W02985-QES

Quanterra

0052601

Quanterra
2800 George Washington Way
Richland, Washington 99352-1613

509 375-3131 Telephone
509 375-5590 Fax

CERTIFICATE OF ANALYSIS

Bechtel Hanford, Inc.
3350 George Washington Way
Richland, WA 99352

RECEIVED
FEB 28 2000
EDMC

January 5, 2000

Attention: Joan Kessner

JAN 2000 RECEIVED Data Log In

SAF Number	:	B00-010
Date SDG Closed	:	January 3, 2000
Number of Samples	:	One (1)
Sample Type	:	Soil
SDG Number	:	W02985
Data Deliverable	:	Summary

I. Introduction

On December 20, 1999, one soil sample was received at the Quanterra Richland Laboratory (QRL) for chemical analysis. Upon receipt, the sample was assigned the following laboratory ID number to correspond with the Bechtel Hanford, Inc. (BHI) specific ID:

QESRL ID#	BHI ID#	MATRIX	DATE OF RECEIPT
9D6MGQ10	B0X583	SOIL	12/20/99

II. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information, analytical results and the appropriate associated statistical errors.

The requested analysis was: **Chemical Analyses**
ICP Metals by EPA method 6010A

III. Quality Control

The analytical results for each analysis performed under SDG W02985 include a minimum of one Laboratory Control Sample (LCS), one method (reagent) blank, and one duplicate. Any exceptions have been noted in the "Comments" section.

Quality control sample results are reported in the same units as sample results with the exception of the chemical analysis which is reported in mg/L.

IV. Comments

Chemical Analyses

ICP Metals by EPA method 6010A

The requested metals were arsenic, barium, cadmium, chromium, lead, selenium and silver. The samples were analyzed under quick-turn protocol and include LCS/LCSD in place of MS/MSD analyses. The prep blank, LCS, LCSD and sample results are within contractual requirements.

I certify that this Certificate of Analysis is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee as verified by the following signature.

Reviewed and approved:

Jackie Waddell

Jackie Waddell
Project Manager

ICAP METAL SAMPLE AND QC SAMPLE DATA REPORT

BATCH # : 9355237

Digestion Date: 12/20/99

Analytical Date: 12/21/99

Matrix: SOIL

Sample Lab. ID	Client ID	units	Arsenic	Barium	Cadmium	Chromium	Lead	Selenium	Silver
	MDL	mg/kg	5	0.2	0.2	0.5	2	5	0.5
Prep Blank	Prep Blank	mg\L	-0.0114	-0.0005	0.0008	-0.0004	-0.0038	.-.0078	0.0012
LCS	LCS	mg/L	1.903	1.910	0.0503	0.1973	0.4973	1.869	0.0337
		% Rec.	95.2%	95.5%	100.6%	98.7%	99.5%	93.5%	96.3%
LCSD	LCSD	mg/L	1.895	1.9	0.051	0.198	0.4833	1.882	0.0346
		%Rec.	94.8%	95.2%	101.4%	98.9%	96.7%	94.1%	98.9%
D6MGC101	B0X4X4	mg/kg	<5	68.6	0.21	5.6	6.3	<5	<0.5
D6MGG101	B0X4X5	mg/kg	<5	59.2	<0.2	7.6	6.1	<5	<0.5
D6MGQ101	B0X583	mg/kg	5.5	293.4	0.47	5.9	12.1	<5	15.5

