Return to URFO 467-SS
40-8550
PDR

Bechtel Civil & Minerals, Inc.
Engineers–Constructors
Fifty Beale Street
San Francisco, California
Mail Address: P.O. Box 3965, San Francisco, CA 94119

30 March 1983

Dr. Harry Pettengill
Uranium Recovery Field Office - Nuclear Regulatory Commission
7915 Eastern Avenue
Silver Spring, Maryland 20910

Dear Dr. Pettengill:

Enclosed is the decontamination report for the T. L. Leach Demonstration Trailer. The final alpha survey indicates the NRC license, SUA-1307, Docket No. 40-8550, can now be terminated.

Each area identified by Mr. Spitzberg, NRC Region IV Field Inspector, was located and decontaminated. The alpha levels were reduced by factors of 2.8 or more. This should easily meet the termination criteria of Attachment C to the license, "Guideline for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-Product, Source or Special Nuclear Material."

The decontamination residue including cleaning waste was converted into a sulfuric acid solution and introduced as feed material to an uranium oxide process. The contaminate disposition is traceable.

If you have any questions about the report, please contact Mr. Crotwell (615/482-0371) or Dr. Goldsmith (615/482-0344). A copy of the report has been provided to Mr. Spitzberg.

Yours very truly,

Walt Niepelt

(W.A. Niepelt for) J.F. Wickham
Engineering Manager

Attach

FEE EXEMPT
00200
info only

ATTACHMENT 1

ORIGINAL: Dr. Harry Pettengill
Uranium Recovery Field Office, NRC
7915 Eastern Avenue
Silver Spring, MD 20910
Phone (301) 427-4648

COPY: Mr. D. B. Spitzberg
Technical Program Branch
Nuclear Regulatory Commission
Region IV
611 Ragan Pl a Drive, Suite 1000
Arlington, Texas 76011
Phone (817) 860-8100

COPY: Mr. Doug Shaw, Project Manager
Hazen Research
4601 Indiana Street
Golden, Colorado 80403
Phone: (303) 279-4501

DECONTAMINATION REPORT
T. L. LEACH DEMONSTRATION UNIT

Introduction

The trailer described as a T. L. Leach Demonstration Unit was developed to provide a mobile capability for pilot processing of uranium ore. Figure 1 is a photo of the trailer in its present condition.

Holmes and Narver (H&N) received a NRC license (SUA-1307) in 1977 to operate the facility. The demonstration unit process was a leaching system which used acid to extract the uranium oxide. During the production period, some spillage of the acid solution probably occurred. After completion of the project about three years ago, the trailer was cleaned and stored at the Hazen Research site in Tuscon, Arizona. H&N performed a radiological survey in August, 1982 and filed it with the NRC requesting termination of the license. The NRC field inspector conducted a release survey on the trailer in November, 1982 and found three (3) spots that exceeded 15000 dpm/100cm^2 and several spots that were above 5000 dpm/100 cm^2. These values clearly exceeded the termination criteria as defined in Attachment C to the NRC License, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-Product, Source or Special Nuclear Material." The NRC could not terminate the license because of this residual contamination.

In late November 1982, Bechtel National was contacted for a proposal to decontaminate the trailer to release limits. In January 1983, Bechtel was authorized to proceed with the decon of the trailer.

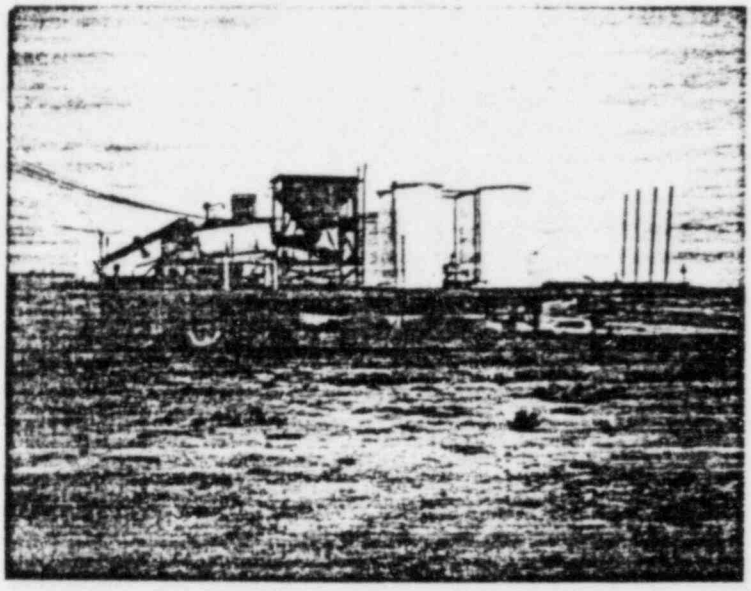


Figure 1

T. L. Leach Demonstration Trailer

Viewed looking West

Decon Approach

The following is a chronological listing of the principal actions taken to decon the trailer.

Date	Actions
2/7/83	General area gamma and alpha survey, general area smears. Photographs taken. Detailed alpha measurements made on underside of trailer.
2/8/83	Detailed alpha measurements made on floor and beams, detailed gamma scan of trailer, defined the hot spots, protected ground surrounding trailer, deconned areas.
2/9/83	Deconned trouble spots, performed final surveys, took contaminate and decon materials to lab to convert to sulfuric acid solution.
2/10/83	Resurveyed ground (general area), resurveyed decontaminated areas to insure no leaching occurred, picked up sulfuric acid solution and transferred to Anamex Uranium Oxide plant.

Decon Techniques

The decon procedure for the contaminated surface was:

(1) Clean area with alcohol to remove loose dirt and paint.

(2) Brush (steel) to remove surface paint and rust, keep surface wet to minimize dust and chips and collect removed material.

(3) Wipe with absorbent and alcohol to remove residue.

(4) Sand (emery paper) or scrape to remove heavy paint and embedded rust, keep surface damp to control dust yet minimize clogging of paper.

(5) Wipe with absorbent and alcohol to remove residue.

(6) Apply naval jelly on pitted areas where hand abrasives were not effective. Naval jelly was removed by absorbent soaked in alcohol.

Note that in each step preventative measures were aggressively used to control the dispersal of removed material and prevent contamination of surrounding areas. Plastic covers were used under the trailer edges to prevent residue from falling on the ground. All material removed collected for controlled disposition.

