VANADIUM CORPORATION OF AMERICA
Shiprock, New Mexico

June 18, 1963

Mr. Donald Nussbaumer, Chief
Source and Special Nuclear Materials Branch
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Mr. Nussbaumer:

Enclosed is our application for renewal of Source Material License No. R-157. The information is proferred according to the requirements of Form AEC-2. The supplied information incorporates the answers to your request of October 17, 1962 to Kerr McGee Oil Industries, Inc. in accordance with your letter of March 5, 1963 to Mr. D. A. Shriver of our company.

Sincerely yours,

PAGE EDWARDS
General Manager, Western Mines

PE/jcg/rc

JUL 1 1963

Copy Provided
Compliance

VANADIUM CORPORATION OF AMERICA
Shiprock, New Mexico

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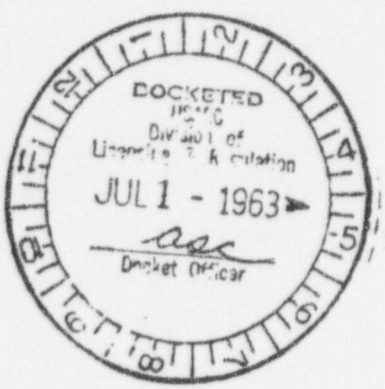
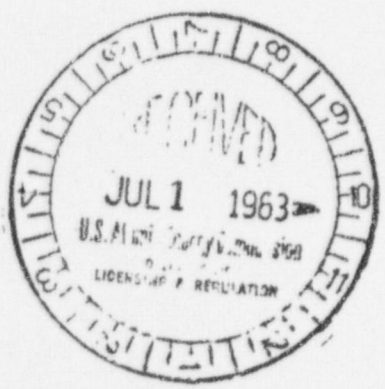
DOCKET NO. 40-2038

L&R File Copy
TRANS w/6-18-63 LTR

Vanadium Corporation of America
Application for Renewal of License No. R-157
Supplemental Sheets & Exhibits





Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Items 8(b) - 8(c)

The uranium concentrate produced at this mill is derived from natural uranium ores received from a multiplicity of captive and custom mines and from upgraded natural uranium ores received from our Monument concentrator. The average U_3O_8 content of all ores is approximately 0.25%.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 9

The accompanying Exhibits I and II are the process flow sheets for the Shiprock Mill. The maximum amount of uranium contained in the sampling and crushing operations is approximately 50,000 pounds as U_3O_8. The maximum amount of uranium in other processes including concentrate storage is approximately 65,000 pounds as U_3O_8.

The primary potential hazard involved in the processing of source material at this mill is the exposure of employees to airborne uranium ore or uranium concentrates during the handling of these materials in a dry state. These handling procedures are performed at locations designated on Exhibit III attached and are further described as follows:

1. Uranium Packaging. This operation consists of drumming, weighing and sampling. The drums are filled by a positive connection from the yellow cake hopper through the drum lid. After a drum is filled, it is manually disconnected from the hopper and transferred to a weighing and sampling station.

2. Uranium Drier. The cake from the Burwell filters is slurried and subsequently dried in the Skinner roaster. The drying process is observed at the various hearth levels and the hearth beds raked as necessary through ports.

3. Sampling and Crushing Plant. The ore from the raw ore bins is crushed in a jaw crusher and sampled by Snyder and Vezin samplers. Belt conveyors transfer the ore through these successive operations. The final ore is further prepared for moisture and laboratory determination as indicated on Exhibit I.

4. Ore Bucking Room. Part of the sample preparation as described in (3) above.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 10

Exhibit IV shows the organizational structure for our Shiprock Mill.

