYSTEMS

Division of United Nuclear Corporation
A UNC RESOURCES Company

One Narragansett Trail
Wood River Junction, Rhode Island 02894

Telephone 401/364-7701

January 28, 1980
CEB 80 - 25

Applicant.....
Check No. 09593
Amount, Fee Category $140.00 - 14
Type of Fee. Amend
Date Check Rec'd. 3/4/80
Received By..... Barr 80-1

U. S. Nuclear Regulatory Commission
W. T. Crow, Chief
Fuel Cycle and Material Safety
7915 Eastern Avenue
Silver Spring, MD 20910

Reference: Letter, C. E. Bowers to W. T. Crow, dated September 28, 1979.

Dear Mr. Crow:

The purpose of this letter is to submit additional information regarding the operation of the facility approved by Amendment No. 4 to License SNM-777. That amendment authorized treatment of lagoon and process wastes by evaporation of the liquid and drying of the solids, in preparation for shipment to an authorized burial site. We are currently preparing that facility.

This work requires two changes in the information previously submitted to you. First, the process has been modified from uranium-recovery to waste treatment. Second, the waste treatment process requires the accumulation of processed waste in shipping containers prior to shipment for burial. The first change is considered to be authorized by existing license approvals, as it has no features which would change the approval basis and the original plan also provided for solids-drying subsequent to uranium recovery. Therefore, we expect to proceed with waste treatment operations as soon as the equipment has been received and installed.

The second change involves an increase in the amount of U235 in the building beyond the amount originally projected as being in the process equipment (although the concentration is still expected to be uniform and considerably less than the exempt quantity of five grams per cubic foot in the shipping containers). In addition, we feel that our current license authorization (SNM-777 subsection 303.3) permits this change without need for further amendment, as the surface density will be far below the 175 grams of U235 per square foot authorized therein. The maximum U235 surface density projected for the shipping containers of processed waste should be no more than seven grams U235 per square foot.

15585

However, since the addition of the drum accumulation is expected to result in a change in the overall U235 content of the building as originally approved, we are interpreting this item as an administrative change to the license. Therefore, while we expect to initiate waste treatment activities in this building under the existing license at an early date, we will initially control the U235 content of the building to the amount currently indicated in the license, pending your agreement that the drums are already permitted by the license or until the license is amended to specifically permit that activity.

Accordingly, attached is a revision to Part 925.17 of license SNM-777 to incorporate the appropriate details of the waste treatment operation and associated safety evaluations. In order to continue our progress in establishing a waste management program and in meeting the lagoon retirement requirement imposed by License Condition No. 26, we would appreciate your action on the waste drum accumulation aspect of this submittal at the earliest possible time. In the meantime, please contact us if you have any questions on this subject.

Very truly yours,

C. E. Bowers
President

CEB:ak

Attachments: SNM-777 Section 900, Part 925.17, pages 1 through 8, Drawing MI-099-1, dated September 14, 1979.

ATTACHMENT

This payment is being made, under protest, to the Nuclear Regulatory Commission in compliance with the final order of the United States Nuclear Regulatory Commission entered on February 9, 1978, and publicly noticed on February 21, 1978 (43 Federal Regulations 7210) for inclusion in Title 10, Chapter I, Code of Federal Regulations, Part 170, entitled "Fees for Facilities and Materials Licenses and Other Regulatory Services under the Atomic Energy Act of 1954, as Amended, Revision of Fee Schedule". United Nuclear Corporation specifically requests that all payments made as a result of this rule refunded with interest, if, as a result of future review or as a result of any subsequent action on the part of any other licensee or concerned party, this rule is determined to be illegal under Federal or State

UNITED NUCLEAR
CORPORATION

LICENSE; SNM-777, DOCKET 70-820	Page 1 of 8
SECTION 900 RECOVERY OPERATIONS	Approved
PART 925.17 RECLAMATION AND TREATMENT OF IMPOUNDED RESIDUES	Issued January 28, 1980
	Supersedes March 26, 1979

General

Reclamation of uranium values from lagooned residues is accomplished by separation of the solids from the chemically neutralized processing wastes, dissolution and chemical adjustment, large-volume extraction, transfer from the extractant to an aqueous solution, and transfer of this very low uranium concentration solution (few ppm range) to the main process stream. This is shown as a flow diagram in Figure 925.17-I.