Instrumentation

Gamma radiation measurements were made using a 2" x 2" NaI (Tl) scintillation detector (Ludlum model 44-11) and a portable survey meter. Based on calibration data provided by the manufacturer, the response to a ^{137}Cs gamma radiation point source was 1.3μ R/h per 1000 cpm. Background radiation at the Tuscon site provided an instrument response of 11K to 14K cpm measured at 1m above the ground. A Ci ^{60}Co check source was used to determine the appropriateness of instrument response before and after each set of measurements.

Surface alpha measurements were made using a ZnS(Ag) scintillation detector (Ludlum Model 43-1) and a portable survey meter. Based on information provided by the manufacturer, the efficiency was calculated to be 60% for 2π geometry for ^{238}U. A conversion factor was calculated based on probe efficiency, surface area and geometry. A 0.1μ Ci ^{210}Po check source was used to determine the adequacy of instrument response at least three times each day.

Smears were counted using a ZnS(Ag) scintillation detector (Ludlum Model 43-10) and a portable scalar. A 0.1μ Ci ^{210}Po check source was used to determine the adequacy of instrument response prior to counting each day's set of smears. Instrument background was typically less than 1 cpm. Based on information provided by the manufacturer, the efficiency was calculated to be 60% for 2π geometry.

Results

A. Gamma Radiation Surveys

Results of gamma-ray surveys are shown in Figures 2 thru 4. Surveys of the grounds used a 8 ft x 8 ft square grid system extending 16 ft around the perimeter of the trailer. Surveys of the trailer used a 4 ft x 4 ft square grid system. The entire trailer was slowly scanned with the gamma probe held within 2 inches of all accessible surfaces (including tanks and piping). A fast detector response time (3 sec) was used during scanning. Results of these measurements indicate that no ^{226}Ra contamination is present on the trailer. The results shown in Figure 4 indicate that no additional gamma-ray activity was transferred to the grounds by the decontamination process. All results shown are gross values; background has not been subtracted.

B. Alpha Radiation Surveys

Detailed alpha surveys were made on the surfaces of the trailer before and after decontamination. Particular attention was given to all steel beams used in trailer construction. The detector was in contact with the surface when all measurements were made. Structural members were "scanned" by positioning the detector in an overlapping pattern on the surface of every grid block. A fast detector response time (3 sec) was used during this "scanning". The area extent and peak activity of "hot spots" were defined by this

BECHTEL

CALCULATION SHEET

DATE 7 Feb 83
11:05 AM

DESIGN BY Bill Goldsmith / Phil Crotwell DATE 7 Feb 83 CHECKED BY ______ SHEET NO. ______

PROJECT Tucson Trailer Decon JOB NO. ______

SUBJECT Surface Survey - γ CALCULATION NO. ______ FILE NO. ______

N

CN921
11K Bkg
70K ^{60}Co @ 10 cm

8' GRID

Measurements made w/ surveyor facing W

NOTE:
Top Rdg - 1M above ground
Bottom Rdg - at ground

12/12	12/12	14/14	17/21	17/19	14/14
12/12	13/13	14/14	17/21	17/17	14/13
11/12	12/12	15/11	17/20	17/17	14/14
11/11	11/11	13/15	15/17	15/19	13/14
11/11	(30) 11/11	15/16	14/15	15/16	14/15
11/11	11/11	12/12	13/14	14/14	14/19
11/12	11/11	14/15	13/14	14/14	13/13
11/12	12/12	12/12	12/14	13/14	14/14
12/12	12/12	13/13	13/13	12/13	13/16
11/12	12/12	12/13	13/13	13/13	13/13

TRAILER (8'x40')

Figure 2

Gamma Survey
Surface Area
Prior to Decon

CALCULATION SHEET

DESIGN BY Bill Goldsmith/Phil Cottrell DATE 7 Feb 83 CHECKED BY

PROJECT Tucson Trailer Dron

SUBJECT Top of Trailer - X Survey

DATE 8 Feb 83 / 1:30 pm SHEET NO.

JOB NO.

FILE NO.

