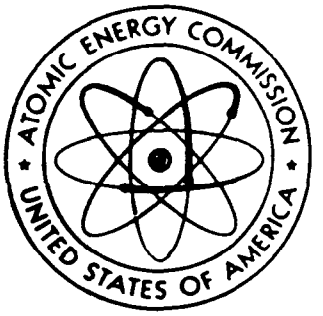
NVO-140

VOLUME III

# ENEWETAK RADIOLOGICAL SURVEY




OCTOBER 1973

UNITED STATES ATOMIC ENERGY COMMISSION

NEVADA OPERATIONS OFFICE

LAS VEGAS, NEVADA

# Appendix II - Survey Results by Island


Introduction . . . . . iii

Map of Enewetak Atoll . . . . . iv

Cross-reference list of island names . . . . . v

Individual photomap scale factors . . . . . vi

Contour map key for use with the EG&G aerial radiological survey figures . . vii

Survey results, Volume II B.

ALICE . . . . . B. 1. 1

BELLE . . . . . B. 2. 1

CLARA . . . . . B. 3. 1

DAISY . . . . . B. 4. 1

EDNA . . . . . B. 5. 1

IRENE A . . . . . B. 6. 1

IRENE B . . . . . B. 7. 1

JANET . . . . . B. 8. 1

KATE . . . . . B. 9. 1

LUCY . . . . . B. 10. 1

PERCY . . . . . B. 11. 1

MARY . . . . . B. 12. 1

NANCY . . . . . B. 13. 1

OLIVE . . . . . B. 14. 1

PEARL . . . . . B. 15. 1

RUBY . . . . . B. 16. 1

SALLY . . . . . B. 17. 1

TILDA . . . . . B. 18. 1

URSULA . . . . . B. 19. 1

VERA . . . . . B. 20. 1

WILMA . . . . . B. 21. 1

YVONNE A . . . . . B. 22. 1

Survey results, Volume III

YVONNE B . . . . . B. 23. 1

YVONNE C . . . . . B. 24. 1

YVONNE D . . . . . B. 25. 1

YVONNE E . . . . . B. 26. 1

YVONNE F . . . . . B. 27. 1

Survey results (continued)

SAM . . . . . B. 28. 1
TOM . . . . . B. 29. 1
URIAH . . . . . B. 30. 1
VAN . . . . . B. 31. 1
ALVIN . . . . . B. 32. 1
BRUCE . . . . . B. 33. 1
CLYDE . . . . . B. 34. 1
DAVID . . . . . B. 35. 1
REX . . . . . B. 36. 1
ELMER A . . . . . B. 37. 1
ELMER B . . . . . B. 38. 1
ELMER C . . . . . B. 39. 1
ELMER D . . . . . B. 40. 1
WALT . . . . . B. 41. 1
FRED A . . . . . B. 42. 1
FRED B . . . . . B. 43. 1
FRED C . . . . . B. 44. 1
FRED D . . . . . B. 45. 1
FRED E . . . . . B. 46. 1
FRED F . . . . . B. 47. 1
GLENN . . . . . B. 48. 1
HENRY . . . . . B. 49. 1
IRWIN A . . . . . B. 50. 1
IRWIN B . . . . . B. 51. 1
JAMES . . . . . B. 52. 1
KEITH . . . . . B. 53. 1
LEROY . . . . . B. 54. 1

Summary of Experimental Data . . . . . C.

## INTRODUCTION

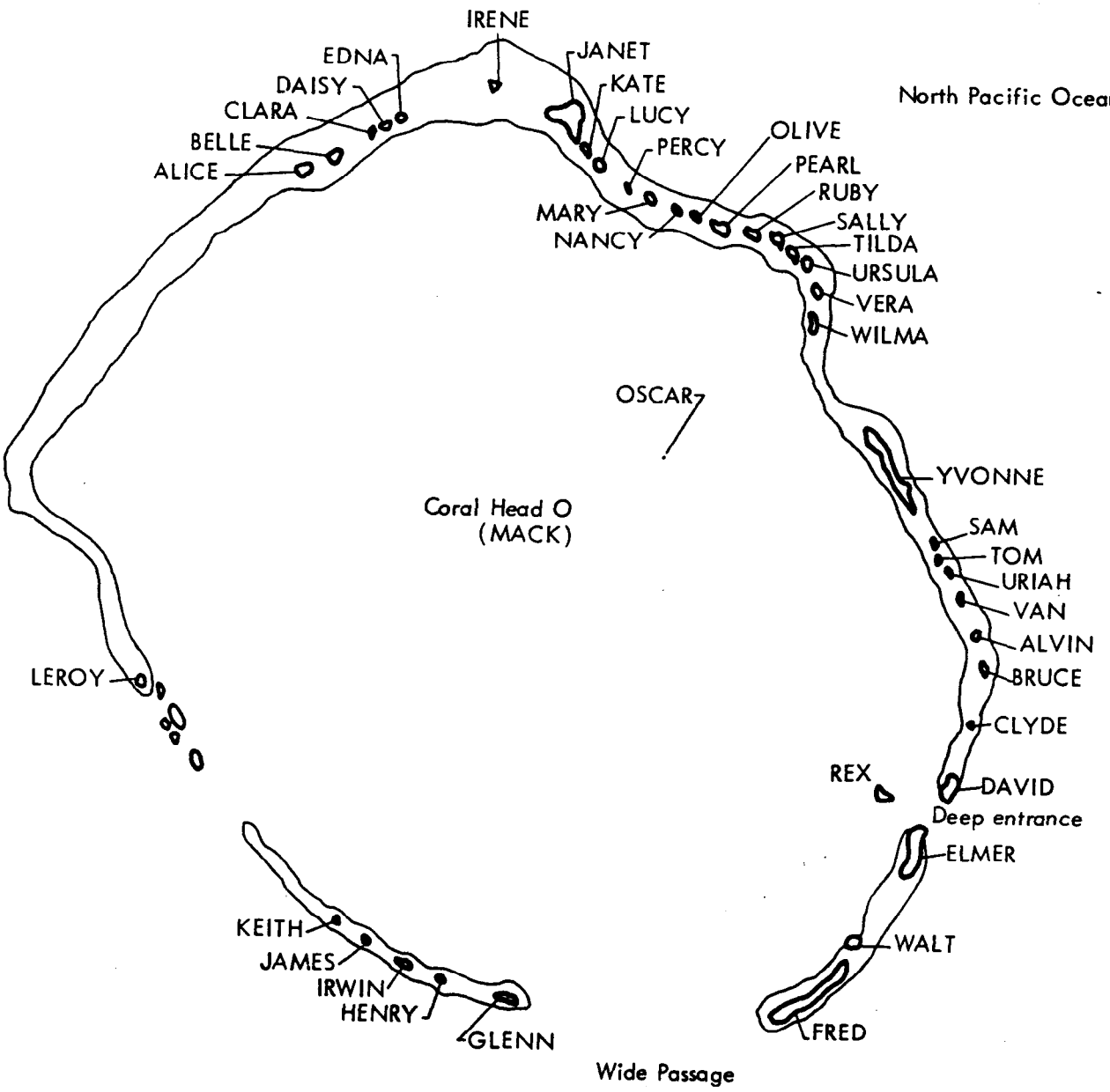
This appendix is a compilation of radiological survey results for each of the islands in Enewetak Atoll. The information for each island includes a color aerial photograph, a series of photographs overprinted with survey data, and a set of analytical data. It should be noted that several islands (i.e., IRENE, YVONNE, ELMER, FRED, and IRWIN) have been subdivided into sections (e.g., IRENE A and IRENE B) because of their relatively large size. In addition, it should be pointed out that the sets of overprints are not necessarily the same for all islands. Thermoluminescent detectors (TLD's), for example, were not used on all islands. For ease of comparison and clarity, the same data parameter for each island is overprinted on the same color of photograph.

For a discussion of the techniques used in collecting the data presented on the photographic overprints, the reader is referred to the appropriate section in Vol. I of this document.

A typical set of survey results is outlined below for ALICE, together with the page and figure designation scheme used.

### ALICE


| | Fig. No. |
|---|---|
| Current condition | |
| a. Color photograph | B.1.1a |
| b. 0-3 MeV EG&G isopleth | B.1.1b |
| c. 0-300 keV EG&G isopleth | B.1.1c |
| d. Ground measurements with Baird Atomic | B.1.1d |
| f. Soil-sampling locations | B.1.1f |
| g. Vegetation sampling locations | B.1.1g |
| h. TLD locations | B.1.1h |
| i. $^{239}$Pu soil content isopleths | B.1.1i |
| j. $^{90}$Sr soil content isopleths | B.1.1j |
| k. $^{137}$Cs EG&G isopleths | B.1.1k |
| l. $^{137}$Cs soil data | B.1.1l |
| m. $^{60}$Co EG&G isopleths | B.1.1m |
| n. $^{60}$Co soil data | B.1.1n |
| o. Animal sampling location | B.1.1o |
| Analytical data for soils | |
| a. through m. Soil profile data plots | B.1.2a through B.1.2m |




Map of Enewetak Atoll

At the end of Volume III, after the section on LEROY, is a section containing microfiche transparencies reproducing all of the analytical data obtained in this survey. Instructions on the use of microfiche film are also included in that section.

Table B.1. Cross-reference list of island names.

| Site | Native names from U. S. Hydrographic Office charts 1946 | 1968 | Native names from Dr. Jack A. Tobin |
|---|---|---|---|
| ALICE | Bogallua | Bogallua | BOKOLUO |
| BELLE | Bogombogo | Bogombogo | BOKOMBAKO |
| CLARA | Ruchi | Eybbiyae | —[a] |
| DAISY | —[a] | Lidilbut | LOUJ |
| EDNA | —[a] | —[a] | —[a] |
| HELEN | Bogairikk | Bogeirik | BOKAIDRIK |
| IRENE | Bogon | Bogon | BOKEN |
| JANET | Engebi | Engebi | ENJEBI |
| KATE | Muzinbaarikku | Mujinkarikku | MIJIKADREK |
| LUCY | Kirinian | Billee | KIDRINEN |
| PERCY | —[a] | —[a] | —[a] |
| MARY | Bokonaarappu | Bokonarppu | BOKENELAB |
| NANCY | Yeiri | Yeiri | ELLE |
| OLIVE | Aitsu | Aitsu | AEJ |
| PEARL | Rujoru | Rujiyoru | LUJOR |
| RUBY | Eberiru | Eberiru | ELELERON |
| SALLY | Aomon | Aomon | AOMON |
| TILDA | Biijiri | Biijiri | BIKILE |
| URSULA | Rojoa | Rojoa | LOJWA |
| VERA | Aaraanbiru | Arambiru | ALEMBEL |
| WILMA | Piiraai | Piirai | BILLAE |
| YVONNE | Runit | Runit | RUNIT |
| SAM | —[a] | —[a] | —[a] |
| TOM | —[a] | —[a] | ANEROWIJ |
| URIAH | —[a] | —[a] | —[a] |
| VAN | —[a] | —[a] | —[a] |
| ALVIN | Chinieero | —[a] | JINEDROL |
| BRUCE | Aniyaanii | Japtan | ANANIJ |
| CLYDE | Chinimi | Chinimi | JINIMI |
| DAVID | Japtan | Muti | JAPTAN |
| ELMER | Parry | Parry | MEDREN |
| WALT | —[a] | —[a] | —[a] |
| FRED | Eniwetok | Eniwetok | ENEWETAK |

Table B.1 (Continued)

| Site | Native names from U.S. Hydrographic Office Charts 1946 | 1968 | Native names from Dr. Jack A. Tobin |
|---|---|---|---|
| GLENN | Igurin | Igurin | IKUREN |
| HENRY | Mui | Buganegan | MUT |
| IRWIN | Pokon | Bogan | BOKEN |
| JAMES | Ribaion | Libiron | RIBEWON |
| KEITH | Giriinien | Grinem | KIDRENEN |
| LEROY | Rigili | Rigili | BIKEN |
| REX | Jieroru | Bogen | JEDROL |
| OSCAR | —[a] | —[a] | DREKATIMON |
| MACK | —[a] | —[a] | UNIBOR |

[a]No native name.

Table B.2. Enewetak Atoll individual photomap scale factors.

| Island | Altitude flown, ft | Scale |
|---|---|---|
| ALICE | 5000 | 1 cm = 37 m |
| BELLE | 5000 | 34 |
| CLARA | 3000 | 23 |
| DAISY | 3000 | 25 |
| EDNA | 5000 | 38 |
| IRENE A, B | 5000 | 51 |
| JANET | 10000 | 87 |
| KATE | 3000 | 24 |
| LUCY | 3000 | 26 |
| PERCY | 3000 | 21 |
| MARY | 3000 | 24 |
| NANCY | 5000 | 33 |
| OLIVE | 5000 | 38 |
| PEARL | 5000 | 44 |
| RUBY | 3000 | 17 |
| SALLY | 8000 | 67 |
| TILDA | 5000 | 36 |
| URSULA | 5000 | 33 |
| VERA | 5000 | 31 |
| WILMA | 3000 | 27 |
| YVONNE A, B, C, D | 5000 | 51 |
| SAM | 1000 | 13 |

Table B.2 (Continued)

| Island | Altitude flown, ft | Scale |
|---|---|---|
| TOM | 2000 | 1 cm = 8 m |
| URIAH | 2000 | 17 |
| VAN | 4000 | 20 |
| ALVIN | 2000 | 15 |
| BRUCE | 5000 | 42 |
| CLYDE | 2000 | 12 |
| DAVID | 5000 | 44 |
| REX | 2000 | 18 |
| ELMER A, B, C, D | 5000 | 47 |
| WALT | 2000 | 15 |
| FRED A, B, C, D, E, F | 5000 | 48 |
| GLENN | 9000 | 77 |
| HENRY | 6000 | 55 |
| IRWIN A, B | 3000 | 29 |
| JAMES | 3000 | 16 |
| KEITH | 3000 | 26 |
| LEROY | 3000 | 20 |
| YVONNE E, F | 10000 | 95 |

Table B.3. Contour map key for use with the EG&G aerial radiological survey figures in Appendix II.[a]

| Symbol | $^{241}Am$ concentration[b] (assumed 10-cm relaxation depth) | | $^{137}Cs$[c] | | $^{60}Co$[d] | | Gross count exposure rate,[e] μR/hr |
|---|---|---|---|---|---|---|---|
| | Total, μCi/m² | averaged over top 10 cm, pCi/g | Concentration ±50% for 1 cm (relaxation depth < 10 cm), μCi/m² | Exposure rate, μR/hr | Concentration ±50% for 1 cm (relaxation depth < 10 cm), μCi/m² | Exposure rate, μR/hr | |
| A⁼ | | | 0-0.1 | 0-0.34 | | | |
| A⁻ | | | 0.1-0.2 | 0.34-0.68 | 0-0.04 | 0-0.59 | |
| A | 0-21 | 0-9 | 0.2-0.4 | 0.68-1.36 | 0.04-0.08 | 0.59-1.14 | 0-1.0 |
| B | 21-30 | 9-13 | 0.4-0.6 | 1.36-2.0 | 0.08-0.12 | 1.14-1.7 | 1.0-1.5 |
| C | 30-45 | 13-19 | 0.6-0.8 | 2.0-2.7 | 0.12-0.16 | 1.70-2.3 | 1.5-2.0 |
| D | 45-66 | 19-28 | 0.8-1.6 | 2.7-5.4 | 0.16-0.32 | 2.3-4.6 | 2.0-4 |
| E | 66-100 | 28-42 | 1.6-3.1 | 5.4-11 | 0.32-0.64 | 4.6-0.9 | 4-8 |
| F | 100-145 | 42-61 | 3.1-6.2 | 11-22 | 0.64-1.3 | 9.2-18 | 8-16 |
| G | 145-210 | 61-89 | 6.2-12 | 22-44 | 1.3-2.5 | 18-36 | 16-33 |
| H | 210-300 | 89-130 | 12-25 | 44-88 | 2.5-5.0 | 36-72 | 33-66 |
| I | 300-450 | 130-190 | 25-50 | 88-170 | 5-10 | 72-140 | 66-130 |
| J | | | 50-100 | 170-340 | 10-20 | 140-290 | 130-260 |
| K | | | 100-200 | 340-700 | 20-40 | 290-580 | 260-520 |
| L | | | 200-400 | 700-1400 | 40-80 | 580-1200 | 520-1050 |

[a] See chapter on the EG&G aerial radiological survey in Vol. 1.

[b] Shown in "e" figures in this Appendix.

[c] Shown in "k" figures in this Appendix.

[d] Shown in "m" figures in this Appendix.

[e] Shown in "o" figures in this Appendix.

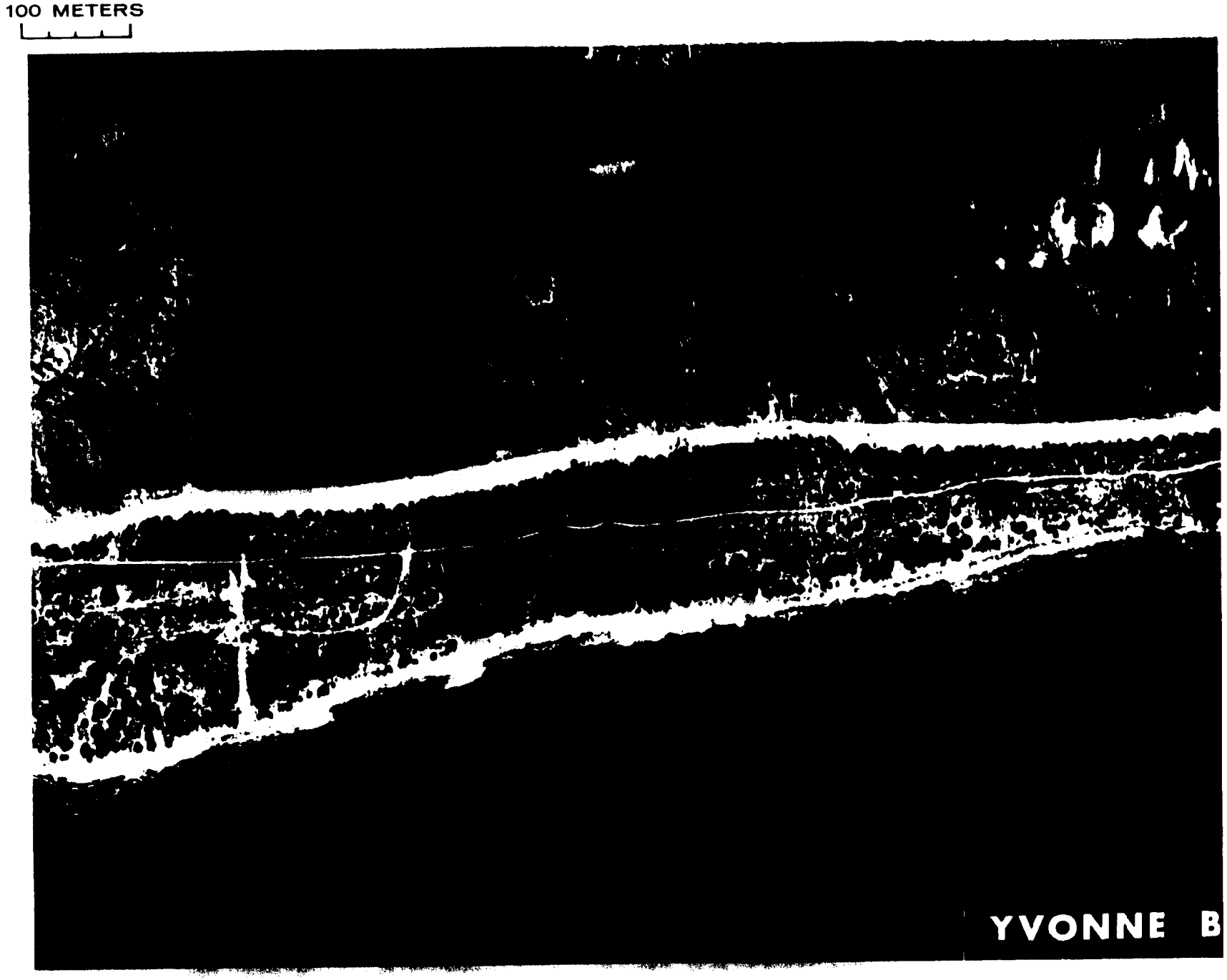



Fig. B.23.1.a.

