TERA

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OCT 31 1979

MEMORANDUM FOR: Kenneth L. Pierson, FHWA-DOT
Arthur Warren, FAA-DOT
Wendell A. Cybriker, MTB-DOT
Ralph J. Jones, SD-NRC
Donald A. Nussabaumer, NMSS-NRC
George H. Bidinger, IE-NRC

FROM: Marie Janinek, State Relations Officer
Office of State Programs

SUBJECT: FOURTH QUARTER (SECOND YEAR) REPORT FROM MICHIGAN ON TRANSPORTATION SURVEILLANCE PROGRAM

Enclosed is the fourth quarter (second year) progress report submitted by Michigan on its transportation surveillance program under contract with NRC and DOT. The report covers work done during the period, June 1, 1979 to August 31, 1979.

I would appreciate any comments you might have on the report.

Marie Janinek

Marie Janinek
State Relations Officer
Office of State Programs

Enclosure:
As stated

1332 019

7911140 098

Distribution List for Fourth Quarter (Second Year) Report submitted by Michigan on Transportation Surveillance Program.

W. Ingram, GA
U. Clark, FL
B. Kahn, Georgia Tech.
H. Shealy, SC
M. Neuweq, IL
D. McDo DA
D. Van Fa:c..e, MI (w/o Encl)
C. Hardin, KY
L. McDonnell, WI
A. Heubner, CT
R. Will, WA
B. Graham, TN
J. Keppler, Reg. III
J. Cain, SLO MI
C. Price, VA
D. Hopkins, SD-NRC
A. Tse, SD-NRC
V. Hodge, MNSS-NRC
J. Sniezek, IE
D. Gibbons, LASL
R. Ryan, SP-NRC
S. Schwartz, SP-NRC
M. Janinek, SP-NRC (4 w/o encl.)
R. DeFayette, SP-NRC
PDR: "Transportation Surveillance" ←
PDR: "Michigan"

1332 020

RADIOACTIVE MATERIALS TRANSPORTATION SURVEILLANCE

CONTRACT #NRC-06-77-051

Fourth Quarterly Progress Report
(June 1, 1979 - August 31, 1979)

Second Contract Year

Introduction

The list of companies under investigation this quarter include:

American Airlines Freight System

Baltimore Airways, Inc.

Eastern Airlines

Emery Air Freight

Northwest Orient Airlines

Republic Airlines

Trans World Airlines

Chesapeake & Ohio Railroad

Grand Trunk Western Railroad

Donald C. Cook Nuclear Power Plants

Palisades Nuclear Power Plant

Big Rock Point Nuclear Power Plant

Casperson, Inc.

DBM Courier Corporation

Elliot Lake Freight Lines Ltd.

The only change this quarter in the list of companies under investigation is the deletion of North Central Airlines and the addition of Republic Airlines, which is the corporation that was created by a merger of North Central Airlines and Southern Airways.

Table I summarizes the field investigations performed during the quarter. Area, vehicle, and package surveys were made with survey meters, and personnel and area exposures were determined using TLD badges. By direct observation and by discussion with workers, an overview of radioactive material (RAM) transportation in Michigan has been constructed.

As shown in Tables II and III, most of the cartons and overpacks surveyed were slightly below the listed T.I. Inclusion of several packages that measured over the listed values brought the measured average over the listed average for Yellow III cartons. Tables IV and V summarize selected area and truck surveys, while Tables VI-IX summarize TLD data, and Tables X-XIII summarize nuclear plant related shipment data.

Eighteen wipe samples from vehicles or packages were analyzed in the Department's Nuclear Counting Facility. Most of these samples showed very low or undetectable levels of contamination, and none exceeded the 49 CFR limits for removable contamination.

Airlines and Air Freight at Detroit Metropolitan Airport

American Airlines shipped very few packages of RAM this quarter, as reflected by the low readings on both area and personnel monitors in Table VI. The only packages observed were in a Canadian shipment of White I cartons being transferred from North Central to Air Wisconsin on the American Airlines dock. Like similar shipments observed in previous quarters, the cartons were not marked as DOT type A approved, and each bore only one label, rather than the required two. The radiation level was barely measurable at the surface of a pallet full of cartons.

Baltimore Airways carries the major portion of RAM during the week on daily charter flights. Table IV is a list of flights surveyed this quarter. Since Baltimore Airways operates under an exemption, the usual 2 mR/hr limit in the cockpit is not applicable. All pilots wear radiation dosimeters, and small lead shielding panels and freight tie down straps are available. Use of the shields and straps is not universal but depends on the pilot's judgment. Two wipe samples were taken from the floor of one plane after unloading, but showed no detectable activity.