Descriptive information on personnel responsible for the radiation safety program is as follows:

NAME:	P. EDWARDS
TITLE:	General Manager, Western Mines
RESPONSIBILITY AND AUTHORITY:	Under the direction of the Senior Vice President, supervises and is responsible for all operations in the Navajo Uranium Division located at Shiprock, New Mexico including milling, mining and maintenance of these facilities through supervisors and their operating personnel.
QUALIFICATIONS AND EXPERIENCE:	A.B. in Geology. Since 1933 has worked with various metal mining and milling operations with engineering, surveying and geologist responsibilities. Hisemployment with Vanadium Corporation of America commenced in 1952.

NAME:	L. A. Daniels
TITLE:	Manager, Navajo Mill
RESPONSIBILITY AND AUTHORITY:	Under the direction of the General Manager, Western Mines, supervises and is responsible for the operation and maintenance of the Navajo Mill located at Shiprock, New Mexico through supervisors and operating personnel.
QUALIFICATIONS AND EXPERIENCE:	Since 1936 has been continuously engaged in vanadium and uranium processing plants with various responsibilities including those of mill operator, metallurgical research, plant superintendent and general mill superintendent.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

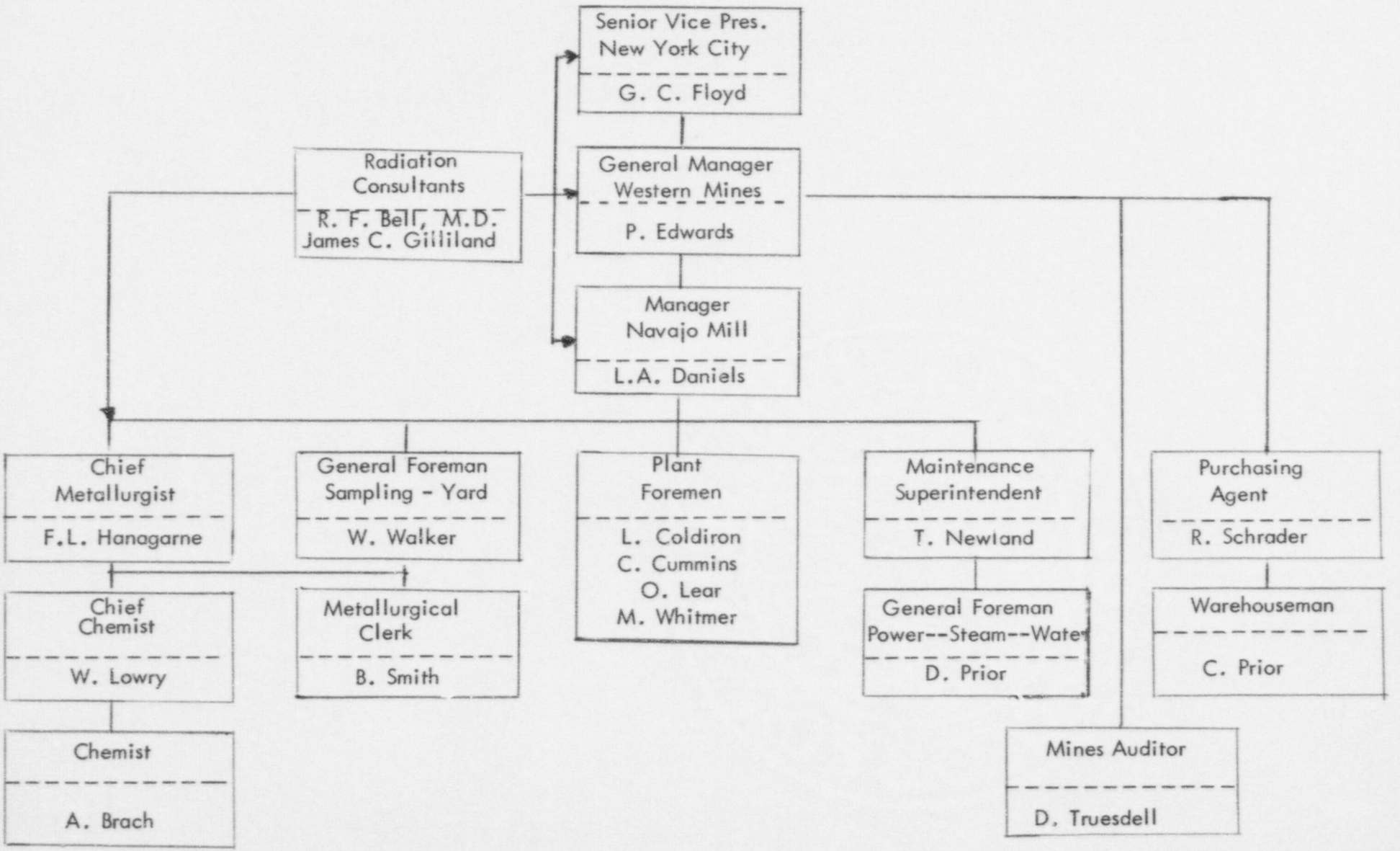
Supplemental Sheet
Item 10 - Continued

NAME:	F. L. Hanagarne
TITLE:	Chief Metallurgist
RESPONSIBILITY AND AUTHORITY:	Under the direction of the Manager, Navajo Mill, carries out the function of the metallurgical department including the supervision of the Radiation Safety Program at Shiprock and Monument Mills.
QUALIFICATIONS AND EXPERIENCE:	B.S. in Mathematics Radiation monitoring course at Grants, New Mexico in December 1957 and December 1959 sponsored by the U.S. P.H.S. Attendance at various symposiums on radiation monitoring and testing. Since 1957 has supervised the Radiation Safety Program at the Shiprock mill.

Exhibit IV

VANADIUM CORPORATION OF AMERICA
Shiprock, New Mexico

Organizational Structure



Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 10 - Continued