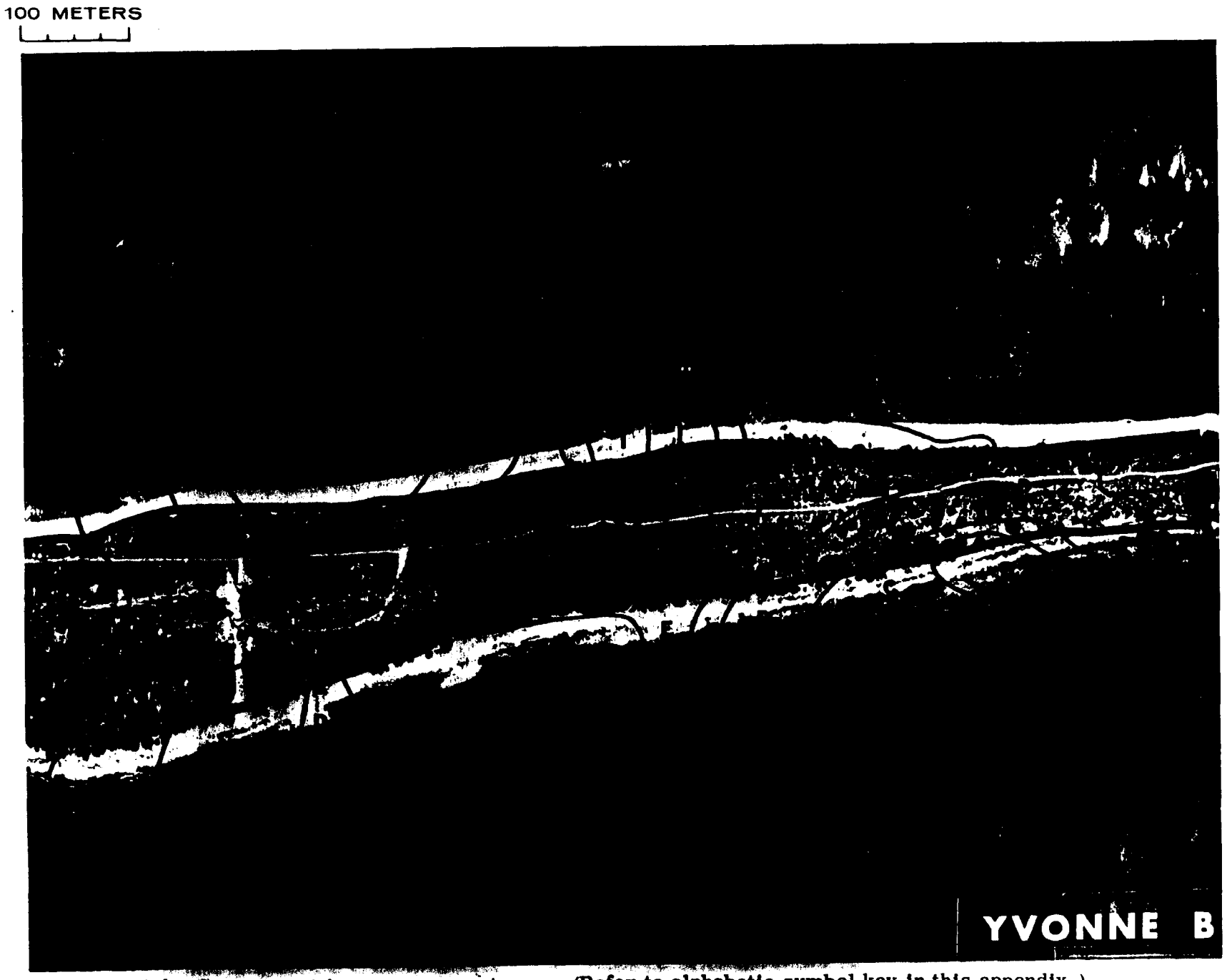



Fig. B.23.1.b. Gross count isoexposure contours. (Refer to alphabetic symbol key in this appendix.)

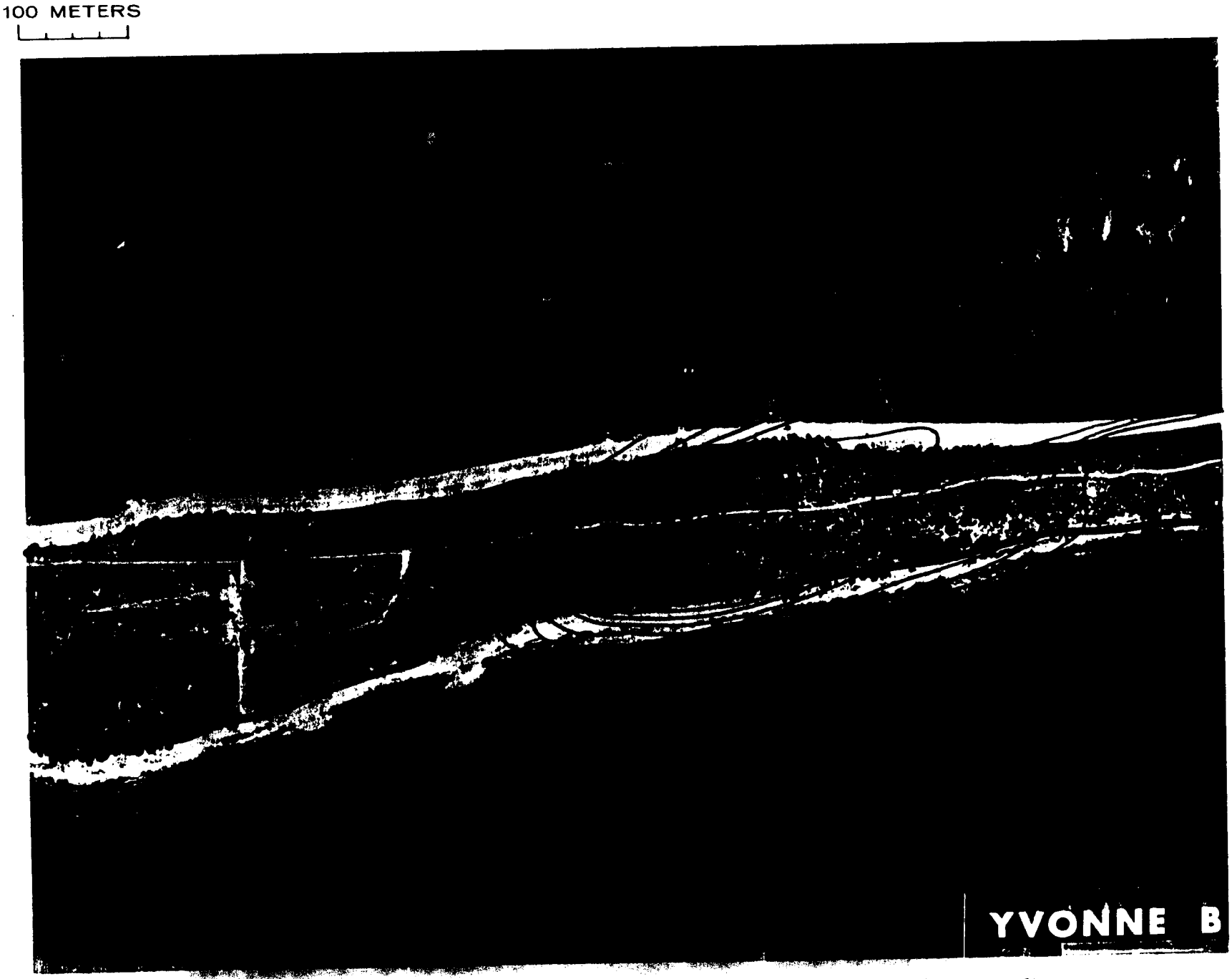
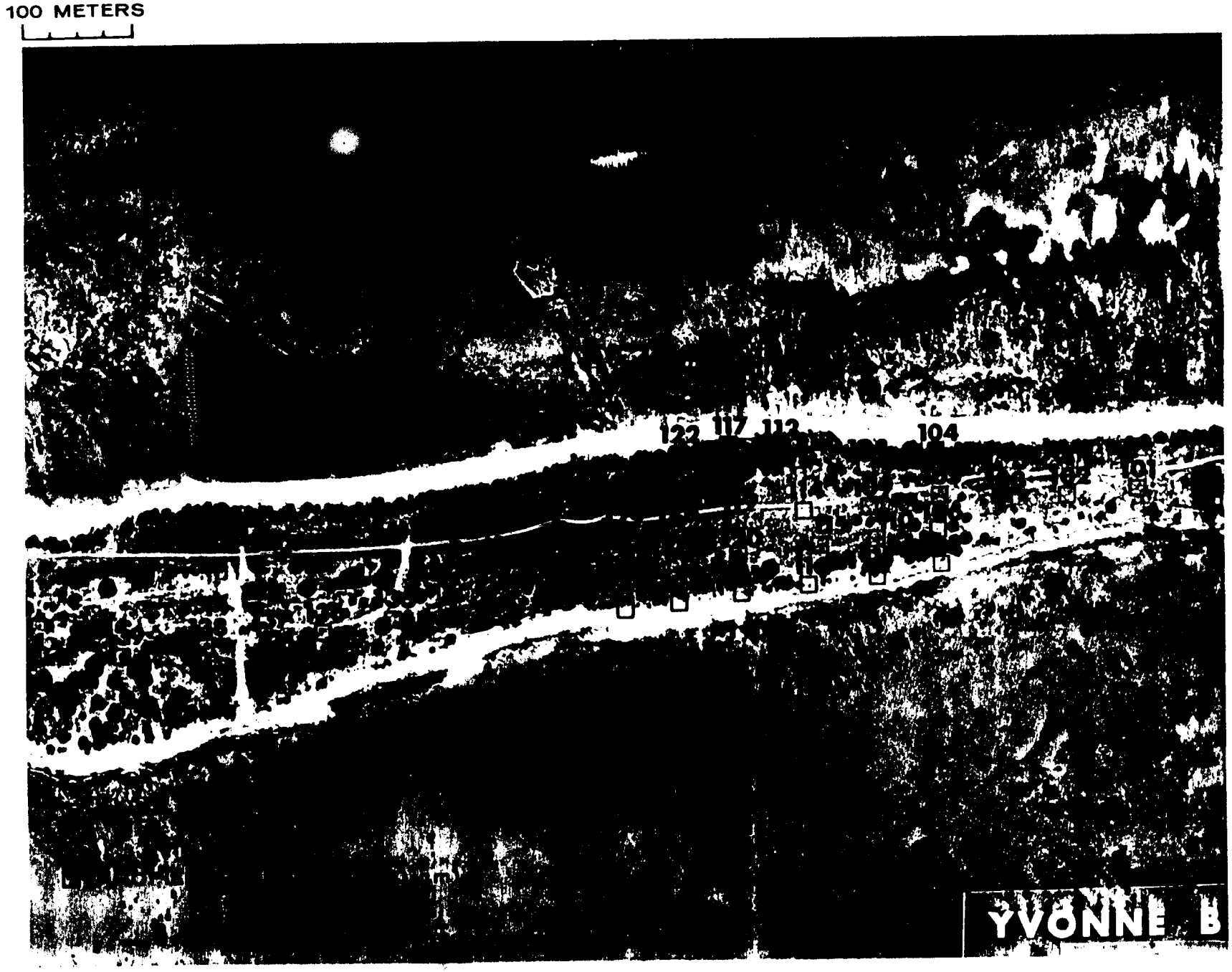



Fig. B.23.1.c. $^{241}$Am isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

B.23.1.d. The gamma background exposure rate (uR/hr) at 1 m above the ground, measured with a portable NaI scintillation counter.




B.23.1.f. Soil-sample locations.

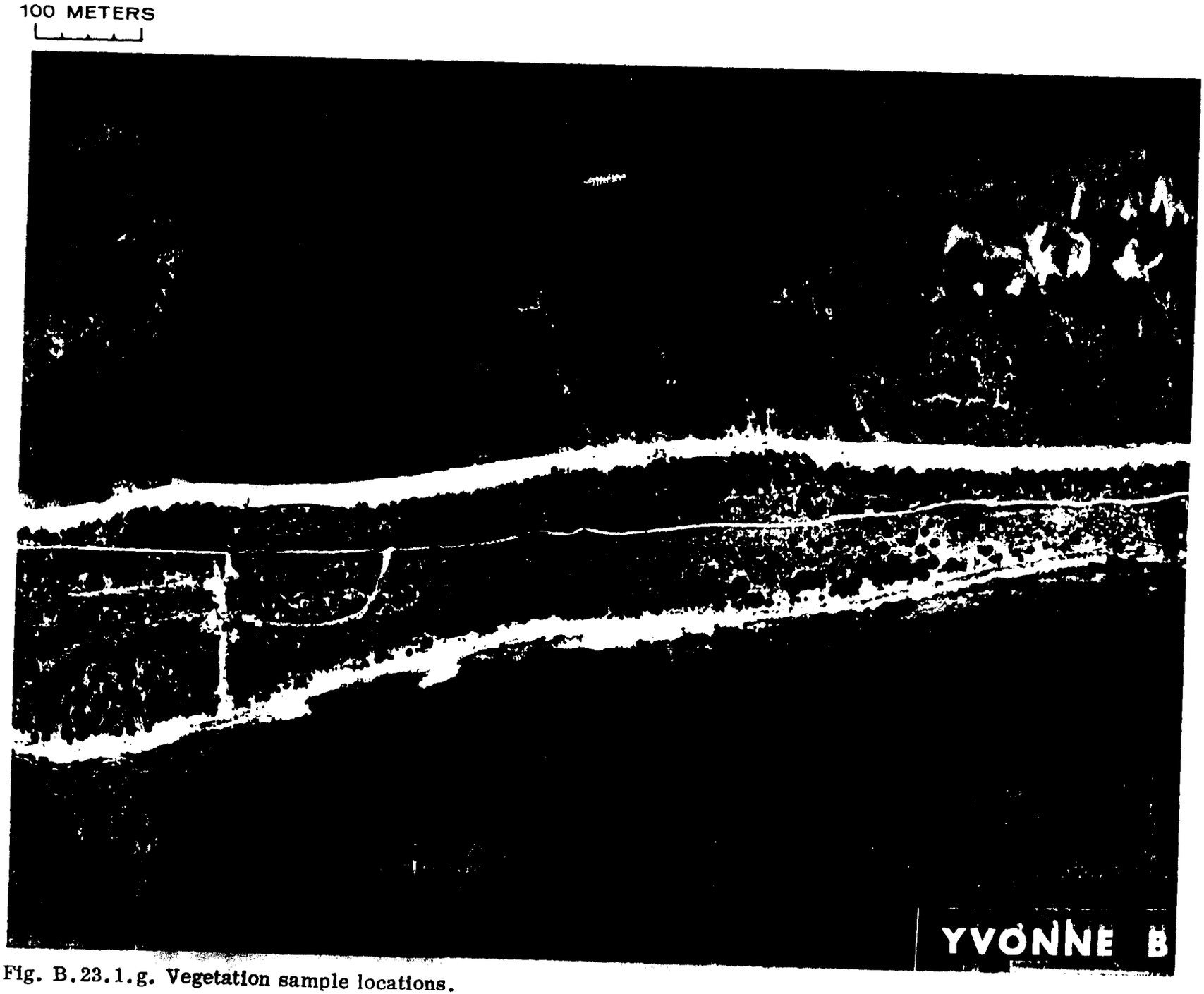



Fig. B.23.1.g. Vegetation sample locations.

B.23.1.i.1. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected between depths of 0 and 10 cm.

B.23.1.1.2. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected between depths of 10 and 20 cm.

B.23.1.1.3. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected between depths of 20 and 30 cm.

B.23.1.1.4. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected between depths of 30 and 40 cm.

B.23.1.1.5. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected between depths of 40 and 50 cm.

B.23.1.i.6. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected between depths of 50 and 60 cm.

B.23.1.i.7. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected between depths of 60 and 70 cm.

B.23.1.1.8. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected between depths of 70 and 80 cm.

B.23.1.1.9. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected between depths of 80 and 90 cm.

B.23.1.1.10. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected between depths of 90 and 100 cm.

B.23.1.i.11. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected between depths of 100 and 110 cm.

B.23.1.1.12. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected between depths of 110 and 120 cm.

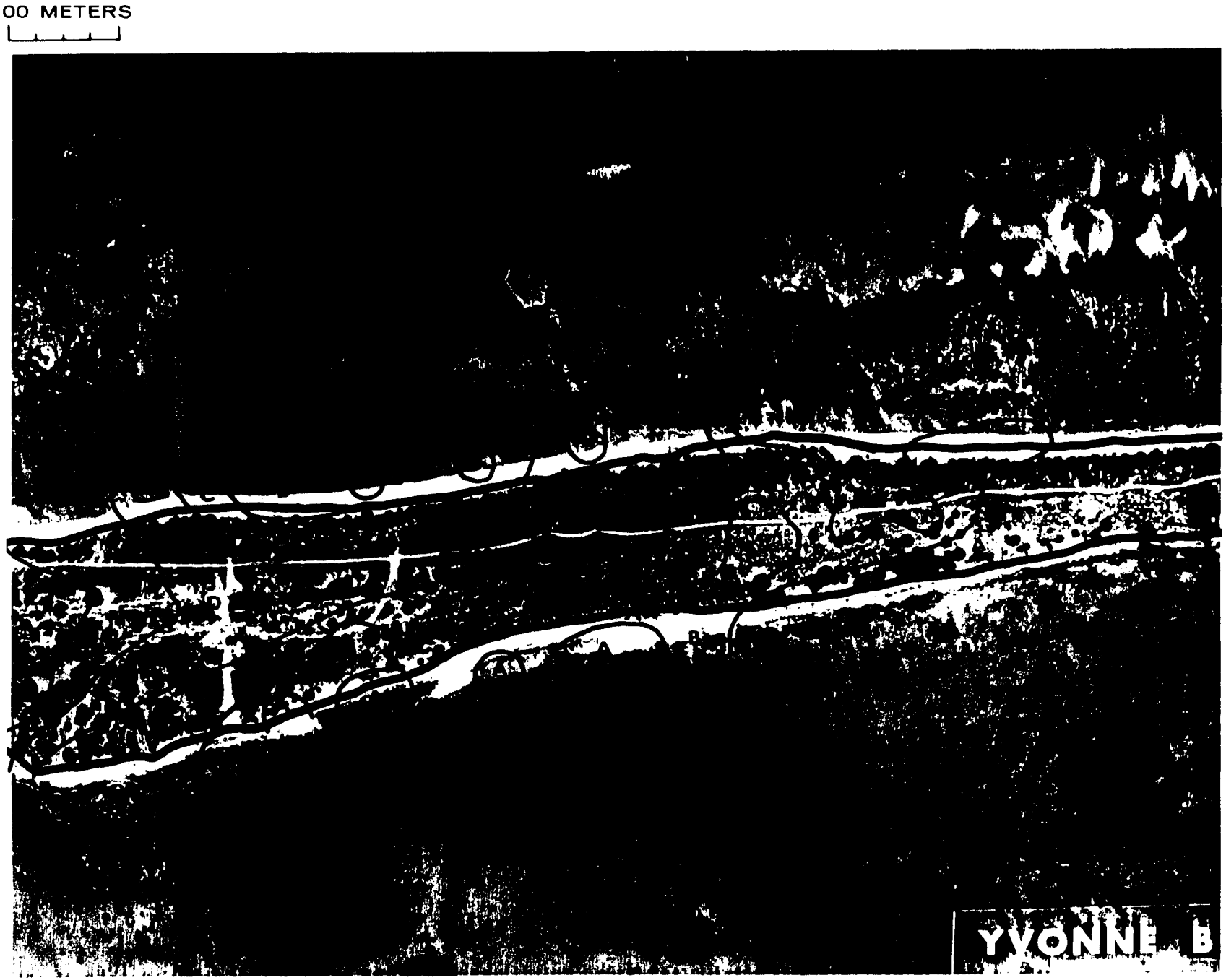



Fig. B.23.1.k. $^{137}Cs$ isoexposure and isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

