

RADIOLOGIC AND ENGINEERING ASSESSMENT

FOR

DOE ID NO.: GJ-12935-MR
ADDRESS: 532 WEST COLORADO AVENUE

JULY 1985

FOR

URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT OFFICE

ALBUQUERQUE OPERATIONS OFFICE

DEPARTMENT OF ENERGY

BY

BENDIX FIELD ENGINEERING CORPORATION
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July 9, 1985

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1.0 EXECUTIVE SUMMARY

1.1 Introduction

The location, DOE ID No. GJ-12935-MR, is a single-family residence located at 532 West Colorado Avenue, Grand Junction, Colorado.

The purpose of this assessment is to evaluate the extent of uranium millsite contamination at this property. This assessment includes recommended remedial action, estimated volume of contaminated material to be removed, and estimated cost of the proposed action.

1.2 Evaluation and Recommendation

The action recommended is the removal of contaminated material and restoration of the property to its original condition. The identified residual radioactive material found on this property is tailings; the estimated volume is: exterior, 110 cu. yd.; interior, 2 cu. yd.

Estimated cost to perform remedial action, including dislocation when applicable, is \$10,283. Remedial action on this property will take approximately 15 days to complete.

Remedial action is recommended on the interior because of the 60.8 pCi/g chemical analysis results of a soil sample taken at location No. 5 (under the bathroom) as logged in Appendix Table 3.2 (Radium Concentrations at Interior Locations).

2.0 PROPERTY DESCRIPTION

2.1 General Description

Address: 532 West Colorado Avenue, Grand Junction, Colorado

Zoning: Residential (RSF-8)

Lot Size: Approximately 5,812 sf (0.13 acre)

Legal Description: Lot 35 + E 1/2 Lot 36, Block 1, Bower Subdivision, City of Grand Junction, County of Mesa, State of Colorado.

Point of Reference: This property is located approximately 2 miles northwest of the State of Colorado Tailings Repository. Appendix Figure 2.1 shows the property location relative to its surroundings.

Utilities: Utility locations are shown in Appendix Figure 2.2.

Electrical:	Overhead
Gas:	Underground
Telephone:	Overhead
Sewer:	Underground
Water:	Underground
Cable TV:	Overhead

Bordering Properties:

North:	Alley
South:	West Colorado Avenue
East:	Single-family residence
West:	Single-family residence

2.2 Existing Facilities and Structures

Primary Structure:

Type:	Single-family residence
Size:	Approximately 1,158 sf
Construction Date:	1908
Construction:	Two-story wood-frame with wood siding
Foundation:	Wood joists on stones, mud sills
Footing Depth:	Approximately 6" to bottom of footing from grade
Basement:	None
Crawl Space:	Minimal; joists on mud sills
Condition:	Fair

Other Structures: None

General Remarks:

Structures, utilities, landscaping, and other special features of this property are included in Appendix Figure 2.2.

Historical Data:

This structure is over 50 years old. Therefore, it does meet the eligibility criteria for consideration of inclusion on the National Register of Historic Places.

Alterations to Structure: 85 sf single-story bathroom addition at north wall of original structure

Architectural Significance: Minimal

Historical Significance: None known

3.0 RADIOLOGIC SURVEY

3.1 Introduction

Radiologic data were collected by Bendix at DOE ID No. GJ-12935-MR on March 25, 1985. Data collection methods were performed in accordance with procedures fully described in the Radiologic Support Operations Procedures Manual GJ-07(84) (Bendix Field Engineering Corporation, 1984). These data were evaluated to determine the areal and vertical extent of uranium mill tailings contamination at this property as well as any other contaminated material that may have originated from the millsite.

A review of historical information from the files of the Colorado Department of Health (CDH) and the inclusion data from Oak Ridge National Laboratory (ORNL) was conducted. These records indicate that contamination is located around the primary structure and most of the yard.

The Bendix radiologic survey was designed to investigate the entire property, with emphasis on previously identified areas of contamination. Conclusions based upon data analyses are discussed in Section 3.5, Extent of Contamination. Photocopies of the Official Survey Report, Memo of Understanding, team leader notes, and deconvolution graphs are included in the Appendix (Section 6.0).

3.2 Gamma Exposure-Rate Surveys

3.2.1 Exterior Findings

Background Readings: 12 to 14 uR/h
Highest Outside Gamma Reading (HOG): 135 uR/h

Exterior radium-concentration measurements are presented in Appendix Table 3.1. Grid-point survey results are shown in Appendix Figure 3.1. Appendix Figure 3.2 presents the ranges of elevated gamma readings and indicates areas of possible contamination.

3.2.2 Interior Findings

Background Readings: 13 to 16 uR/h
Highest Inside Gamma Reading (HIG): 24 uR/h

Interior radium-concentration measurements are presented in Appendix Table 3.2. Interior gamma exposure-rate measurements are summarized in Appendix Table 3.3. Appendix Figures 3.3a and 3.3b show interior exposure rates and locations of these measurements.

3.3 Boreholes, Soil Samples, and Other Measurements

Areas which displayed elevated gamma levels were further investigated; these areas are shown in Appendix Figures 3.3a, 3.4a, and 3.4b. Data from these investigations are included in Appendix Tables 3.1 and 3.2.

3.4 Radon/Radon Daughter Concentration (RDC)

Determined by CDH: 0.008 gross working level (WL). No additional RDC measurements were taken by Bendix.

3.5 Extent of Contamination

Appendix Figures 3.5a and 3.5b show identified areas and estimated depths of contamination on this property, based on assessments of all measurements taken. As noted in these figures, areas recommended for remedial action that contain identified residual radioactive materials are:

- (AREA A) The portion of soil that underlies the bathroom addition of the primary structure is contaminated to a depth of 12 inches. This depth was measured from ground level under the structure (approximately 50 sf).
- (AREA B) A deposit at the north end of the property is contaminated to a depth of 6 inches (approximately 330 sf).
- (AREA C) The soil that abuts the north side of Area D and the south side of Area B is contaminated to a depth of 12 inches (approximately 450 sf).
- (AREA D) The portion of the yard adjacent to Area C on the north and Area E on the south is contaminated to a depth of 15 inches (approximately 570 sf).
- (AREA E) A portion of the backyard contiguous to the south side of Area D has contamination to a depth of 6 inches (approximately 394 sf).
- (AREA F) Two small deposits north of the primary structure and north of Area G are contaminated to an estimated depth of 6 inches, based on data collected in Area E (approximately 96 sf).
- (AREA G) A deposit which abuts the north and northeast part of the primary structure is contaminated to a depth of 12 inches (approximately 487 sf).
- (AREA H) The soil under the 3-inch-thick uncontaminated concrete patio is contaminated. The total estimated depth of contamination is 12 inches, based on data collected in Area G (approximately 16 sf).

- (AREA I) Under the 2-inch-thick uncontaminated asphalt slab, which is between Areas G and K, there is contaminated soil to a total depth of 12 inches (approximately 80 sf).
- (AREA J) A small portion of soil that abuts Area I is contaminated to a depth of 12 inches (approximately 14 sf).
- (AREA K) A large deposit lies west of the primary structure; the depth of contamination is 6 inches (approximately 799 sf).
- (AREA L) A narrow strip of soil adjacent to the west side of the primary structure is contaminated to a depth of 6 inches (approximately 87 sf).
- (AREA M) A deposit that is adjacent to the southeast corner of the primary structure has contamination to a depth of 6 inches (approximately 357 sf).
- (AREA N) A small portion of soil that abuts Area M on the south is contaminated to a depth of 12 inches (approximately 45 sf).
- (AREA O) The soil surrounding the water meter is contaminated to a depth of 9 inches (approximately 9 sf).
- (AREA P) A part of the south yard that abuts Area O on the west is contaminated to a depth of 6 inches (approximately 112 sf).
- (AREA Q) A small portion of soil that lies west of Area P, and south of Area K, is contaminated to a depth of 6 inches (approximately 24 sf).

(AREAS REQUIRING FURTHER INVESTIGATION DURING REMEDIAL ACTION)

Under the north addition (Area A), elevated gamma readings were observed. Minimal exploration could be done to accurately identify the extent of this contamination. The deposit may extend beyond the boundaries indicated on Appendix Figure 3.5b.

4.0 RECOMMENDED REMEDIAL ACTION

4.1 Decontamination and Restoration

The recommended remedial action for this property, DOE ID No. GJ-12935-MR, includes removal of all areas identified as containing radioactive material (as discussed in Section 3.5 and shown in Appendix Figures 3.5a and 3.5b) and transport of removed material to the disposal site.

After remedial action is completed, the areas involved will be restored to original condition in accordance with the Bendix drawings, Vicinity Properties General Construction Specification (Bendix Field Engineering Corporation, 1984), and Statement of Work for Construction Subcontractor.

Dislocation of the occupants will not be required for this remedial action.

4.2 Evaluation of Recommended Remedial Action

Volume calculations of the areas included for remedial action are presented in Appendix Table 4.1. Cost estimates are presented in Appendix Table 4.2.

Estimated cost of remedial action is \$10,283.

This remedial action will result in removal of the identified residual radioactive materials.

Owner preference is for remedial action to begin as soon as possible.

There are no legal or other complications foreseen at this time.

5.0 REFERENCES

ARIX, A Professional Corporation, Procedures Manual for the Grand Junction Remedial Action Program, for Colorado Department of Health, Radiation Control Division, and the U.S. Department of Energy, 1983.

Bendix Field Engineering Corporation, Procedures Manual Radiologic Support Operations Grand Junction Vicinity Properties, (GJ-07), for U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, 1984.

Bendix Field Engineering Corporation, Engineering, Construction, and Land Support Manual Grand Junction Vicinity Properties Project, (GJ-08), for U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, 1984.

Bendix Field Engineering Corporation, Grand Junction Vicinity Properties Operating Manual, (GJ-16) for U.S. Department of Energy, Nuclear Energy Programs, Division of Remedial Action Projects, UMTRA, 1984.

Bendix Field Engineering Corporation, Vicinity Properties General Construction Specification, for U.S. Department of Energy, Nuclear Energy Programs, Division of Remedial Action Projects, UMTRA, 1984.

Bendix Field Engineering Corporation, Environmental Assessment of Preliminary Cleanup Activities at Offsite Properties Contaminated by Tailings from the Grand Junction Inactive Uranium Millsite, (GJ-04), for U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, 1983.

U.S. Department of Energy, Programmatic Memorandum of Agreement (DOE No. DE-GM04-84AL28460) between the U.S. Department of Energy, the Advisory Council on Historic Preservation, and the Colorado State Historic Preservation Officer, for UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, 1984.

U.S. Department of Energy, Vicinity Properties Management and Implementation Manual, for UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, 1984.

U.S. Environmental Protection Agency, Standards for Remedial Action at Inactive Uranium Processing Sites (40 CFR Part 192), Washington, D.C., 1983.

6.0 APPENDIX

This Appendix contains the following:

Appendix Tables:

Table 3.1	Radium Concentrations at Exterior Locations
Table 3.2	Radium Concentrations at Interior Locations
Table 3.3	Summary of Interior Gamma Exposure Rates
Table 4.1	Area and Volume Calculations
Table 4.2	Estimated Cost of Decontamination and Restoration

Appendix Figures:

Figure 2.1	Vicinity Map
Figure 2.2	Site Plan
Figure 3.1	Exterior Grid-Point Exposure Rates
Figure 3.2	Exterior Gamma Scan
Figure 3.3a	Interior Gamma Exposure Rates and Sample Locations
Figure 3.3b	Interior Gamma Exposure Rates
Figure 3.4a	Interior Sample Locations
Figure 3.4b	Exterior Sample Locations
Figure 3.5a	Interior Estimated Extent of Contamination
Figure 3.5b	Exterior Estimated Extent of Contamination

Official Survey Report

Memo of Understanding

Team Leader Notes

Deconvolution Graphs (Apparent Radium-226 Concentration)

Radium Concentrations at Exterior Locations

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Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
6	109274	00	DS	1.8		*	Edge of alley
7	113293	00	DS	3.9		*	Northeast corner of property
		06	DS	1.7		*	
8	115275	00	DS	7.6		*	Backyard
		06	DS	<1.0		*	
9	118264	00	DS	<1.0		*	East of fence
10	123292	03	TC	7.3		*	South of alley
		06	BH	6.4	3.2	*	East side of yard
		09	TC	5.5		*	DC = 12 inches
		12	BH	4.8	1.5	*	Based on the
		15	TC	4.4		*	deconvolution graph
		18	TC	4.1		*	
		21	TC	3.9		*	
		24	TC	3.9		*	
		27	TC	3.9		*	
11	125259	00	DS	4.6		*	East of fence
		06	DS	1.4		*	
12	145259	03	TC	32.5		*	Northwest on fence line
		06	BH	30.5	28.6	*	
		09	TC	22.1		*	DC = 15 inches
		12	BH	14.6	10.0	*	Based on the
		15	TC	9.4		*	deconvolution graph
		18	TC	7.1		*	
		21	TC	5.8		*	
		24	BH	5.1	2.3	*	
		27	TC	4.5		*	
		30	TC	4.4		*	
		33	TC	4.2		*	
		36	TC	4.0		*	
		39	TC	3.9		*	
		42	TC	3.9		*	
		45	TC	3.9		*	
		48	TC	3.9		*	
		51	TC	4.1		*	
13	145288	03	TC	26.5		*	Backyard
		06	TC	25.3		*	
		09	TC	18.7		*	