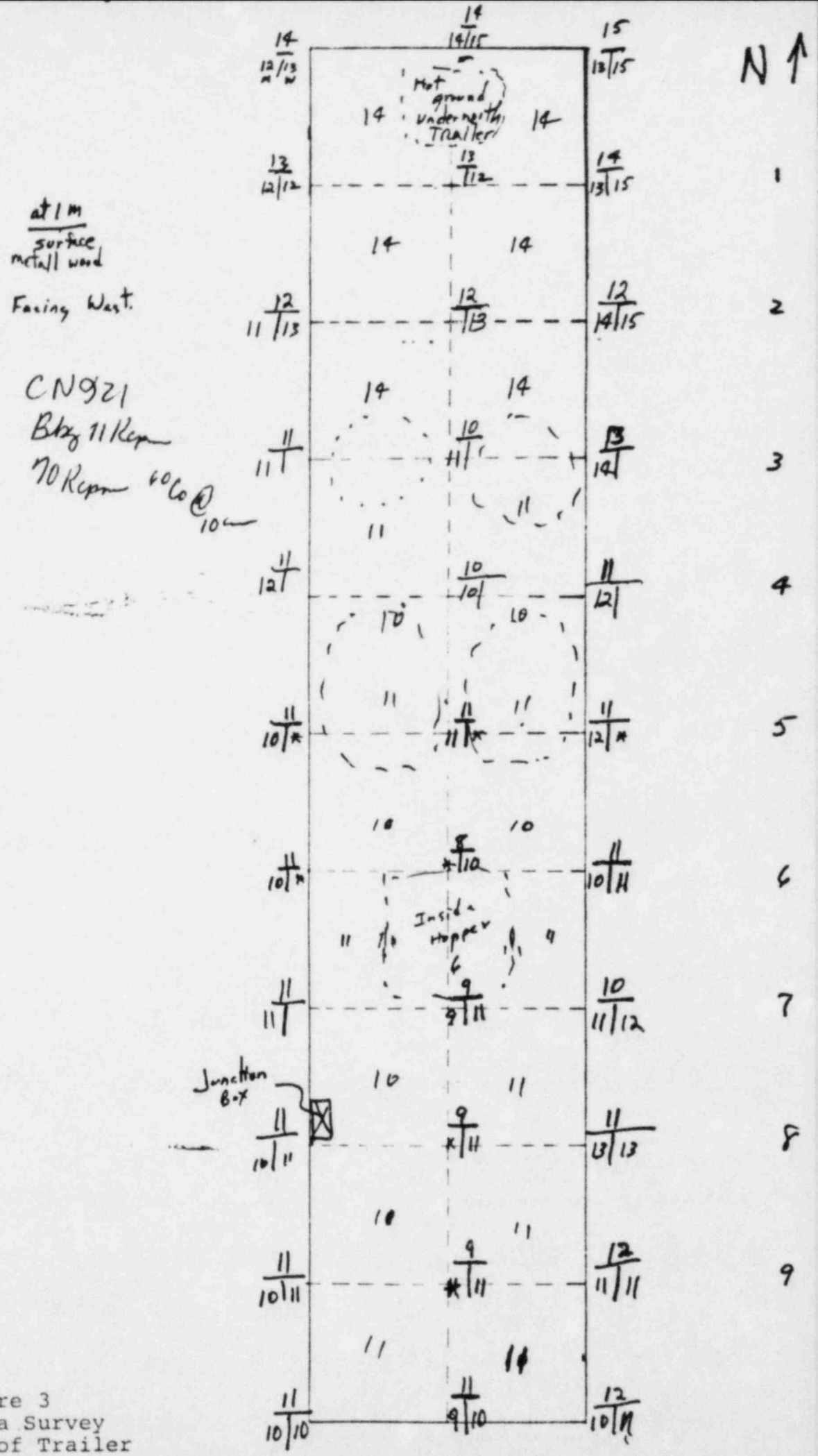


Figure 3
Gamma Survey
Top of Trailer

CALCULATION SHEET

DATE

DESIGN BY Bill Goldsmith / Phil Cretwell DATE 10 Feb 83 CHECKED BY SHEET NO 3 of

PROJECT Tucson Trailer Decon JOB NO

SUBJECT Surface Survey - δ CALCULATION NO FILE NO

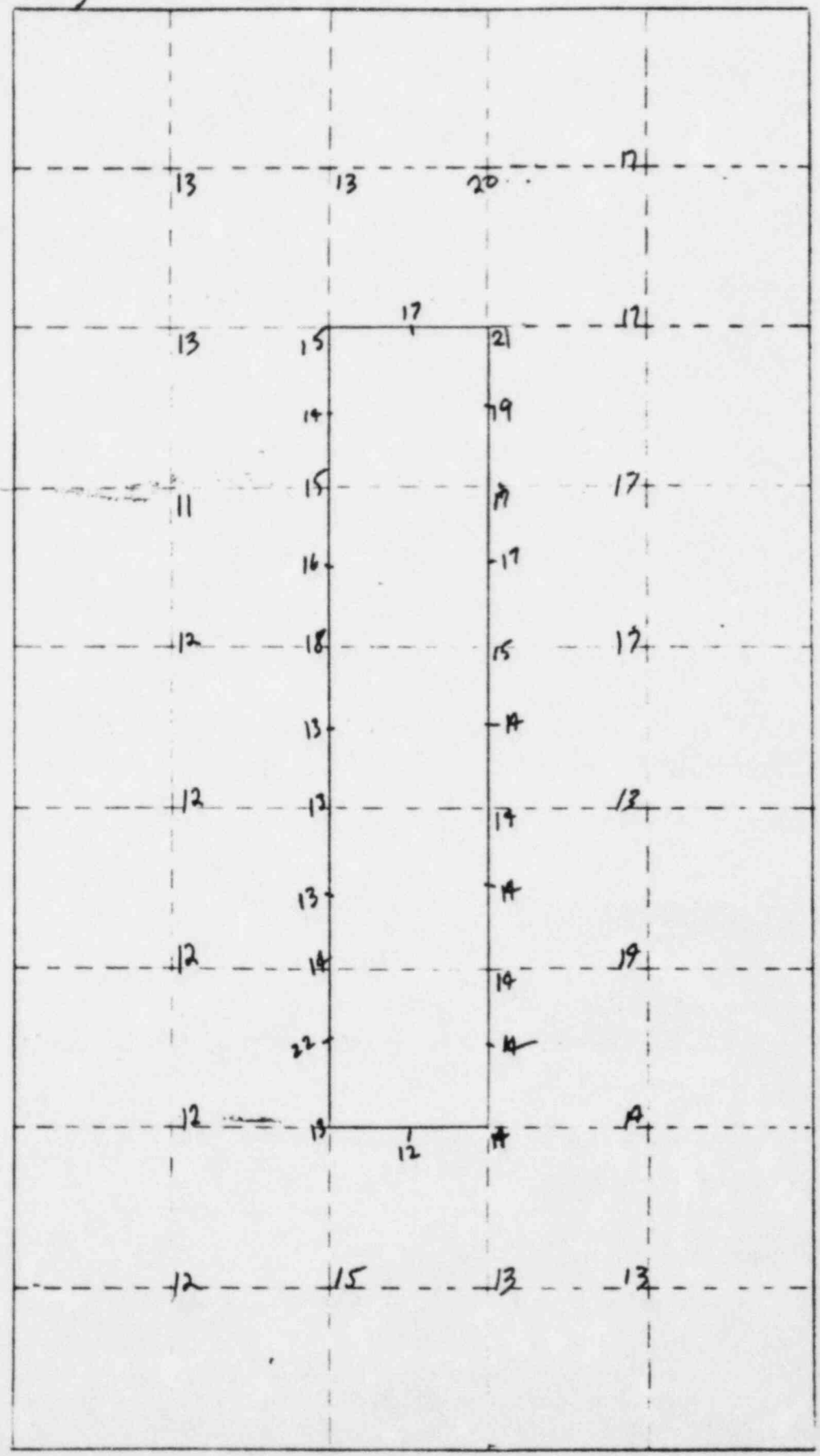


Figure 4

Gamma Survey
Surface Area
After Decon

process. In addition, measurements were made and recorded at all grid points and on all surfaces of structural members at locations where the member intersected a grid line. In this manner, the presence or absence of surface contamination was noted and documented. Results of the surveys conducted prior to decontamination are given in Figures 5 and 6. Results obtained after decontamination are given in Figure 7. All these data are gross measurements; the background component has not been subtracted.

As shown in Figure 5, no areas on the underside of the trailer were found where alpha contamination was in excess of 500 dpm/100cm^2. As shown in Figure 6, all contaminated areas found by the November 1982, NRC inspection were identified by the present survey. Additional areas of suspect contamination were also identified. A total of 13 locations were identified and decontaminated. Each of these 13 areas was resurveyed after decontamination; results are given in Figure 7. A summary of data obtained for each of the contaminated areas before and after decontamination is given in Table 1. The decontamination factors (D.F.) calculated in Table 1 were based on the maximum level observed after decontamination; these DF's would generally be much higher if the area average were used rather than the maximum. Furthermore, no maximum value after decontamination was more than 15% of the NRC limit for contaminated areas as large as 100 cm^2 (15000 dpm/100 cm^2). Additionally, no area had an average of more than 30% of the NRC limit for surface contamination or areas as large as 1m^2 (5000 dpm/100 cm^2). Photos of the decontaminated areas are shown in Figures 8, 9, 10, and 11.