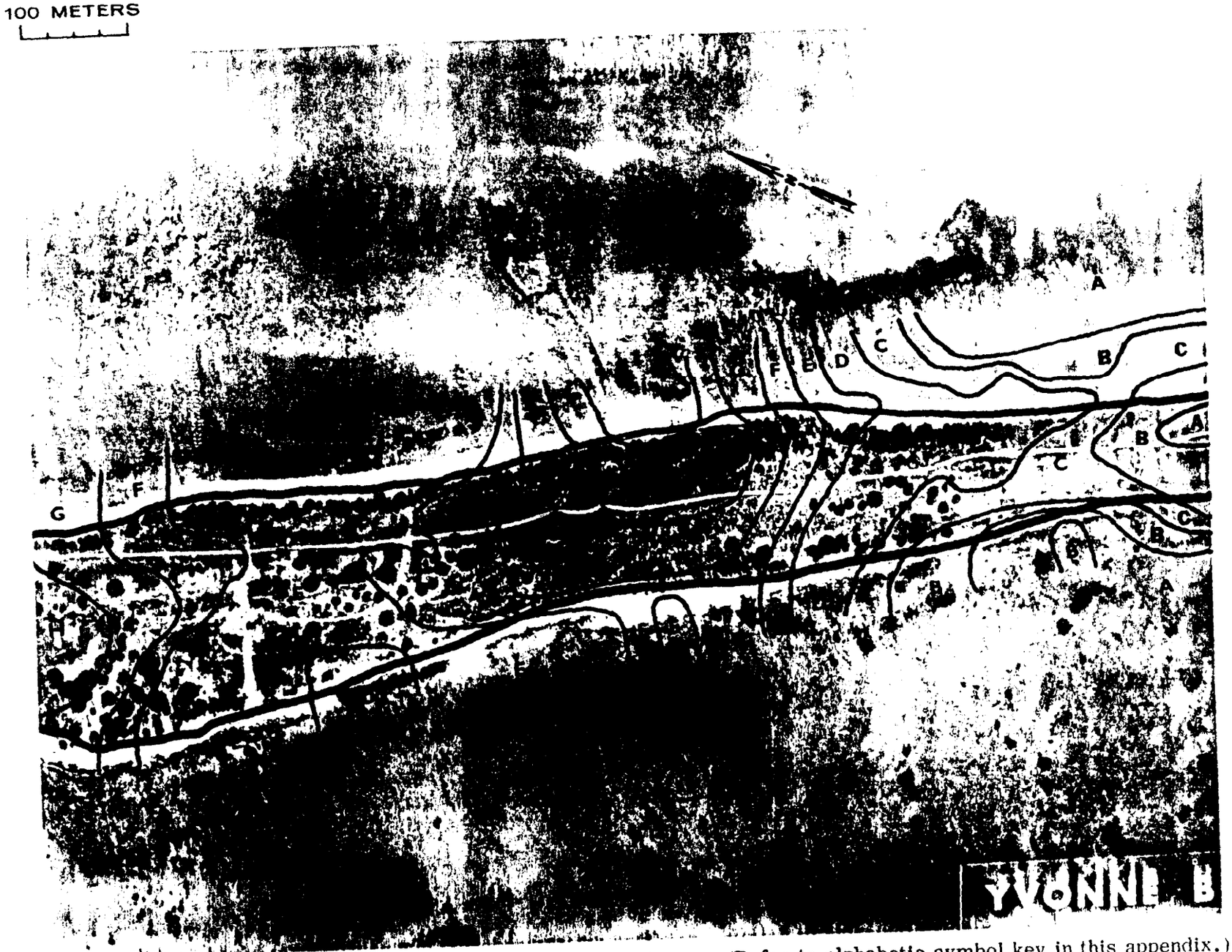



Fig. B.23.1.m. $^{60}$Co isoexposure and isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

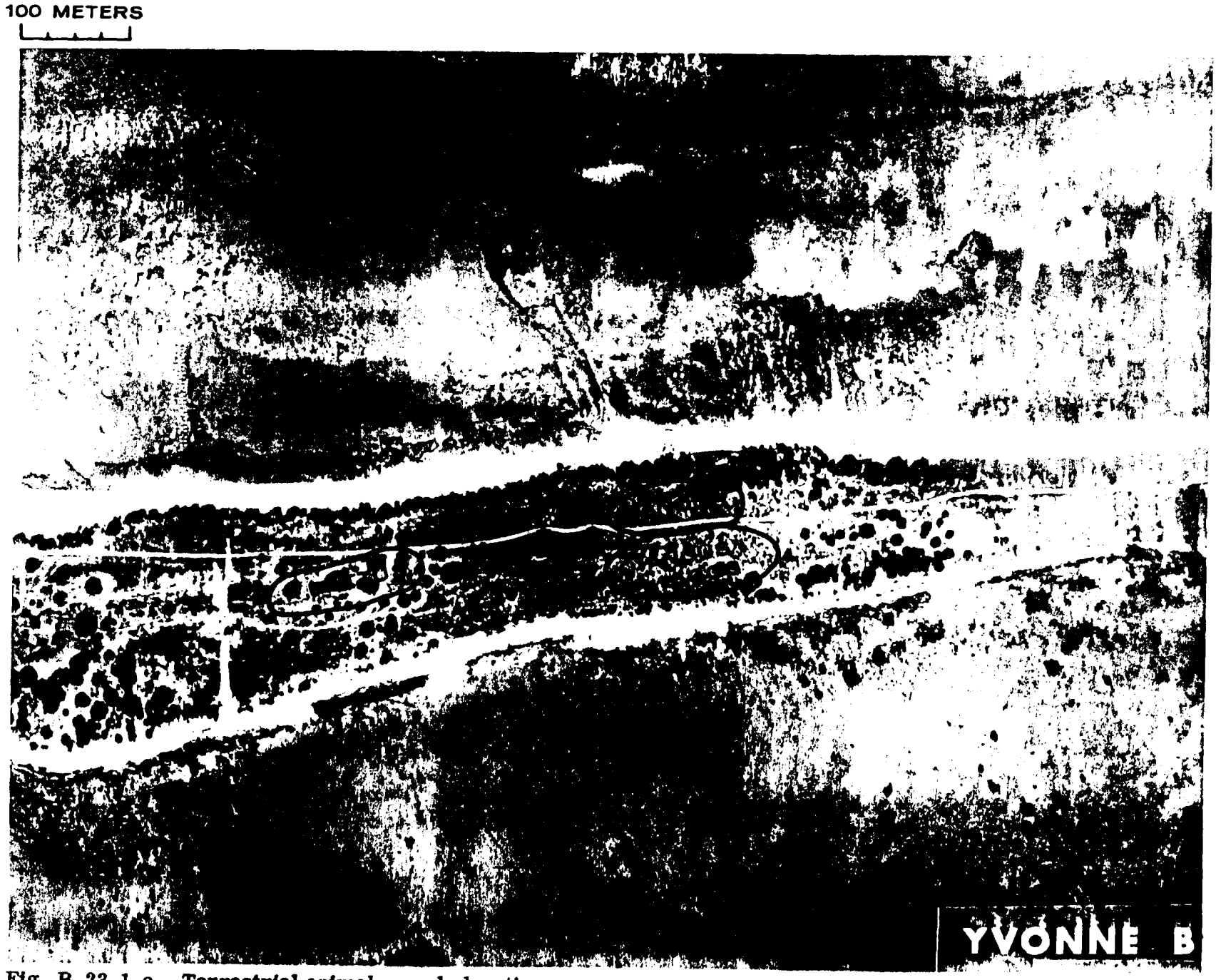



Fig. B.23.1.o. Terrestrial animal sample locations.

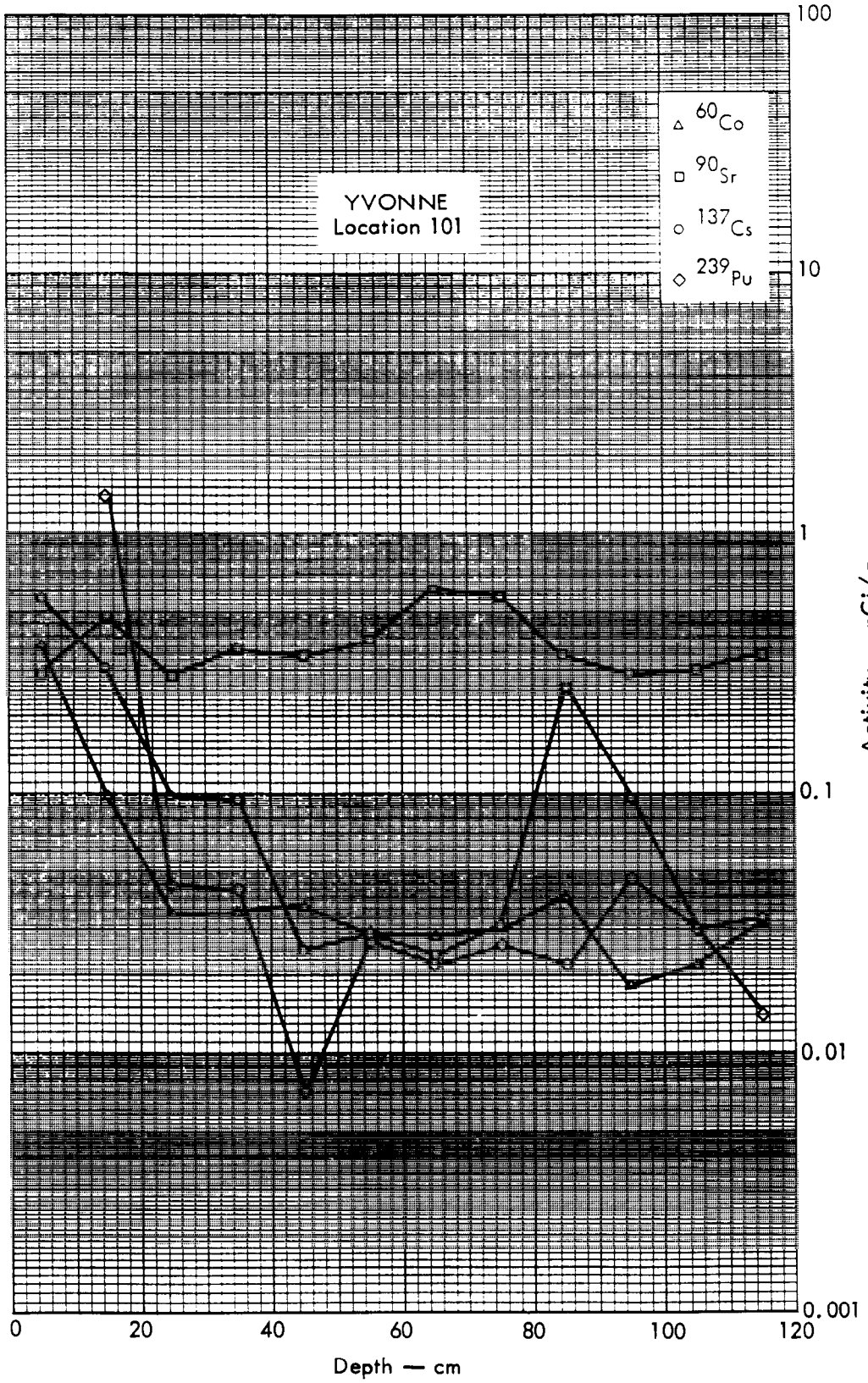



Fig. B. 23.2a. Activities of selected radionuclides as a function of soil depth.

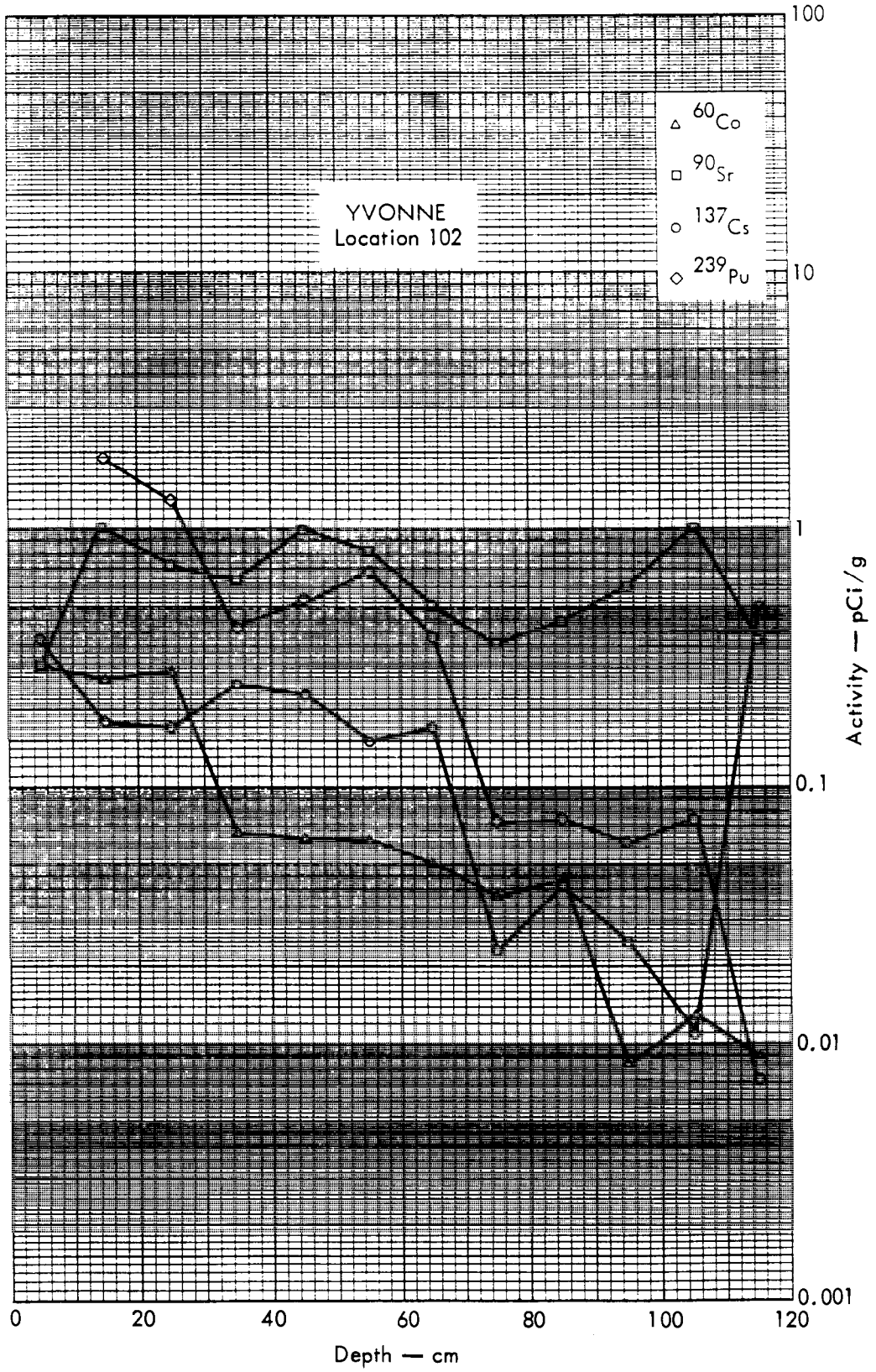



Fig. B. 23.2b. Activities of selected radionuclides as a function of soil depth.

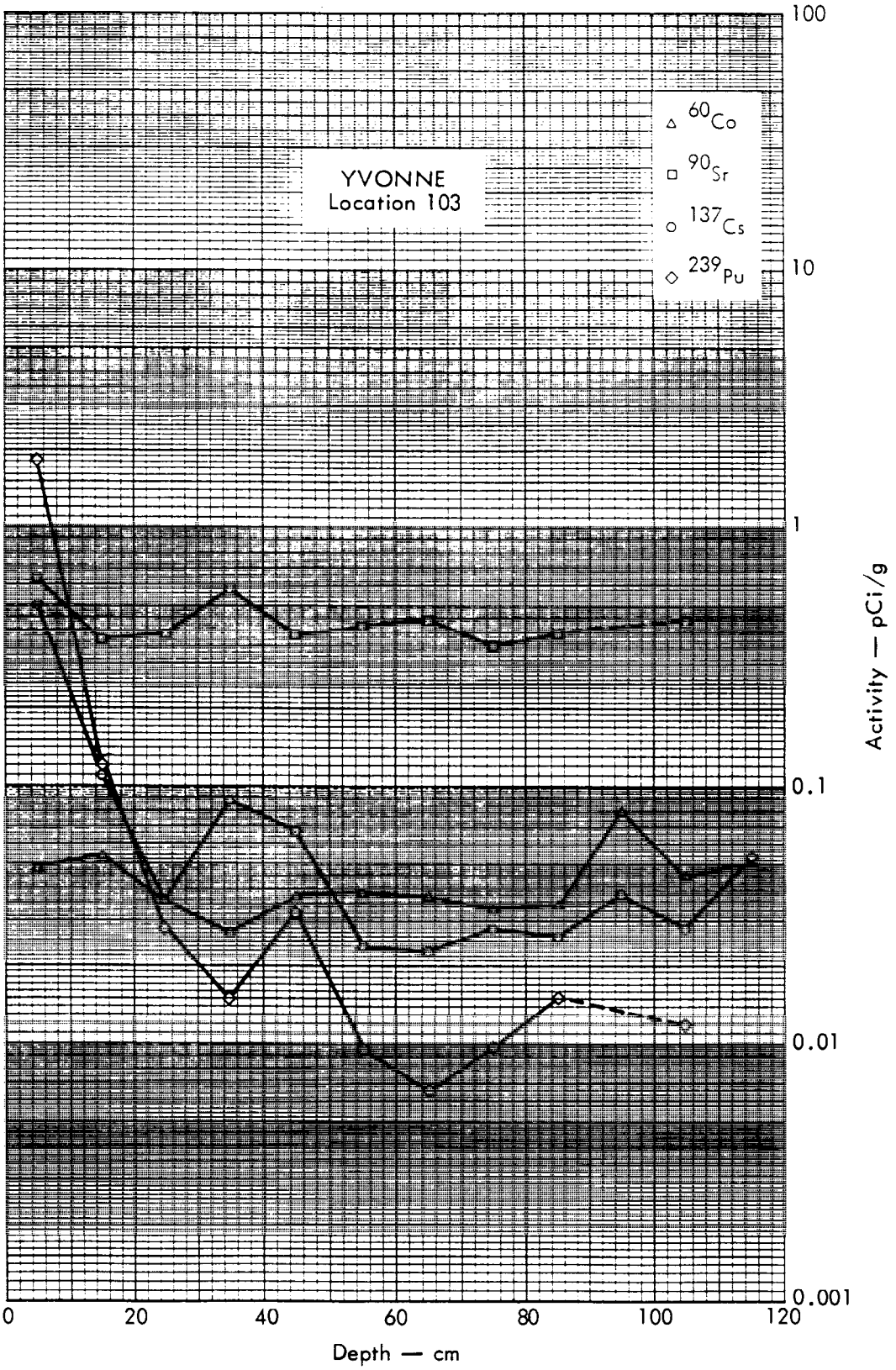



Fig. B. 23.2c. Activities of selected radionuclides as a function of soil depth.

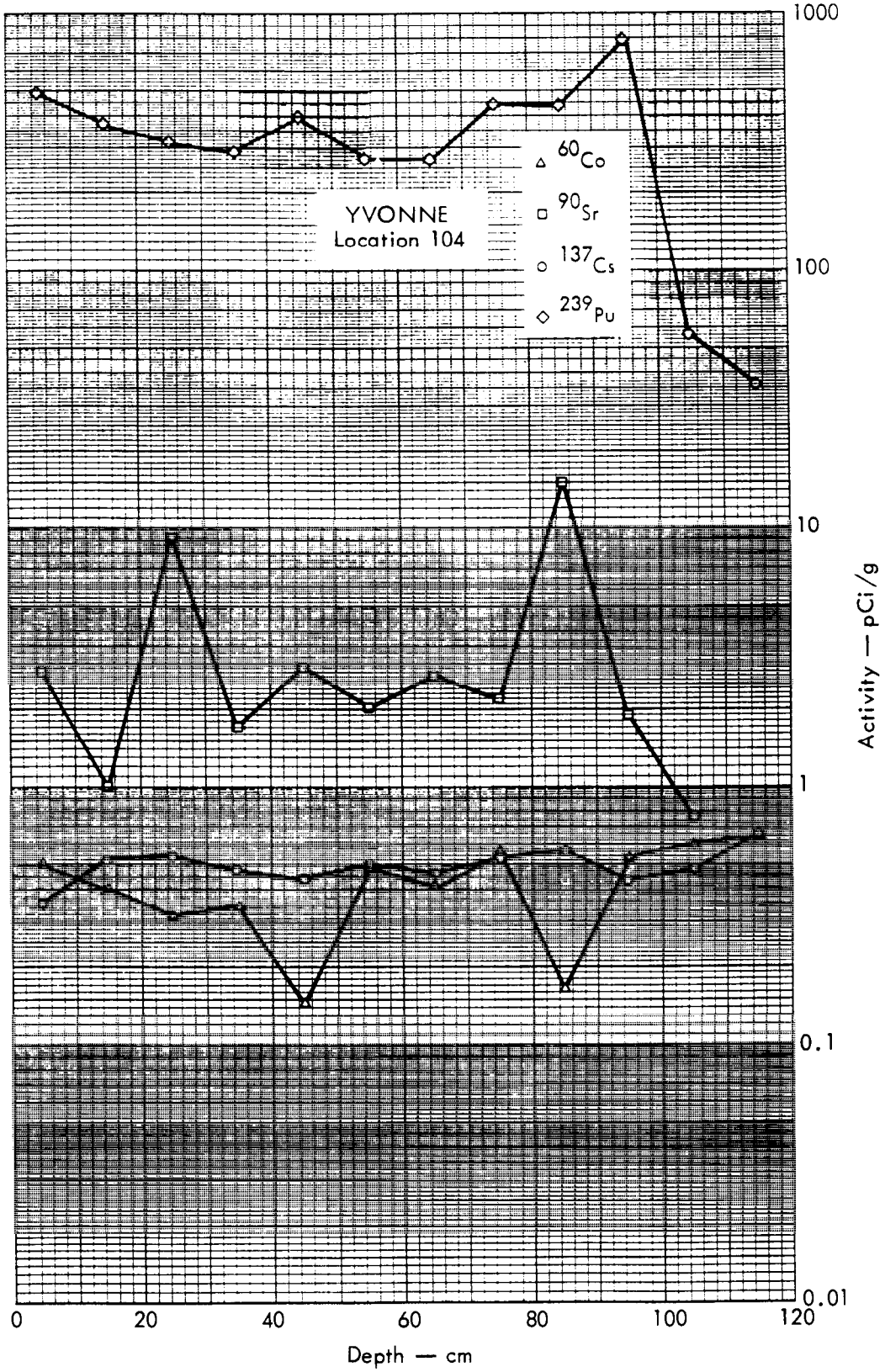



Fig. B. 23.2d. Activities of selected radionuclides as a function of soil depth.