A separate bay, approximately 15 feet high and 50 x 50 in area extends from the main process building to the north. The original north building wall of cement blocks remains as a permanent physical divider. The plan view, elevation, location and floor equipment layout are shown in drawings MI-007-2, MI-097-3, MI-097-4, and MI-097-5. An optional layout for use in liquids evaporation and solids drying is shown in drawing MI-099-1.

The total quantity of the U-235 isotope in this physically separated bay during the reclamation option is limited to a nominal 350 grams (with an uncertainty of plus or minus 150 grams). This places the maximum value at 500 grams of U-235. With the application of the option of treatment by drying and containerizing, the maximum quantity in the building will be exceeded by the addition of material in the stored drums, bringing the maximum value to approximately 4500 grams U-235, distributed throughout the building.

Multiple analyses are performed, but because of the very low uranium content, a large uncertainty is carried. The original material, before neutralization and discharge to the lagoon, was analyzed to insure that no more than 100 ppm of U-235 were present, with a design expectation of 20 ppm. The settled solids (and supernate) in the lagoons and holding ponds are regularly sampled, with a final analysis before reclamation. In the reclamation process, samples for process control are taken at several points. These steps provide confidence in the control of the total quantity in the reclamation bay.

925.17.1 Reclamation Process

The reclamation process for recovering uranium values from residues previously discarded as economically unrecoverable is based upon enhancement of the solvent extraction process. The extraction process is designed to operate at low concentrations with very small mass transfer. Co-extraction of other cations is permitted (and may even be encouraged as carriers for the uranium). The final result is an acidic aqeuous solution containing very small quantities of uranium.

This solution is adjusted to be compatible with the primary recovery and purification processes of the main facility. It is therefore transferred at this low concentration to the main process area. This precludes any concentrations or buildup in the reclamation area.

The reclamation process steps are:

1. The solids are transferred from the lagoons, holding (settling) ponds, or solids storage to a large holding tank for dissolution; the holding vessel is an 1800 gallon tank fabricated from a reinforced polymeric resin with provision for mechanical agitation. The solids are slurried with water (if not already in this form), and a previously-determined quantity of concentrated nitric acid is added.

2. The acid is added slowly and intermittently to allow the gas (primarily CO_2) to evolve at a controllable rate that will not overload the exhaust venting system. The temperature is controlled to avoid boiling off free nitric acid.

3. The resulting solution, with the remaining insoluble solids (such as calcium fluoride), is adjusted for acid concentration and the solids removed. In the flow diagram of Figure 927.17-I, the alternate methods of decanting, filtration or centrifugation are shown. Any of these, or any combination, may be used, with continuous centrifugation preferred.

4. The solids are washed and collected in a container (a "Dumpster" or equivalent) for final disposal as removed. As an alternative, solids may be transferred to tank or pond storage pending a decision on disposal.

925.17.1 (continued)

5. The acidic aqueous liquid is transferred to a similar 1800 gallon tank for holding and final adjustment of the salting-out agents and acidity. The salting, or carrier agents are primarily inorganic or organic cations. Their identity and concentrations are proprietary and not pertinent to the health and safety evaluation, except that any with toxic properties are identified and monitored to insure control to below accepted limits.

6. The extraction system is scaled up from a pilot unit operated in the main facility. Organic extractant and acidic aqueous solution are fed concurrently into an in-line turbulent mixer. The mixing is intensified by internal spiral-form baffles. The discharge from this unit flows into a horizontal pipe (three inch diameter in the pilot, 12 inch diameter in the production unit) of sufficient length to allow separation of the two phases. Lengths 12 feet or greater are planned. Rectangular pipe of equivalent cross-section (but narrower horizintally) may be substituted.

   As an alternative to or in addition to the in-line turbulent mixer, the 1800 gallon tanks may be used as a conventional mixer-settler system.