mg/kg = ug/L*final volume in liters / weight of sample in grams

RB 12/27/99

0004

Quanterra

Richland Laboratory
Data Review Check List
METALS

Work Order Number(s): D6MGC, D6MGG, D6MGQ Batch 9355237 Lot. J9L210110 J9L210111

Lab Sample Numbers or SDG: WO2984 & WC2985

Method/Test/Parameter: ICP Metals (7) in soil

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
A. Initial Calibration				
1. Performed at required frequency wih required number of levels?	✓			
2. Correlation coefficient within QC limits?	✓			
3. Initial calibration verification (ICV) analyzed immediately after calibration and results within QC limits?	✓			
4. Initial calibration blank(ICB) analyzed immediately after ICV and concentrations of all parameters ≤ reporting limit?	✓			
B. Continuing Calibration				
1. CCV analyzed at required frequency and all parameters within QC limits?	✓			
2. CCB analyzed at required frequency and all results ≤ reporting limit?	✓			
C. Sample Analysis				
1. Were any samples with concentrations above the linear range for any parameter diluted and reanalyzed?		✓		
2. Were all sample holding times met?	✓			
D. QC Samples				
1. All results for the preparation blank below limits?	✓			
2. MS or MS/MSD recoveries within QC limits and %RPD (for MSD) acceptable?			✓	
3. LCS percent recovery within QC limits and %RPD (for LCSD) acceptable?	✓			
4. Analytical spikes within QC limits where applicable?			✓	
5. ICP only: One serial dilution performed per SDG?	✓			
6. ICP only: CRDL standard (CRI or CRA) analyzed at required frequency?			✓	
7. ICP only: Interference check samples (ICSA, ICSAB) and ~~HICAL~~ analyzed at the required frequencies and within QC limits? (R) 12/21/97	✓			

0005

Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
E. Other				
1. Are all nonconformances included and noted?			✓	
2. Is the correct date and time of analysis shown?	✓			
3. Did the analyst sign and date the front page of the analytical run?	✓			
4. Correct methodology used?	✓			
5. Transcriptions checked?	✓			
6. Calculations checked at minimum frequency?	✓			
7. Units checked?	✓			

Comments on any "No" response:

Note - Quick Turn samples do not have MS, MSD's or sample duplicates but have LCS & LCSD.

Analyst: Roxie Ross Date: 12/21/99

Second-Level Review: Jackie Waddell Date: 1/4/00

Form No. CG-191, Rev. 2, 1/97

CHAIN OF CUSTODY

Bechtel Hanford Inc.	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		B00-010-02	Page 1 of 1
Collector Doug Bowers	Company Contact Jeff Learch	Telephone No. 373-5904	Project Coordinator TRENT, SJ	Price Code Air Quality ☐
Project Designation 300-FF-1 Landfill 1A Cleanup	Sampling Location 300 FF-1 1A landfill		SAF No. B00-010	Data Turnaround 24 HR per J. Waddell
Ice Chest No. RAT 12.20.99 ~~ERC 96 087~~ ERC99003	Field Logbook No. EL 1395-2	COA RNDF1A 2600	Method of Shipment Gov Vehicle	
Shipped To Quanterra Incorporated	Offsite Property No. N/A		Bill of Lading/Air Bill No. N/A	

POSSIBLE SAMPLE HAZARDS/REMARKS

Special Handling and/or Storage

Preservation	Cool 4C										
Type of Container	aG										
No. of Container(s)	1										
Volume	~~60mL~~ 250	D 12-17-99									
	See item (1) in Special Instructions.										

SDL

SAMPLE ANALYSIS

W02985 J9L210111

Sample No.	Matrix *	Sample Date	Sample Time										
BOX583	Soil	12-17-99	0940	X	D6MGG		253 cpm						

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By Doug Bowers Doug Bowers	Date/Time 12-17-99/1445	Received By Rof 1A	Date/Time 12-17-99/1445
Relinquished By Rof 1A	Date/Time 12.20.99/0730	Received By R Thoren	Date/Time 12.20.99/0730
Relinquished By R. Thoren	Date/Time 12.20.99/0840	Received By J Hudelberg	Date/Time 12-20-99 0840
Relinquished By J Hudelberg	Date/Time 12-20-99 1600	Received By JA 12-20-99 1000 cpm	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS

** Friability shall be described in the WSCF case narrative.

** COC Note-- The ERC Contractor acknowledges the 48-hour holding time for nitrate, nitrite, and phosphate is not likely achievable.

(1) ICP Metals - 6010A (TAL); ICP Metals - 6010A (Add-on) {Arsenic, Beryllium, Lead, Selenium, Thallium}

JW 12/21/99
Metal List per SAF

Matrix *

S=Soil
SE=Sediment
SO=Solid
S =Sludge
W = Water
O=Oil
A=Air
DS=Drum Solids
DL=Drum Liquids
T=Tissue
WI=Wipe
L=Liquid
V=Vegetation
X=Other

LABORATORY SECTION	Received By	Title	Date/Time
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

BHI-EE-011 (10/99)

0008

Figure 1

SAMPLE CHECK-IN LIST

Date/Time Received: 12-20 0840 SG#: W02985

Work Order Number: U9L2101.11 SAF #: B00-013 B00-010

Shipping Container ID: 99-003 Chain of Custody # B00-013-52 B00-010-02 B00-011-02