A number of alpha measurements were also made on the ground surface before and after the decontamination operations. These values are given in Figure 12. It may be observed that the alpha measurements made after the decontamination operation were equivalent in value to those made before trailer decontamination. These values also provide a reference background for the alpha measurements made on the trailer.

CALCULATION SHEET

DESIGN BY Bill Grillitsch / Ph. Cotwell DATE 7 Feb CHECKED BY ______ DATE 7 Feb 83

PROJECT Tucson Trailer Decon SHEET NO. ______

SUBJECT Underside of Survey (dpm/100cm²) JOB NO. ______ FILE NO. ______

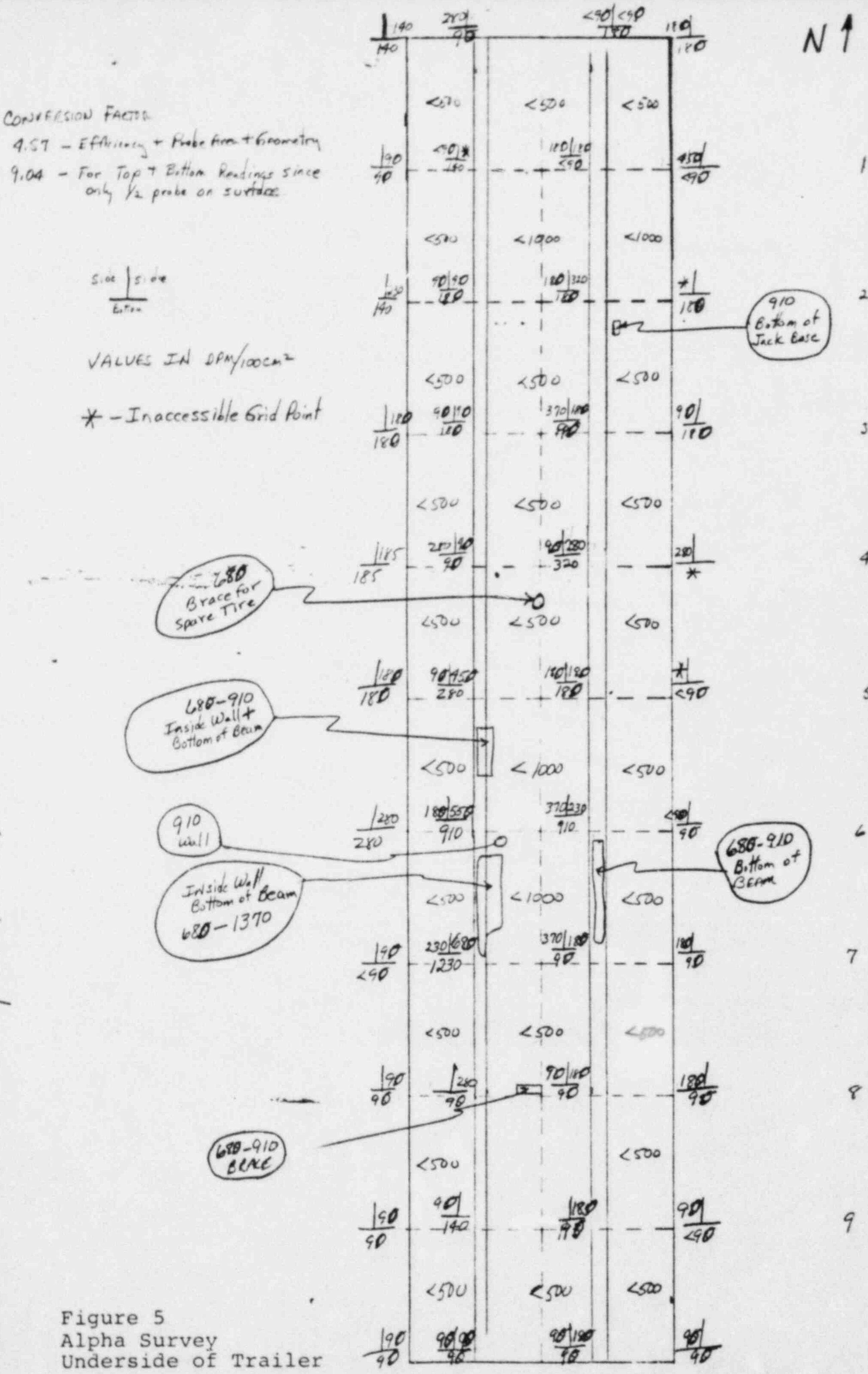
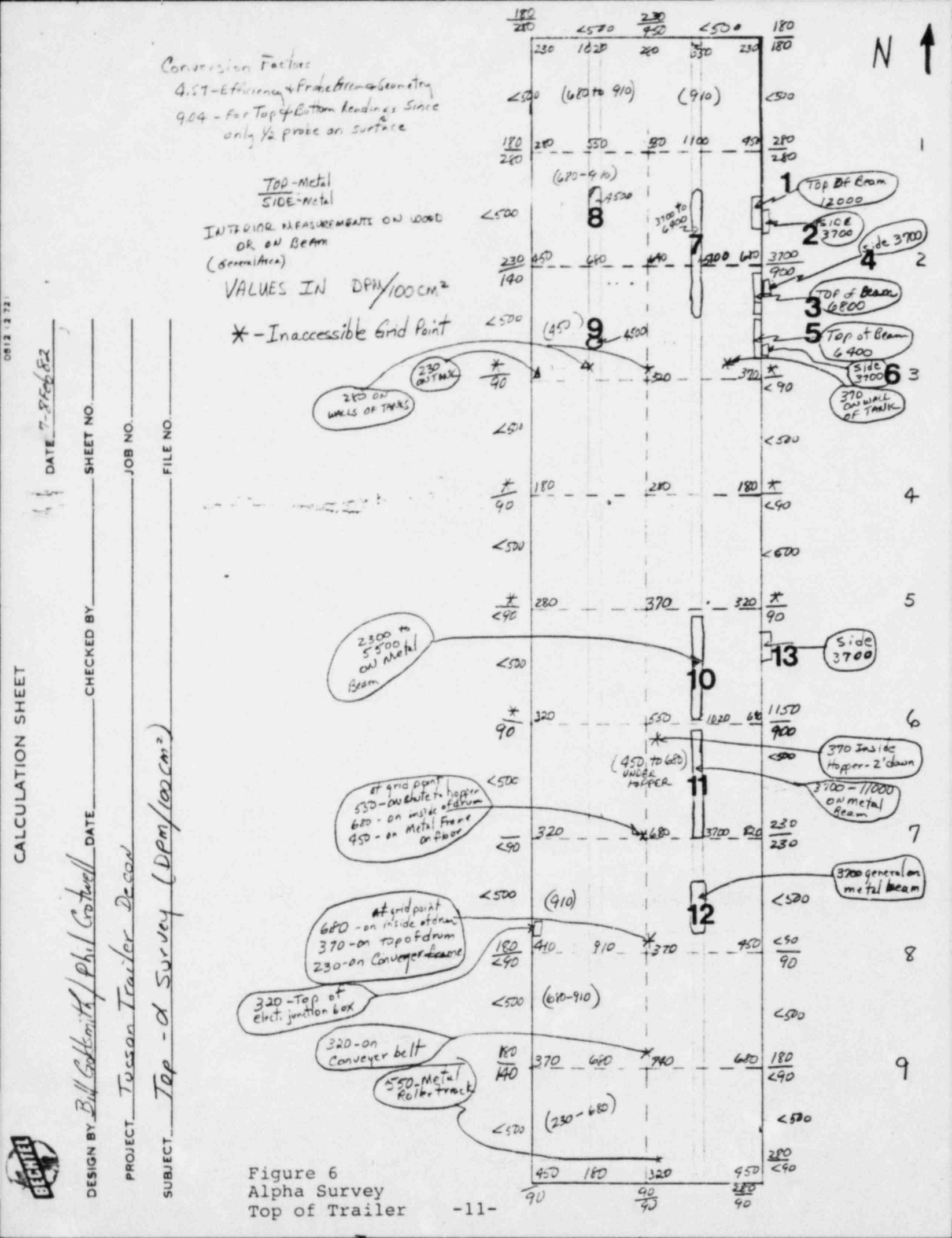