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Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
13	145288	12	TC	13.1		*	
		15	TC	8.8		*	DC = 15 inches
		18	TC	6.8		*	Based on the
		21	TC	5.5		*	deconvolution graph
		24	TC	4.6		*	
		27	TC	4.4		*	
		30	TC	3.9		*	
		33	TC	3.8		*	
		36	TC	3.7		*	
		39	TC	3.6		*	
		42	TC	3.6		*	
		45	TC	3.7		*	
		48	TC	3.7		*	
14	156294	00	DS	1.4		*	West of fence pole
15	158285	00	DS	2.1		*	Backyard
16	168265	00	DS	2.7		*	East of fence
		06	DS	1.7		*	
17	175285	00	DS	1.5		*	Background
		00	GS		2.0	*	DC = 0 inches
		00-06	SS			3.5	
		03	TC	3.6		*	
		06	BH	3.8	1.3	*	
		09	TC	3.9		*	
		12	TC	4.0		*	
		15	TC	3.9		*	
		18	BH	3.8	1.3	*	
		21	TC	3.9		*	
		24	TC	4.0		*	
		27	TC	4.1		*	
		30	BH	4.1	1.8	*	
18	183260	00	DS	1.9		*	East of fence
19	193293	00	DS	3.8		*	Northeast of
		06	DS	2.4		*	house
		12	DS	1.0		*	
20	194285	00	DS	1.9		*	Backyard
21	197268	00	DS	2.1		*	North of asphalt pad

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Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
22	208267	00	DS	4.4		*	North of asphalt pad
		06	DS	3.9		*	
		12	DS	1.5		*	
23	208285	03	TC	7.3		*	Backyard DC = 12 inches Based on the deconvolution graph
		06	TC	6.7		*	
		09	TC	5.5		*	
		12	TC	4.7		*	
		15	TC	4.3		*	
		18	TC	4.0		*	
		21	TC	3.9		*	
		24	TC	3.7		*	
		27	TC	3.6		*	
24	212271	00	DS	3.9		*	Corner of patio Horizontal under patio
		06	DS	3.3		*	
25	215263	00	GS		4.3	*	On asphalt pad By sewer line DC = 12 inches Based on the deconvolution graph
		03	TC	7.3		*	
		06	TC	6.8		*	
		09	TC	5.6		*	
		12	TC	4.8		*	
		15	TC	4.4		*	
		18	TC	4.3		*	
		21	TC	4.2		*	
		24	TC	4.1		*	
		27	TC	4.1		*	
26	215291	03	TC	5.7		*	East of house DC = 12 inches Based on the deconvolution graph
		06	TC	7.0		*	
		09	TC	6.1		*	
		12	TC	5.0		*	
		15	TC	4.3		*	
		18	TC	4.1		*	
		21	TC	4.0		*	
		24	TC	3.8		*	
		27	TC	3.9		*	
		30	TC	3.7		*	
27	219266	03	TC	5.4		*	Sewer line DC = 6 inches
		06	TC	4.9		*	

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Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
27	219266	09	TC	4.5		*	Based on all data available
		12	TC	4.3		*	
		15	TC	4.1		*	
		18	TC	4.1		*	
		21	TC	3.9		*	
		24	TC	4.0		*	
		27	TC	3.9		*	
		30	TC	3.9		*	
		33	TC	4.0		*	
		36	TC	3.9		*	
		39	TC	3.8		*	
		42	TC	3.9		*	
		45	TC	3.9		*	
28	220259	00	DS	3.4		*	West of house
		06	DS	1.7		*	
29	226271	00	DS	4.6		*	West of house
		06	DS	1.7		*	
30	230291	16	DS	<1.0		*	On gas line
31	237293	00	DS	3.0		*	South of gas meter
		06	DS	1.2		*	
32	249293	00	DS	1.5		*	Southeast of house
33	250259	00	DS	4.2		*	West side of yard
		06	DS	1.6		*	
34	250273	00	DS	7.2		*	By front porch door
		06	DS	1.7		*	
35	252279	03	TC	3.9		*	Water line DC = 0 inches
		06	TC	4.0		*	
		09	TC	4.0		*	
		12	TC	4.0		*	
		15	TC	4.0		*	
		18	TC	3.9		*	
		21	TC	3.8		*	
		24	TC	3.8		*	
		27	TC	3.8		*	
		30	TC	3.8		*	
		33	TC	3.8		*	

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Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
35	252279	36	TC	3.8		*	
		39	TC	3.7		*	
		42	TC	3.8		*	
		45	TC	3.8		*	
36	254263	03	TC	4.5		*	Front yard DC = 0 inches
		06	TC	4.7		*	
		09	TC	4.5		*	
		12	TC	4.2		*	
		15	TC	4.1		*	
		18	TC	4.1		*	
		21	TC	4.0		*	
		24	TC	4.0		*	
		27	TC	3.9		*	
		30	TC	3.9		*	
		33	TC	3.8		*	
		36	TC	3.9		*	
37	256278	00	DS	3.1		*	South of front porch door
		06	DS	1.7		*	
38	260274	00	DS	5.6		*	South of front porch door
		06	DS	1.7		*	
39	262276	00	DS	1.5		*	South of front porch door
						*	
40	263260	03	TC	3.9		*	Edge of sidewalk DC = 6 inches Based on all data available
		06	TC	4.0		*	
		09	TC	4.0		*	
		12	TC	3.9		*	
		15	TC	4.0		*	
		18	TC	4.1		*	
		21	TC	4.2		*	
		24	TC	4.4		*	
		27	TC	4.5		*	
		30	TC	4.5		*	
		33	TC	4.2		*	
		36	TC	4.1		*	
		39	TC	4.1		*	
		42	TC	4.0		*	
		45	TC	4.0		*	
		48	TC	4.1		*	

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Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
40	263260	51	TC	4.0		*	
		54	TC	4.1		*	
		57	TC	4.2		*	
41	264293	03	TC	4.1		*	Front yard DC = 0 inches
		06	TC	4.4		*	
		09	TC	4.4		*	
		12	TC	4.3		*	
		15	TC	4.3		*	
		18	TC	4.1		*	
		21	TC	4.1		*	
		24	TC	4.1		*	
		27	TC	4.1		*	
42	266285	00	DS	4.5		*	South of front door
		06	DS	3.5		*	
		12	DS	2.0		*	
43	276275	00	DS	2.0		*	Between water meters Under brick walk
		06	DS	1.2		*	
44	276290	00	DS	5.5		*	West of east water meter
		06	DS	2.3		*	
		12	DS	1.1		*	
45	278259	00	DS	3.5		*	North of curb
		06	DS	1.8		*	
46	278271	03	TC	3.7		*	Front yard DC = 0 inches
		06	TC	4.4		*	
		09	TC	4.5		*	
		12	TC	4.5		*	
		15	TC	4.4		*	
		18	TC	4.3		*	
		21	TC	4.3		*	
		24	TC	4.4		*	
		27	TC	4.3		*	
		30	TC	4.4		*	
		33	TC	4.3		*	
		36	TC	4.3		*	
		39	TC	4.1		*	
		42	TC	4.3		*	
		45	TC	4.1		*	
		48	TC	4.1		*	

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Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
46	278271	51	TC	4.1		*	
		54	TC	4.3		*	
		57	TC	4.5		*	
47	278294	03	TC	4.5		*	Water meter
		06	TC	4.4		*	DC = 9 inches
		09	TC	4.3		*	Based on all
		12	TC	4.3		*	data available
		15	TC	4.3		*	
		18	TC	4.2		*	
		21	TC	4.3		*	
		24	TC	4.2		*	
		27	TC	4.1		*	

Tool Types: GB = GAD-6 Borehole
 GS = GAD-6 Surface
 DS = Delta Scintillometer
 TC = Total Count Borehole
 SS = Soil Sample
 BH = Combined GAD-6 and
 Total Count Borehole

Notes: DC = Depth of Contamination
 * = No Soil Sample Taken
 [n] = Reading Taken n-Inches
 Above Floor or Ground
 Date of Survey = 03-25-85
 Team Leader = TRU

Radium Concentrations at Interior Locations

DOE ID #GJ-12935-MR

532 West Colorado Avenue

Page 1 of 1

Loc #	Grid Location	Depth (in.)	Meas. Type	In Situ Ra-226 (pCi/g)		Chem Ra-226 (pCi/g)	Comments
				Tot. Ct	Spectr.		
1		00	DS	10.8		*	Northeast corner of bathroom
2		00	DS	6.0		*	West of northeast corner of bathroom
3		00	DS	6.0		*	Northwest corner of bathroom
4		00-06	SS			1.2	Crawl space, sandy
5		06	DS	4.2		*	Under northeast
		12	DS	1.9		*	corner of bathroom
		00-06	SS			60.8	

Tool Types: GB = GAD-6 Borehole
GS = GAD-6 Surface
DS = Delta Scintillometer
TC = Total Count Borehole
SS = Soil Sample
BH = Combined GAD-6 and
Total Count Borehole

Notes: DC = Depth of Contamination
* = No Soil Sample Taken
[n] = Reading Taken n-Inches
Above Floor or Ground
Date of Survey = 03-25-85
Team Leader = TRU

Location *	Number of Readings Taken at Waist Level	Range at Waist Level (uR/h)	Mean at Waist Level (uR/h)	Number of Readings Taken at Surface	Range at Surface (uR/h)	Mean Surface (uR/h)
BATHROOM	05	13-21	17	05	12-24	18
GROUND FLOOR	*	*	*	*	13-16	*
FIRST FLOOR	*	*	*	*	13-16	*

=====

* The CDH and ORNL data indicated the absence of interior contamination at this property. This information was investigated by performing a walking gamma scan in the primary structure. These areas and the ranges of gamma measurements are shown on Appendix Figures 3.3a and 3.3b. Exposure rates in the bathroom are shown in Appendix Figure 3.3a.

Table 4.1
Area and Volume Calculations
DOE ID No. GJ-12935-MR

Page 1 of 3

<u>AREA</u>	<u>CALCULATIONS(ft)</u>	<u>SF</u>	<u>DEPTH(ft)</u>	<u>CF</u>	<u>CUBIC YARDS</u>
-------------	-------------------------	-----------	------------------	-----------	--------------------

INTERIOR

Contaminated Fill

A	10	x	5	=	50	x	1.0	=	50
---	----	---	---	---	----	---	-----	---	----

	Volume of Contaminated Fill =	50	=	50/27	=	2
--	-------------------------------	----	---	-------	---	---

EXTERIOR

Contaminated Fill

Concrete

H	8	x	12	=	96	x	0.3	=	29
---	---	---	----	---	----	---	-----	---	----

	Volume of Concrete =	29	=	29/27	=	1
--	----------------------	----	---	-------	---	---

Asphalt

I	8	x	10	=	80	x	0.2	=	16
---	---	---	----	---	----	---	-----	---	----

	Volume of Asphalt =	16	=	16/27	=	1
--	---------------------	----	---	-------	---	---

B	10	x	10	=	100
	15	x	10	=	150
	3	x	10	=	30
	10	x	5	=	50

		330	x	0.5	=	165
--	--	-----	---	-----	---	-----

C	7	x	10	=	70
	8	x	10	=	80
	13	x	10	=	130
	17	x	10	=	170

		450	x	1.0	=	450
--	--	-----	---	-----	---	-----

Table 4.1
Area and Volume Calculations
DOE ID No. GJ-12935-MR

Page 2 of 3

<u>AREA</u>	<u>CALCULATIONS(ft)</u>			<u>SF</u>	<u>DEPTH(ft)</u>	<u>CF</u>	<u>CUBIC YARDS</u>
D	15	x 38	=	570	x 1.3	= 741	
E	18	x 10	=	180			
	8	x 10	=	80			
	9	x 10	=	90			
	3	x 3	=	9			
	7	x 5	=	35			
				394	x 0.5	= 197	
F	6	x 5	=	30			
	10	x 3	=	30			
	3	x 7	=	21			
	5	x 3	=	15			
				96	x 0.5	= 48	
G	40	x 5	=	200			
	14	x 13	=	182			
	10	x 8	=	80			
	5	x 5	=	25			
				487	x 1.0	= 487	
H	4	x 4	=	16	x 0.7	= 11	
I	8	x 10	=	80	x 0.8	= 64	
J	7	x 2	=	14	x 1.0	= 14	
K	47	x 17	=	799	x 0.5	= 400	
L	29	x 3	=	87	x 0.5	= 44	
M	13	x 14	=	182			
	35	x 5	=	175			
				357	x 0.5	= 179	
N	3	x 15	=	45	x 1.0	= 45	
O	3	x 3	=	9	x 0.8	= 7	

Table 4.1
Area and Volume Calculations
DOE ID No. GJ-12935-MR

Page 3 of 3

<u>AREA</u>	<u>CALCULATIONS(ft)</u>	<u>SF</u>	<u>DEPTH(ft)</u>	<u>CF</u>	<u>CUBIC YARDS</u>
P	7 x 16 =	112	x 0.5 =	56	
Q	6 x 4 =	24	x 0.5 =	12	
				2,920	
Volume of Contaminated Fill				=	2,920/27 = 108
TOTAL VOLUME - INTERIOR					2
TOTAL VOLUME - EXTERIOR					110

See Appendix Figures 3.5a and 3.5b For Areas

Table 4.2
Estimated Cost of Decontamination and Restoration
DOE ID No. GJ-12935-MR

Page 1 of 2

INTERIOR

Undermine and shore exterior walls and floor 27 lf @ \$6/lf	\$ 162
Remove and reinstall toilet room fixtures and water heater Lump Sum	100
Remove floor covering and subfloor 85 sf @ \$1.50/sf	128
Remove identified residual radioactive material (manual-close) 2 cy @ \$100/cy	200
Remove additional fill to provide minimum depth crawl space 3 cy @ \$100/cy	300
Install concrete footing and stem walls 3 cy @ \$175/cy	525
Install moisture barrier at perimeter of structure 120 lf @ \$.50/lf	60
Install new floor joists 77 bf @ \$2/bf	154
Replace subfloor 85 sf @ \$1.20/sf	102
Replace carpet 10 sy @ \$18/sy	180
	<hr/>
TOTAL INTERIOR	\$ 1,911

EXTERIOR

Remove identified residual radioactive material (machine) 82 cy @ \$14.50/cy	\$ 1,189
Remove identified residual radioactive material (manual-open) 26 cy @ \$44/cy	1,144

Table 4.2
Estimated Cost of Decontamination and Restoration
DOE ID No. GJ-12935-MR