NAME: Robert F. Bell, M.D.

POSITION IN UNIVERSITY: Assistant Clinical Professor
Acting Head of Division of Industrial Medicine
University of Colorado Medical Center

RELATIONSHIP TO COMPANY: Industrial Medical Consultant

HIGHEST ACADEMIC DEGREE: M.D., University of Colorado - 1937

SCIENTIFIC EXPERIENCE:

Post Graduate Training -
Baltimore City Hospital - chest diseases - 1 year
University of Maryland Hosp., Baltimore, Md. - 1 year
Sheppard-Enoch Pratt Hospital, Baltimore, Md. - 1 year
Salt Lake Clinic, Salt Lake City, Utah - 1 year
Dr. K.C. Sawyer, Denver, Colo. (Preceptorship) - 1 year

Teaching Appointments -
Clinical Instructor in Physical Diagnosis of Chest -
John Hopkins University - 1 year
Clinical Instructor - University of Colorado - 5 years
Assistant Clinical Professor, Univ. of Colorado - 12 years

Industrial Physician
E.I. duPont de Nemours and Co., Inc. - 10 years,
the last 6 years of which was in the capacity of
Medical Supervisor

Acting Head, Division of Industrial Medicine (1951 - present)
University of Colorado Medical Center, Denver, Colo.
Duties with Division including medical consultation
with industry, research, teaching and administration.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 10 - Continued

NAME: James C. Gilliland

POSITION IN UNIVERSITY: Assistant Professor of Industrial Hygiene Engineering

RELATIONSHIP TO COMPANY: Industrial Hygiene Engineering Consultant

HIGHEST ACADEMIC DEGREES:

B.S., Chemical Engineering
University of Nebraska - 1949

M.S., Industrial Hygiene Engineering
Harvard University - 1950

SCIENTIFIC EXPERIENCE:

Industrial Hygiene Engineering Consultant - 12 years,
Division of Industrial Medicine, University of Colorado
Medical Center

Duties include both field and laboratory evaluation of the many factors involved in offering a general industrial hygiene service to industry. He also performs extrinsic research activities and acts as statistician for the Division.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Items 11(a) - 11(b)

The following equipment or its equivalent is used for our airborne survey program:

A. Air Sampling Devices
   1. Gelman Bantam Air Sampler
      Model No. 19001-1
      Free Air Capacity - 45 lpm

   2. Staplex High Volume Sampler
      Model TF1A
      Free Air Capacity - 70 CFM

   3. Gelman Air Sampling Kit
      Model No. 25002
      Free Air Capacity - 4 CFM

   4. Gast Air Sampler
      Free Air Capacity - 30 lpm

B. Filter Holders and Impingers
   1. Gelman Filter Holders
      Model No. 1100 AQ
      1" Open Type

   2. Staplex Filter Holder
      4" Open Type

   3. Impinger -- 500 ml.

C. Filtering Media
   1. Whatman #41
      1" and 4" size

   2. Staplex TFA #2133
      4" size

Periodic surveys of beta and gamma radiation levels are made with the following equipment or equivalent:

Universal Atomics Beta-Gamma Survey Meter
Model No. 700
Range: 0-50 Mr/hr

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Items 11 (a) - 11 (b) (Continued)

Film Badge service is supplied by Radiation Detection Company.

The low capacity air samplers are calibrated by use of a calibrated flowmeter. Calibration is performed at least semi-annually or after equipment maintenance which may effect flow-rates. The high volume samplers are sent to an independent laboratory for calibration at approximately six (6) month intervals.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 11(c)

Ventilation equipment consists of the following:

I. Sampling and Crushing Plant

A. General Area

The general area is ventilated by an exhaust vent situated in the roof of the building. This vent is 2 feet in diameter and is covered by a louvered spherical cowl. Ventilation is effected by the movement of convection currents through the vent and exhausted to the atmosphere. Local exhaust ventilation is presently being installed at the jaw crusher and selected transfer points. Details of this installation will be supplied in future correspondence.

B. Ore Drying and Blending Room

1. General Area. The general area is ventilated by an exhaust vent situated in the roof of the room. This vent is 2 feet in diameter and is covered by a louvered spherical cowl. Ventilation is effected by the movement of convection currents through the vent and exhausted to the atmosphere.

2. Ore Drying Pans. These gas-fired drying pans are enclosed on three sides, hooded to an exhaust duct exhausting to the atmosphere. The effluent exhaust is supplied by a 1000 CFM rated fan installed in the exhaust duct.

3. Ore Blender. The blender is hooded, enclosed on three sides and exhausted to the atmosphere. The effluent exhaust is supplied by a 1000 CFM rated fan installed in the exhaust duct.

4. Ore Splitter. The sampler splitter is located adjacent to a 1000 CFM rated fan. The fan pulls air across the splitter and exhausts the atmosphere.

5. Coffee Mill Enclosure. The coffee mill is totally enclosed and an exhaust fan rated at 500 CFM exhausts generated dust to the atmosphere.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 11(c) Cont'd

C. Ore Bucking Room

1. Ore Pulverizer. This pulverizer is enclosed on three sides with plywood and hooded to a 10-inch diameter exhaust duct. At the face of the plywood enclosure a clear plastic sash is installed which may be moved up or down as desired. Air is drawn from the hooded enclosure by a Buffalo Forge "Breezflo" fan rated at 500 CFM. The fan and motor assembly are enclosed in a metal housing with one louvered side open for effluent exhaust. The metal housing is situated directly above the pulverizer enclosure, flush on the roof of the building.

2. Ore Blenders. The blenders are enclosed in the same manner as the ore pulverizer and air is exhausted by the same type of fan and motor assembly

II. Uranium Drier

This dust collection system consists of a National Hydro Filter, Type ICL. The suction of the filter is attached directly to the No. 1 hearth of the drier. Air is drawn from this hearth at approximately 1000 CFM and discharged into the bottom of the filter. The air is then passed through a filter bed of 1-inch round rocks with a constant water wash. The water and dust pass through the bottom of the filter where the scrubbing water from the Hydro Filter, containing the yellow cake dust, is received into a settling tank, 4 ft. X 2 ft. X 2 ft., for the purpose of permitting the yellow cake to settle out and for the supernatant water to be recirculated into the Hydro Filter. The upper bed of the filter is the moisture eliminator which consists of 1 cubic foot of 1 1/2 inches porcelain saddles. The discharged air is pulled through the upper bed and then into the settling tank. The discharge vapors, after passing through the filter, are exhausted vertically into the atmosphere 10 feet above the roof of the building.