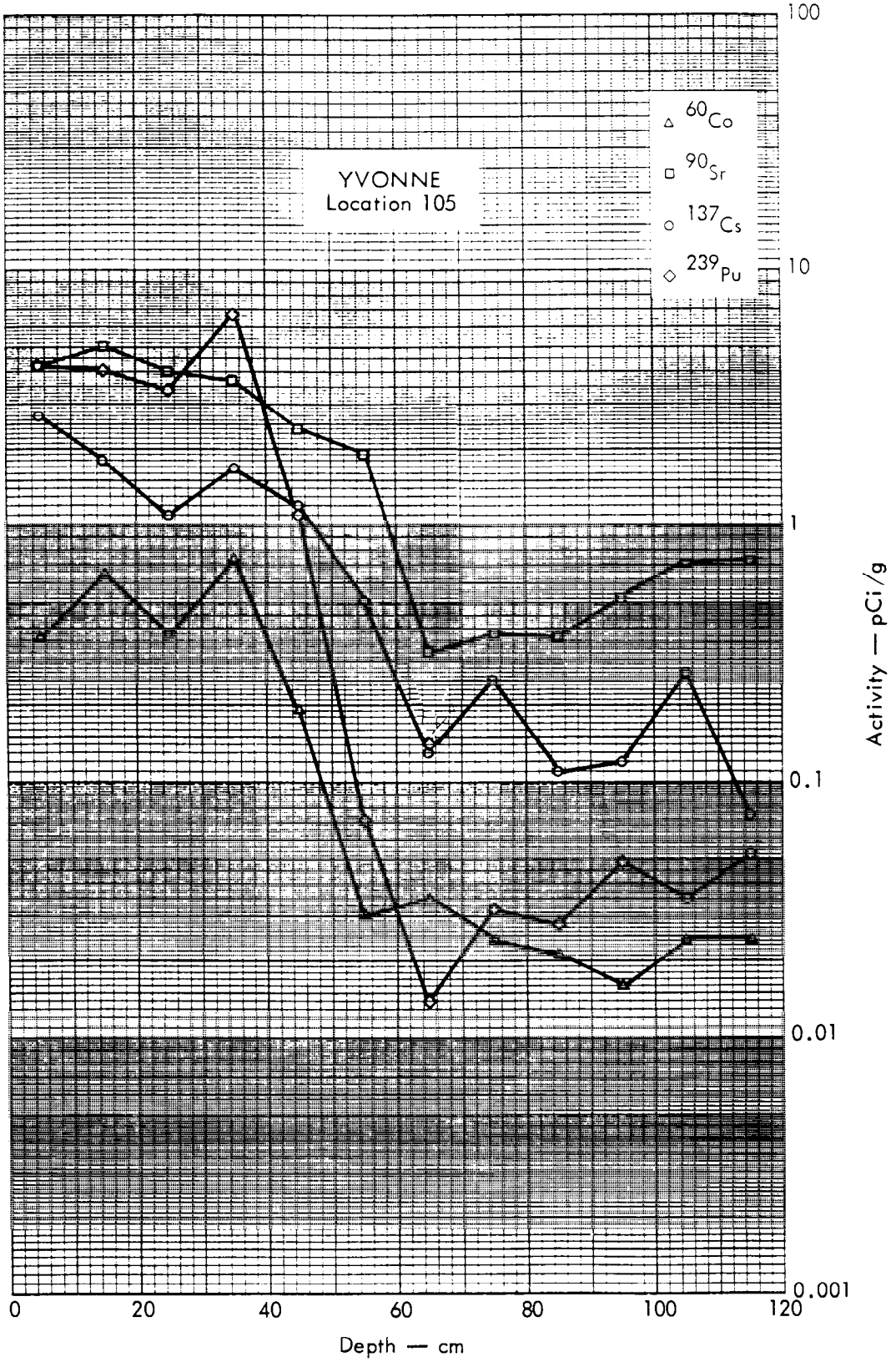



Fig. B. 23.2e. Activities of selected radionuclides as a function of soil depth.

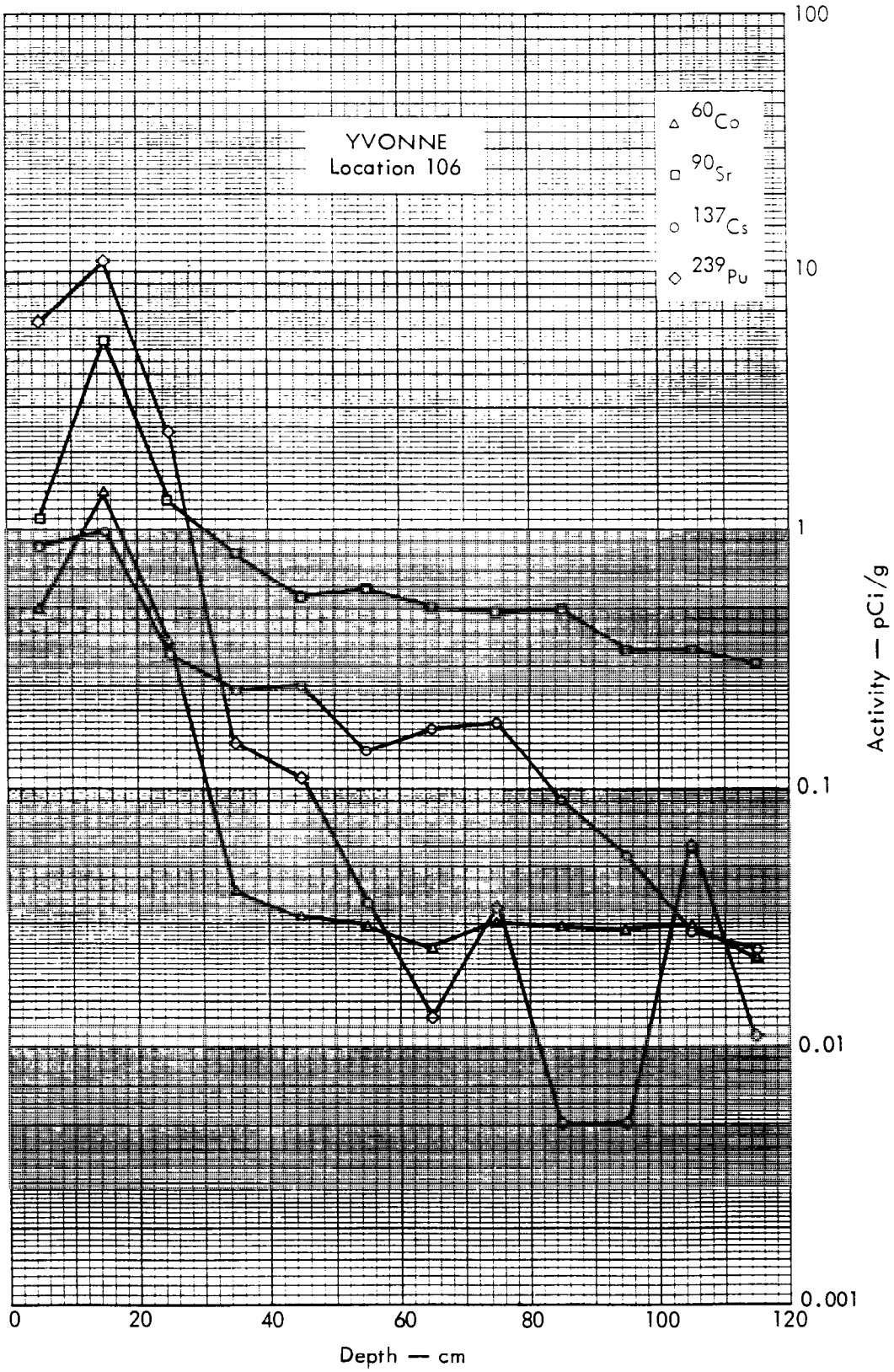



Fig. B. 23.2f. Activities of selected radionuclides as a function of soil depth.

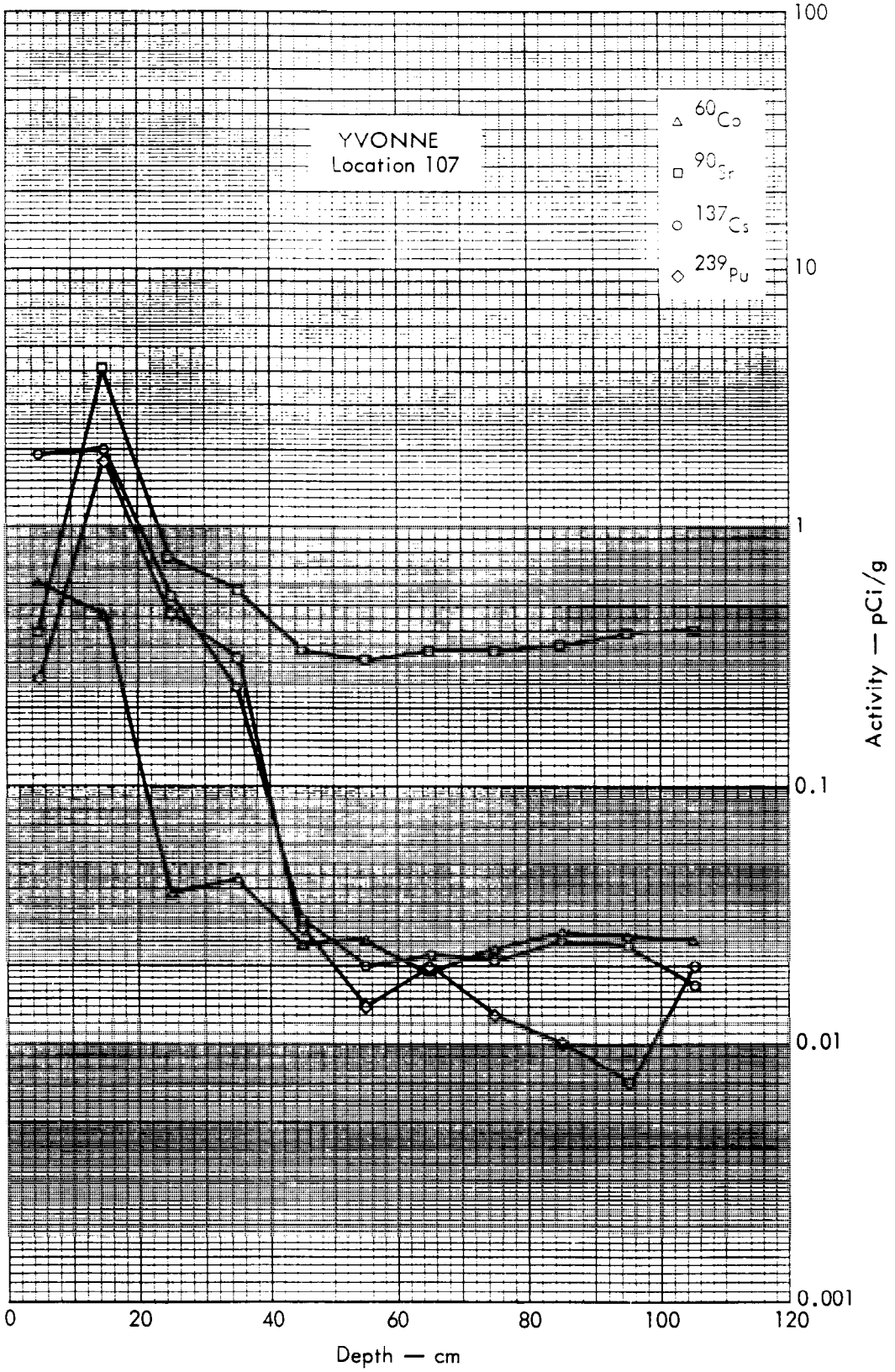



Fig. B. 23.2g. Activities of selected radionuclides as a function of soil depth.

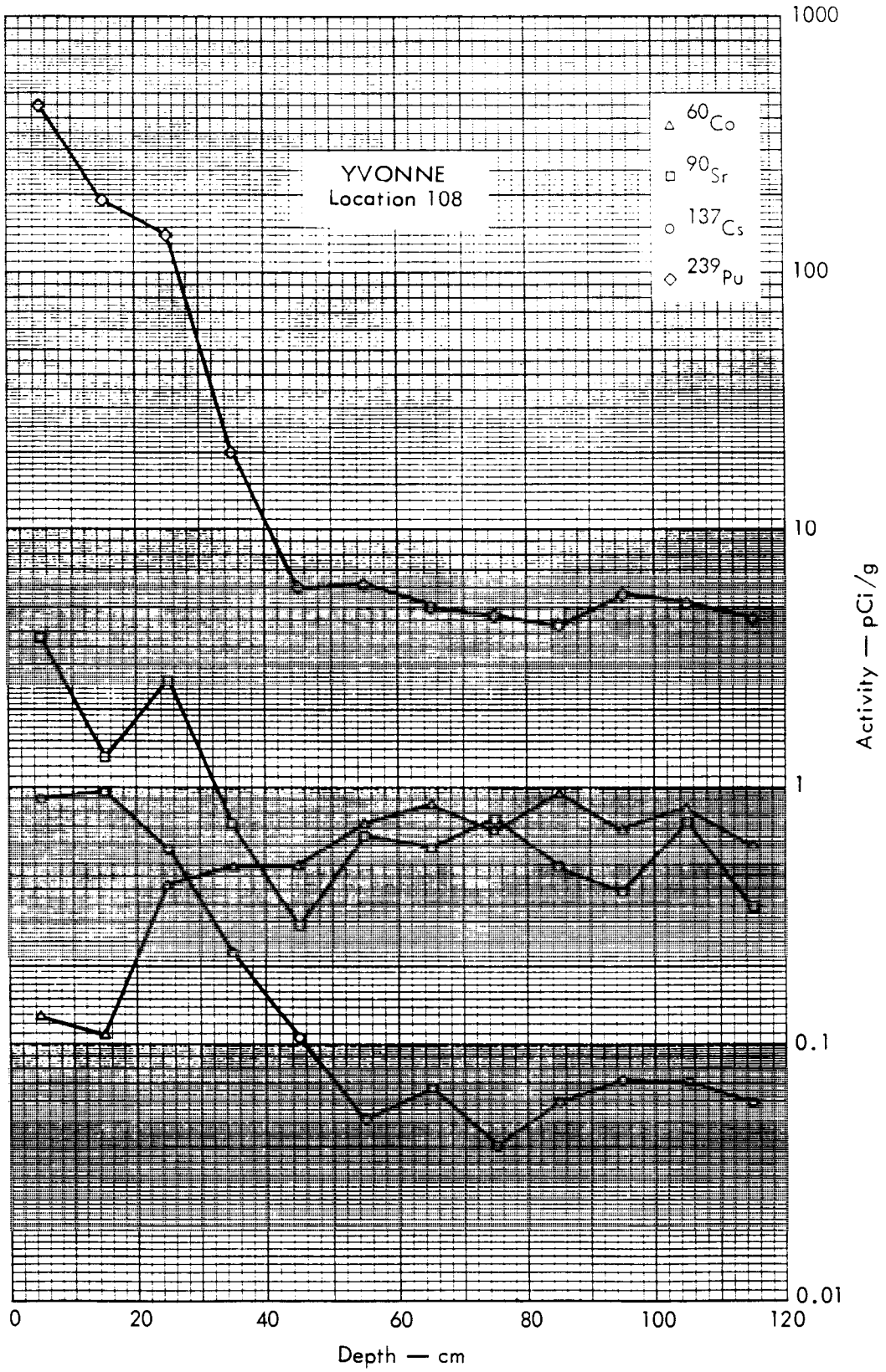



Fig. B. 23.2h. Activities of selected radionuclides as a function of soil depth.

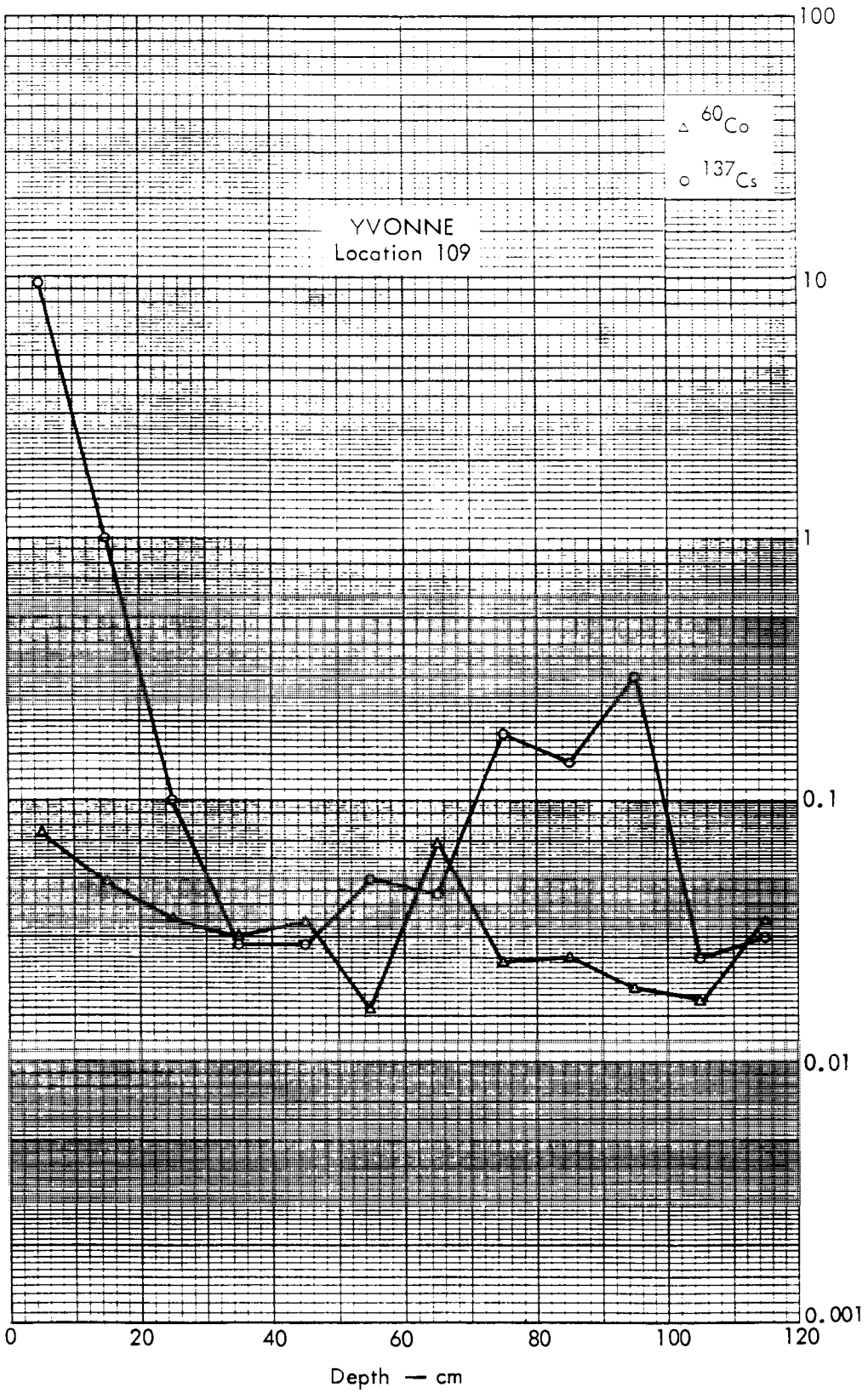



Fig. B. 23.2i. Activities of selected radionuclides as a function of soil depth.