1. Custody Seals on shipping container intact? Yes [✓] No [ ]
2. Custody Seals dated and signed? Yes [✓] No [ ]
3. Chain-of-Custody record present? Yes [✓] No [ ]
4. Cooler temperature on ice
5. Vermiculite/packing materials is Wet [ ] Dry [ ] na
6. Number of samples in shipping container: 9
7. Sample holding times exceeded? Yes [ ] No [✓]

8. Samples have:
   - ✓ tape
   - ✓ custody seals
   - ____ hazard labels
   - ____ appropriate sample labels

9. Samples are:
   - ✓ in good condition
   - ____ broken
   - ____ leaking
   - ____ have air bubbles

10. Where any anomalies identified in sample receipt? Yes [ ] No [✓]
11. Description of anomalies (include sample numbers): _____

Sample Custodian/Laboratory: [signature] Date: 12-20-99

Telephoned To: _____ On _____ By _____

Author: [redacted] at ~BHI021 [redacted]
Date: 10/7/97 4:34 PM
Priority: Normal
TO: Dennis L Hill at ~BHI017
TO: Andrew A Greif at ~BHI016
CC: David A St John at ~BHI001
CC: Michael J Galgoul at ~BHI007
CC: Robert I Orewiler at ~BHI001
Subject: SAMPLE SCREENING FOR OFF SITE SHIPMENT

Message Contents

A while back I discussed the screening of samples taken by Doug Bowers to be sent off site for analysis. The samples can be surveyed with existing hand held instruments and with the tech basis document correction factors, given a total activity estimate.

For these samples, direct surveys are required. The purpose of the survey is determine if the samples are less than 2,000 pCi/gm.

Once the survey is performed, document it as you would any other survey, give a copy to Mr. Bowers (or whoever the sampler is) and on the survey reference the tech basis document number which we use to guide the screening of the excavation at 300 FF-1.

This will help the samplers get the samples to off site radiological labs without having to go to a counting facility first. Any questions, please give me a call.

thanks.

sk

FIELD SAMPLE COPY

BHI-01010
Rev. 1

Survey Method for Radiological Surveys of 300-FF-1 Operable Unit Soils and Material

Author
D. M. Brehm

Date Published
June 1998

Environmental Excellence
HANFORD

Prepared for the U.S. Department of Energy
Office of Environmental Restoration

Bechtel Hanford, Inc.
Richland, Washington

0011

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ATTACHMENT

GAMMA ENERGY ANALYSIS REPORTS FOR SAMPLES USED AS REFERENCE SOURCES FOR SHP-380 ..... A-1

TABLES

1. NE DP-6BD Field Test Results. 2
2. Eberline PG-2 Field Test Results. 2
3. P-11 Field Test Results. 2
4. Eberline SHP-380AB Field Test Results. 3
5. Field Correction Factors for Uranium Contaminated Soil. 4

1.0 PURPOSE

This technical basis is to be used to survey soils at the 300-FF-1 Operable Unit during remediation of the site. Its purpose is to provide a basis for the survey methods to be employed by radiological control technicians (RCTs) to guide the excavation effort in accordance with the 300-FF-1 waste site Record of Decision (ROD).

2.0 RELEASE LIMITS

The ROD for the 300-FF-1 Operable Unit requires selective excavation, removal, and disposal of contaminated soil above 350 pCi/g total uranium activity. Soil above this level will be disposed of as radioactive waste. The remaining soil will remain onsite.

3.0 RADIOLOGICAL SURVEY INSTRUMENTATION

The radiological detection instrumentation used must be capable of detecting soil contamination levels of 300 pCi/g total uranium activity to ensure that the soil contamination limit in the 300-FF-1 ROD is not exceeded. The instrumentation used to determine surface radioactivity must also be capable of detecting 1,000 disintegrations per minute (dpm)/100 cm^2 total uranium activity on a technical smear and 5,000 dpm/100 cm^2 total uranium activity using a static count.

To determine if portable instruments are capable of detecting the above stated levels of soil contamination, two plastic scintillation detectors (NE DP-6BD and Eberline SHP-380AB 100 cm^2 probes), a pancake Geiger-Mueller (GM) counter (15.5 cm^2), and a PG-2 Eberline sodium iodide (NaI) detector were tested. Three soil standards of 100 pCi/g, 600 pCi/g, and 2,500 pCi/g were used. The activity of the soil was equally distributed between ^{238}U, ^{234}U and its progeny, and a small amount of ^{235}U. These soil standards were made up of soil obtained from the 300-FF-1 Operable Unit to serve as an accurate representation of the distribution of radioactivity expected at the site.