Page 2 of 2

Remove concrete patio and ramp 96 sf @ \$1.50/sf	144
Remove asphalt pad 80 sf @ \$.60/sf	48
Replace concrete patio and ramp 96 sf @ \$1.50/sf	144
Replace asphalt pad 80 sf @ \$1.50/sf	120
Replace roadbase 9 cy @ \$11.50/cy	104
Replace topsoil 99 cy @ \$9.50/cy	941
Replace sod 2,016 sf @ \$.50/sf	1,008
	<hr/>
TOTAL EXTERIOR	\$ 4,842
TOTAL INTERIOR	\$ 1,911
ACCESS CONTROL	400
	<hr/>
SUBTOTAL	\$ 7,153
CONTINGENCY @ 15%	1,073
	<hr/>
SUBTOTAL	\$ 8,226
CONTRACTOR OVERHEAD & PROFIT @ 25%	2,057
	<hr/>
GRAND TOTAL	\$ 10,283

RDJ062885
REAL2935:GE002/LAJ

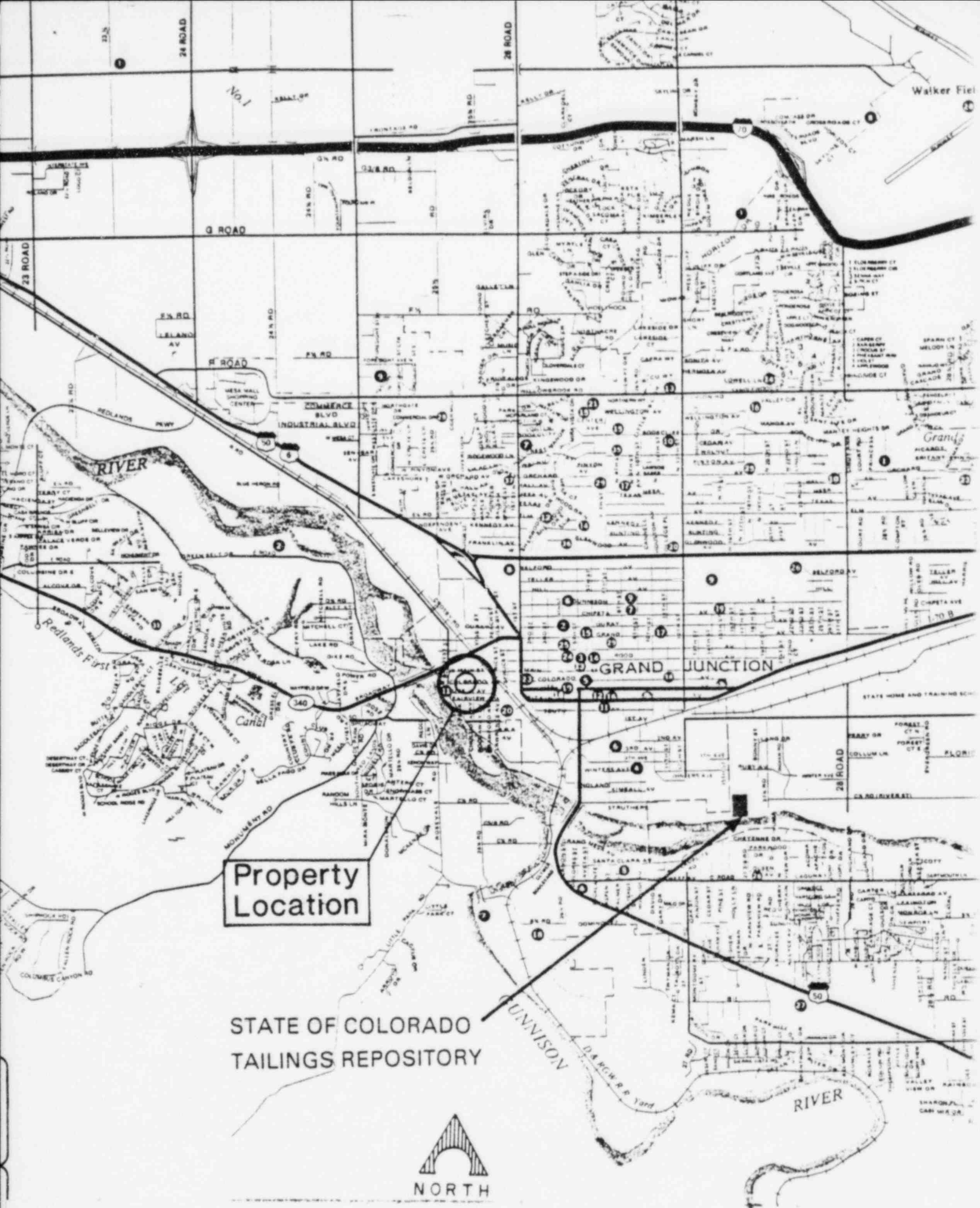
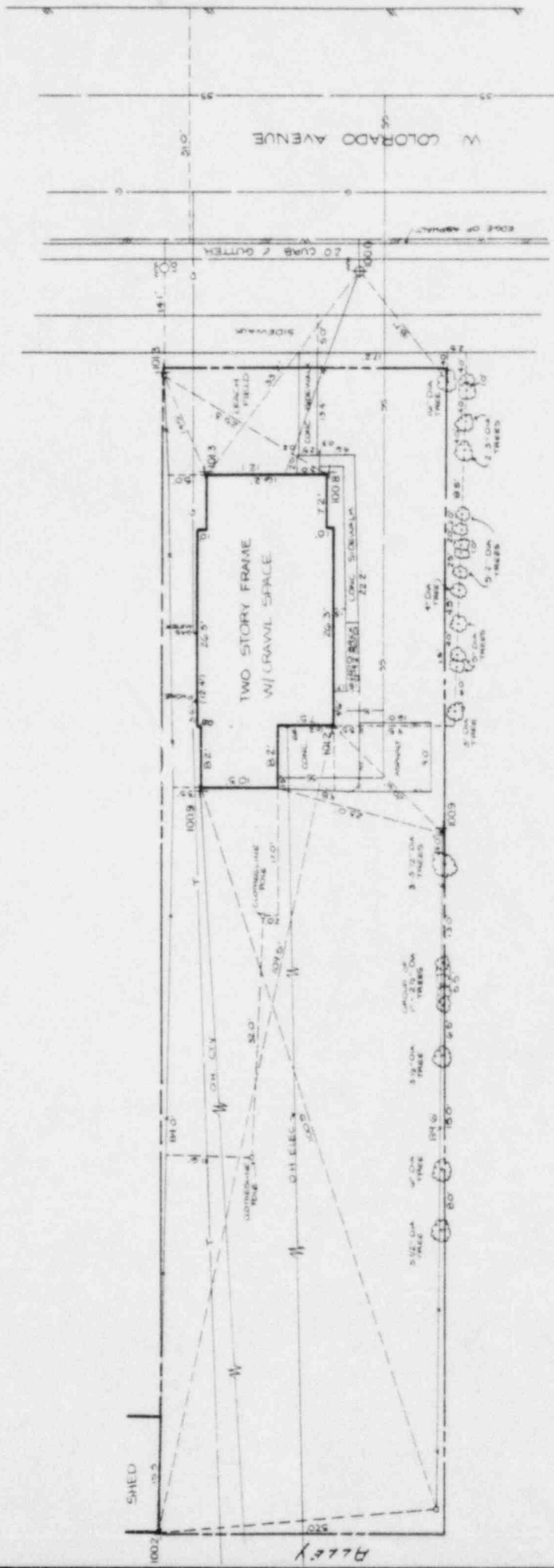