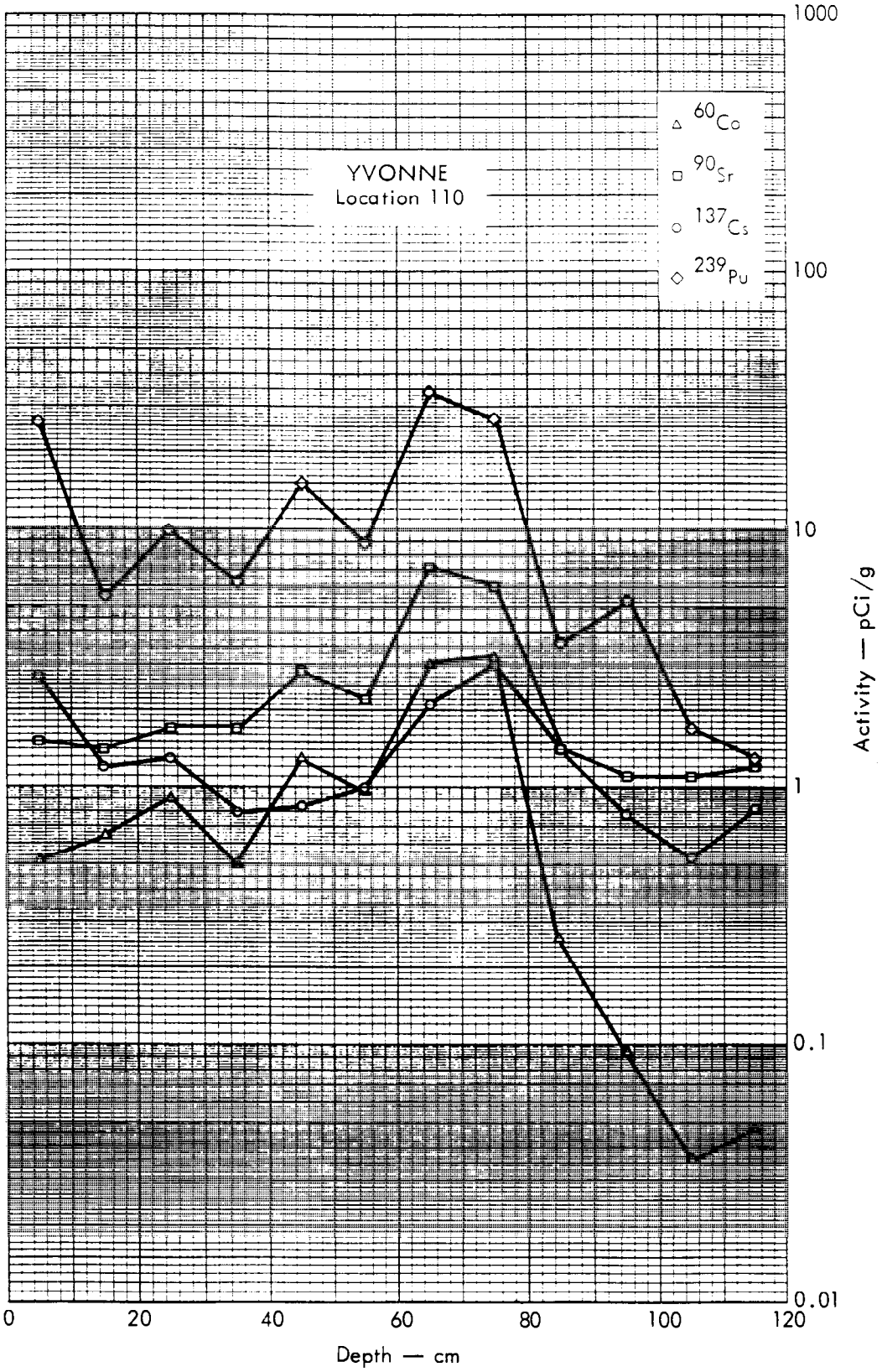



Fig. B. 23.2j. Activities of selected radionuclides as a function of soil depth.

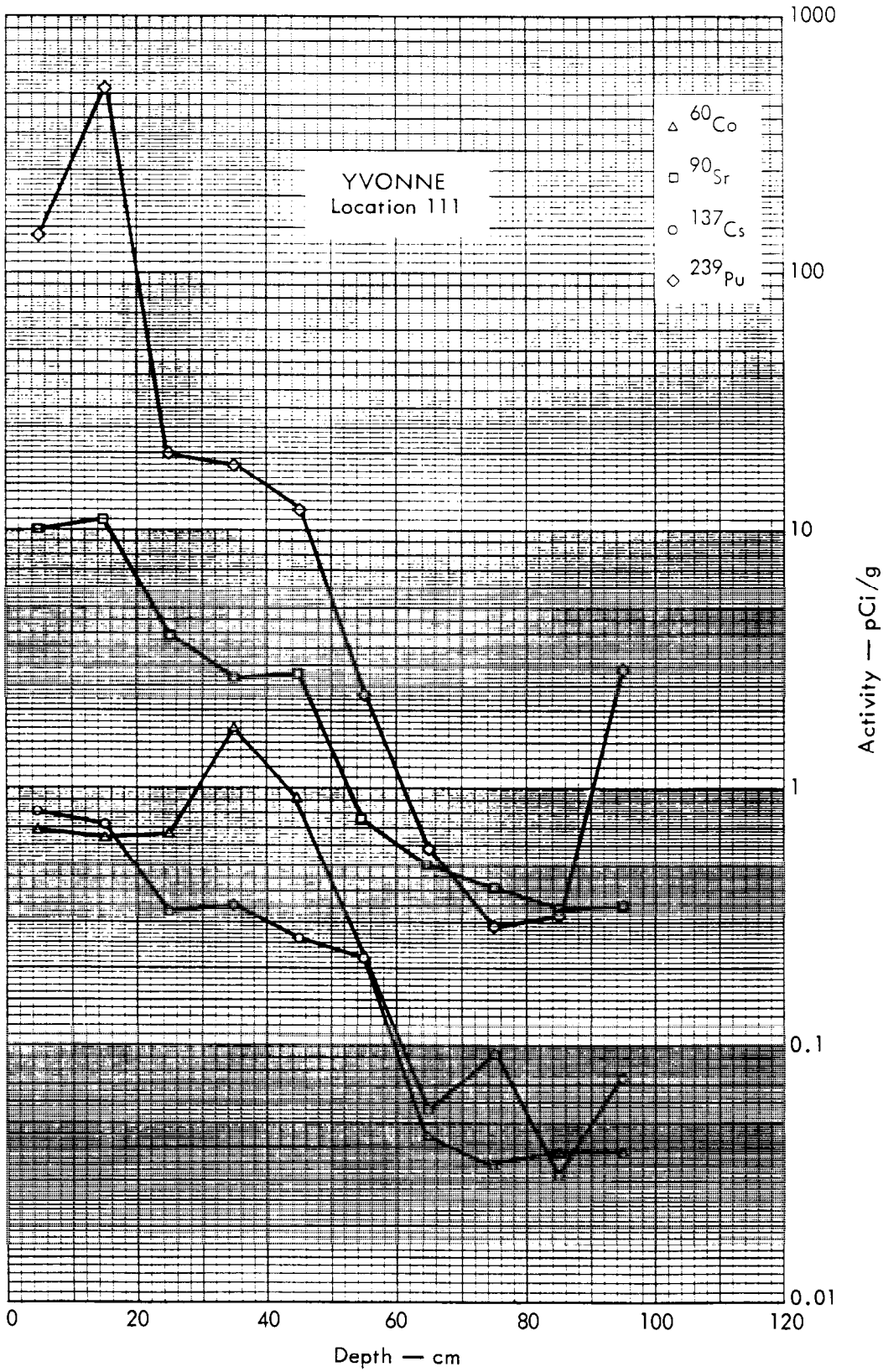



Fig. B. 23.2k. Activities of selected radionuclides as a function of soil depth.

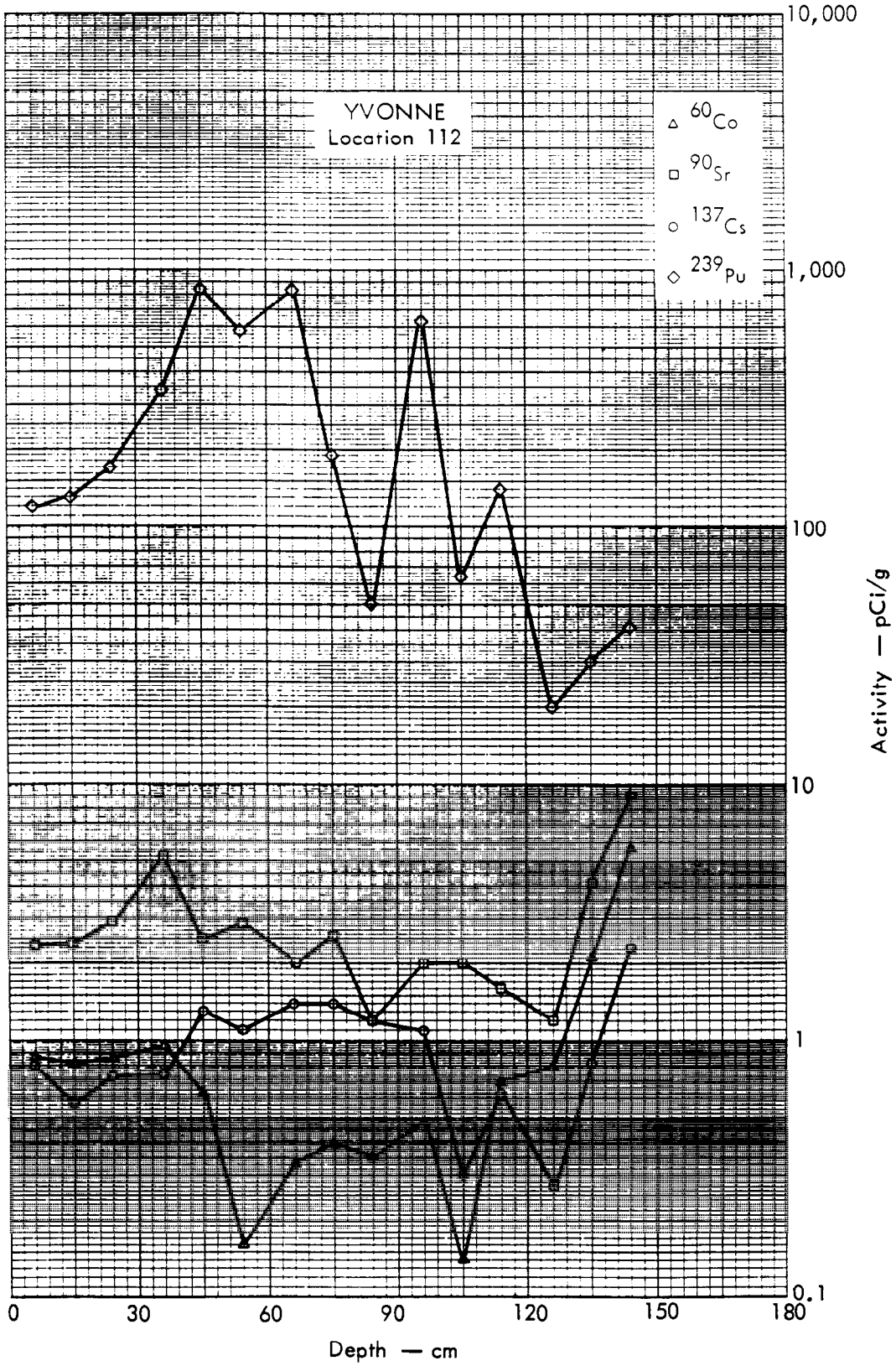



Fig. B. 23.21. Activities of selected radionuclides as a function of soil depth.

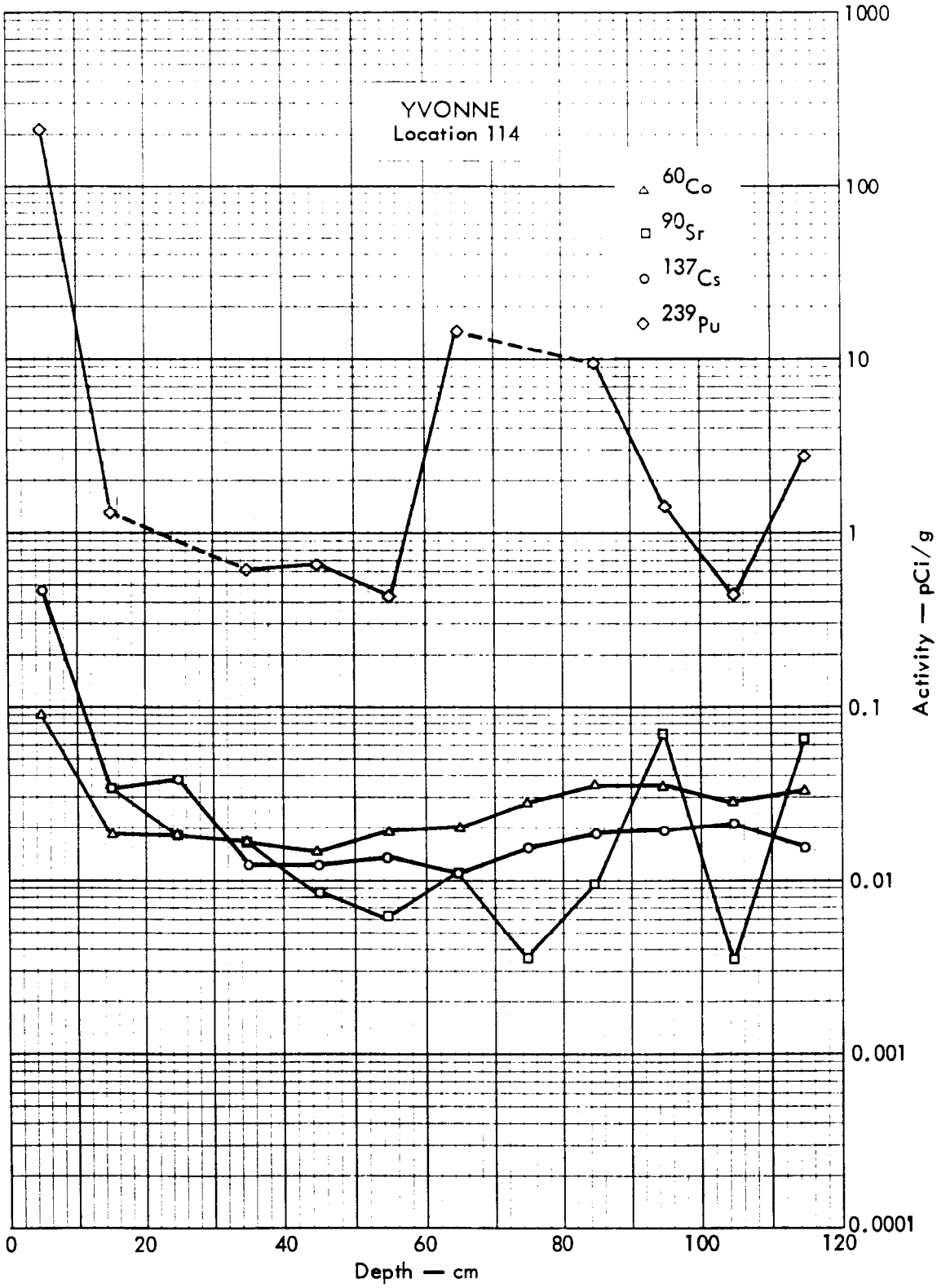



Fig. B. 23.2n. Activities of selected radionuclides as a function of soil depth.

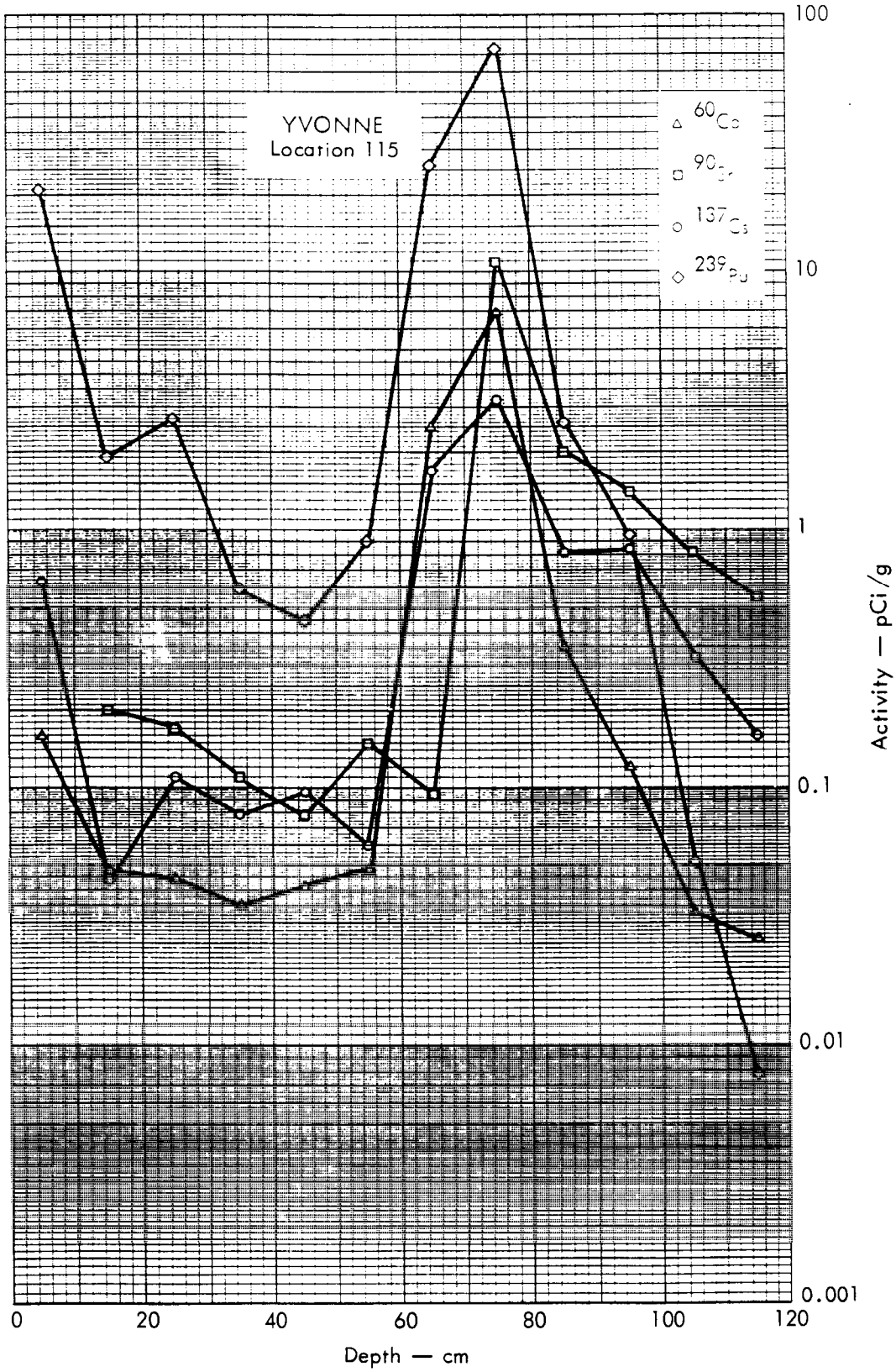



Fig. B. 23.2o. Activities of selected radionuclides as a function of soil depth.

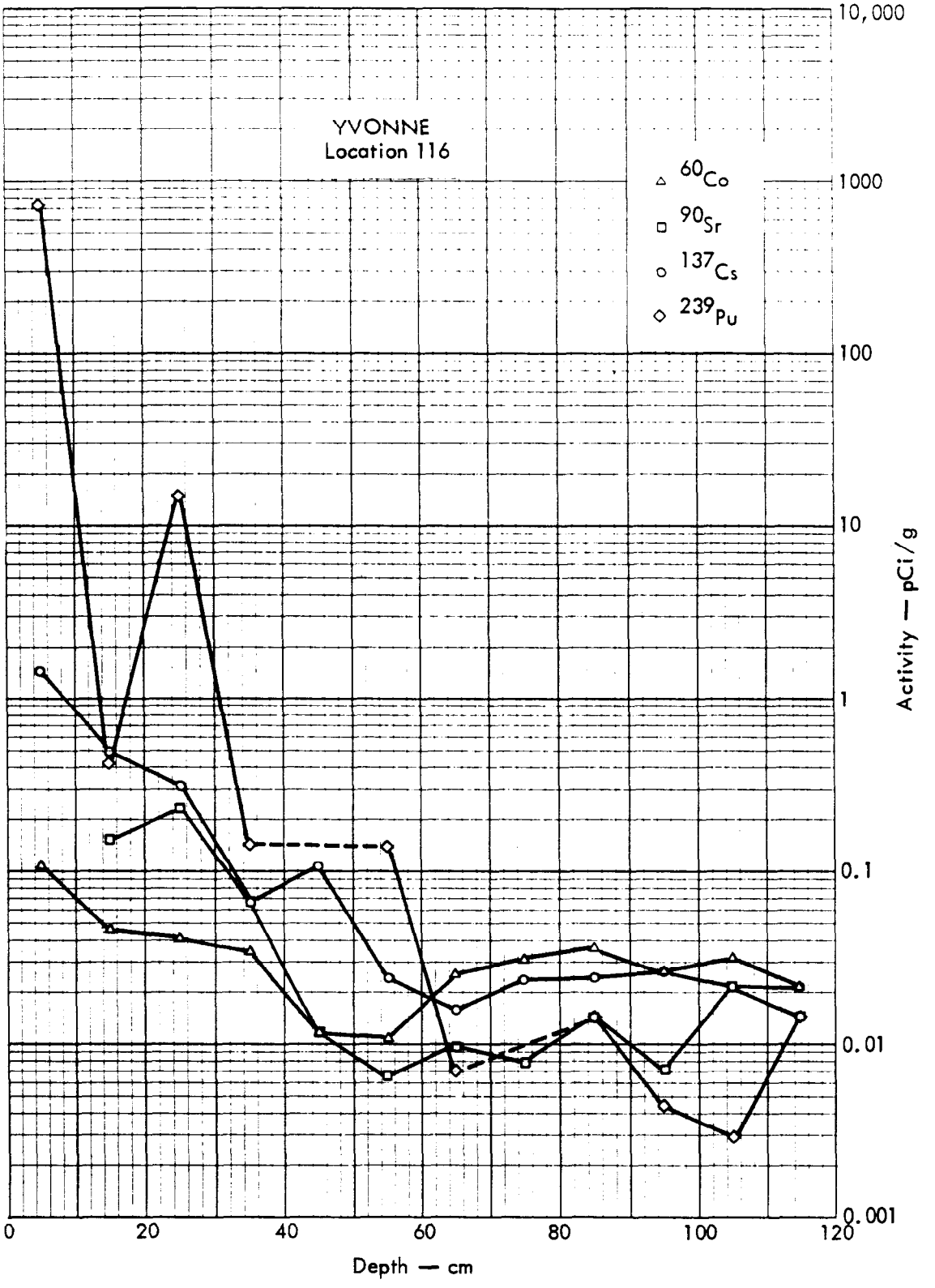



Fig. B. 23.2p. Activities of selected radionuclides as a function of soil depth.