The plastic scintillator and pancake GM detectors respond principally to the beta radiation emitted by the ^{238}U progeny. The PG-2 NaI detector responds to the low-energy gamma radiation that is emitted by the uranium decay chain, as well as to any high-energy beta particles that penetrate the window on the bottom of the probe. Results of the field test are shown in Tables 1 through 5.

Table 1. NE DP-6BD Field Test Results.

Source-Detector Dist.	Net Count Rate		
	100 pCi/g Source	600 pCi/g Source	2,500 pCi/g Source
0.5 inch	310 cpm	2,900 cpm	9,300 cpm
4 inches	200 cpm	1,600 cpm	5,900 cpm
	Calculated Correction Factor		
0.5 inch	$3 \frac{cpm}{pCi/g}$	$4.8 \frac{cpm}{pCi/g}$	$3.7 \frac{cpm}{pCi/g}$
4 inches	$2 \frac{cpm}{pCi/g}$	$2.7 \frac{cpm}{pCi/g}$	$2.4 \frac{cpm}{pCi/g}$

Measured background = 360 cpm

Table 2. Eberline PG-2 Field Test Results.

Source-Detector Dist.	Net Count Rate		
	100 pCi/g Source	600 pCi/g Source	2,500 pCi/g Source
0.5 inch (DTEBU-001)	200 cpm	1,900 cpm	4,900 cpm
0.5 inch (DTEBU-002)	300 cpm	2,400 cpm	5,700 cpm
4 inches (DTEBU-001)	100 cpm	900 cpm	2,200 cpm
4 inches (DTEBU-002)	300 cpm	1,200 cpm	3,100 cpm
	Calculated Correction Factor		
0.5 inch	$2.5 \frac{cpm}{pCi/g}$	$3.6 \frac{cpm}{pCi/g}$	$2.1 \frac{cpm}{pCi/g}$
4 inches	$2 \frac{cpm}{pCi/g}$	$1.8 \frac{cpm}{pCi/g}$	$1.1 \frac{cpm}{pCi/g}$

Measured background = 2,100 cpm (DTEBU-001), 2,300 cpm (DTEBU-002)

Table 3. P-11 Field Test Results.

Source-Detector Dist.	Net Count Rate		
	100 pCi/g Source	600 pCi/g Source	2,500 pCi/g Source
0.5 inch	100 cpm	550 cpm	2,000 cpm
4 inches	< 100 cpm	350 cpm	1,000 cpm
	Calculated Correction Factor		
0.5 inch	$1 \frac{cpm}{pCi/g}$	$0.9 \frac{cpm}{pCi/g}$	$0.8 \frac{cpm}{pCi/g}$
4 inches	------	$0.6 \frac{cpm}{pCi/g}$	$0.4 \frac{cpm}{pCi/g}$

Measured background = 50 cpm

Table 4. Eberline SHP-380AB Field Test Results.

Sample ID	Assay Activity (pCi/g U)[a]	SHP-308AB # 1122-383 (Background = 141 cpm)		SHP-308AB # 1101-257 (Background = 150 cpm)	
		cpm	cpm/(pCi/g)	cpm	cpm/(pCi/g)
BOL9M5	755.0	1,946	2.4	2,120	2.6
BOL9M6	326.5	1,126	3.0	1,252	3.4
BOL9M2	137.8	763	4.5	896	5.4
BOL9M4	326.9	1,011	2.7	1,103	2.9
BOL8H1	425.5	1,049	2.1	1,240	2.6
BOL8H3	245.0	1,059	3.7	1,136	4.0
BOL9M1	1210.0	4,590	3.7	5,300	4.3
BOL8H0	386.0	1,559	3.7	1,705	4.0
BOL9M7	126.7	540	3.1	596	3.5
BOL9M9	106.4	432	2.7	502	3.3
BOL9M8	777.0	2,870	3.5	2,900	3.5
BOM008	176.7	868	4.1	951	4.5
BOM009	117.7	692	4.7	790	5.4
BOM006	392.0	2,190	5.2	2,320	5.5
BOM010	90.2	464	3.6	517	4.1
BOM007	226.6	1,251	4.9	1,379	5.4
BOM011	33.1	368	6.9	424	8.3
Detectors 0.5 inch from source.		average:	3.8	average:	4.3
		min:	2.1	min:	2.6
		max:	6.9	max:	8.3

[a]The uranium activities were calculated from the values given in the gamma energy analysis (see Attachment 1) by adding the ^{235}U activity and two times the uranium-238 activity (to account for the ^{234}U).