FIGURE 2.1
VICINITY MAP



LOT 35 AND EAST 1/2 OF LOT 36,
BLOCK 1 OF BOWER SUBDIVISION
CITY OF GRAND JUNCTION
MESA COUNTY, COLORADO

FIGURE 2.2 SITE PLAN

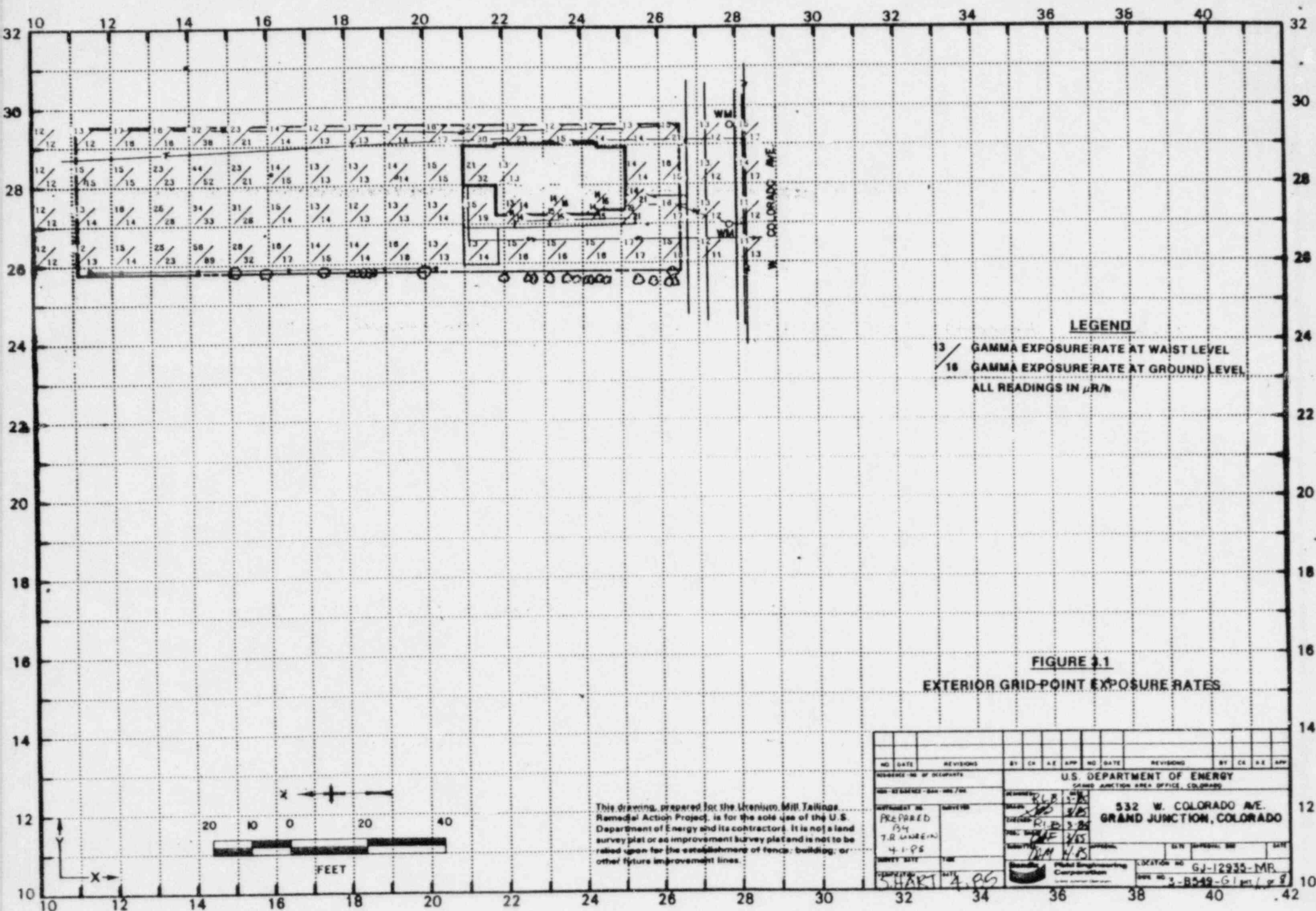


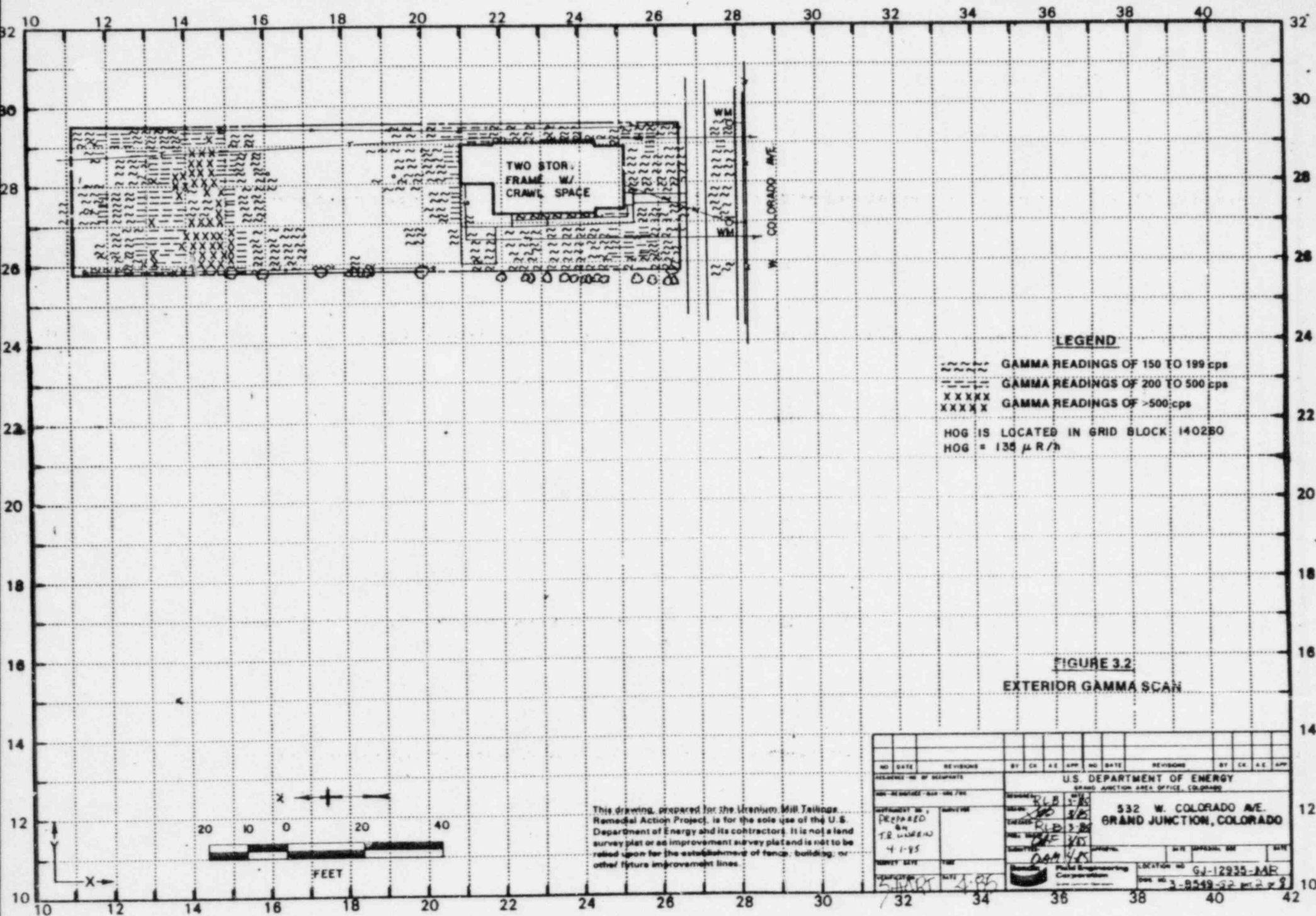
SCALE IN FEET

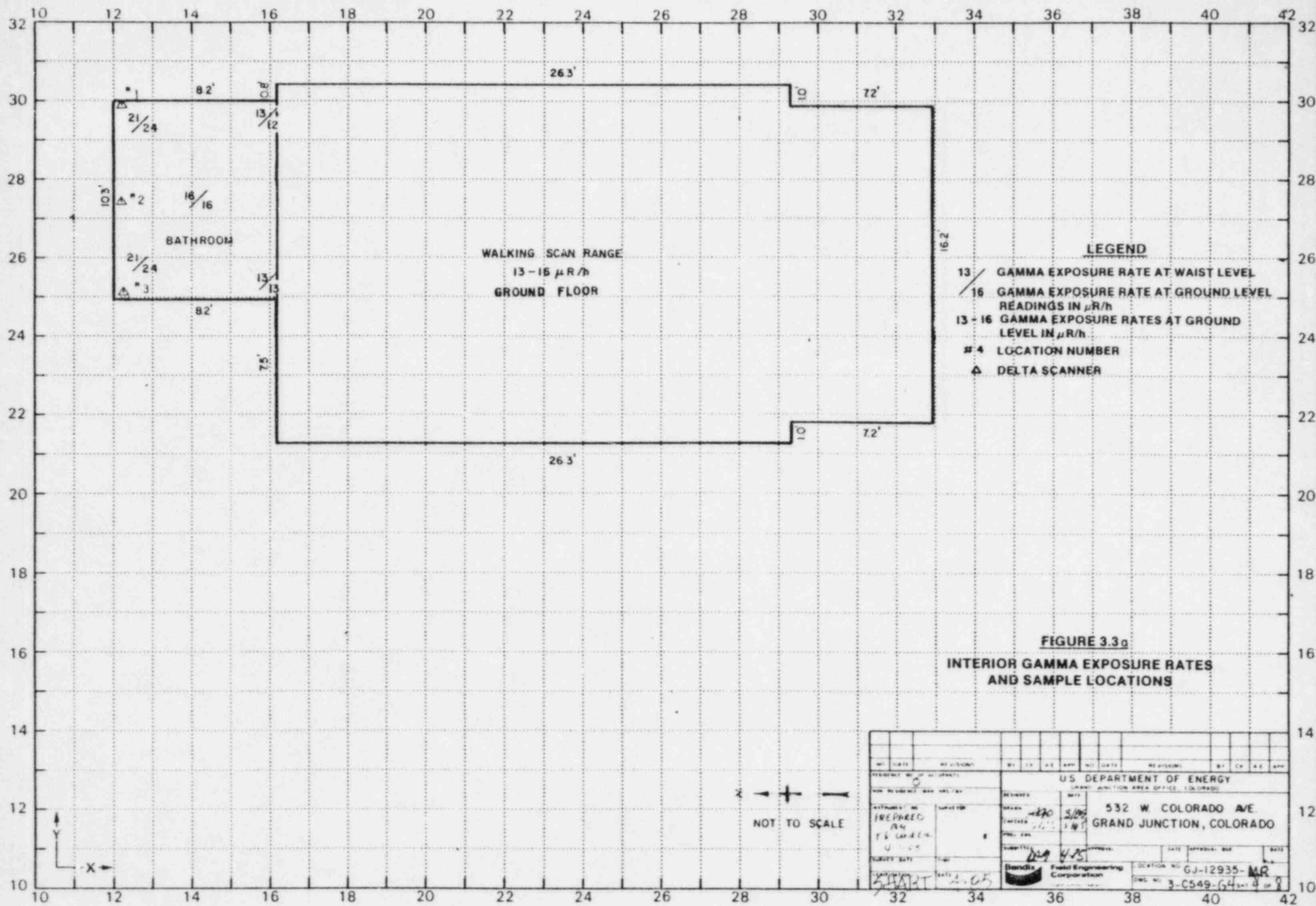


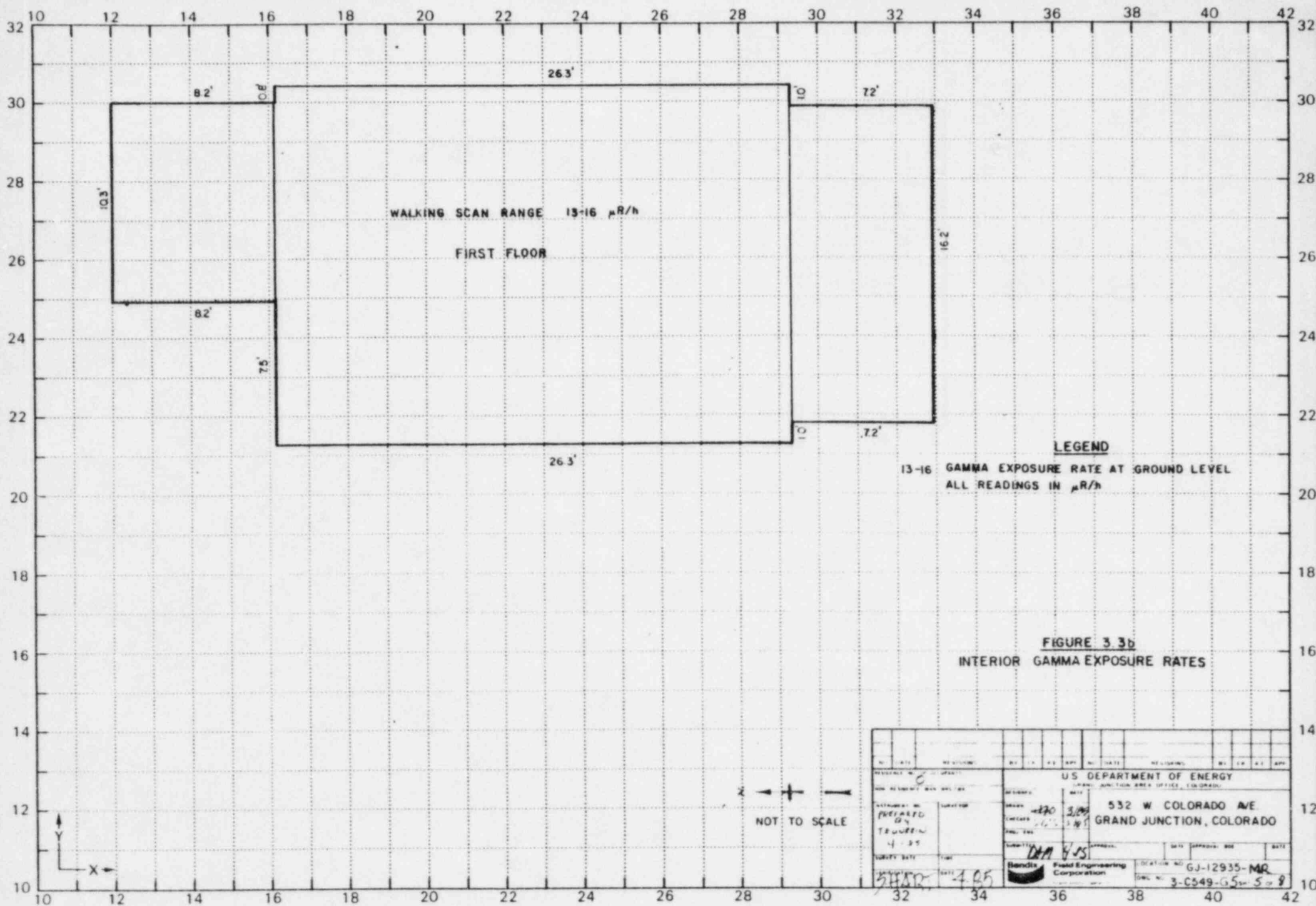
This drawing prepared for the U.S. Department of Energy
Remedial Action Project. It is for the sole use of the U.S.
Department of Energy and its contractors. It is not a final
survey plat or an improvement survey plat and is not to be
relied upon for the establishment of fence, building, or
other future improvement lines.

U.S. DEPARTMENT OF ENERGY	DOE ID NO.
GRAND JUNCTION PROJECT OFFICE, COLORADO	GJ-12435-MR
ADDRESS 552 W COLORADO AVE	
GRAND JUNCTION, COLORADO	ALLIED
SURV RLB/5-11-89	DATE RAS/5-11-89
DRAWING NO. 3-C-549-F1	SHEET 1 OF 1