Emery Air Freight has not carried any RAM this quarter. The one company which was using Emery has begun using another shipper (as yet unknown) or has temporarily suspended shipments of Br-82 labeled motor oil. Emery will be contacted periodically, since RAM transportation is flexible and may recommence at any time.

Federal Express carries a major portion of the weekend RAM traffic aboard a Boeing 727 chartered by New England Nuclear. The plane commonly carries 800 to 900 T.I. when it lands at Detroit Metropolitan Airport on Saturday mornings. This flight is well operated with minimal exposure to the flight crew, who wear film badges, and to the ground crew, who have minimal contact with RAM due to the containerization of the freight. Handling after unloading from the aircraft is unacceptable, as noted in the discussion under DBM Courier.

1332 022

A van and several miscellaneous packages have been monitored at the Federal Express terminal. The van was well within the regulatory limits. Most packages are shipped according to regulations or else rejected by a restricted articles specialist. The only problem package this quarter was shipped by American X-ray of Farmington Hills, Michigan. A six Curie Ir-192 source was padlocked in a well built metal case. The key was in the padlock and was apparently held in by a lead and wire security seal. Upon closer examination it was discovered that the security seal was ineffective, and that the key could be turned easily without breaking the seal.

While Federal Express handles a moderate amount of RAM, none of the workers appear to be receiving a significant radiation dose, as shown in Table IX. Two sets of area monitors (#1, #2, #3, and #4) have received doses significantly above background, since they are near the area where RAM is stored. However, the levels are not excessive and resulted in no detectable personnel exposure.

Republic Airlines has lost most of its RAM business to the Baltimore Airways charter flights. Two low activity shipments were observed this quarter at Republic but were not surveyed, because the efficient DBM Courier drivers promptly removed them for land transport. One consisted of 44 White I packages containing a tritium compound packed in dry ice. The other was a net bag overpack containing White I and Yellow II labeled packages.

Northwest Orient Airlines carries the most regular RAM shipments of any passenger line. Packages were generally in compliance with regulations. However, three Mediphysics cartons (parts of two days' shipments) did not have an activity notation, and one Squibb package was mislabeled as a Yellow II instead of a Yellow III carton. Two wipe samples taken from packages were far under the limits for removable contamination, being just at or just below the minimum detectable level.

Transworld Airlines often carries RAM on a passenger flight from St. Louis, Missouri. In the past quarters as well as this quarter, the Mallinckrodt packages have been surveyed, and radiation readings have been found to be 2 or 3 times their listed T.I. in many cases. This continuing series of violations is now under investigation by the Federal Aviation Administration as a result of our observations.

Couriers

DBM Courier Corporation carries most of the radiopharmaceuticals that are distributed throughout the Lower Peninsula. Starting from the Detroit area, RAM moves through a network of routes to reach any point in the Peninsula in less than twelve hours. The company is efficient in the transportation of short half-life radionuclides, but lack of concern for safety and regulations results in exposure of workers to unnecessary amounts of radiation.

1332 023

Especially negligent is the treatment of the RAM from Federal Express Saturday charter flights. Such a flight was ordered to deliver 177 T.I. of RAM to Detroit Metropolitan Airport where all of it was loaded into a single DBM vehicle. This is a violation of the 50 T.I. limit for DBM, and it is possible that Federal Express may be liable as an accessory, since their employees assist in the loading of the DBM truck.

As shown in Table V, the DBM trucks surveyed often exceed the 2.0 mR/hr. limit for radiation level at the driver's seat and occasionally exceed the 50 T.I. per vehicle limit. The large amounts of RAM handled also create elevated radiation levels at the terminal as indicated by the area monitor readings in Table VIII. Personnel monitors for drivers 1, 6, 7, and 8 indicate high personnel exposures. Drivers 1 and 6 in particular are close to 125 mR, one fourth of the annual non-occupational dose limit. Ideally, all freight handlers and drivers should be badged, since there is a high probability of radiation exposure. The scheduling of drivers is so flexible that badging by the Department has been difficult at best. Because of the continued poor handling practices, DBM Courier Corporation should have a radiation protection program similar to those of Baltimore Airways and Federal Express. In addition to being continually monitored, the workers would benefit from education in safe working practices by a consulting health physicist.