For the purpose of simplicity, the 100 pCi/g, 600 pCi/g, and 2,500 pCi/g values for the pancake GM, NE DP6-BD, and Eberline PG-2 are averaged and rounded to two significant digits. Due to the non-homogeneous distribution of the reference sample activities (energy analysis results are included in Attachment 1), the most conservative value was chosen and then rounded to two significant digits. The resulting correction factors to be applied are in Table 5. The factors given are for a probe-to-source distance of 0.5 in.

Table 5. Field Correction Factors for Uranium Contaminated Soil.

Detector	Correction Factor
Pancake GM	$0.9 \frac{\text{cpm}}{\text{pCi/g}}$
NE DP-6BD	$3.8 \frac{\text{cpm}}{\text{pCi/g}}$
Eberline PG-2 NaI	$1.9 \frac{\text{cpm}}{\text{pCi/g}}$
Eberline SH-380AB	$4.0 \frac{\text{cpm}}{\text{pCi/g}}$

4.0 SCAN SURVEY TECHNICAL BASIS

The ability for the SHP-380AB and DP-6BD to detect for beta radiation during a scanning survey (using minimum scan sensitivity [MSS]) is estimated by Equation 1 (obtained from BHI-EE-05, *Field Screening Procedures*, Procedure 2.13, "MDA and Scan Speed Determination for Environmental Radiological Surveys").

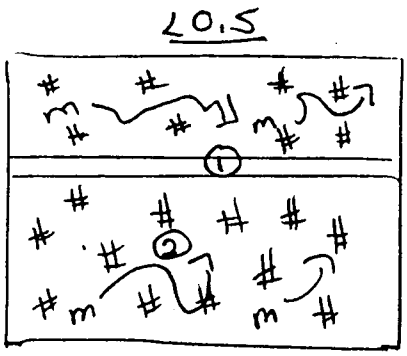
$$\sqrt{\quad}$$

$$[\quad (\ /\ )]$$

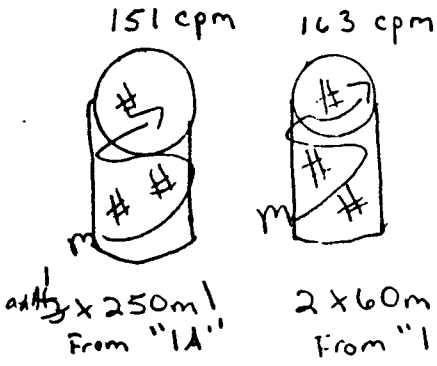
ERC RADIOLOGICAL SURVEY RECORD

Type of Survey (check one only)	Survey #
☐ *Release ☐ Routine n/A ☐ Work Progress ☒ Shipment * The potential for internal contamination was evaluated.	RSR - FF1/2-99-1953

RWP # / Rev. #	Date	Time	Location Code/Description
FF1/2-0010 / Rev 0	12-17-99	1515	FF1



Small Ice Chest
ERC-96-082



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All radiation readings are γ dose rates in units of mR/hr unless otherwise indicated. Technical Assessment # TA-97-SR-31

CA Contamination Area	HCA High Contamination Area	RBA Radiological Buffer Area	ARA Airborne Radioactivity Area	RMA Radioactive Materials Area	RA Radiation Area	HRA High Radiation Area	VHRA Very High Radiation Area

○ Technical Smear	# Direct	M Large Area Wipe	Contact / 30 cm General Area Dose Rates =Uncorrected Meter Reading (mR/hr)	Radiological Boundary x—x—x	△ Micro Rem (μR/hr)	N Neutrons (mRem/hr)	[AS] Air Sample Location	SCA Small Contamination Area

Instruments

Model	Serial #	Source ✓(Initial)	CF	Cal Due Date	Model	Serial #	Source ✓(Initial)	CF	Cal Due Date
E600 / 380AB	1247 / 1003	CAH	9.1α / 6.38β	9.10.00 / 10.25.00	2929	143881	CAH	n/A	11.10.00
RO20	1265	CAH	1	5.11.00	2929 Probe	099105	CAH	2.9α / 3.2β	11.10.00

RCT Name/Signature/Date:	RCT Supervisor Name/Signature/Date:
Annette L Howell / Annette L Howell 12.17.99	12-20-99