III. Uranium Sample Preparation Room and Yellow Cake Roll Crushers

A duplicate of the Hydro Filter explained in (II) is used in conjunction with these locations.

A. Uranium Sample Preparation Room. Fresh air is brought into this room by means of a 10-inch duct. The fresh air intake is located on the west side of the mill, 30 feet above ground level. The working area in this room is totally enclosed with a hinged sash at the face for access to the equipment. The suction from the enclosed area discharged into the Hydro Filter.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 11(c) Continued

B. Yellow Cake Roll Crusher. The roll crusher is totally enclosed with a dampered port allowing the entrance of air into the enclosed area. The suction from the enclosed area discharges into the Hydro-Filter.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 12 (a)

In case of fire, the plant foreman has been instructed to call the local fire department, the mill supervisory staff, and to use the available manpower and fire equipment to initiate fire control procedures. The plant has available an automatic pump for the fire water supply system and hydrants are strategically located to reach all sections of the plant site. A standby power unit is available to operate this system in the event of electrical power failure.

In addition to the water system, the follower portable fire extinguishers are available:

23 Dry Chemical Extinguishers
5 CO_2 Extinguishers
14 Water Extinguishers
3 Foam Extinguishers (large)

These extinguishers are periodically inspected by plant personnel and by our insurance underwriters.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 12 (b)

Approximately eight (8) of the supervisors on call at the plant have received first-aid training that could be utilized in the event of accidents of any nature. There are four (4) first-aid boxes located in the process and control areas. Safety showers and eye wash fountains are located in the process areas. A company ambulance is maintained at all times and medical assistance is available on call from Farmington Clinic, Farmington, New Mexico.

Radiation survey equipment and trained operating personnel could be utilized to evaluate the environmental effect of accidents involving source material.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 12 (c)

The following is the work schedule in effect at this time:

1. Sampling and Crushing Plant

   One 8-hour shift for 5 days per week. This operation is intermittent dependent upon ore volume.

2. Mill Production Operations

   A. Grinding and Leaching -- Three 8-hour shifts for 7 days per week.

   B. Solvent Extraction -- Three 8-hour shifts for 7 days per week.

   C. Vanadium Precipitation and Filtration - Three 8-hour shifts for 7 days per week.

   D. Vanadium Packaging -- Three 8-hour shifts for 7 days per week. This will be an intermittent operation dependent upon vanadium volume.

   E. Uranium Precipitation and Filtration -- Three 8-hour shifts for 7 days per week.

   F. Uranium Drying and Packaging -- This operation will be intermittent dependent upon uranium volume.

Note: Operations (C), (E) and (F) are performed by one operator during any one shift.

In respect to the above work scheduling, for the purpose of complying with 10 CFR 20.101 (b), we request that the limits given in Appendix B, Table 1, be deemed to apply to exposure to the concentrations specified for 160 hours in any period of 28 consecutive days. In any period where the number of exposure hours is less than 60 hours, the limits specified may be increased proportionately. In any period where the number of exposure hours is greater than 160 hours, the limits specified may be decreased porportionately.

Airborne Radiation Survey Program - Restricted Area

The accompanying Forms VCA-1 through Form VCA-4 apply to this portion of our survey program.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplementa Sheet
Item 12 (c) - Continued

1. Form VCA-1 - Quarterly Airborne Sampling Program

As noted, the types of sampling are designated as walk-around (W.A.) and breathing zone (B.Z.).