Casperson, Inc. is in a similar position. Drivers are eager to cooperate with the exposure study, since they carry large amounts of RAM in each load. This is the first quarter in which TLD data have been acquired, and field observations are confirmed. Radiation exposures of some drivers are greatly excessive, as shown in Table VII. Three of the six monitored drivers received exposures greater than one quarter of the 500 mrem annual limit, one more was at the limit, and two were at or over the annual limit in this quarter. Personnel monitoring and radiation safety training would benefit Casperson drivers in the same way that it would benefit DBM workers.

Nuclear Power Plant Shipment

The Michigan Department of Public Health is notified through the State Police communications system of RAM shipments to and from the nuclear power plants. In addition, a system of prior notification of intent to ship RAM was implemented during the quarter. Plants now phone the Department several days before a truck is to depart, thus permitting unannounced surveys of waste shipments. Since the Department does not have authorization to stop trucks enroute, they are investigated just prior to leaving plant premises.

Only one shipment left Big Rock Point this quarter as shown in Table X, but it was not investigated. Waste trucks from both Palisades and Donald C. Cook Nuclear Power Plants were surveyed, although not all of the trucks shown in Tables XI and XII were checked.

In accordance with established policy, waste processing and handling procedures were observed at the Palisades Plant prior to the initiation of shipment surveys. Palisades radioactive wastes include trash and equipment, spent ion exchange resins, and evaporator concentrates. The trash and equipment are compressed, if possible, and shipped in steel 55-gallon drums or wooden boxes. Spent resins and solidified evaporator concentrates are shipped in larger steel tanks constructed especially for waste disposal. Only the evaporator concentrates are liquid, but these are solidified in the shipping containers.

In the solidification process evaporator concentrates are mixed with urea formaldehyde and pumped into the shipping casks with a catalyst. This mixture solidifies as a plastic, but small pockets of liquid remain, mostly water. Although the interiors of the vessels are coated with asphalt to prevent the contents from attacking the steel, even a small break in the asphalt lining will allow tank corrosion, especially at a plug near the bottom of the tank. Some of the new tanks were observed at the plant during the processing investigation. A single layer of red primer protected the exterior surfaces of the tanks except where it had been abraded during shipment to the plant. At these points patches of surface rust formed, resulting in a "used tank" appearance, but not affecting the structural integrity of the casks.

During July several tanks of solidified waste shipped from the Palisades Nuclear Plant to Beatty, Nevada developed leaks while at or enroute to the burial site. As a result of this and similar leakages from other plants, the Nevada site was temporarily closed, and the NRC formulated stringent measures to curb future leakage. For these reasons the urea formaldehyde process is being abandoned in favor of an asphalt encapulation process which will eliminate all water from the waste. As an interim method, a contractor will solidify waste using a sodium silicate/cement process.

One truck trailer loaded with 55-gallon drums of radioactive waste was surveyed at Palisades before it left the plant. Gamma readings were below regulatory limits, as were all four wipe samples.

At the Cook Plant, a truck loaded with three carbon steel tanks of solidified waste was surveyed and wipe tested for contamination. Of the six wipe samples taken, none exceeded either federal or state limits for removable contamination. Gamma radiation levels were all well below regulatory limits, but some survey instrument readings made by Cook personnel were two to four times higher than corresponding readings made by the Department physicist. In no cases were there any Cook readings lower than the corresponding Department readings.

Railroads

Phone contact with the railroads has indicated that the railyards most likely to contain RAM have already been examined. Therefore, only one trip was made to a railyard this quarter. The nature of rail shipment is such that only large amounts of RAM or heavy items are likely to be shipped by rail, and then only if the RAM has a long half life. Spent fuel or large contaminated structures from nuclear plants might be transported by rail, but no such shipments have been made within the past 10 years. Contact will be maintained with both the nuclear plants and railroads to determine if such possibilities are to be considered in the future.

1332 025

Yellowcake Shipments

Denison Mines Ltd. continues to ship uranium ore concentrates (yellowcake) via Elliot Lake Freight Lines Ltd. Eleven trucks were reported to the Department as shown in Table XIII, with one truck, as noted, reported to carry raw ore instead of yellowcake. Difficulty is encountered in arranging investigations of these trucks. The route passes no State Weigh Stations, and there are no known scheduled stops in Michigan. These trucks must be stopped enroute by Michigan Public Service Commission officers (PSC) for joint DPH/PSC inspections. One truck was halted and investigated last quarter, but none have been stopped this quarter. Future surveys are planned.