Figure 5
Alpha Survey
Underside of Trailer


CALCULATION SHEET
DESIGN BY Bill Goldsmith / Phil Cotterell DATE
PROJECT Tucson Trailer Decon CHECKED BY
SUBJECT Top - α Survey (DPM/100 cm²) JOB NO.
DATE 7-8 Feb 92 SHEET NO.
FILE NO.
0512 (2 72)
Conversion Factors
4.57 - Efficiency & Probe Area & Geometry
9.04 - For Top & Bottom Readings Since only ½ probe on surface
TOP - Metal
SIDE - Metal
INTERIOR MEASUREMENTS ON WOOD OR ON BEAM
(General Area)
VALUES IN DPM/100 CM²
* - Inaccessible Grid Point
N
Top Of Beam 12000
Side 3700
Side 3700
Top of Beam 6800
Top of Beam 6400
Side 3700
370 on wall of tank
230 on tank
280 on walls of tanks
2300 to 5500 on Metal Beam
Side 3700
370 Inside Hopper - 2' down
3700 - 11000 on metal Beam
At grid point 530 - on chute to hopper 680 - on inside of drum 450 - on Metal Frame or floor
3700 general on metal beam
At grid point 680 - on inside of drum 370 - on top of drum 230 - on Conveyer frame
320 - Top of elect. junction box
320 - on Conveyer belt
550 - Metal Roller track
(450 to 680 UNDER HOPPER)
(680 to 910)
(910)
(450)
(230 - 680)
3700 to 6400
4500
Figure 6
Alpha Survey
Top of Trailer