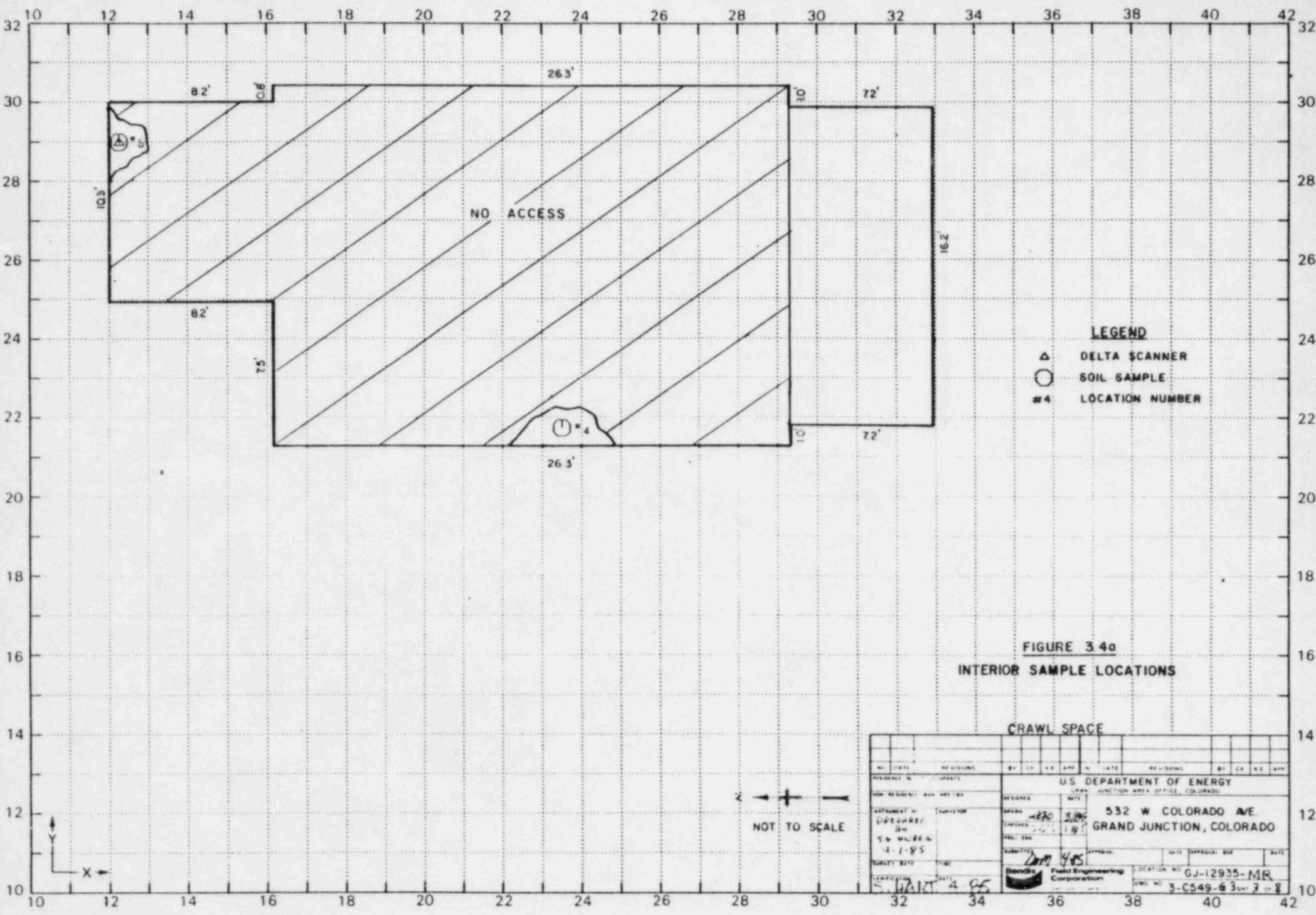
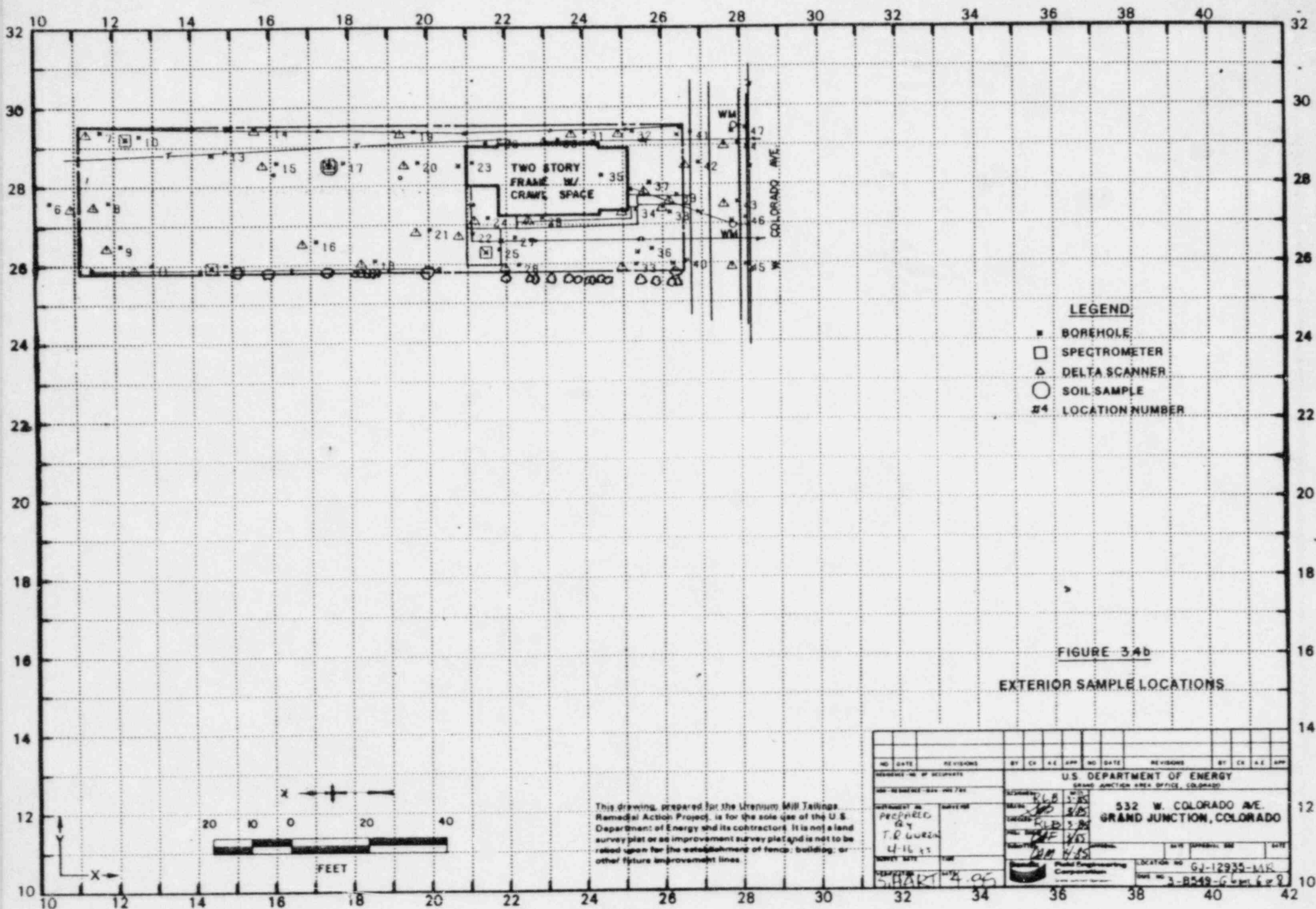
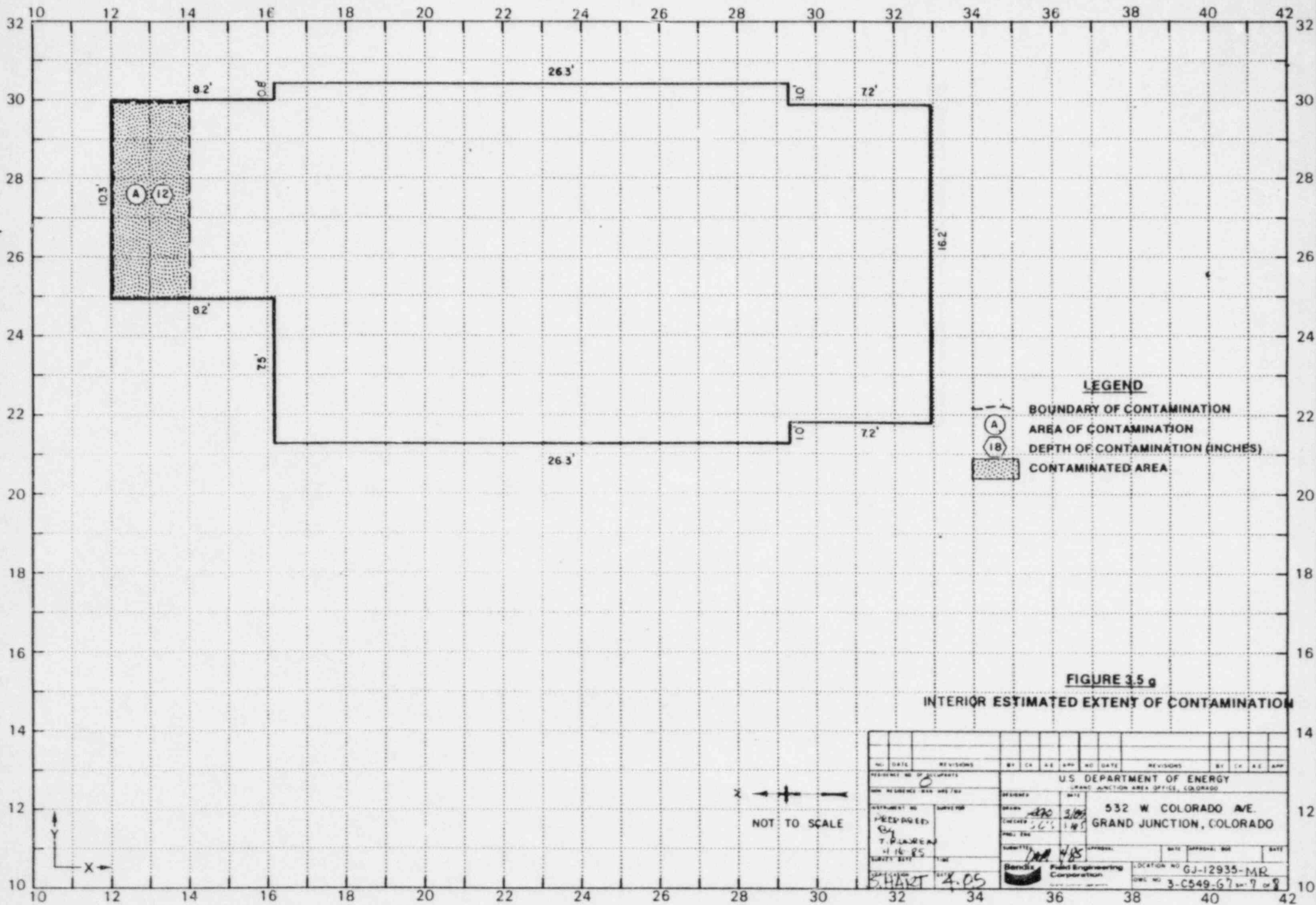


FIGURE 3.4a
INTERIOR SAMPLE LOCATIONS

CRAWL SPACE												
NO.	DATE	REVISIONS	BY	CH	RE	APP	DATE	REVISIONS	BY	CH	RE	APP
PROJECT NO. 12345			U.S. DEPARTMENT OF ENERGY									
HOW REQUESTED: BY AIR MAIL			GRAND JUNCTION AREA OFFICE, COLORADO									
DESIGNED BY: [Signature]			532 W COLORADO AVE.									
CHECKED BY: [Signature]			GRAND JUNCTION, COLORADO									
SUBMITTED BY: [Signature]			DATE: 3-1-85									
APPROVED BY: [Signature]			DATE: 3-1-85									
SURVEY DATE: 3-1-85			LOCATION NO. GJ-12935-MR									
DRAWN BY: [Signature]			DWC NO. 3-C549-63-3-1-85									





LEGEND

BOUNDARY OF CONTAMINATION

AREA OF CONTAMINATION

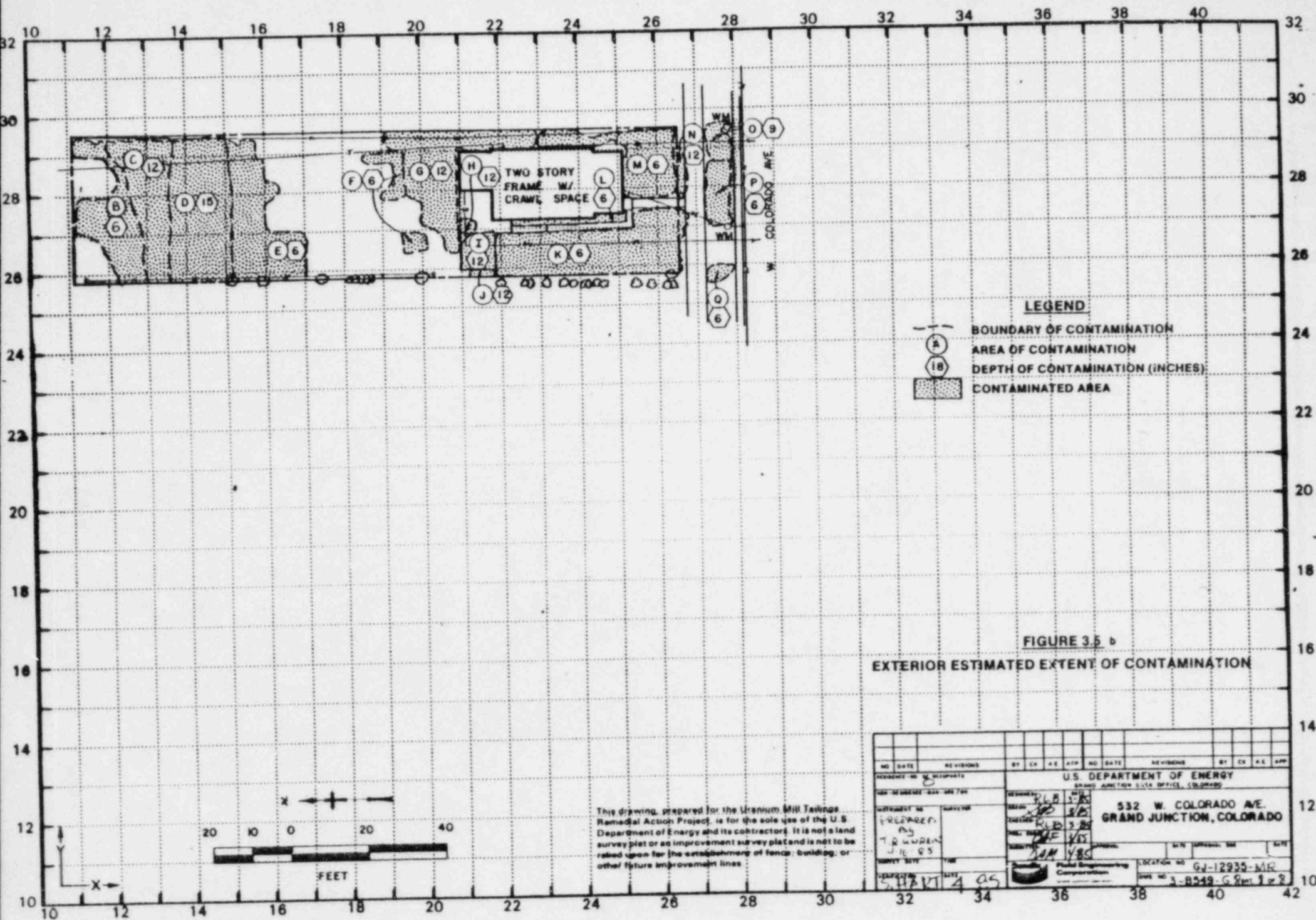
DEPTH OF CONTAMINATION (INCHES)

CONTAMINATED AREA

FIGURE 3.5 g

INTERIOR ESTIMATED EXTENT OF CONTAMINATION

REVISIONS										REVISIONS									
NO.	DATE	BY	CHK	APP	NO.	DATE	BY	CHK	APP	NO.	DATE	BY	CHK	APP					
<p>U.S. DEPARTMENT OF ENERGY GRAND JUNCTION AREA OFFICE, COLORADO</p> <p>532 W COLORADO AVE. GRAND JUNCTION, COLORADO</p>										<p>LOCATION NO. GJ-12935-MR DWS NO. 3-C549-G7-9 or 8</p>									
<p>DESIGNED BY: [Signature] CHECKED BY: [Signature] DATE: 3/10/85</p>					<p>SUBMITTED BY: [Signature] DATE: 4/25/85</p>					<p>APPROVED BY: [Signature] DATE: [Blank]</p>									
<p>PREPARED BY: T. PLAZA DATE: 4/16/85</p>					<p>SURVEYED BY: [Signature] DATE: 4/25/85</p>					<p>DESIGNED BY: [Signature] CHECKED BY: [Signature] DATE: 3/10/85</p>									
<p>SHART 4.05</p>					<p>Bandco Field Engineering Corporation</p>					<p>DATE: [Blank]</p>									



3/85

DOE ID NO. GJ-12935-RS MR Date April 16, 1985

U.S. DEPARTMENT OF ENERGY
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT
GRAND JUNCTION VICINITY PROPERTIES

Official Survey Report

Property Address 532 West Colorado Avenue
Property Owner Winfred and Wanda Holding
Address of Owner (if different from above) 104 North Easter Hill, G.J.
Report Prepared By T.R. Unrein

I. PRESENCE/ABSENCE OF RESIDUAL RADIOACTIVE MATERIALS

☐ No evidence of residual radioactive material on surveyed property.

☒ Residual radioactive materials found at the following locations:

☐ In open areas.

☒ Under or around exterior improvements.

☐ Under or around a typically nonoccupied structure.

☒ Under or around a typically occupied structure.

II. RESULTS OF RADIOLOGIC ASSESSMENT

☐ Levels of radiation from residual radioactive materials, if any, do not exceed EPA Standards and no action is required under the Uranium Mill Tailings Remedial Action Project.