Transportation Radiation Incident Response

The only transportation incident this quarter occurred at Northwest Orient Airlines. An overpack shipped by Skycab and containing two I-125 test kits and a Co-60 package was run over after bouncing out of a baggage cart that lacked any closure device, such as curtains or doors. Investigation by the Division was somewhat hampered by mislabeling of the overpack. The Co-60 package label was copied and placed on the overpack, but the I-125 was not noted. Contamination of the pavement and workers was prevented by the cardboard overpack, which completely contained the dry powder I-125 compound. After being wipe tested and found to be uncontaminated, the Co-60 carton was released. The remains of the kits were confiscated for disposal with other Departmental radioactive waste. Since the federal emergency phone number listed in the Airline's Emergency Manual was out-of-date, the newest NRC number was given to the terminal manager. Several DOT booklets which outlined an emergency response plan were left with the manager when it was discovered that no radiation emergency instructions were included in the manual.

1332 026

Table I

FIELD INVESTIGATIONS

Radioactive Material Transporter	Number of Investigations
American Airlines	7
Baltimore Airways	6
Emery Air Freight	7
Federal Express	12
Northwest Orient Airlines	9
Republic Airlines	4
Casperson, Inc.	3
DBM Courier Corporation	9
TWA	7
Chessie System	1
Donald C. Cook Nuclear Power Plants	1
Palisades Nuclear Power Plant	3

1332 027

Table II

CART N DATA

Label	Number	Average List T.I.	Average mR/hr. @ Surface	Average mR/hr. @ 3 ft.
I	1	*	0.05	0.0
II	24	0.3	5.4	0.2
III	7	1.1	53.7	1.4

Table III

OVERPACK DATA

Label	Number	Average List T.I.	Average mR/hr. @ Surface	Average mR/hr. @ 3 ft.
I	1	*	0.1	0.0
II	35	0.4	6.7	0.2
III	5	1.8	27.0	1.2

* Not applicable

1332 028

Table IV

BALTIMORE AIRWAYS PLANE SURVEYS

T.I. Carried	mR/hr. in Cockpit
43.6	7.0
45.9	8.0
5.4	0.3
30.2	7.0
unknown	0.6
41.1	10.0

Table V

DBM COURIER TRUCK SURVEYS

T.I. Carried	mR/hr. in Cab
>44.4	6.0
177.0	40.
unknown	0.3
30.2	3.0
9.6	0.8
49.6	2.5
45.6	4.8

1332 029

Table VI

DIRECT RADIATION EXPOSURE MEASUREMENTS

USING LiF THERMOLUMINESCENT DOSIMETERS

Station, Location, & Monitoring Period		Monitoring Days	Total mrem For Period	Gross mrem Per Day	*Net mrem Per Day	mrem Per Quart
American Airlines						
Detroit Metropolitan Airport - Romulus						
Area Monitors Over RAM carts May 30, 1979 - Sept. 10, 1979	#1	103	26.62	0.26	0.14	13
	#2	103	26.16	0.25	0.13	12
Area Monitors Near Men's Room May 30, 1979 - Sept. 10, 1979	#3	103	23.07	0.22	0.10	10
	#4	103	20.83	0.20	0.08	8
Supervisor 1	Not returned					
Supervisor 2	Not returned					
Supervisor 3	Not returned					
Handler 1 May 30, 1979 - Sept. 10, 1979		103	11.79	0.11	-0.01	0
Handler 2	Not returned					
Handler 3	Not returned					
Handler 4 May 30, 1979 - Sept. 10, 1979		103	12.71	0.12	0.00	0

* Control = 0.12 mrem/day

1332 030

Table VII

DIRECT RADIATION EXPOSURE MEASUREMENTS
USING LiF THERMOLUMINESCENT DOSIMETERS

Station, Location, & Monitoring Period		Monitoring Days	Total mrem For Period	Gross mrem Per Day	*Net mrem Per Day	mrem Per Quarter
Federal Express						
Romulus						
Area Monitors Beside Phone May 30, 1979 - Sept. 10, 1979	#1	103[106]	40.11	-	0.27	24
	#2	103[106]	39.98	-	0.26	24
Area Monitors Under Rollers May 30, 1979 - Sept. 10, 1979	#3	103[106]	135.2	-	1.38	127
	#4	103[106]	138.8	-	1.22	113
Area Monitors On wall May 30, 1979 - Sept. 10, 1979	#5	103[106]	18.10	-	0.05	5
	#6	103[106]	16.93	-	0.04	4
Area Monitors In Van One May 30, 1979 - Sept. 10, 1979	#7	103[106]	14.52	-	0.02	2
	#8	103[106]	14.82	-	0.02	2
Supervisor 1 May 30, 1979 - Sept. 10, 1979		103[106]	14.83	-	0.02	2
Handler/Driver 1 May 30, 1979 - Sept. 10, 1979		103[106]	20.60	-	0.08	7
Handler/Driver 2 May 30, 1979 - Sept. 10, 1979		103[106]	11.76	-	0.10	0
Handler/Driver 3		Not returned				
Handler/Driver 4		Not returned				
Handler/Driver 5 May 30, 1979 - Sept. 10, 1979		103[106]	13.67	-	0.01	1