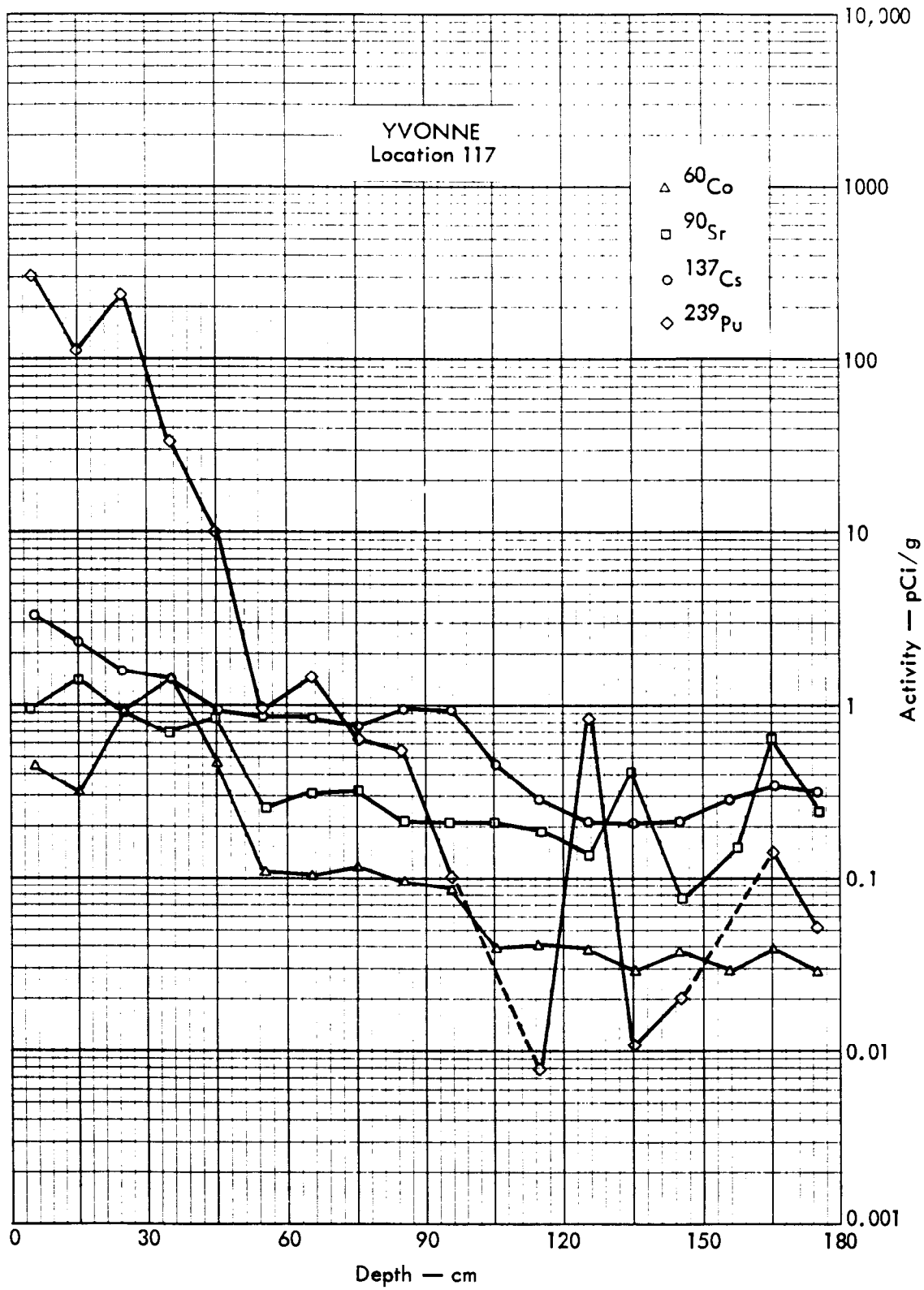



Fig. B. 23.2q. Activities of selected radionuclides as a function of soil depth.

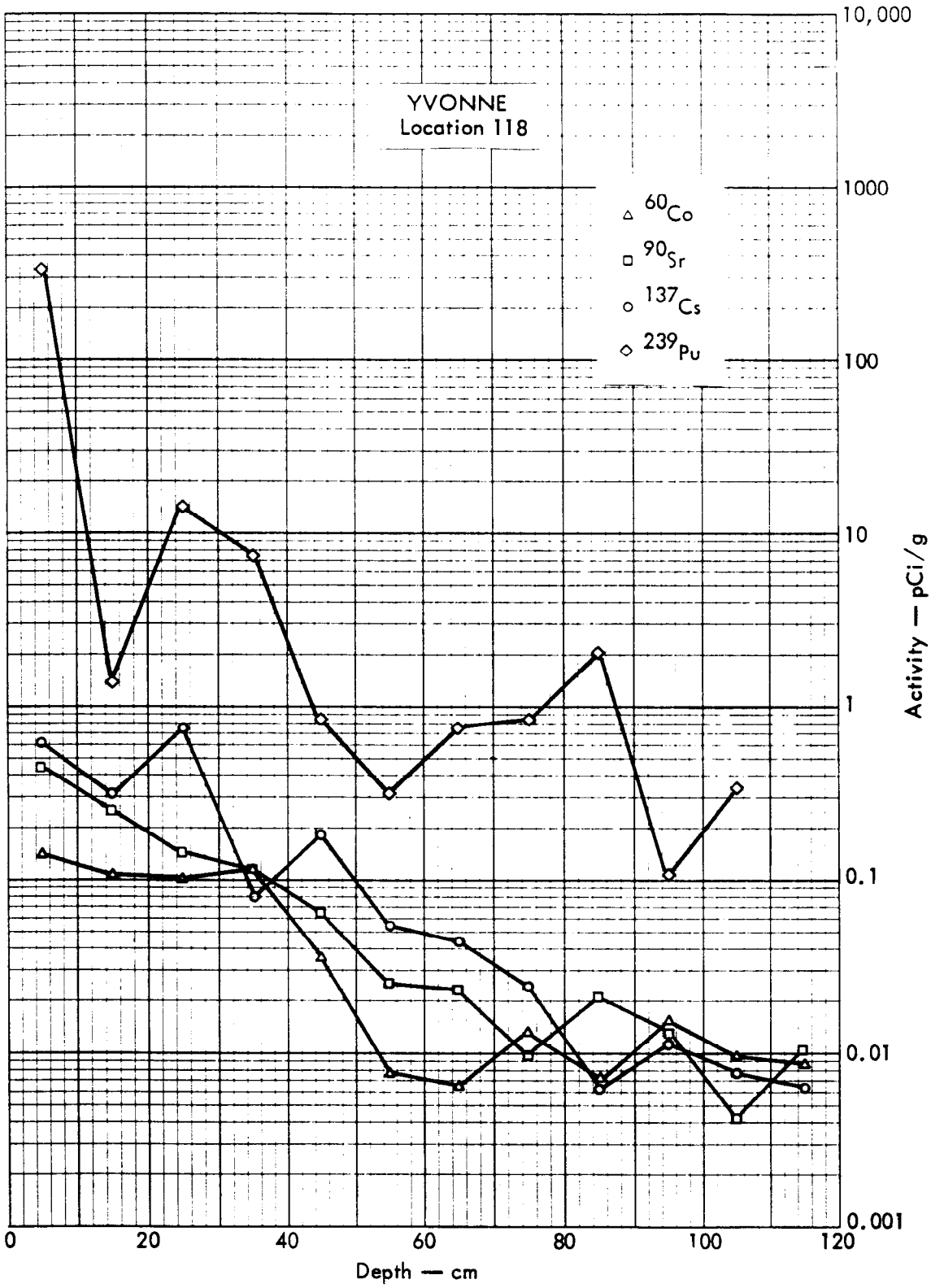



**Fig. B. 23.2r.** Activities of selected radionuclides as a function of soil depth.

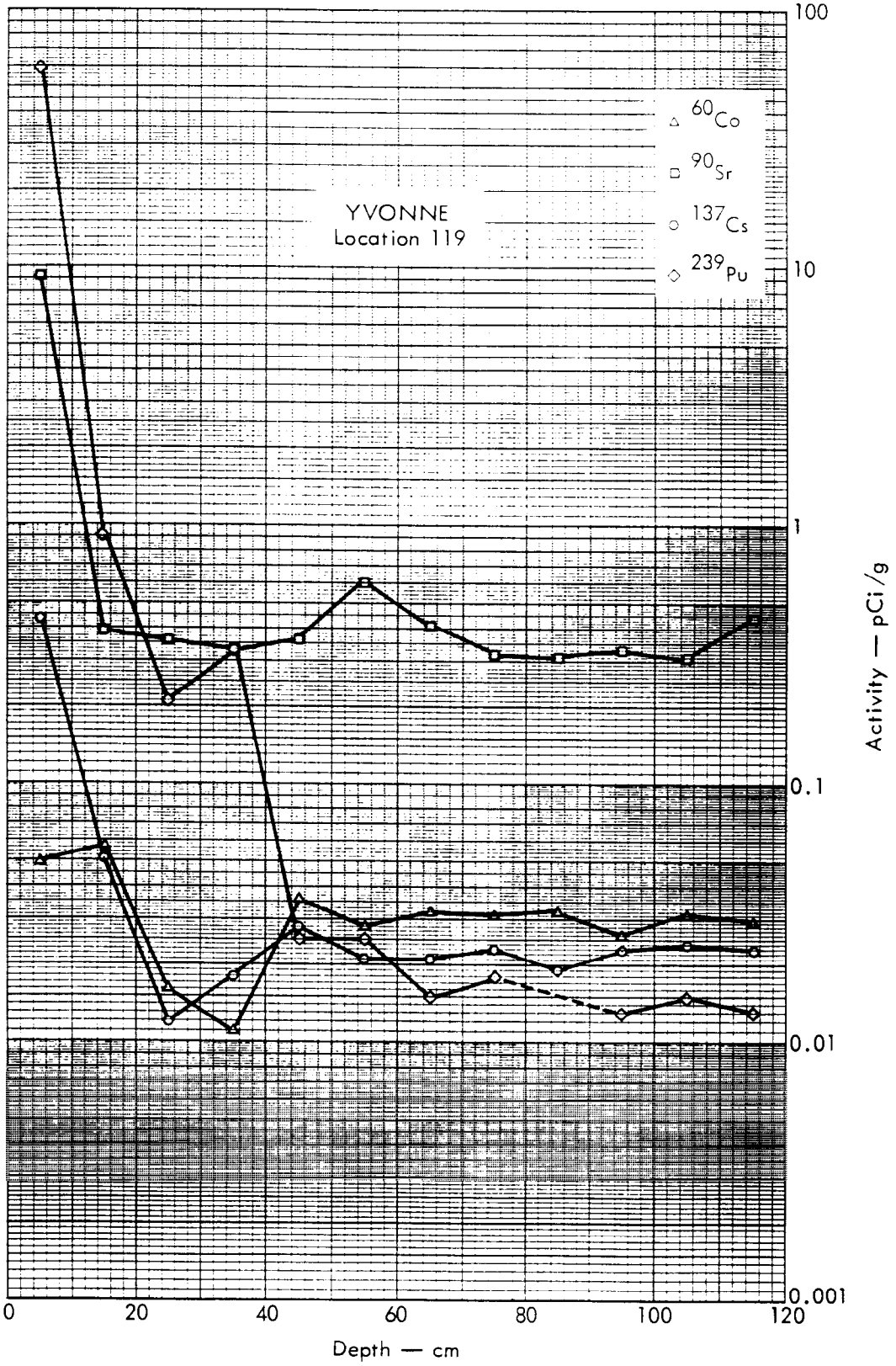



Fig. B. 23.2s. Activities of selected radionuclides as a function of soil depth.

Fig. B. 23.2t. Activities of selected radionuclides as a function of soil depth.

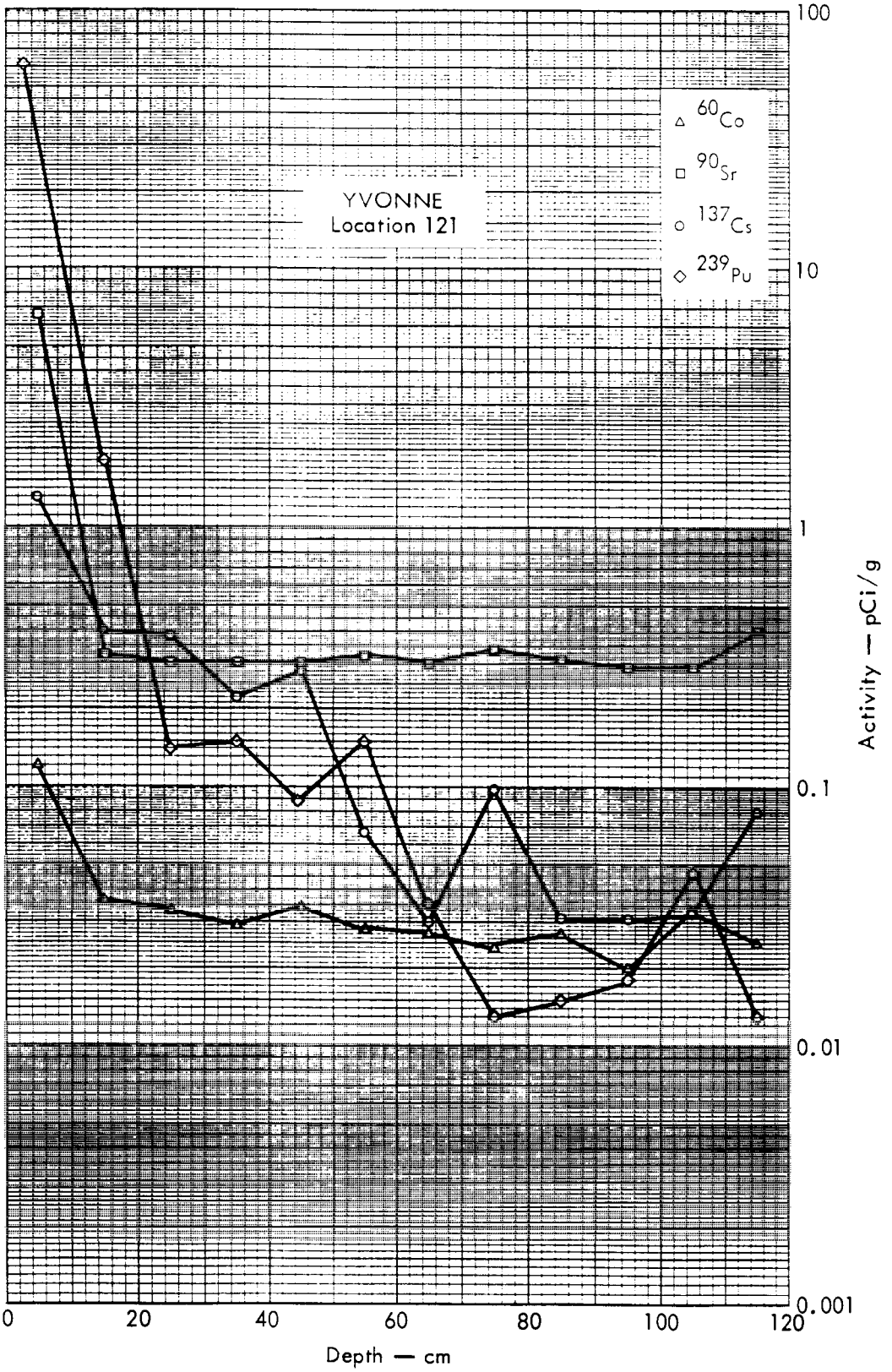



Fig. B. 23.2u. Activities of selected radionuclides as a function of soil depth.

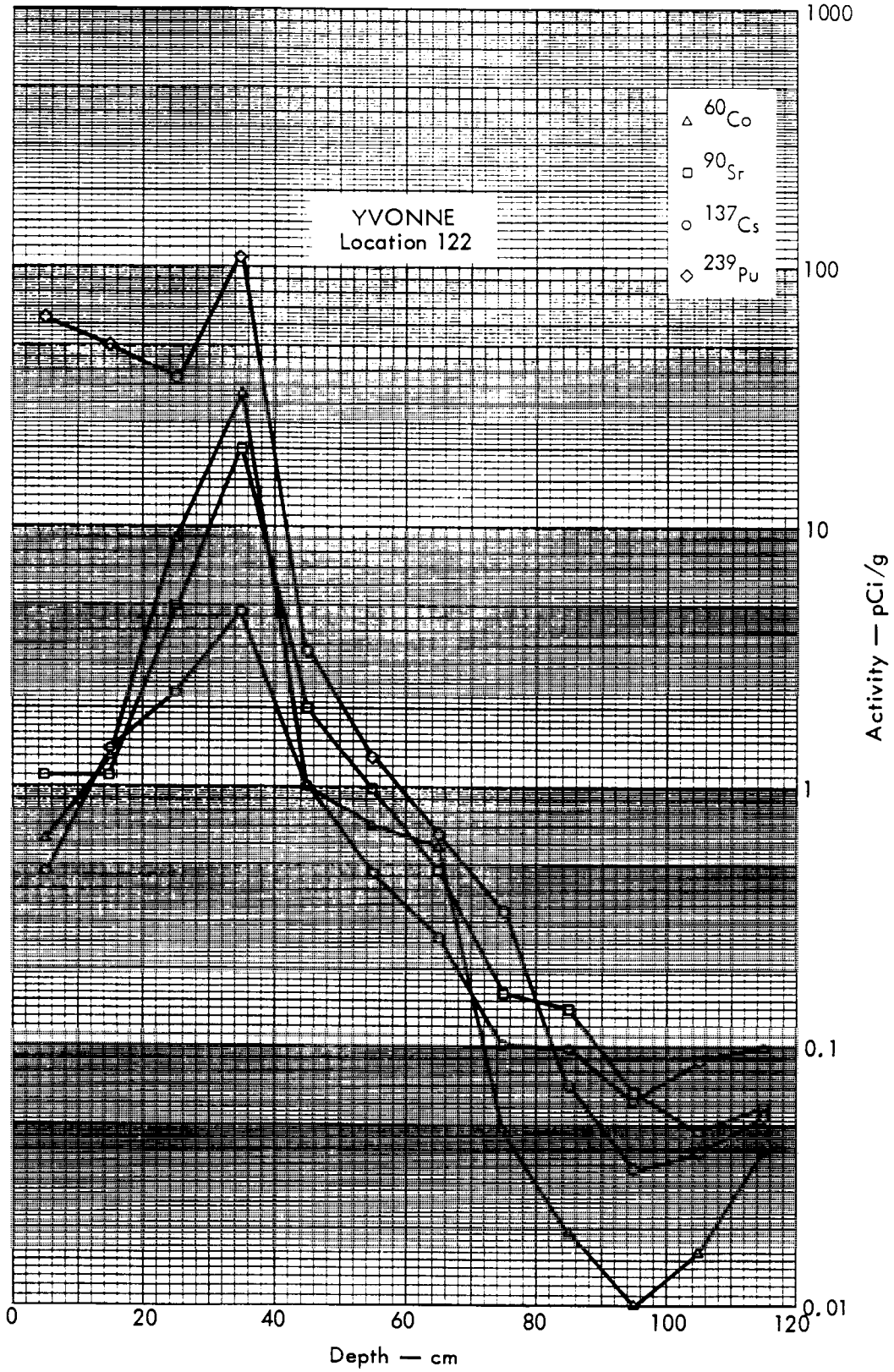



Fig. B. 23.2v. Activities of selected radionuclides as a function of soil depth.