Figure 925.17-I shows the countercurrent flow designed to contact the solution for optimum extraction efficiency. Raffinate from this system is neutralized with lime, and centrifuged (or otherwise treated) to remove solids. Solids are collected in a large container (a "Dumpster or equivalent) and discarded in accordance with approved procedures. An option is retained to directly evaporate the solution as a volume reduction step, or to collect in a tank or pond for rework as needed.

The acidic aqueous solution containing very low concentrations of uranium (ppm range) is transferred through small diameter pipe (one inch or less) to the main process area. An airbreak is provided in this line to preclude reverse flow. In the main process area, the solution is concentrated and processing is completed.

925.17.1 (continued)

In combination with or in lieu of the reclamation process described above, the lagoon and process waste materials may be treated by direct evaporation of liquids, drying of solids, and containerization. In this case, the treatment of the waste material in the lagoons and the waste being generated by the plant operation will be accomplished by elimination of moisture through the use of heat and the subsequent transfer of the dry residue to 55 gallon drums. Disposal of this material will be by burial at an authorized burial site or alternate acceptable means. The equipment and layout for this treatment is shown in drawing MI-099-1.

There will be two types of waste streams from the lagoons. The first will be a slurry with a high undissolved solids content, and the second will contain essentially no suspended solids but will contain trace amounts of dissolved uranium. The slurry stream will be transferred from the lagoons to a 1000 gallon tank for adjustment of the pH with nitric acid. The adjusted slurry will then be mixed with a flocculant and passed to a belt filter press for removal of a portion of the liquid. The remaining damp solids will then be carried by conveyor to a dryer. After drying, the solids will in part be transferred by an enclosed conveyor to drums and in part returned to the 1000 gallon tank to maintain an appropriate solids content. The filtered solution will be processed in a hydroclone (cyclone separator). The clarified liquid will go to a 500 gallon tank; the remaining slurry will be transferred into the 1000 gallon tank to contribute to the solids content. From the 500 gallon tank, the clarified liquid will go to (a) a spray wash for the belt filter press (b) an evaporator for concentration or (c) the 1000 gallon tank. The evaporator steam effluent will be exhausted to the atmosphere and the concentrated evaporator residue (bottoms) will be transferred to the 1000 gallon tank or, optionally, to the lagoon to be recycled. The second stream, primarily liquid from the lagoons, will be transferred to the 1000 gallon tank for addition of solids from the lagoon waste previously processed and for the adjustment of the pH. The mixture will subsequently be given the same treatment as the slurry stream.

925.17.2 Safety Evaluations

Nuclear Criticality Safety

Multiple analyses have been performed on the feed material for the reclamation bay. Considering all uncertainties of sampling and analysis, the room action limit established as 350 grams will insure that the 500 gram limit for U-235 is not exceeded. Should pumps fail, and reverse flow begin in the transfer line to the main process area, an air-break has been provided to preclude any increase in uranium concentration. As an additional safeguard, the system in the process area to which the solution is transferred is also controlled to a low U-235 concentration (less than five grams U-235 per liter).

The building walls of the main facility are retained as a physical barrier between the two areas. Material must leave the controlled area, go outside, and then enter the reclamation bay. Internal procedures prohibit the transfer of any unknown quantities to insure that the room limit is maintained.

In the optional situation of waste treatment, the material is totally contained within the reclamation bay, with no connections to the main process area. In this mode of operation, at nominal U-235 weight fractions, the total quantity of U-235 in process (exclusive of that in the drums) is conservatively calculated not to exceed 270 grams. Considering upper error tolerances on U-235 weight fractions, this value becomes 400 grams. Assuming a single contingency each for the dryer (double batching) and the evaporator (completely filled internally with solids) simultaneously, the total U-235 in process, again at upper error tolerances on U-235 weight fractions and excluding drums, is conservatively calculated to be less than 710 grams, which is clearly subcritical. The atomic constituency of the polymer was also examined and found to produce a hydrogen atom density less than that of water. In addition, even considering upper error tolerances on U-235, concentrations at all stages of the treatment process (including the final dried product) are calculated to be significantly less than 0.25 grams U-235 per liter.