CALCULATION SHEET

DESIGN BY Bill Gabler / Phil Cantrell DATE 9 Feb 83 CHECKED BY ____ DATE ____

PROJECT Tucson Trailer Decon SHEET NO. ____

JOB NO. ____

SUBJECT Release Survey – α (dpm/100 cm²) FILE NO. ____

CONVERSION FACTORS

4.57 Efficiency + Probe Area + Geometry

9.04 – For Frame Edge Readings Since only ½ probe on Surface

Reading $\frac{MAX}{AVE}$

VALUES IN DPM/100cm²

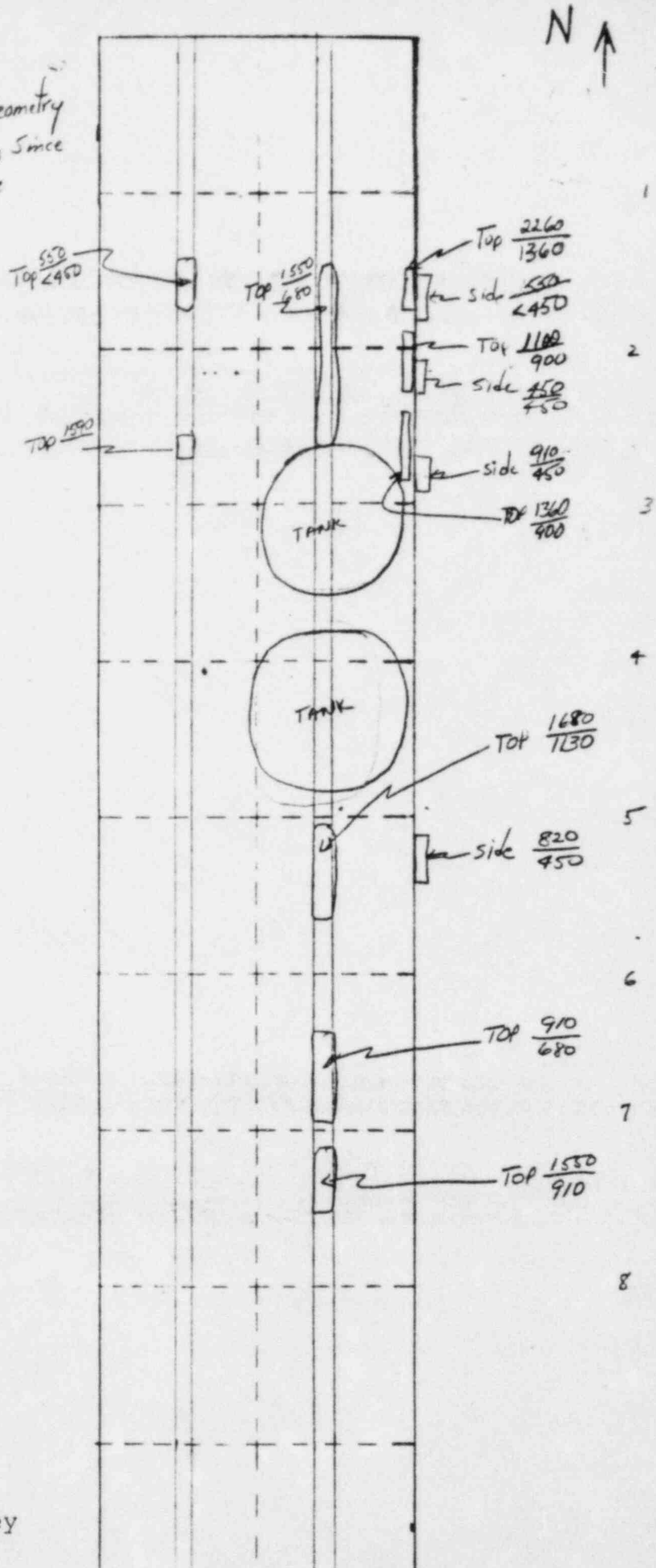


Figure 7
Alpha Release Survey
Top of Trailer

TABLE 1

CONTAMINATED AREAS

BECHTEL Area #	NRC Area #	Contaminated Area Dimension (in)	Area (m^2)	Contamination Levels (dpm/100 cm^2) NRC	Before Decon	After Decon Max	After Decon Avg	*Decontam. Factor
1		30"x3"	.058		12,000	2260	1360	5.3
2		16"x6"	.062		3,700	550	450	6.7
3		18"x3"	.035		6,800	1100	900	6.2
4		12"x6"	.046		3,700	450	450	8.2
5	26	18"x3"	.035	34,500	6,400	1360	900	4.7
6		12"x6"	.046		3,700	910	450	4.1
7	25	69"x4"	.178	6,900	6,400	1550	680	4.1
8		18"x4"	.046		4,500	550	450	8.2
9	24	6"x4"	.015	5,175	4,500	1590		2.8
10		32"x4"	.083		5,500	1680	1130	3.3
11	23	30"x4"	.077	16,200	11,000	910	680	12.0
12		18"x4"	.046		3,700	1550	910	2.4
13	27	8"x6"	.031	20,700	3,700	820	450	4.5

* Decontamination Factor = Contamination level prior to decon ÷ maximum contamination level after decon

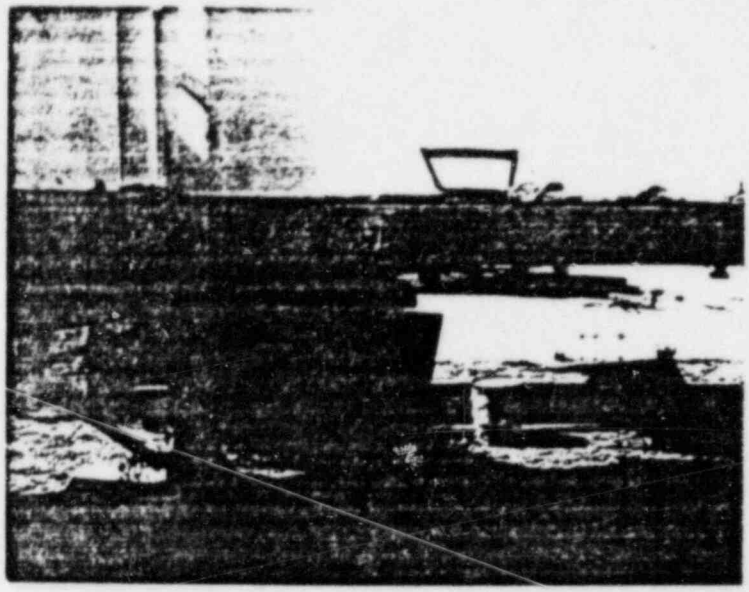


Figure 8
Deconned Areas 1 thru 6
Viewed looking West

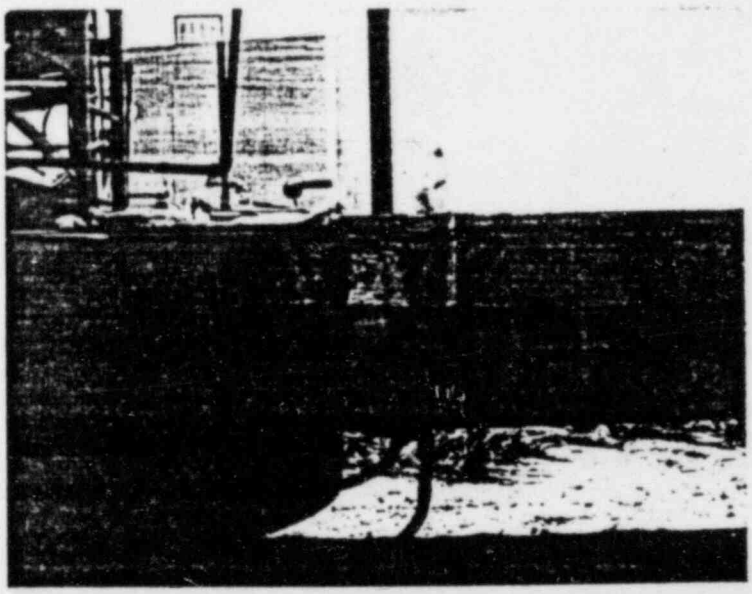


Figure 9
Deconned area 13 on side of trailer. Area 10 on top of trailer is being deconned. Viewed looking West

Figure 10
Deconned areas 11 and 12 on Support beam. Area 11 is on center, area 12 is at far right. Viewed looking East.