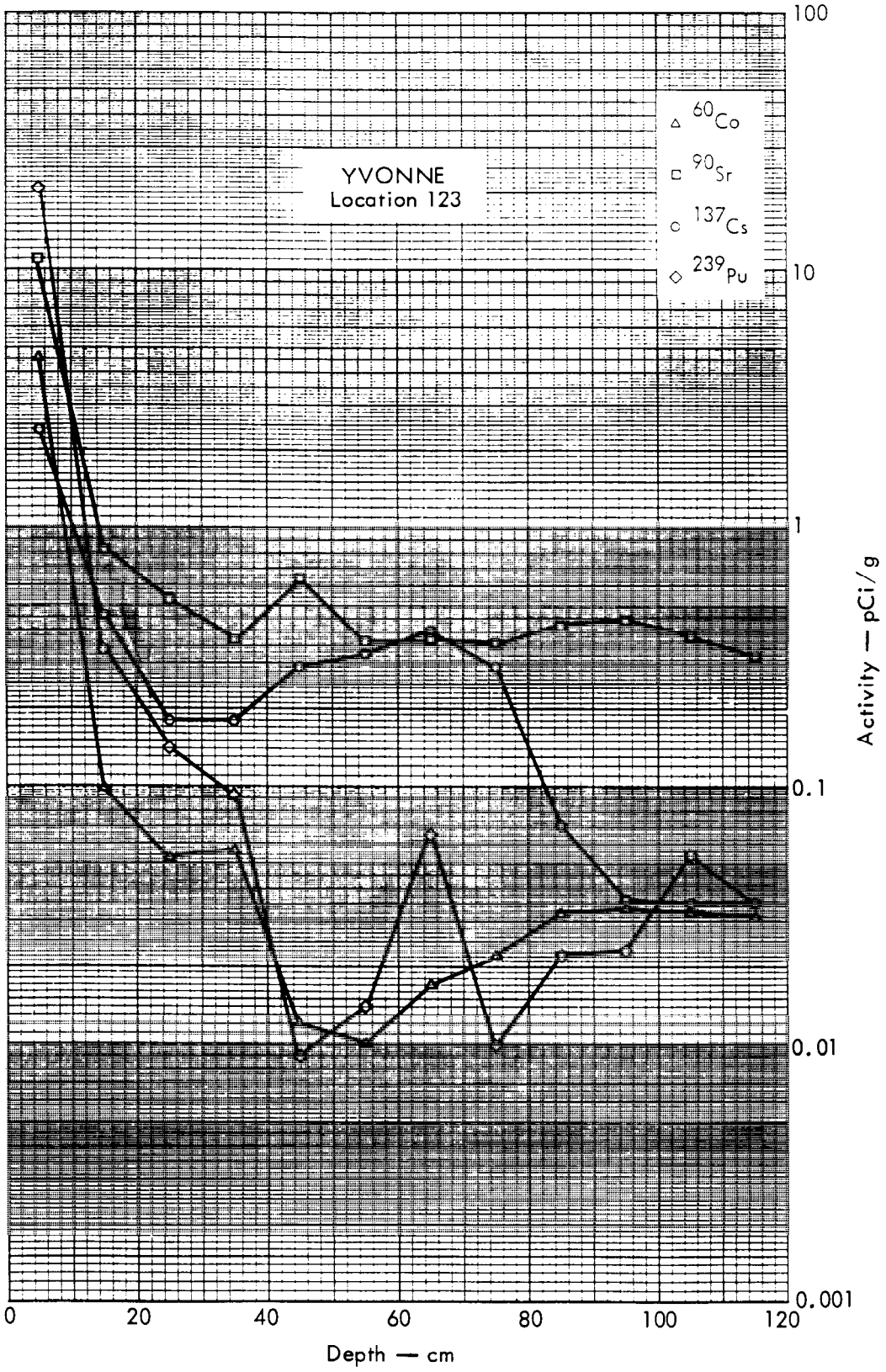



Fig. B. 23.2w. Activities of selected radionuclides as a function of soil depth.

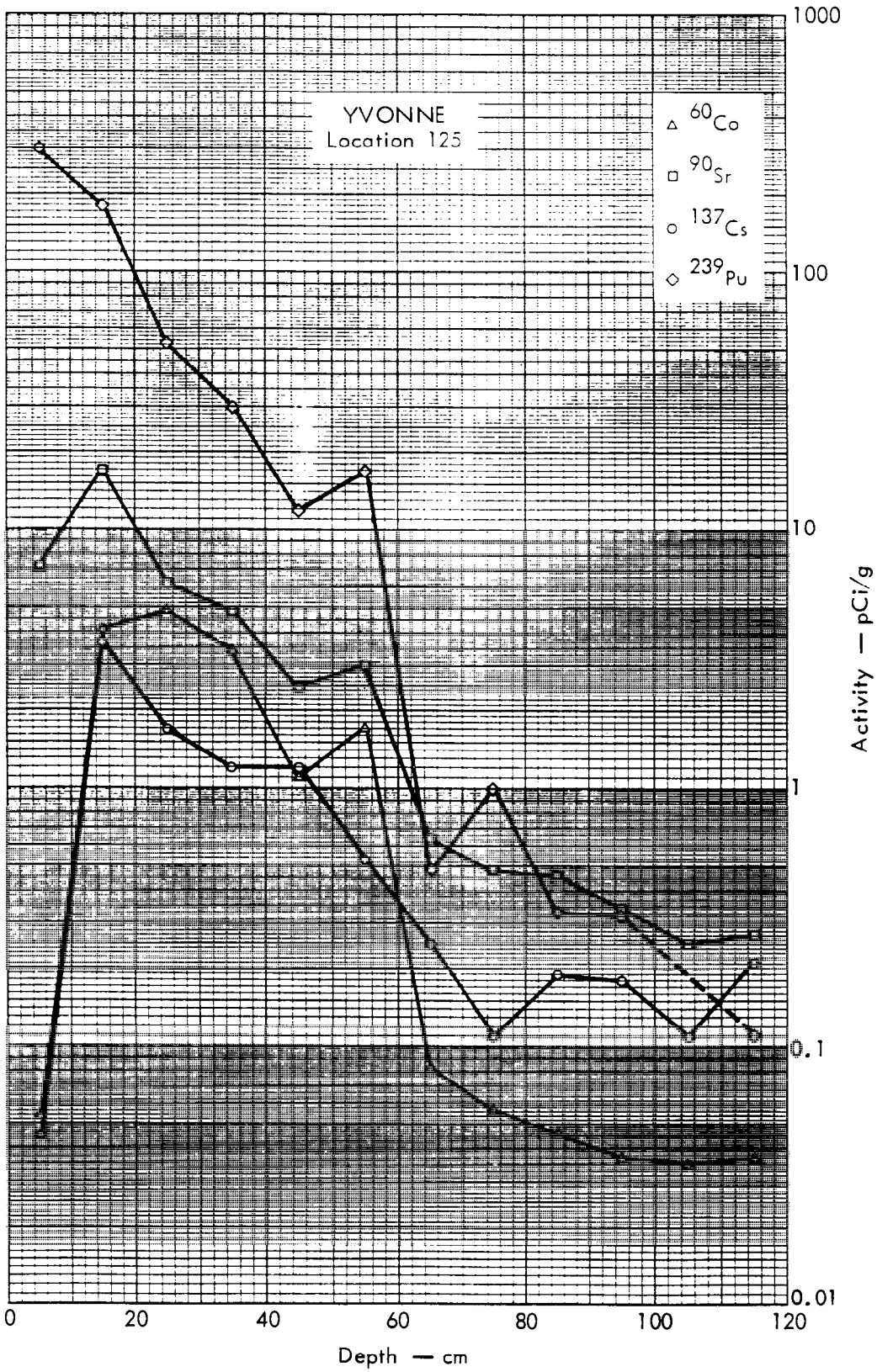



Fig. B.23.2y. Activities of selected radionuclides as a function of soil depth.

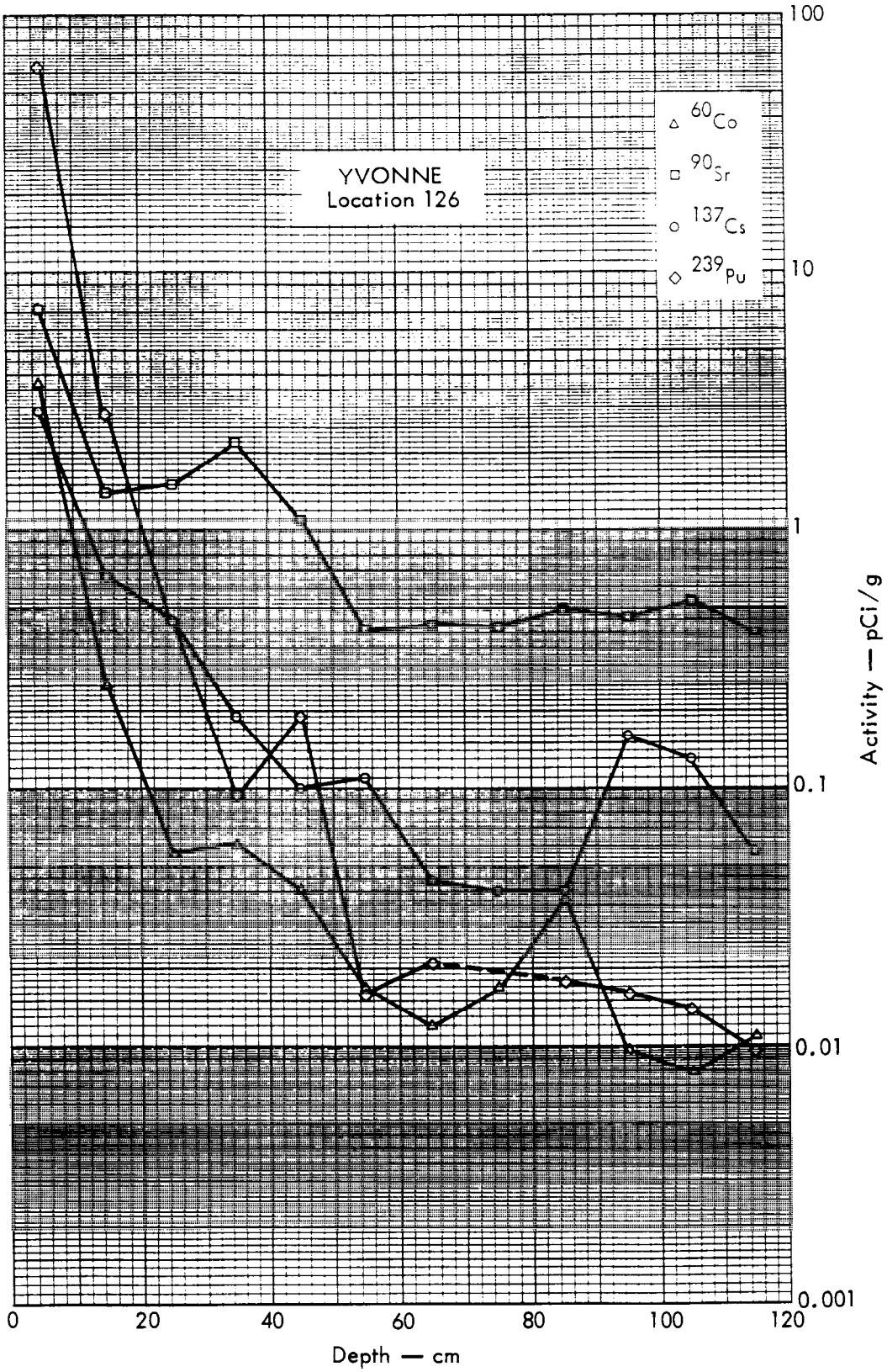



Fig. B. 23.2z. Activities of selected radionuclides as a function of soil depth.

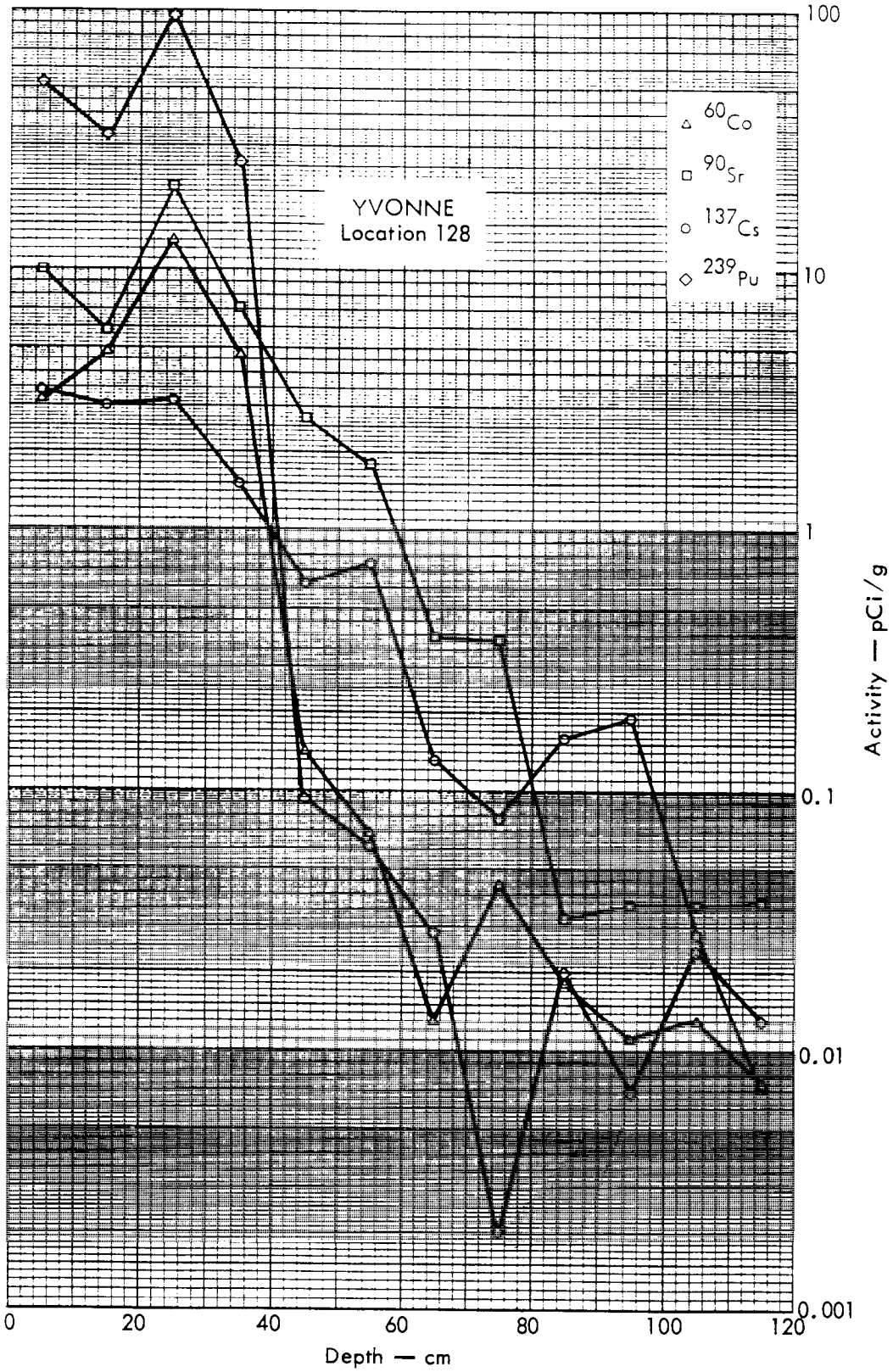



Fig. B. 23.2aa. Activities of selected radionuclides as a function of soil depth.

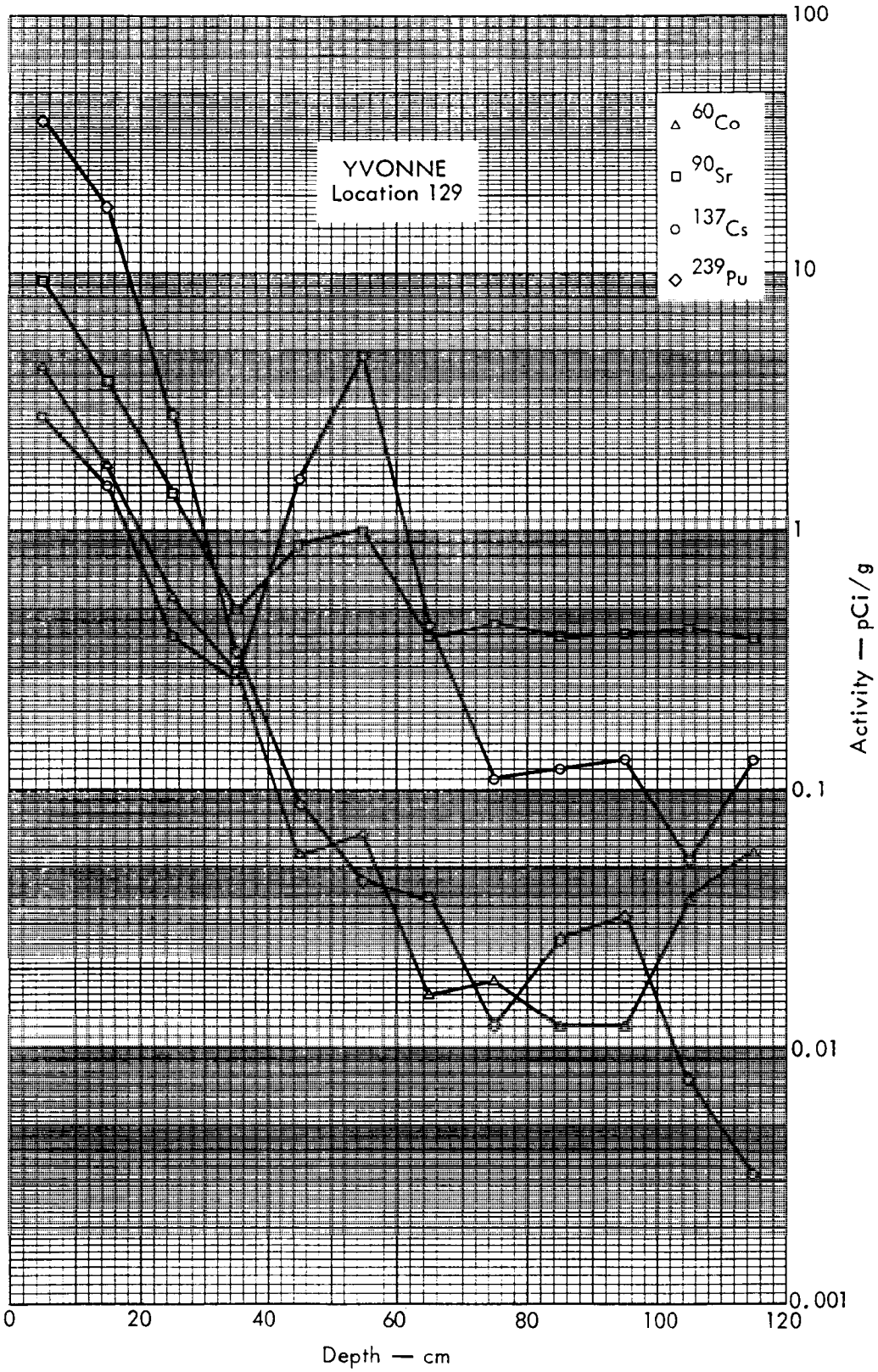



Fig. B. 23.2bb. Activities of selected radionuclides as a function of soil depth.

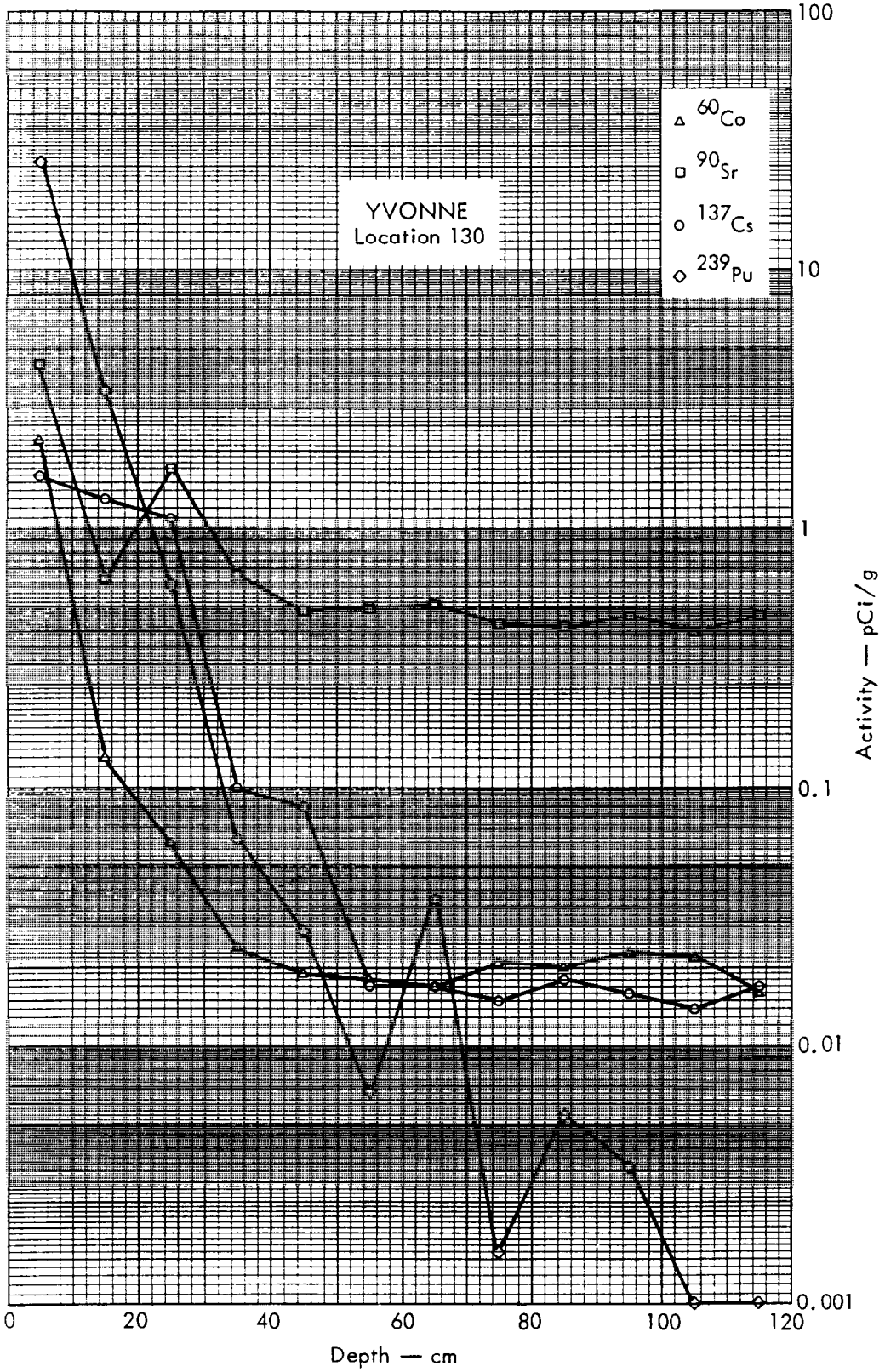



Fig. B. 23.2cc. Activities of selected radionuclides as a function of soil depth.