W.A. samples are short-term samples of approximately 300 liters of air which are taken while walking throughout the described location. This type of sampling is used for locations where the airborne concentrations are not directly related to a worker's performance within that location or wherever his potential airborne exposure or job duties within that location cannot be related to any specific operation. Samples at static positions taken over full or half-shift periods of time may be used for sample locations 8, 9, 12, 13, 15 and 18.

B.Z. samples are short-term samples of approximately 300 liters of air obtained during specific job operations which are significant in respect to worker time allocation and subsequent potential airborne exposure. The sample is obtained as closely as possible from within the worker's breathing environment without interferring with his normal pattern of work performance at that specific job location.

Sampling frequencies for locations of most significant potential concentration are related to worker exposure, i.e. concentration X time. Previously acquired data was used in the formulation of the sampling frequencies at these locations and modifications will be incorporated as necessary to maintain the representativeness of the data.

Locations of relatively insignificant potential concentration are to be sampled with a minimum frequency of once per quarter.

For those locations where multiple sampling is indicated, sampling will be spaced throughout the quarter at approximately equal intervals.

The collected airborne material will be analyzed for uranium content.

2. Form VCA-2 - Airborne and External Radiation Survey Data (Restricted Area)

This form is the permanent record of survey data. Separate sheet(s) will be used for each sample location.

The collected airborne material will be analyzed for uranium contents.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 12 (c) - Continued

3. Form VCA-3 - Airborne Radiation Exposure Report

This form is used for the calculation of individual weighted average exposures on each employee who works in locations wherein the average airborne concentrations exceeds 10 CFR 20 limits.

4. Form VCA-4 - Time Study Information

This form may be used for the compilation of time study information either by the worker himself or by observation of his work performance by the radiation technician

External Radiation Survey Program -Restricted Area

External radiation exposure is evaluated by film badge. Every employee in the final uranium section and one employee in each other production job classification is supplied with a badge. Final product section employees are processed at approximate monthly intervals. Badges representative of other production job classifications are processed quarterly and the badges rotated, wherever feasible, within these job classifications at quarterly intervals.

In addition to the film badge program, survey meter readings may be taken at the various airborne sampling locations. A column for recording this data is provided for on Form VCA-2.

Airborne Radiation Survey Program - Unrestricted Area

The status of the airborne effect of plant operations to the unrestricted area will be evaluated by quarterly down-wind sampling. Form VCA-5 will be used for recording the survey data. High-volume samples of approximately thirty (30) minutes duration will be taken quarterly at several locations down-wind from the mill including:

1. The down-wind boundary of the restricted area.

2. Approximately 1/4 mile down-wind from the restricted area.

3. Approximately 3/4 mile down-wind from the restricted area.

4. Approximately 1 1/2 miles down-wind from the restricted area.

In addition to these airborne samples, the hydro-filter stack discharges and other selected ventilation discharges may periodically be sampled for the primary purpose of evaluating the effectiveness of dust control equipment.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 12 (c) - Continued

External Radiation Survey Program - Unrestricted Area

Gamma and Beta + Gamma readings will be recorded at the time and locatic [illegible] unrestricted area airborne samples

Liquid Effluent Survey Program - Unrestricted Area

Exhibit VII shows locations where there is some apparent seepage. We do not feel that Seep (4) can be remotely associated with our tailings disposal system and the sampling of this seep is to be discontinued on a routine basis. Samples obtained from the other seeps do not show concentrations of radioactive materials in excess of 10 CFR 20 limits. If there is an association of these seeps with our tailings disposal system, it is most likely that Seep (1) is influenced by the raffinate storage ponds and Seeps (1A), (1B), (2) and (3) are influenced by the sand-slimes disposal system. These seeps will be sampled in the following manner:

1. Weekly sampling of Seep (1) composited for quarterly determination of U, Ra and Th concentrations. The relative amount of each weekly sample introduced into the quarterly composite will be flow-rate proportioned.