☒ Levels of radiation from residual radioactive materials exceed EPA Standards such that Remedial Action is recommended and will be accomplished, with your consent, as soon as budget and schedule permit.

cc:

G. A. Franz, III, GJ/CDH
J. Themelis, Mgr. UMTRA Proj. Off.

HIG = 24 uR/h
HOG = 135 uR/h

Bendix



**Field Engineering
Corporation**

Grand Junction Operations

P.O. Box 1569
Grand Junction, CO 81502
Tel (303) 242-8621

A Subsidiary of
The Bendix Corporation

April 15, 1985

Colorado Department of Health
222 South 6th Street
Grand Junction, Colorado 81501

ATTN: Chuck Thornberg

Subject: GJ-12935-^{SHA 85}RS MR

Dear Chuck:

The following is in response to your questions and comments during the Technical Review concerning Department of Energy (DOE) Identification (ID) number GJ-12935-RS.MR ^{SHA 85} MR.

1. The Colorado Department of Health working level has been noted and is a part of the folio.
2. Yes, location 28 should read 12-feet west of the house. This has been corrected in Table 3.1.
3. Yes, boreholes 41, 46, and 47 did not show much. I based my depth of contamination in those areas on the surface gamma readings and the data from the deltas.
4. The squiggles in the alley were covered by location 6 and the area of contamination will be extended to include them.

Thank you for your time and cooperation. If you should have additional questions or comments, please contact me at 242-8621, extension 418.

Sincerely,

Thomas R. Unrein
Radiologic Survey Team

TRU:dk

ALLIED Bendix
Aerospace

Bendix Field Engineering Corporation
Grand Junction Operations
Grand Junction, Colorado

Date: March 25, 1985

To: Files

From: Thomas Unrein

Subject: Team Leader Notes - GJ-12935-RS ^{MA} 6/28/85

Address: 532 West Colorado Avenue

Owner: Winfred W. Holding

Team Members

T. Unrein (Team Leader)	D. Herrera
D. Fossey	P. Tuhey
V. Rothman	T. Flores
M. Gilfillan	R. Herman
M. Dexter	L. Kula

The team members arrived on the site at 8:45 A.M. and began gridding procedures.

The primary structure is vacant. I went inside to locate the crawl space entrance. After inspecting the crawl space, I decided not to send anyone down into it. The reasoning for this decision was based on the lack of space and the piles of debris. Health and Safety concurred with this decision.

There is spillover contamination on the east and west sides of this property. The property to the west is 538 West Colorado, Department of Energy (DOE) Identification (ID) number GJ-12941-RS, which is on the inclusion list. The property on the east is 524 West Colorado, DOE ID number GJ-12936-RS, which is not on the inclusion list. The owners of DOE ID number GJ-12936-RS reside in Arizona.

A spillover request for DOE ID number GJ-12936-RS is in progress in radiologic survey.

The original structure on this property was built in the early 1900's, but an addition (bathroom) has been built since.

Team Leader Notes

Thomas Unrein

GJ-12935-RS MR

March 25, 1985

Page 2

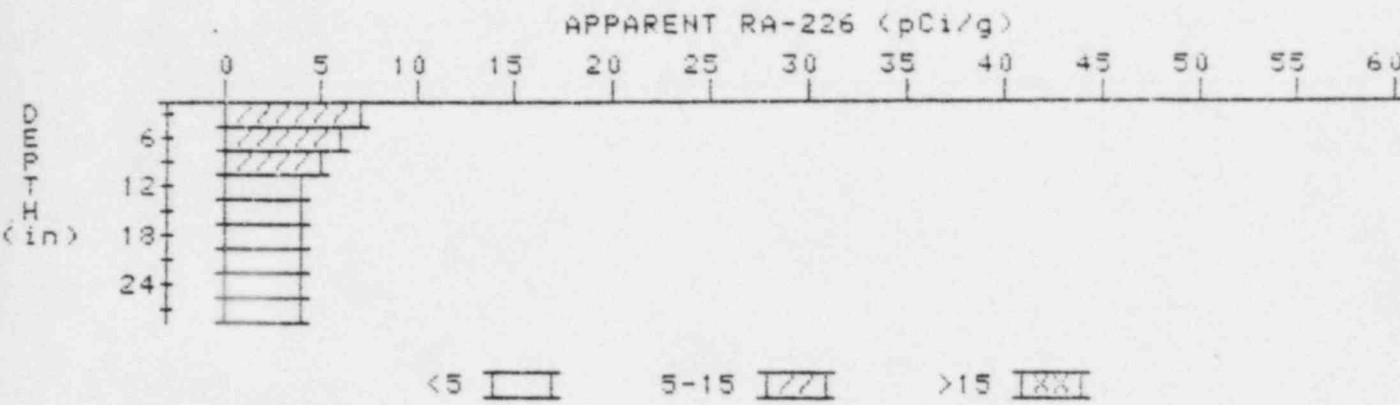
The interior showed no elevated readings except the bathroom. This primary structure sits on a wood and rock foundation.

Team members were partially able to get beneath the addition to take a soil sample and some delta's. Scanning (what was possible) indicated that tailings were put down before the addition was built. Tailings are throughout almost the entire yard.

The team members completed surveying at 3:00 P.M., frisked, and returned to the compound.

APPARENT RADIUM-226 CONCENTRATION 10 DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-12933-MR
HOLE NUMBER: 10
LOCATION: 123292



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	7.3	7.3
6	6.4	6.4
9	5.5	5.1
12	4.8	4.3
15	4.4	4.2
18	4.1	3.9
21	3.9	3.5
24	3.9	3.9
27	3.9	3.9

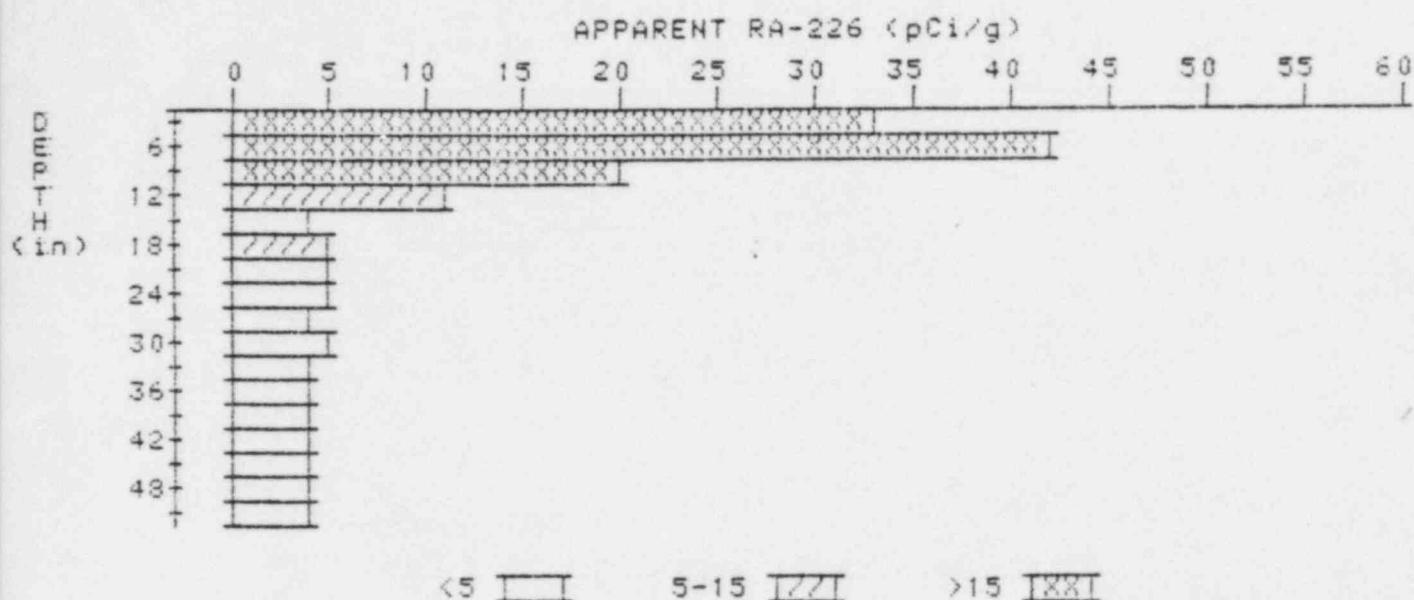
APPARENT RADIUM-226 CONCENTRATION 12

DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-12935-MR

HOLE NUMBER: 12

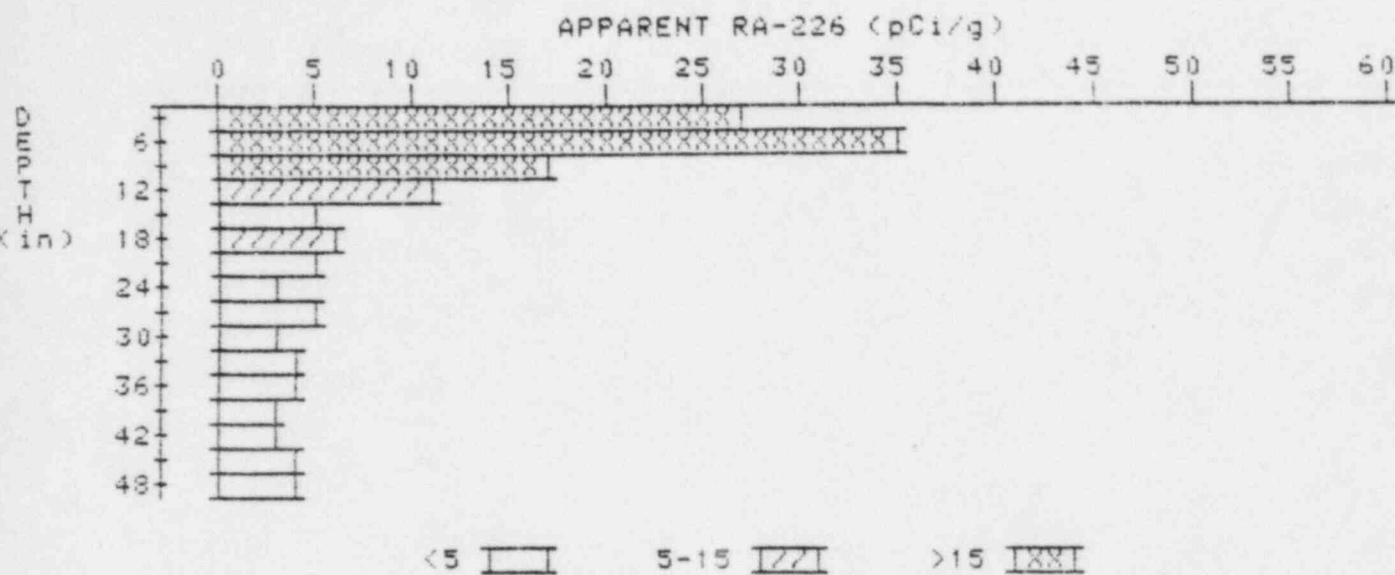
LOCATION: 145259



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	32.5	32.5
6	30.5	41.9
9	22.1	20.5
12	14.6	10.5
15	9.4	4.2
18	7.1	5.3
21	5.8	4.7
24	5.1	4.9
27	4.5	3.6
30	4.4	4.6
33	4.2	4.2
36	4.0	3.8
39	3.9	3.7
42	3.9	3.9
45	3.9	3.9
48	3.9	3.5
51	4.1	4.1

APPARENT RADIUM-226 CONCENTRATION 13 DECONVOLUTION GRAPH

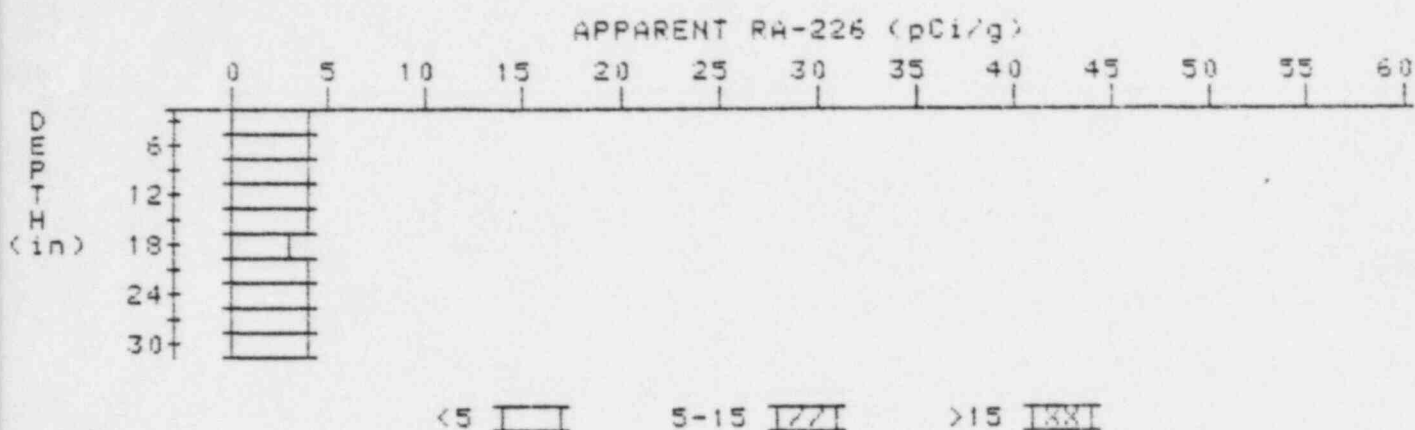
PROPERTY NUMBER: GJ-12935-MR
HOLE NUMBER: 13
LOCATION: 145288



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	26.5	26.5
6	25.3	34.9
9	18.7	16.9
12	13.1	10.8
15	8.8	4.7
18	6.8	5.6
21	5.5	4.8
24	4.6	3.4
27	4.4	4.9
30	3.9	3.2
33	3.8	3.8
36	3.7	3.7
39	3.6	3.4
42	3.6	3.4
45	3.7	3.9
48	3.7	3.7