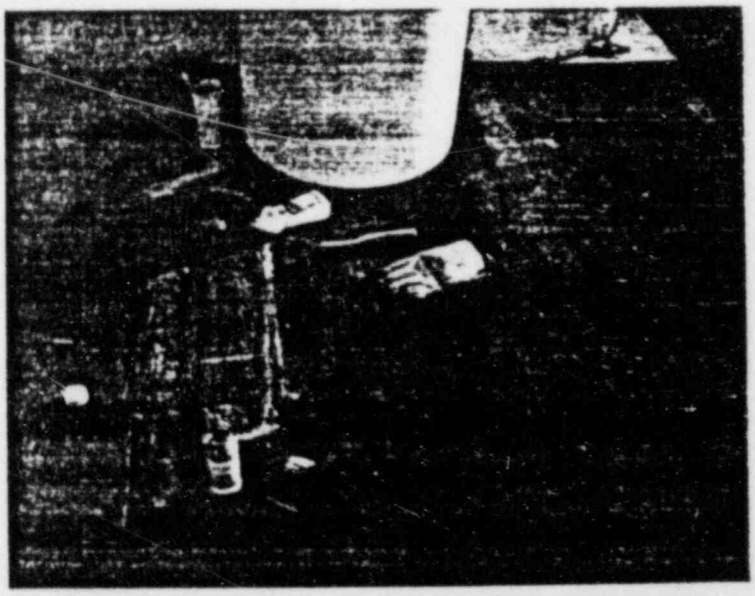


Figure 11
Area 7 on left being deconned. Area 8 and 9 on right after decon. Viewed looking South.

DATE

DESIGN BY DATE CHECKED BY SHEET NO.

PROJECT JOB NO.

SUBJECT CALCULATION NO. FILE NO.

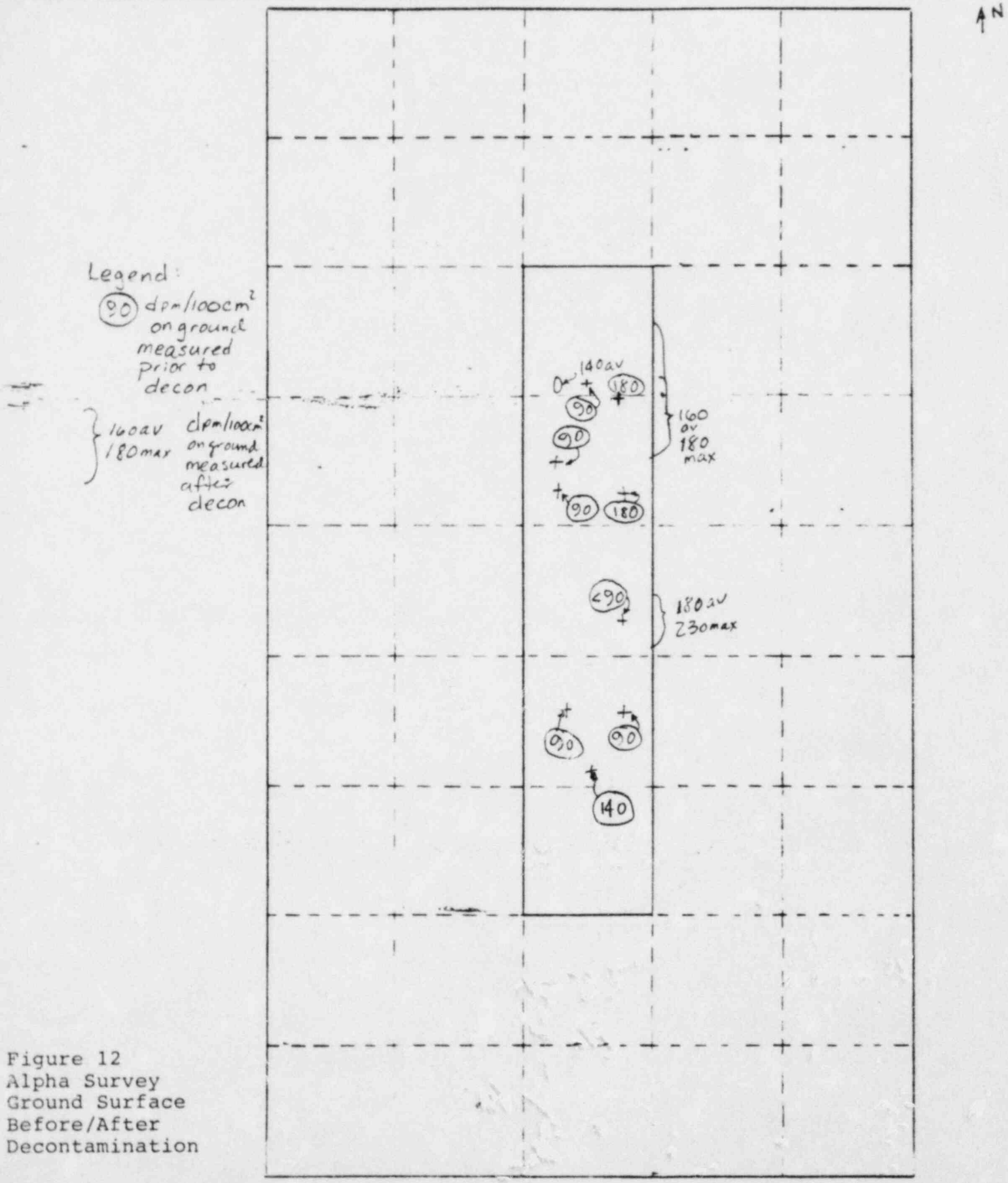


Figure 12
Alpha Survey
Ground Surface
Before/After
Decontamination

C. Removable Contamination Surveys

Standard smears were made at numerous locations on the trailer as shown in Figure 13. All decontaminated areas were smeared after decon was completed. Results of smear counting are given in Table 2. These results indicate that no trailer surfaces contain removable contamination in excess of NRC requirements of 1000 dpm/100cm^2.

Residue Disposal

The residue and absorbent material used to decon the trailer were collected in plastic bags. The quantity of material was minimized by using final wipe materials on a deconned area for the initial, gross residue removal on the next contaminated area. Any chips or loose material that fell on the plastic ground covering were brushed into the plastic bag. The bag was taken to American Analytical Laboratory where the material was converted into a sulfuric acid solution and placed in a large glass jug and transported to the Anamex uranium ore processing facility at Green Valley, AZ. Anamex took the material and entered it as feed material into their uranium oxide process. The American Analytical and Metallurgical Laboratories invoice for the conversion of the material into sulfuric acid solution was used to trace the disposal of the contamination removed from the trailer (Figure 14).