2. Separate samples from Seeps (1A), (1B), (2) and (3) will be composited on a weekly basis in proportion to flow rates. The weekly composites will be combined in proportion to flow rates into a quarterly composite for the determination of U, Ra and Th concentrations.

3. The flow-rate of seeps will be measured by directing the stream through a conduit into a pre-measured container. The time required to fill the container determines the flow-rate.

River samples will be obtained weekly from the following locations:

1. Upstream from Seep 1.

2. At the San Juan River highway bridge, shown on Exhibit VII. This is the location of the U.S. Government domestic water intake.

3. Several hundred feet downstream from the highway bridge. This is the location of the Bureau of Mines helium plant water intake

Quarterly analysis for U, Ra and Th will be performed on composites of weekly samples at each separate sampling location. Form VCA-6 will be used for recording the liquid effluent survey data.

Vanadium Corporation of America
P.O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 12 (c) - Continued

Miscellaneous Considerations

Form VCA-7 will be used for the purpose of recording information on plant changes or modifications pertinent to potential radiation exposure.

Analyses for uranium are performed by a fluorometric technique similar to that described in IDO-12017. Samples for Ra and Th determination are sent to Radiation Detection Laboratory or other qualified laboratory.

VANADIUM CORPORATION OF AMERICA
Navajo Mill - Shiprock, New Mexico

Quarterly Airborne Sampling Program - Restricted Area

Sample Location Number	Description	Approximate Number of Samples	Type of Sample
1	Sample Plant Office	1	W.A.
2	Ore Bucking Room	1	W.A.
3	Ore Drying and Blending Room	12	W.A.
4	Sampling and Crushing Plant General	6	W.A.
5	Primary Crusher Operators' Area	12	B.Z.
6	Conveyor Ramp	1	W.A.
7	Ore Pad	1	W.A.
8	Rodmill Area	1	W.A.
9	Leaching - Classification	1	W.A.
10	SX Control Shack	1	W.A.
11	SX Stripping Section	1	W.A.
12	Vanadium Precipitation and Filter	1	W.A.
13	Vanadium Drying	1	W.A.
14	Vanadium Fusion and Packaging	1	W.A.
15	Uranium Precipitation and Filter (Non-Operating)	1	W.A.
15a	Uranium Precipitation and Filter (Operating)	12	W.A.
15b	Dumping Y.C. Filters (Operating)	3	B.Z.
16	Uranium Drier (Operating)	3	B.Z.
17	Uranium Drier Top Deck (Operating)	6	B.Z.
18	Uranium Packaging and Slurry Tank Area (Non-Operating)	1	W.A.
18a	Uranium Packaging and Slurry Tank Area (Operating)	3	W.A.

Vanadium Corporation of America
Shiprock, New Mexico

Quarterly Airborne Sampling Program - Restricted Area

Sample Location Number	Description	Approximate Number of Samples	Type of Sample
19	Uranium Packaging Operation (Operating) Changing drums, etc.	9	B.Z.
20	Sampling Y.C. Barrels	6	B.Z.
21	Uranium Sample Prep.	6	B.Z.
21a	Met. Sample Bucking	1	B.Z.
21b	Vanadium Sample Prep	1	B.Z.
22	Mill Office	1	W.A.
23	I X Lab	1	W.A.
24	Lunchroom	1	W.A.
25	Plant Office	1	W.A.