APPARENT RADIUM-226 CONCENTRATION 17 DECONVOLUTION GRAPH

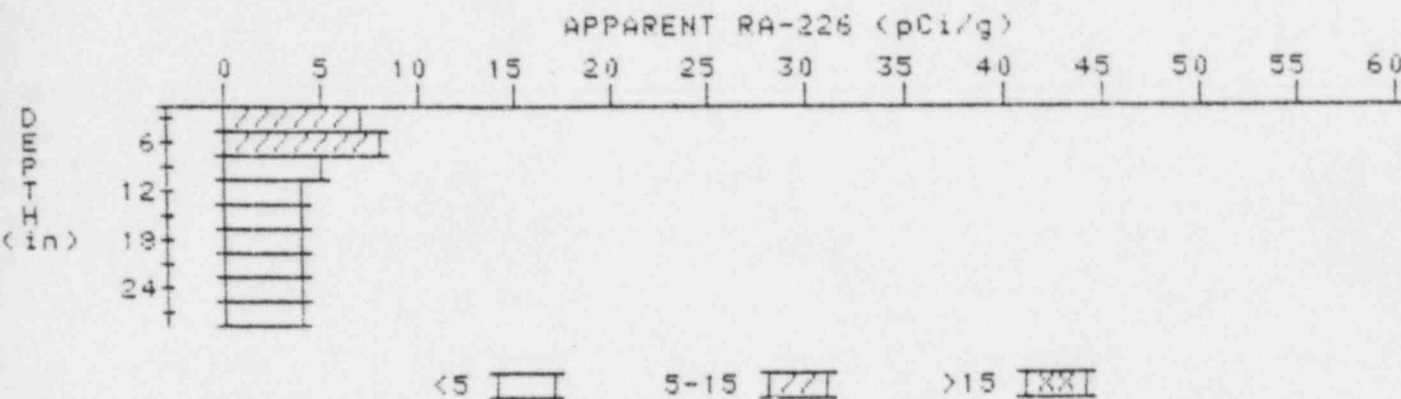
PROPERTY NUMBER: GJ-12935-MR
HOLE NUMBER: 17
LOCATION: 175285



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	3.6	3.6
6	3.8	4.0
9	3.9	3.9
12	4.0	4.4
15	3.9	3.9
18	3.8	3.4
21	3.9	3.9
24	4.0	4.0
27	4.1	4.3
30	4.1	4.1

APPARENT RADIUM-226 CONCENTRATION 23 DECONVOLUTION GRAPH

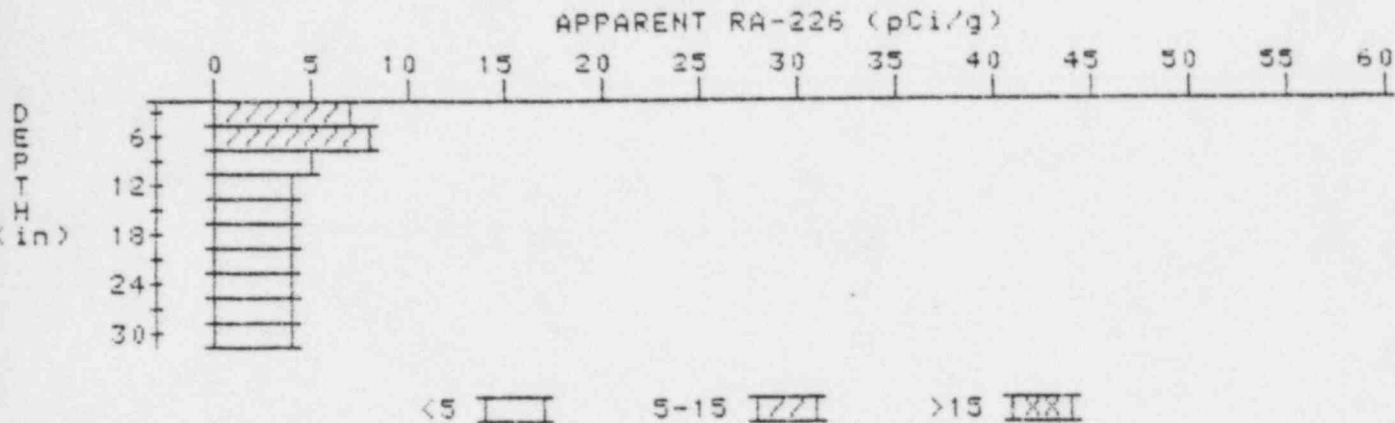
PROPERTY NUMBER: GJ-12935-MR
 HOLE NUMBER: 23
 LOCATION: 208285



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	7.3	7.3
6	6.7	7.8
9	5.5	4.8
12	4.7	4.0
15	4.3	4.1
18	4.0	3.6
21	3.9	4.1
24	3.7	3.5
27	3.6	3.6

APPARENT RADIUM-226 CONCENTRATION 25 DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-12935-MR
HOLE NUMBER: 25
LOCATION: 215263

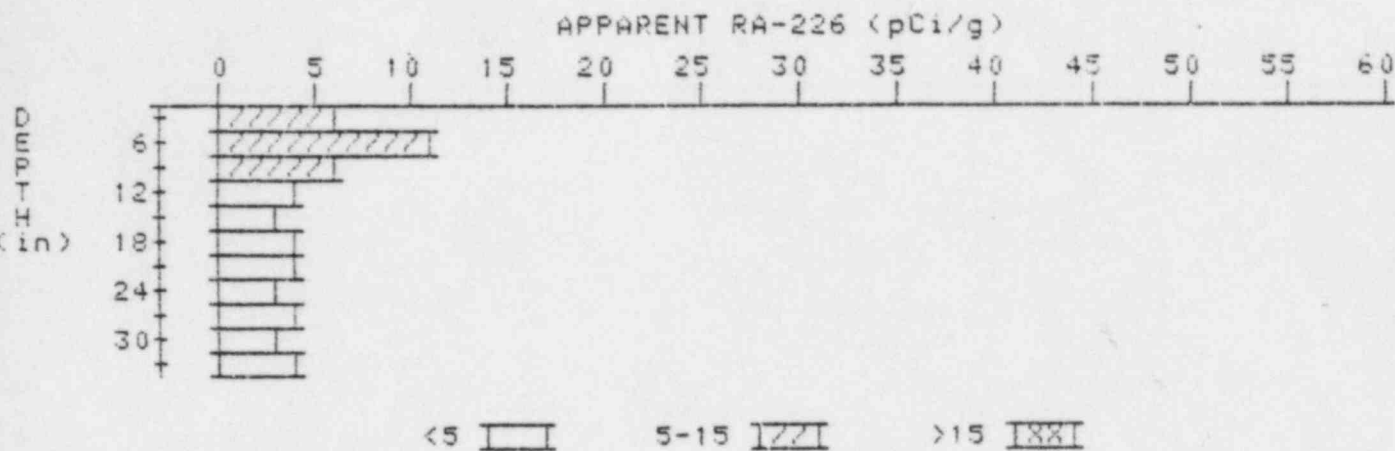


Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	7.3	7.3
6	6.8	8.0
9	5.6	4.9
12	4.8	4.1
15	4.4	3.9
18	4.3	4.3
21	4.2	4.2
24	4.1	3.9
27	4.1	4.5
30	3.9	3.9

APPARENT RADIUM-226 CONCENTRATION 26

DECONVOLUTION GRAPH

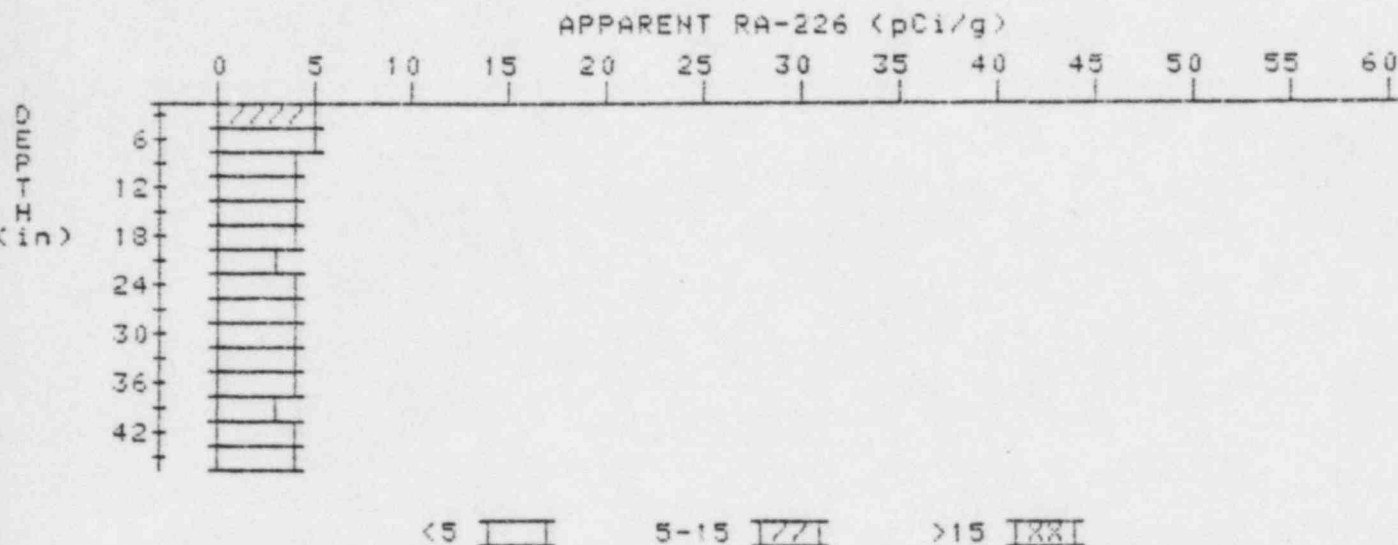
PROPERTY NUMBER: GJ-12935-MR
HOLE NUMBER: 26
LOCATION: 215291



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	5.7	5.7
6	7.0	10.9
9	6.1	6.5
12	5.0	4.3
15	4.3	3.4
18	4.1	3.9
21	4.0	4.2
24	3.8	3.3
27	3.9	4.4
30	3.7	3.3
33	3.7	3.7

APPARENT RADIUM-226 CONCENTRATION 27 DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-12935-MR
HOLE NUMBER: 27
LOCATION: 219266



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	5.4	5.4
6	4.9	4.7
9	4.5	4.1
12	4.3	4.3
15	4.1	3.7
18	4.1	4.5
21	3.9	3.4
24	4.0	4.4
27	3.9	3.7
30	3.9	3.7
33	4.0	4.4
36	3.9	3.9
39	3.8	3.4
42	3.9	4.1
45	3.9	3.9

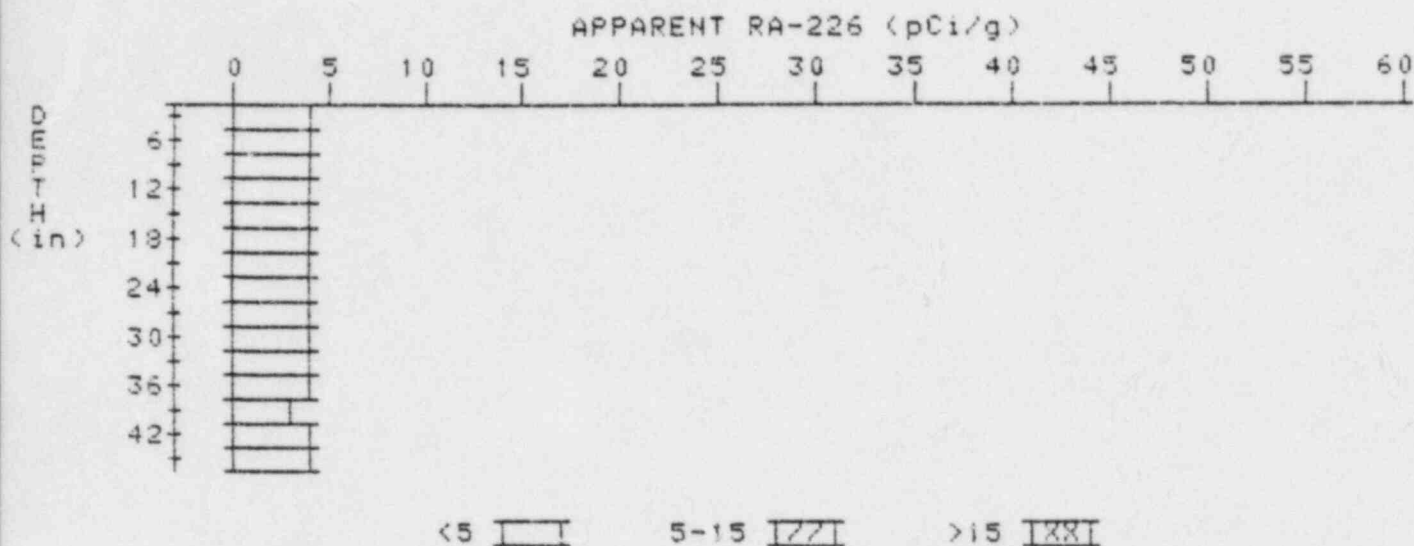
APPARENT RADIUM-226 CONCENTRATION 35

DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-12935-MR

HOLE NUMBER: 35

LOCATION: 252279



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	3.9	3.9
6	4.0	4.2
9	4.0	4.0
12	4.0	4.0
15	4.0	4.2
18	3.9	3.9
21	3.8	3.6
24	3.8	3.8
27	3.8	3.8
30	3.8	3.8
33	3.8	3.8
36	3.8	4.0
39	3.7	3.3
42	3.8	4.0
45	3.3	3.8