CALCULATION SHEET

DESIGN BY B. U. Golsen / Ph. Crawford DATE 7 Feb 82 CHECKED BY ____ DATE 8 Feb 83 / 7 Feb 83 / 1200 (op.) SHEET NO. ____

PROJECT Tucson Trailer Decon JOB NO. ____

SUBJECT Smear Locations FILE NO. ____

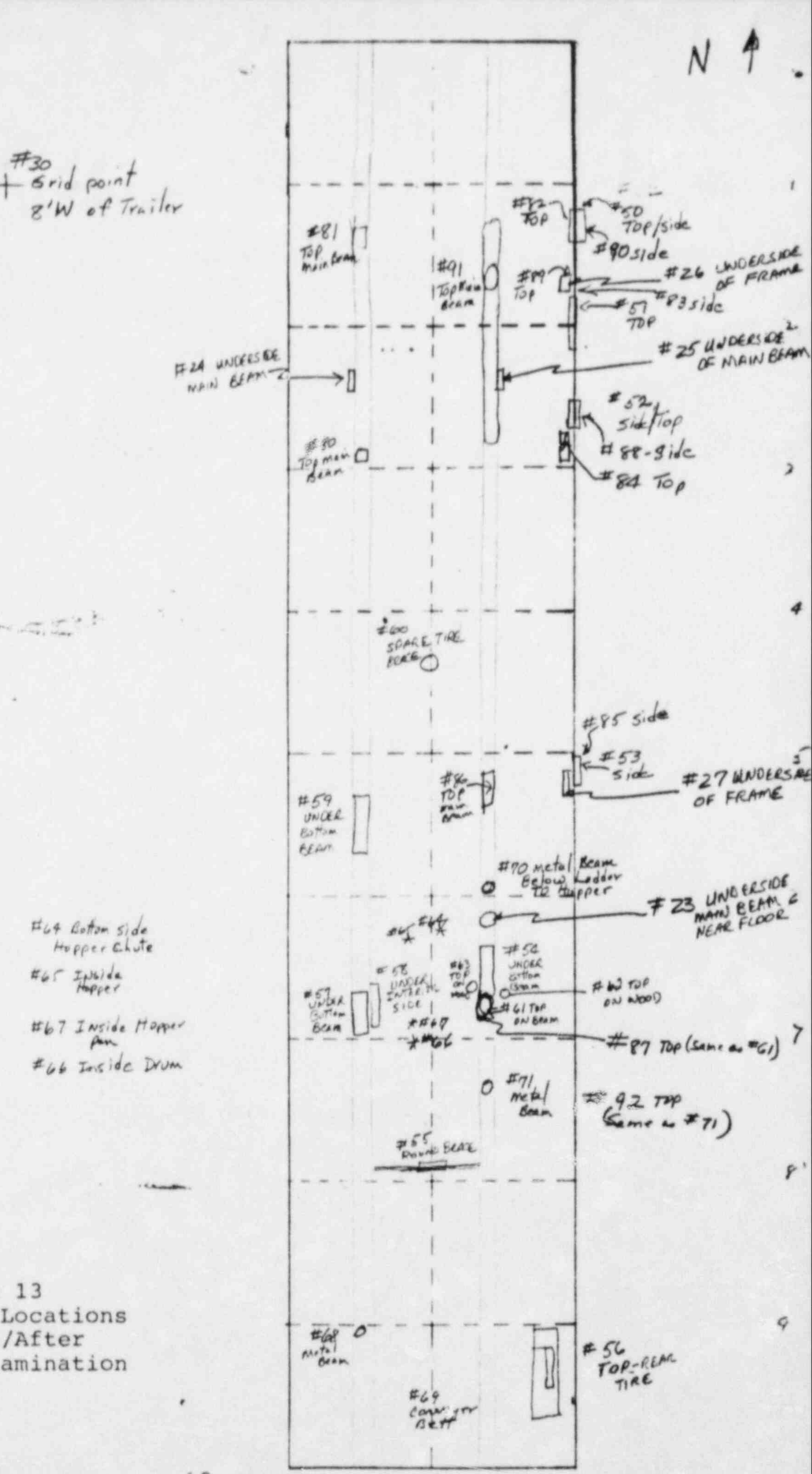


Figure 13
Smear Locations
Before/After
Decontamination

TABLE 2

REMOVABLE ALPHA CONTAMINATION

Smear No.		Value (dpm/100cm^2)		
Before Decon	After Decon	Before Decon	After Decon	Remarks:
23		50		Underside of Trailer
24		30		
25		20		
26		60		
27		<20		Background
30		<20		
50	82 Top	50	<20	Smear #50 taken over
	90 Side		<20	both side and top
51	89	<20	<20	surfaces.
52	84 Top	<20	<20	Smear #52 taken over
	88 Side		<20	both side and top surfaces
53	85	30	<20	Underside of trailer
54		<20		" "
55		<20		" "
56		<20		" "
57		30		" "
58		<20		" "
59		20		" "
60		<20		" "
61	87	30	<20	" "
62		<20		#62 and #63 were taken
63		<20		on wood surfaces next
64		<20		to metal beam.
65		<20		Equipment - Hopper chute
66		<20		- Inside Hopper
67		<20		- Hopper Pan
68		<20		- Inside Drum
69		<20		Equipment - Conveyor
70	86	<20	<20	belt
71	92	<20	<20	
	80		<20	
	81		<20	
	83		<20	
	86		<20	
	91		<20	

INVOICE G3080

AMERICAN ANALYTICAL & METALLURGICAL LABORATORIES

ASSAYERS - CHEMISTS - METALLURGISTS

3441 EAST MILBER • TUCSON, ARIZONA 85714 • PHONE: (602) 889-5787

SAMPLE SUBMITTED BY Bechtel DATE 02/10/83

02-99990100

SAMPLE MARKED	ANALYSIS	CHARGES
Bottle of Liquid As Received	1 Leaching Service @ $100.00 Per Quote	$100.00

ANAMEX
NO CHARGE
RECD BY
H. R. Moyer
2/10/83

Paid 2/10/83
Ck# 004438
Thank you
J. J. Smith

Figure 14
American Analytical &
Metallurgical Laboratories
Invoice - Receipt by Anamex

Summary

The primary findings of this task are:

1. The T. L. Leach Demonstration unit trailer did contain surface uranium alpha contamination at levels in excess of NRC limits in license SUA-1307. All areas identified in the NRC survey of November, 1982 were found. A total of 13 areas of excess surface alpha contamination were identified and decontaminated. The surface alpha contamination levels of each of these areas were well within NRC limits in license SUA-1307 after decontamination was performed.

2. Results of gamma ray scans indicated that no ^{226}Ra contamination was present on the trailer.

3. Measurements of the grounds before and after the trailer decontamination indicate that no contamination was transferred to the grounds as a result of the trailer decontamination.

4. The contamination removed from the trailer was used as feed material in a licensed uranium processing operation.

5. Radiological survey results indicate that the trailer now has no area of surface contamination which is in excess of the limits of license SUA-1307.