1332 031

* Control = 0.12 mrem/day
[ ] = Total days in the field.

Table VIII

DIRECT RADIATION EXPOSURE MEASUREMENTS
USING LiF THERMOLUMINESCENT DOSIMETERS

Station, Location, & Monitoring Period		Monitoring Days	Total mrem For Period	Gross mrem Per Day	*Net mrem Per Day	mrem Per Quarte
DBM Courier Corp.						
Oak Park						
Area Monitors On wall (Position 1)	#1	Not returned				
	#2	Not returned				
Area Monitors On wall (Position 2) May 19, 1979 - Aug. 14, 1979	#3	87[121]	83.50	-	0.79	73(1)
	#4	87[121]	81.56	-	0.77	71(1)
Area Monitors Under Sorting Table May 19, 1979 - Aug. 14, 1979	#5	87	884.3	10.16	10.04	924
	#6	87	871.2	10.01	9.89	910
Area Monitors Under Dispatch Window May 19, 1979 - Aug. 14, 1979	#7	87	358.6	4.12	4.00	368
	#8	87	324.8	3.73	3.61	332
Area Monitors On Office Wall May 19, 1979 - Aug. 14, 1979	#9	87	22.25	0.26	0.14	12
	#10	87	23.34	0.27	0.15	14
Vehicle Monitor 1 May 19, 1979 - Aug. 14, 1979	#1	87	41.78	0.48	0.36	33
	#2	87	36.38	0.42	0.30	27
Vehicle Monitor 2		Not returned				

1332 032

Table VIII cont.

DIRECT RADIATION EXPOSURE MEASUREMENTS
USING LiF THERMOLUMINESCENT DOSIMETERS

Station, Location, & Monitoring Period	Monitoring Days	Total mrem For Period	Gross mrem Per Day	*Net mrem Per Day	mrem Per Quart
DBM Courier Corp.					
Driver 1 May 19, 1979 - Aug. 14, 1979	87[121]	117.1	-	1.18	108(1)
Driver 2 May 19, 1979 - Aug. 14, 1979	87[121]	29.66	-	0.17	16(1)
Driver 3	Not returned				
Driver 4 May 19, 1979 - Aug. 14, 1979	87[121]	26.43	-	0.14	13(1)
Driver 5	No longer employed				
Driver 6 May 19, 1979 - Aug. 14, 1979	87[121]	118.80	-	1.20	110(1)
Driver 7 May 19, 1979 - Aug. 14, 1979	87[121]	69.79	-	0.64	58(1)
Driver 8 May 19, 1979 - Aug. 14, 1979	87	82.53	0.95	0.83	76
Dispatcher 1	Not returned				
Dispatcher 2	Not returned				

* Control = 0.12 mrem/day

(1) Badge was returned late. Dose calculation was corrected for total days between issuance and the final reading.

[ ] = total days in the field

1332 033

Table IX

DIRECT RADIATION EXPOSURE MEASUREMENTS
USING LiF THERMOLUMINESCENT DOSIMETERS

Station, Location, & Monitoring Period	Monitoring Days	Total mrem For Period	Gross mrem Per Day	*Net mrem Per Day	mrem Per Quart
Casperson Courier					
Driver 1 May 21, 1979 - Aug. 28, 1979	99	153.8	1.55	1.43	132
Driver 2 May 21, 1979 - Aug. 28, 1979	99	642.2	6.49	6.37	586
Driver 3 May 21, 1979 - Aug. 28, 1979	99[112]	15.37	-	0.02	2(1)
Driver 4 May 21, 1979 - Aug. 28, 1979	99[112]	11.36	-	-0.02	0(1)
Driver 5 May 21, 1979 - Aug. 28, 1979	99	240.2	2.43	2.31	212
Driver 6 May 19, 1979 - Aug. 28, 1979	101	562.3	5.57	5.45	501

* Control = 0.12 mrem/day

(1) Badge was returned late. Dose calculation was corrected for total days between issuance and the final reading.