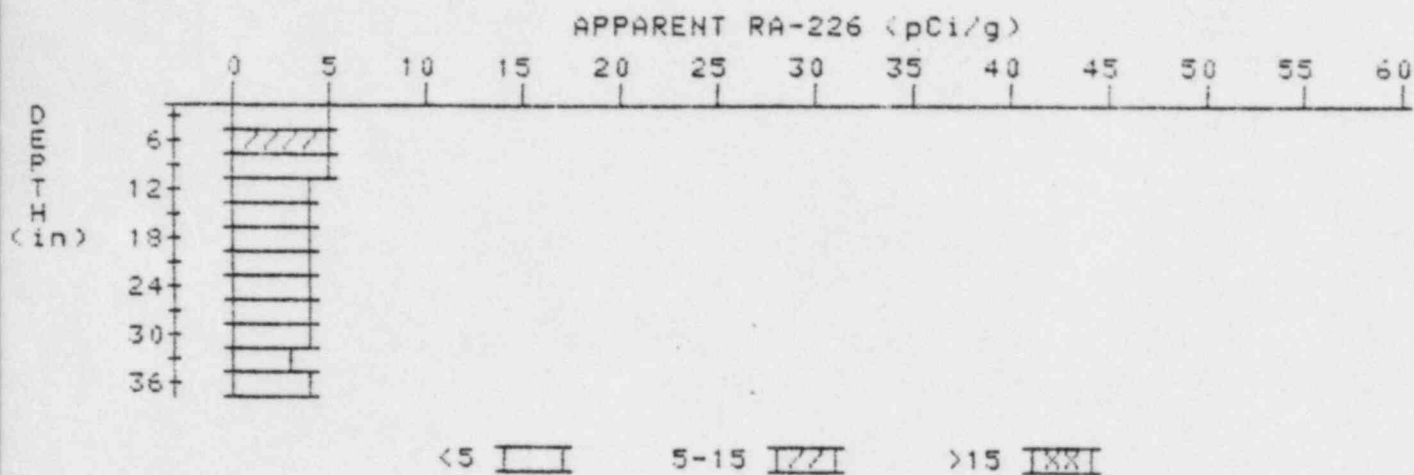
APPARENT RADIUM-226 CONCENTRATION 36

DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-12935-MR

HOLE NUMBER: 36

LOCATION: 254263



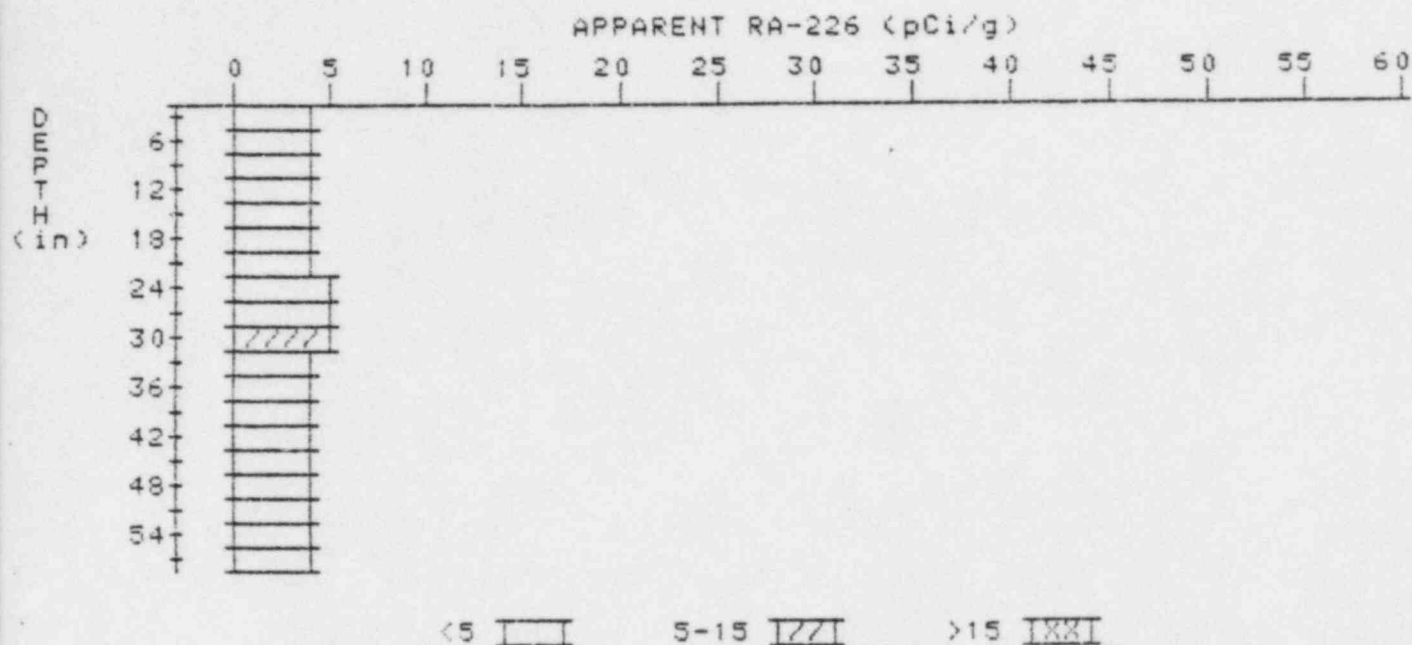
Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	4.5	4.5
6	4.7	5.4
9	4.5	4.7
12	4.2	3.8
15	4.1	3.9
18	4.1	4.3
21	4.0	3.8
24	4.0	4.2
27	3.9	3.7
30	3.9	4.1
33	3.8	3.4
36	3.9	3.9

APPARENT RADIUM-226 CONCENTRATION 40 DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-12935-MR

HOLE NUMBER: 40

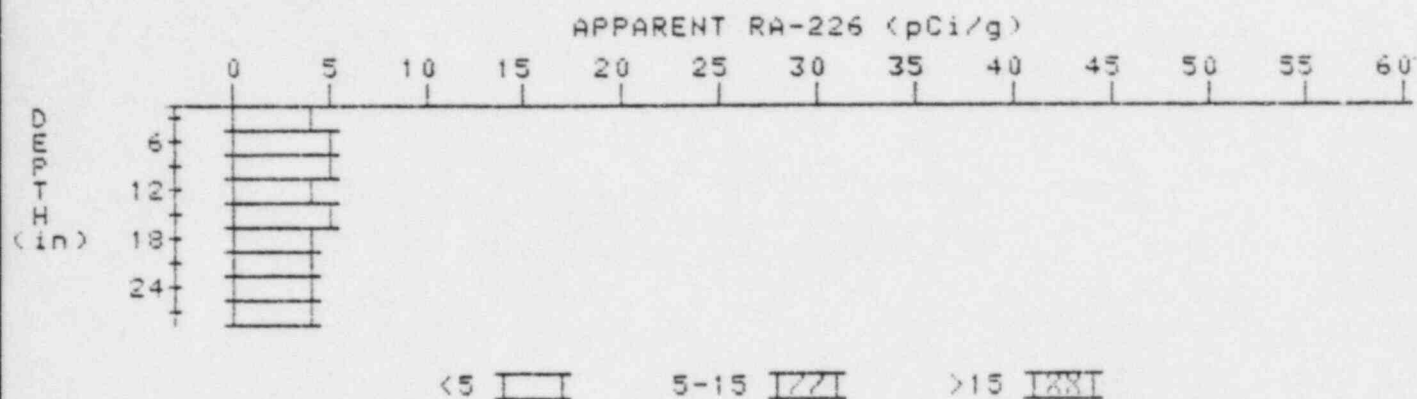
LOCATION: 263260



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	3.9	3.9
6	4.0	4.2
9	4.0	4.2
12	3.9	3.5
15	4.0	4.0
18	4.1	4.1
21	4.2	4.0
24	4.4	4.6
27	4.5	4.7
30	4.5	5.0
33	4.2	3.8
36	4.1	3.9
39	4.1	4.3
42	4.0	3.8
45	4.0	3.8
48	4.1	4.5
51	4.0	3.6
54	4.1	4.1

APPARENT RADIUM-226 CONCENTRATION 41 DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-12935-MR
HOLE NUMBER: 41
LOCATION: 264293



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	4.1	4.1
6	4.4	4.9
9	4.4	4.6
12	4.3	4.1
15	4.3	4.7
18	4.1	3.7
21	4.1	4.1
24	4.1	4.1
27	4.1	4.1

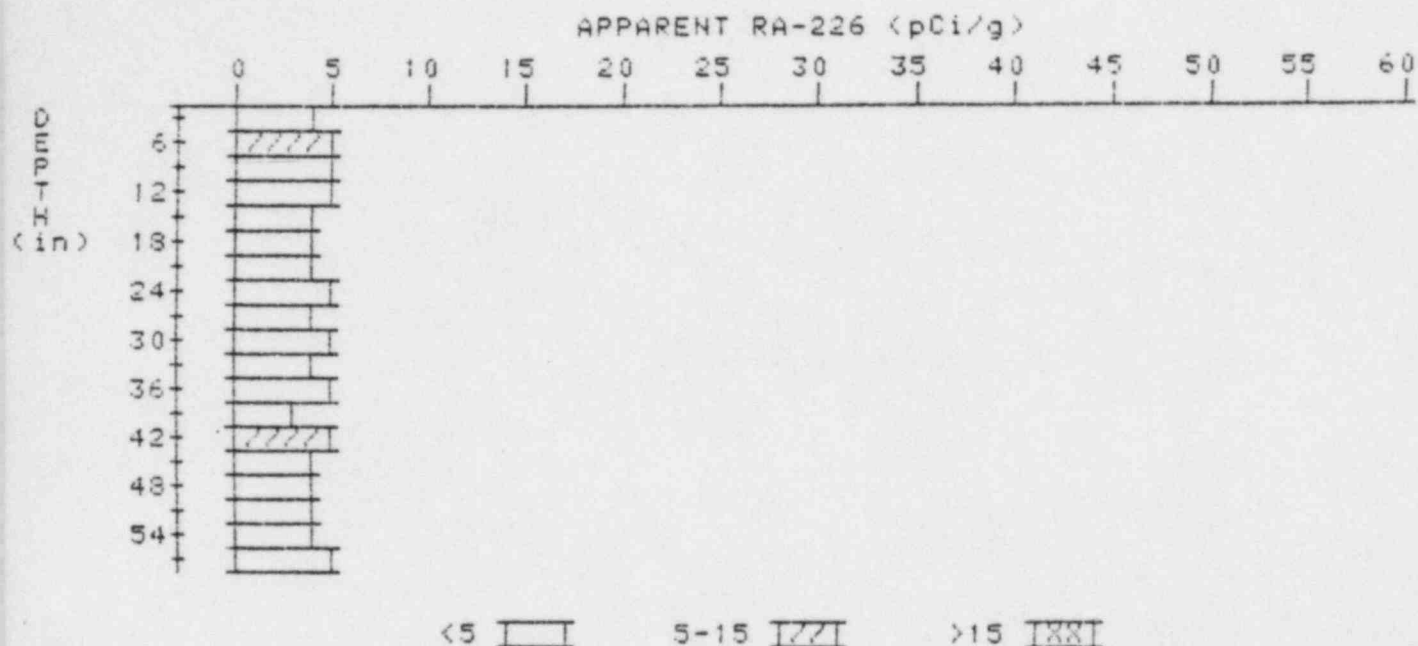
APPARENT RADIUM-226 CONCENTRATION 46

DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-12935-MR

HOLE NUMBER: 46

LOCATION: 278271



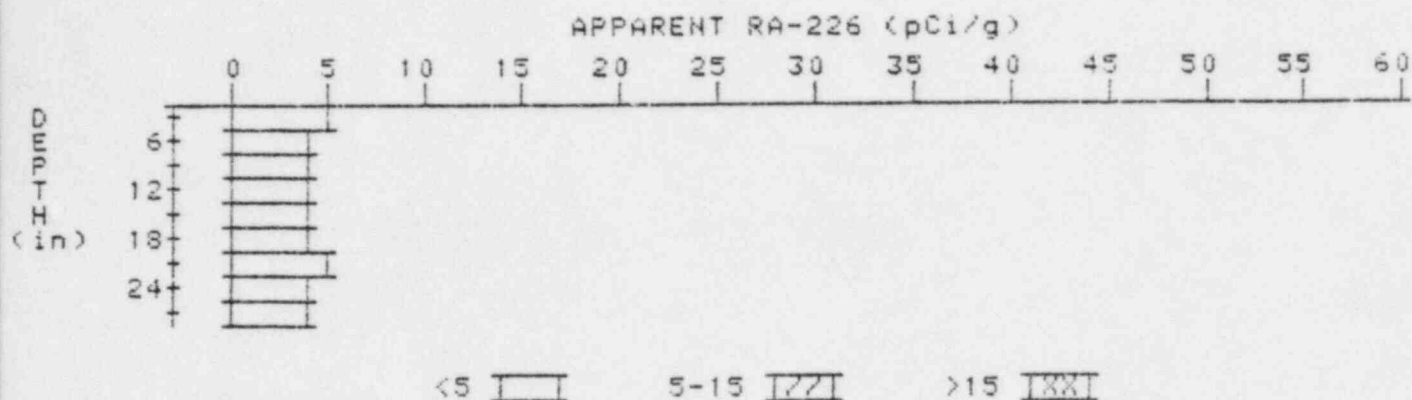
Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	3.7	3.7
6	4.4	5.5
9	4.5	4.7
12	4.5	4.7
15	4.4	4.4
18	4.3	4.1
21	4.3	4.1
24	4.4	4.8
27	4.3	3.9
30	4.4	4.8
33	4.3	4.1
36	4.3	4.7
39	4.1	3.4
42	4.3	5.0
45	4.1	3.7
48	4.1	4.1
51	4.1	3.7
54	4.3	4.3

APPARENT RADIUM-226 CONCENTRATION 47 DECONVOLUTION GRAPH

PROPERTY NUMBER: GJ-12935-MR

HOLE NUMBER: 47

LOCATION: 278294



Depth (in)	Apparent Radium-226 (pCi/g) Undeconvolved	Apparent Radium-226 (pCi/g) Deconvolved
3	4.5	4.5
6	4.4	4.4
9	4.3	4.1
12	4.3	4.3
15	4.3	4.5
18	4.2	3.8
21	4.3	4.7
24	4.2	4.2
27	4.1	4.1