925.17.2 Safety Evalustions

Nuclear Criticality Safety (continued)

Regarding the drum array, again at the upper error tolerance on U-235 weight fractions, the U-235 content per drum is calculated to be less than 5 grams per cubic foot, which is an exempt quantity. Further, the drum array provides a surface density far below the 175 grams of U-235 per square foot authorized in Section 303.3 of License SNM-777 (calculations indicate a maximum of 7 grams per square foot). No more than two drums containing dried wastes will be allowed to be uncovered at any time, as one being filled and one in process after being filled. Thus, internal water moderation of the array is not credible. In addition, the array is separated from the processing equipment by at least eight feet.

Finally, relative to the main processing (recovery) area of the plant, the disposal bay is separated from the main facility by the building wall and an aisle approximately four feet wide, with no direct means of material transfer between the two areas.

Health Physics

All materials containing any radioactivity in this area are wet (except when utilizing the waste treatment option) and of low specific activity. Where large volumes are handled with exposed surfaces (as in a mixing tank), adequate ventilation is provided to sweep any airborne material into the exhaust and air cleaning system. Initially, filtered exhausts will be used with continuous sampling maintained. Should the filters be incompatible (because of dampness, for example) a scrubber system may be provided. In the design of the area, space has been provided to install additional air cleaning equipment. There has been little airborne activity detected from this material while it has been stored exposed to the atmosphere. There should be little airborne activity from it while in process. Even so, working zone air sampling will be provided. The entire area will be a part of the controlled access contamination control area.

925.17.2 Safety Evaluations

Health physics (continued)

In the utilization of the waste treatment option, the drum loading station will have a local exhaust hood for dust collection purposes (although lab tests have indicated that the material coming from the dryer will consist primarily of hard chunks). The hood arrangement will be exhausted into the HEPA filtering system.

The building as a whole will be monitored for airborne particulates using a series of standard open face work zone samplers, operating continuously. Samples will be collected on a 24 hour basis. As virtually all of the operation in this facility is either wet or totally contained, we feel that there should be no problem with airborne contamination. This building will also be included in the smear sampling program in effect in the main facility.

Industrial and Fire Safety

All materials of construction are fire resistant and corrosion resistant. Ventilation is provided to remove any toxic fumes. Safety showers, eyewash fountains and personal safety equipment are required. This area will meet the regulatory requirements as a safe and healthful work place.

925.17.3 Environmental Considerations

Extension of the present building to form an extended north bay will not have an adverse impact on the environment. The ground area covered by the building foundation is presently covered by impermeable asphalt or concrete. Therefore, there is no change in the groundwater recharge area.

The only effluent from the uranium recovery process is carbon dioxide. The excess calcium hydroxide used originally to neutralize the acid effluent before discharge into the