VANADIUM CORPORATION OF AMERICA
Navajo Mill -- Shiprock, New Mexico

Airborne and External Radiation Survey Data
Restricted Area

Sample Location	Sample Date	External Radiation mr/hr B + σ	External Radiation mr/hr σ	Airborne Sample Type	Liters of Air Sampled	Micrograms U Collected on Filter Paper	Airborne Radiation Level μc U/ml X 10^{-11}	Remarks

Average Radiation Level (μc U/ml X 10^{-11}): 1st Quarter 1963 _____ 3rd Quarter 1963 _____

2nd Quarter 1963 _____ 4th Quarter 1963 _____

Form VCA-3

Quarter _____

VANADIUM CORPORATION OF AMERICA
Navajo Mill -- Shiprock, New Mexico

Date _____

Airborne Radiation Exposure Report

Employee Name	Job Classification	Av. Hrs. on Job per week	Exposure Location No.	Location Average Level $\mu c\ U/ml \times 10^{-11}$	Location Occup. Hrs.	Location Occup. Frac.	Fractional Exposure $\mu c\ U/ml \times 10^{-11}$	Remarks

Weighted Average Exposure =

VANADIUM CORPORATION OF AMERICA
Navajo Mill -- Shiprock, New Mexico

Time Study Information

Date _____

Name _____

Job Classification _____

Location	Time Spent in Location (Minutes)	Totals

Instructions: Place the time spent in each location in accordance to the location designation. Location designations are described on Form VCA-1

This form will be filled out during the day by each operator and turned into the shift foreman at the end of the shift.

VANADIUM CORPORATION OF AMERICA
Navajo Mill -- Shiprock, New Mexico

Airborne and External Radiation Survey Data
Unrestricted Area

Sample Number	Date	Time of Day	Location Sampled	Direction and Distance from Plant	Wind Direction	Wind Velocity	Liters of Air Sampled	µg of U on Paper	Radiation µc U/ml x 10^{-12}	External Radiation Count (mr/hr) B + σ	σ

VANADIUM CORPORATION OF AMERICA
Navajo Mill -- Shiprock, New Mexico

Liquid Effluent Samples
Unrestricted Area

Quarter ____________________

Sample No.	Location	Description	Uranium $\mu c/ml \times 10^{-5}$	Ra 226 $\mu c/ml \times 10^{-8}$	Th 230 $\mu c/ml \times 10^{-6}$	Comments

VANADIUM CORPORATION OF AMERICA
Navajo Mill -- Shiprock, New Mexico

Plant Changes, Modifications or
Information That May Affect
Radiation Exposure

Date	Information

Vanadium Corporation of America
P. O. Box 757
Shiprock, New Mexico

Supplemental Sheet
Item 13 (a) - 13 (b)

Approximately 8,000,000 gallons per month of solvents extraction are pumped to four (4) available raffinate ponds. Approximately 12,000 tons of sand-slime solid tailings and 9,500,000 gallons of sand-slime tailings solution are pumped per month to the sand-slime tailings pond. Exhibit V shows the layout of our tailings disposal system and Exhibit VI shows typical dike cross-sections of those locations noted on Exhibit V.

The raffinate ponds are constructed of native ground and compacted by the normal passage of construction equipment. Minimum freeboards are noted on Exhibit V and a diversionary dike is shown on Exhibit III.

The sand-slime tailings pond covers approximately 1,000,000 square feet of area. Tailings lines are positioned and periodically moved along the west and south banks to allow the tails discharge at designated locations. The tailings solution and a portion of the slimes flow down the pond incline toward the northeast leaving the sands and most of the slimes in place. The small amount of solution that is not absorbed within the sands is collected on the east end of the pond where it subsequently evaporates. Coarse moist tailings are used for raising the dike height on the south and west. The north and east banks are periodically strengthened and raised with alluvium and topsoil containing rocks and gravel of various sizes and angularity. An auxiliary along the north side of this pond is shown on Exhibit III.

The lead operator on shift makes inspections of the tailings system twice per shift and is responsible for the necessary maintenance of the system.

We cannot foresee any condition which might result in the accidental release of tailings waste to an unrestricted area. There are several seepage areas, as noted on Exhibit VII, some of which may be related to our tailings storage. These seeps are being sampled as described in answer to Item 12 (c).

We do not use seepage check drill holes. These holes were originally drilled by Kerr-Mac for the purpose of determining the flow and disposition of vanadium liquor that had been stored prior to the construction of the vanadium recovery section of the mill.