ERC RADIOLOGICAL SURVEY RECORD (continuation)

Contamination Measurement Information

Circled values indicate Removable β contamination in mrad/hr β

No.	Description of Item or Location	Removable (dpm/100 cm²)				Total (dpm/100 cm²)			
		α	α C-F	β-γ	β-γ C-F	α	α C-F	β-γ	β-γ C-F
-	Inside Ice chest	n/A	n/A	<1/K	~~6.3~~ 9.1	n/A	n/A	<5/K	6.3
-	outside Ice chest				12.17.59				
-	Inside Jar dirt								
-	outside Jar								
-	Suburban								
				n/A					

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Corrected Dose Rate Calculations

Show all work. CF = 1 unless noted.

Location	Contact Readings		30 cm Readings	
	β (mrad/hr) (WO-WC) X CF = DR	γ (mR/hr) WC X CF = DR	β (mrad/hr) (WO-WC) X CF = DR	γ (mR/hr) WC X CF = DR
Ice chest	<0.5	<0.5	<0.5	<0.5
		N/A		

ERC RADIOLOGICAL SURVEY RECORD (continuation)
Smear Counting Results

Survey #RSR- FF 1/2 · 99 · 1953

Counter Location:		Background (cpm)	MDCR (cpm)	MDA (dpm)	Counter Eff.
	α	1.1	6.25	18	34.4 %
m0905 Rm 8	βγ	50	26.55	86	31 %

Sample		Counting Results				Final Analysis
No	Description of Smear Location	Con. Type	Sample Count Duration (min)	Gross CPM	Net CPM	Removable (dpm/100 cm²)
1	on Ice chest	α	1	0	(<MDCR)	(<20)
		βγ	1	53	(<MDCR)	(<1000)
2	on Ice chest	α	1	1	↓	↓
		βγ	1	44	↓	↓
		α				
		βγ				
		α				
		βγ				
		α				
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		βγ				
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		βγ				
		α				
		βγ				

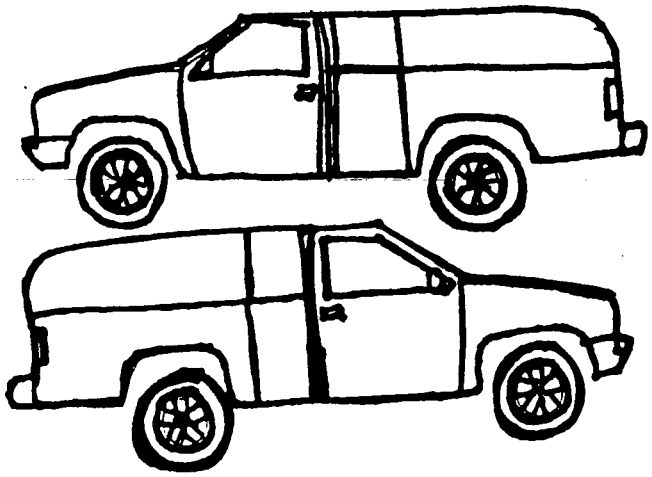
COPY

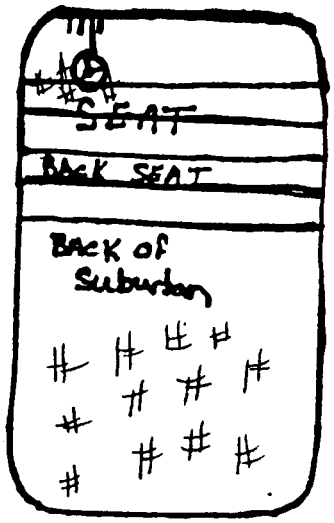
A

BHI-TM-R006k (12/98)

Additional Information
(Drawing, Map, Etc.)

* PACKAGES WERE SHIPPED FROM ~~6184 IN THIS VEHICAL~~
~~6184~~ 12.17.99
From "1A" + "1B"





LIC # G63 19584
Green Suburban

COPY

Quanterra

COC Signature Page

Lot or Batch #: 9355237	Initials/Date	Procedure #
Released By	12/17/2099	[illegible]
Received	(B) 12-20-99	CORP-RICH-ZIP-0002 R.0 BHI-MT-0001 R.1
Released By	(B) 12-21-99	n/a
Received		
Released By		n/a
Received		
Released By		n/a
Received		
Released By		n/a
Received		
Released By		n/a
Received		
Released By		n/a
Received		

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