925.17.3 Safety Evaluations

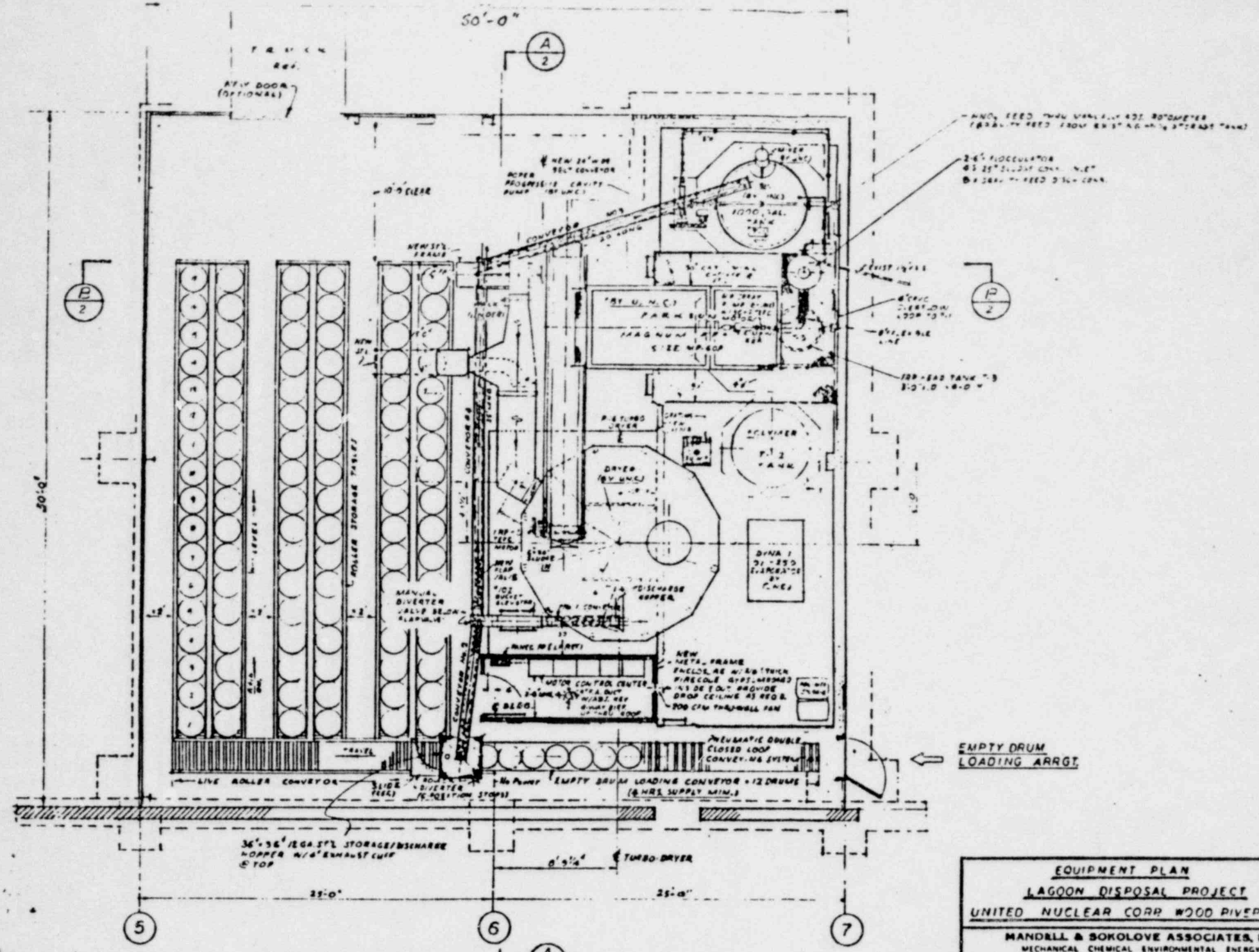
Environmental Considerations (continued)

lagoons and holding ponds slowly picks up carbon dioxide from the air to form calcium carbonate. When redissolved in acid, this releases carbon dioxide.

Effluents from the uranium recovery process are filtered and continuously sampled for airborne radioactivity. The material in process is much less concentrated than that in the main process area. Therefore, the contribution to offsite radioactivity is not detectable (Ref. UNC EI December, 1974).

Exhaust effluent from the waste treatment process will consist of steam exhaust from the evaporator and the exhaust from the turbodryer. The evaporator steam exhaust is discharged through a de-entrainer to the atmosphere and is continuously sampled by use of an impinger device. This representative sample is used to determine the activity discharged per unit time. Discharge concentrations varied during the shakedown phase of the evaporator with a weekly average output of approximately five microcuries, or approximately twenty percent of the amount allowed by license. The turbodryer exhaust will be passed through a prefilter/absolute filter combination and will be sampled representatively downstream of the filters on a continuous basis with samples collected every 24 hours. Because of the filtration (HEPA) in this exhaust, it is expected that its contribution to the total plant effluent will be negligible.

15585



EQUIPMENT PLAN

EQUIPMENT PLAN			
LAGOON DISPOSAL PROJECT			
UNITED NUCLEAR CORP WOOD RIVER JT R.I			
MANDELL & SOKOLOVE ASSOCIATES, INC. MECHANICAL CHEMICAL ENVIRONMENTAL ENERGY Consulting Engineers Providence, Rhode Island			
SCALE AS NOTED	DRAWN E BERGDEL	DRAWING NUMBER MI-099-1	REV
DATE OCT 16 1979	APPROVED		