[ ] = total days in the field

1332 034

Table X

REPORTED RADIOACTIVE MATERIAL SHIPMENTS

from

BIG ROCK POINT NUCLEAR POWER PLANT

Date Time	Description of Shipment	Curies	mR/hr at 6 ft.	Destination
6/20/79 3:10p.m.	Compacted Low Level Waste	1.214	9.6	Richland, WA

1332 035

Table XI

REPORTED RADIOACTIVE MATERIAL SHIPMENTS

from

PALISADES NUCLEAR POWER PLANT

Consumers Power Company

South Haven, Michigan

Date Time	Description of Shipment	Curies	mR/hr at 6 ft.	Destination
6/6/79 9:00a.m.	Contaminated Trash	0.609	8.5	Beatty, NV
6/25/79 10:30a.m.	Dewatered Resin	22.9	2.5	Barnwell, SC
6/27/79 10:00p.m.	Evaporator Concentrates Non-compacted Trash	0.942	6	Beatty, NV
8/2/79 9:30a.m.	Compacted Trash & Dewatered Resin	1.08	5	Barnwell, SC

1332 036

Table XII

REPORTED RADIOACTIVE MATERIAL SHIPMENTS

to and from

DONALD C. COOK NUCLEAR POWER PLANTS

Indiana & Michigan Electric Company

Bridgman, Michigan

Date Time	Description of Shipment	Curies	mR/hr at 6 ft.	Destination
6/5/79 10:50a.m.	Solidified Waste/ Evaporator Concentrates	0.2427	2.5	Barnwell, SC
6/6/79 5:00p.m.	Solidified Waste/ Evaporator Concentrates	0.18092	1.6	Barnwell, SC
6/8/79 7:30p.m.	Rad-waste	0.733	4	Barnwell, SC
6/12/79 10:15a.m.	Solidified Waste/ Evaporator Concentrates	0.22326	2.5	Barnwell, SC
6/29/79 10:15a.m.	Solidified Evaporator Bottoms	0.274	2.0	Barnwell, SC
6/29/79 2:15p.m.	High Level Filter Material	1.911	6	Barnwell, SC
7/8/79 6:30a.m.	Low Level Waste	0.1843	3.8	Barnwell, SC
7/12/79 1:30p.m.	Dry Compressed Waste	0.1211	4.5	Seneca, IL
7/19/79 10:00a.m.	Solidified Evaporator	0.228	4	Barnwell, SC
11:05a.m.	Concentrates	0.336	3	Barnwell, SC
8/2/79 10:10a.m.	Dry Compressibles Spent Filter Cartridges	1.041	3	West Chicago, IL
8/8/79 12:45p.m.	Nuclear Fuel	6.6	1.65	Cook Plants

1332 037

Table XII cont.

REPORTED RADIOACTIVE MATERIAL SHIPMENTS

to and from

DONALD C. COOK NUCLEAR POWER PLANTS

'iana & Michigan Electric Company

Bridgman, Michigan

Date Time	Description of Shipment	Curies	mR/hr at 6 ft.	Destination
8/15/79 12:40p.m.	Solidfied Waste/ Evaporator Concentrates	0.344	2.3	Barnwell, SC
8/16/79 7:45a.m.	Nuclear Fuel	9.9	-	Cook Plants
8/16/79 2:20p.m.	Solidfied Waste/ Evaporator Concentrates	0.271	3	Barnwell, SC
8/30/79 5:35a.m.	Nuclear Fuel	9.9	1.5	Cook Plants

1352 038

Table XIII

REPORTED YELLOWCAKE SHIPMENTS

from

DENISON MINES LTD.

Elliot Lake, Ontario, Canada

to Metropolis, Illinois

Date Time	Number of Trucks	Curies	mR/hr at 6 ft.
6/7/79 5:33p.m.	1	5.8	5
6/11/79 3:04p.m.	1*	5.8	5
7/5/79 11:30a.m.	1	5.8	5
7/12/79 5:C0p.m.	2	5.8/truck	5
7/19/79 3:47p.m.	1	5.8	5
10:15p.m.	1	5.8	5
7/24/79 2:15p.m.	1	5.8	5
8/15/79 10:40p.m.	1	5.8	5
8/28/79 6:20p.m.	1	5.8	5
8/30/79 6:33p.m.	1	5.8	5

* Shipment is raw ore not concentrate

Date/Time - Departure southbound from the International Bridge, Sault Ste. Marie.

1332 039