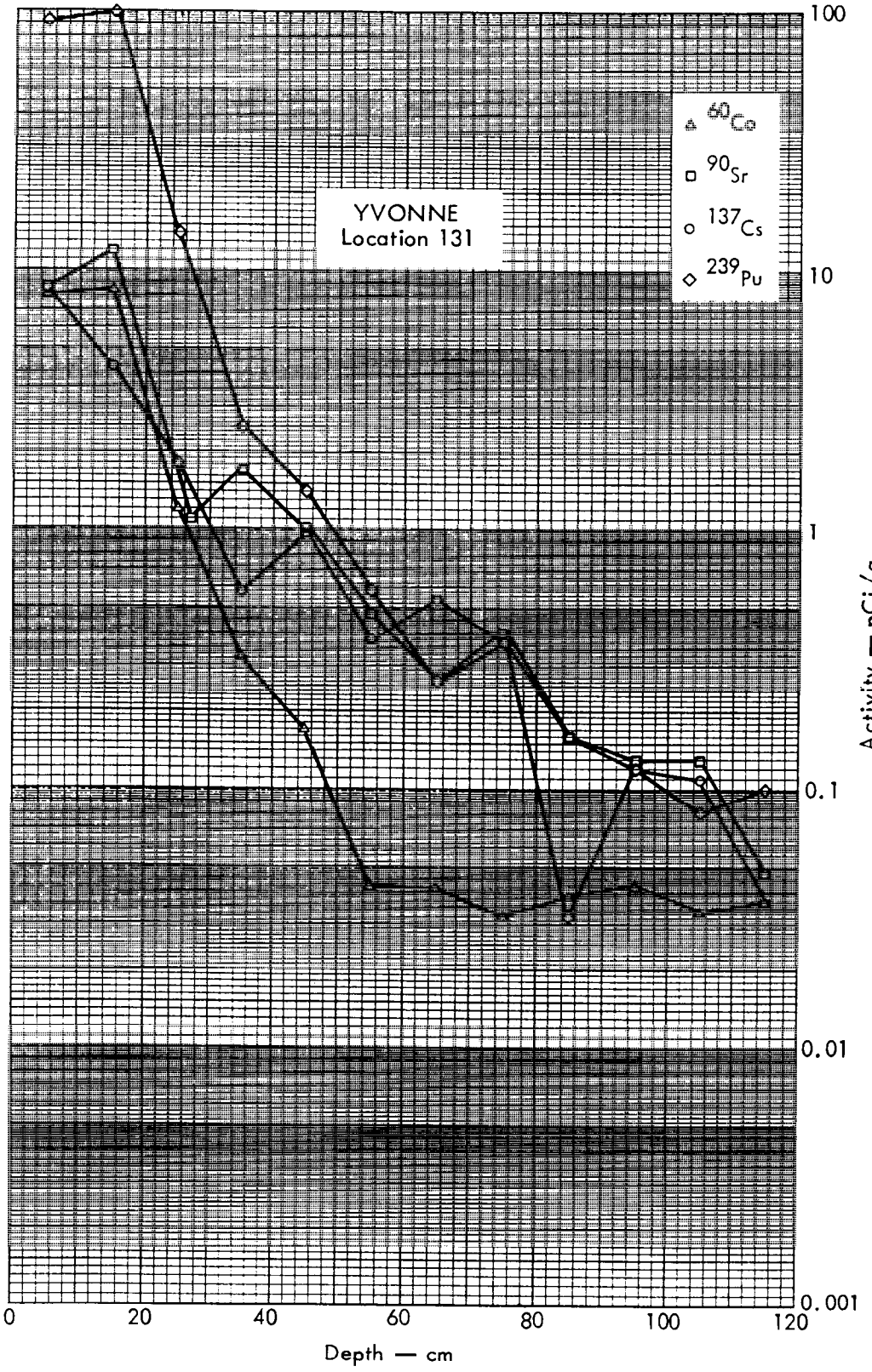



Fig. B. 23.2dd. Activities of selected radionuclides as a function of soil depth.

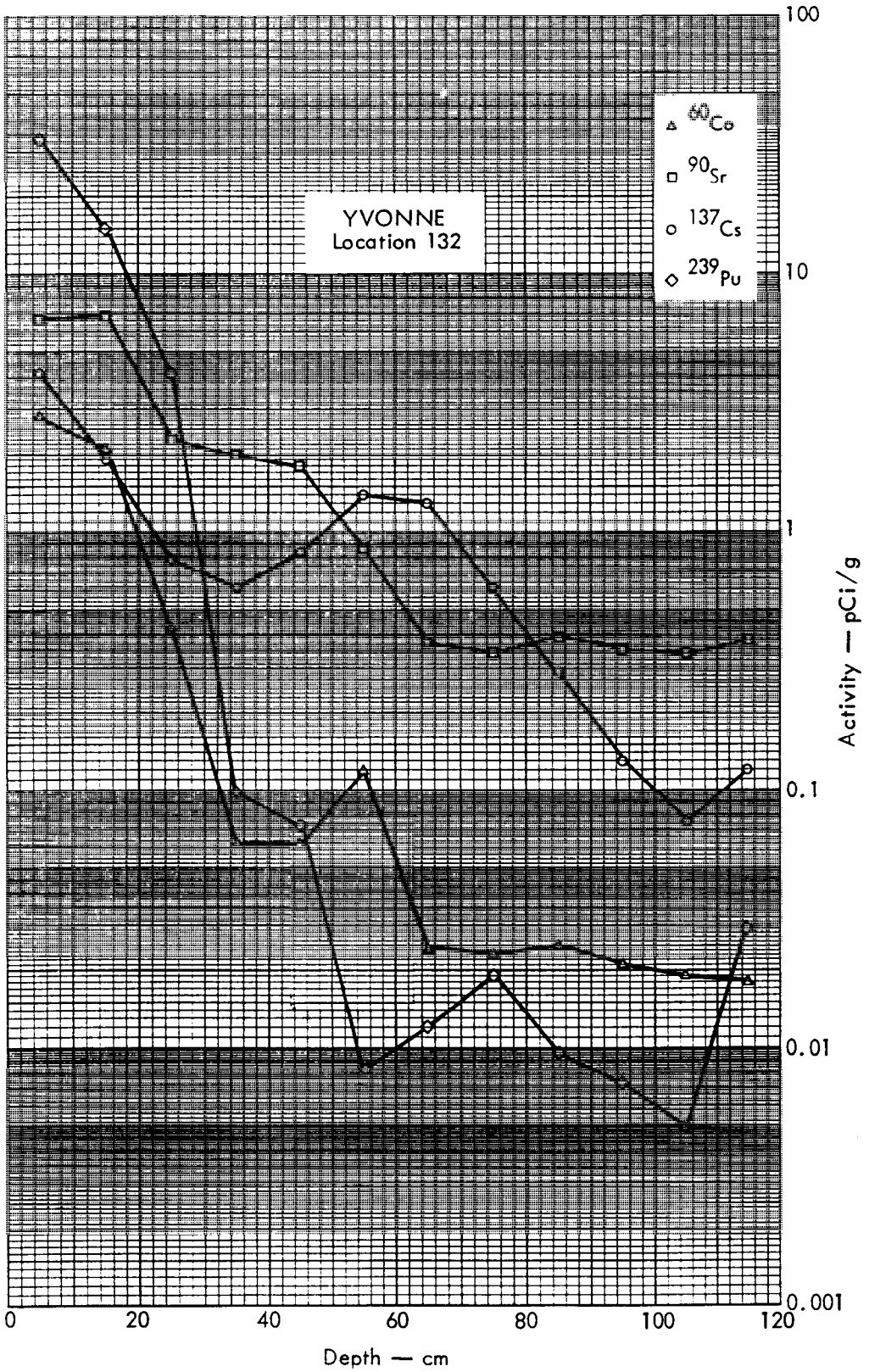



Fig. B. 23.2ee. Activities of selected radionuclides as a function of soil depth.

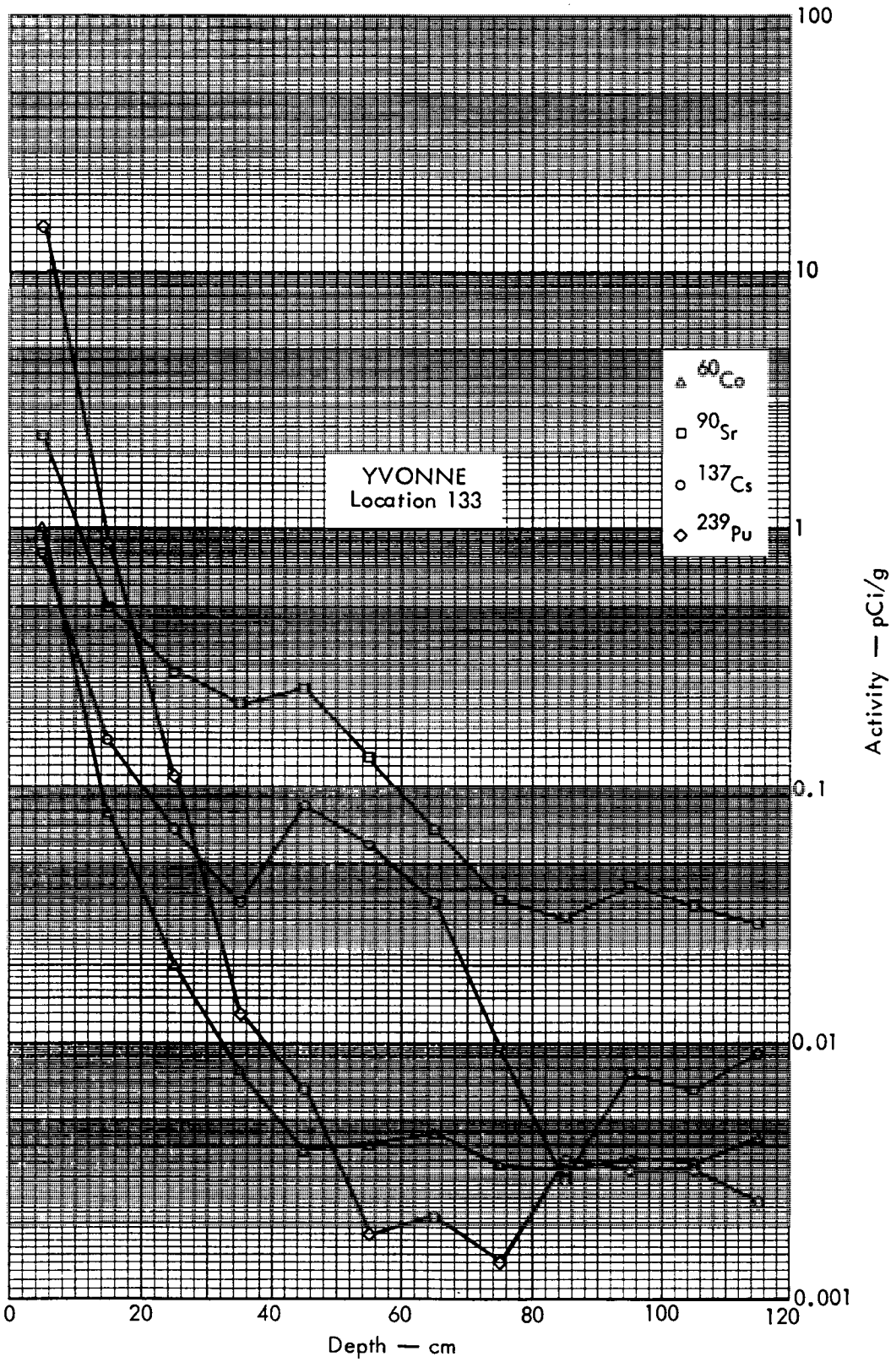



Fig. B. 23.2ff. Activities of selected radionuclides as a function of soil depth.

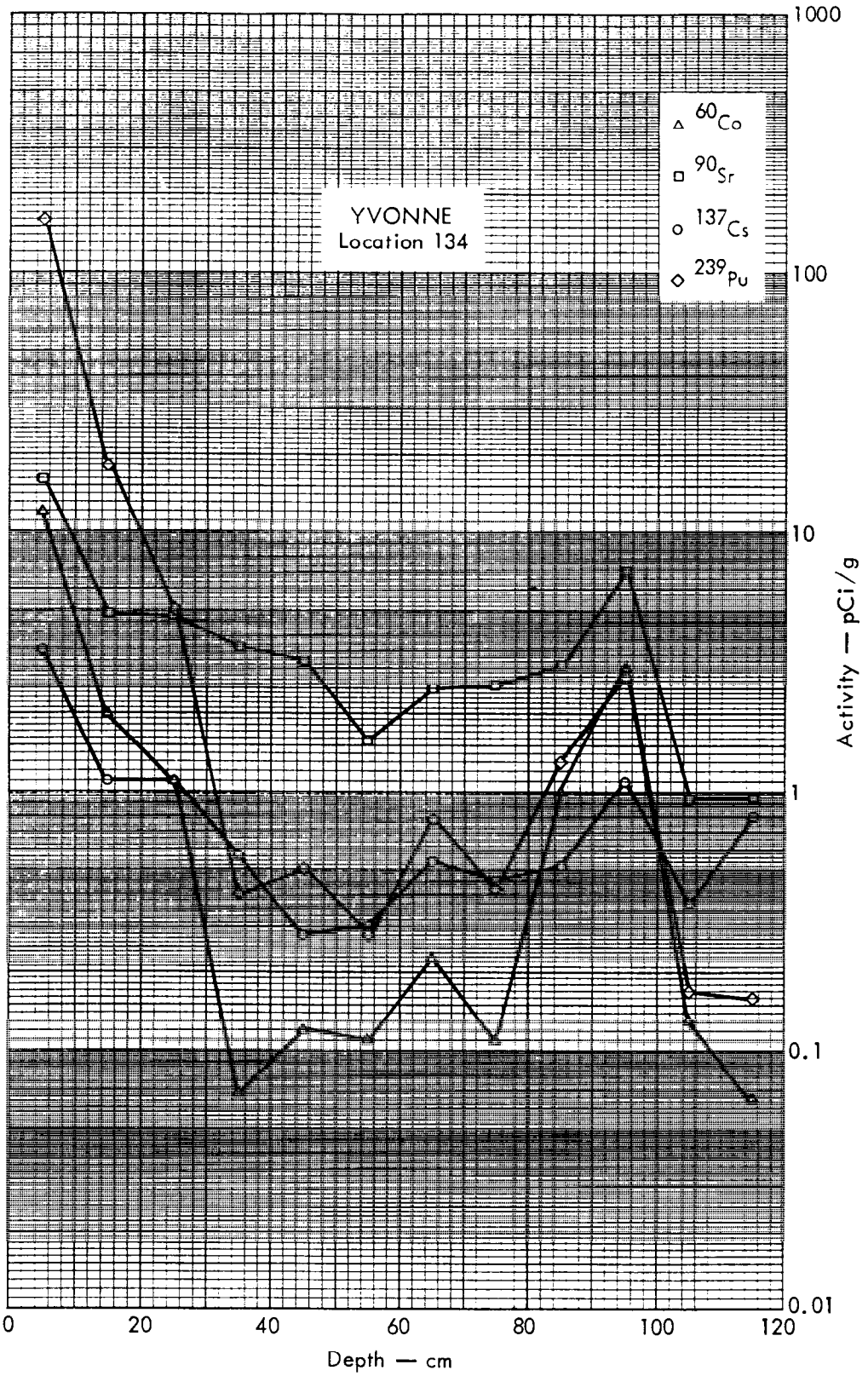



Fig. B. 23.2gg. Activities of selected radionuclides as a function of soil depth.

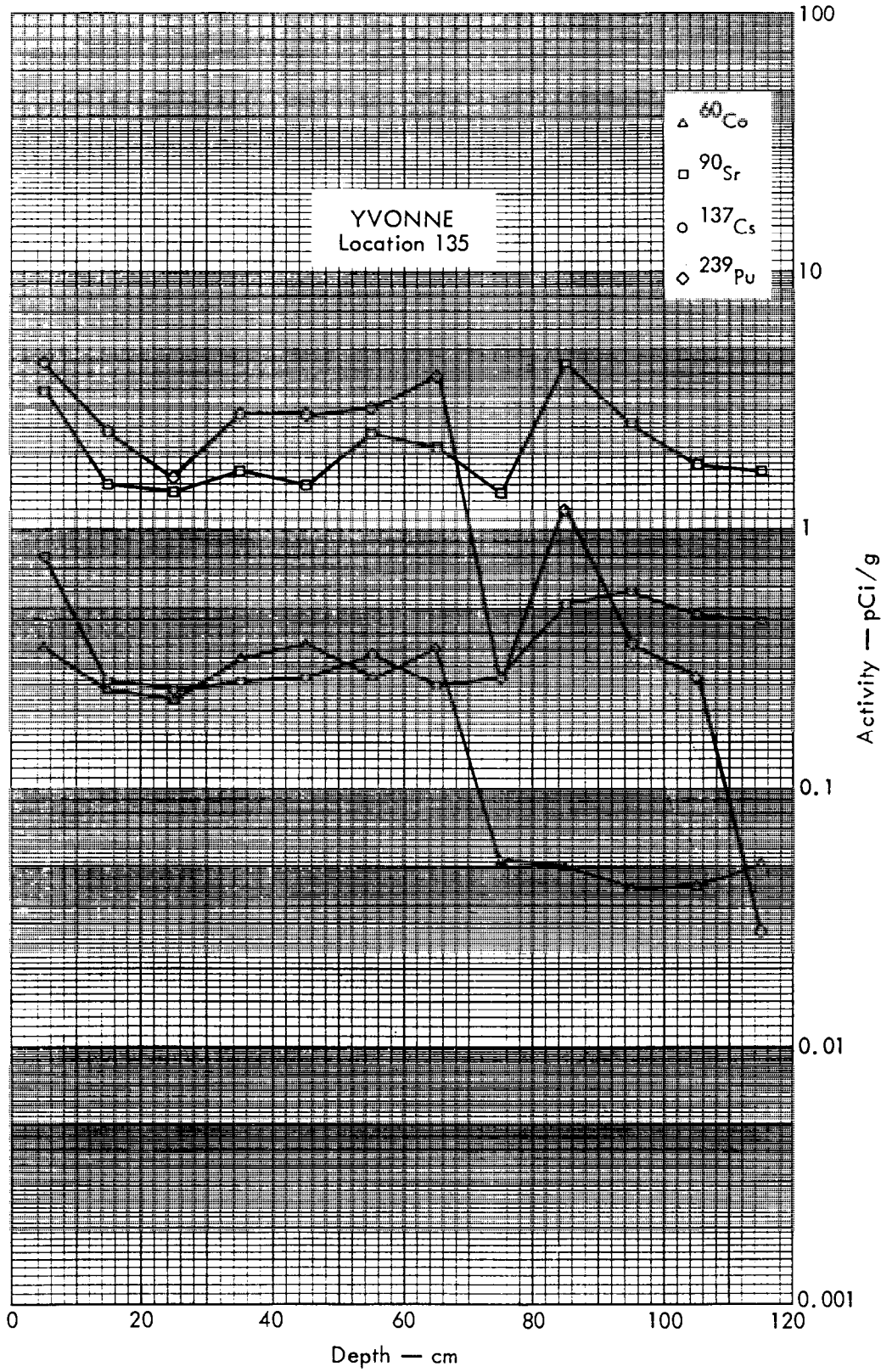



Fig. B.23.2hh. Activities of selected radionuclides as a function of soil depth.

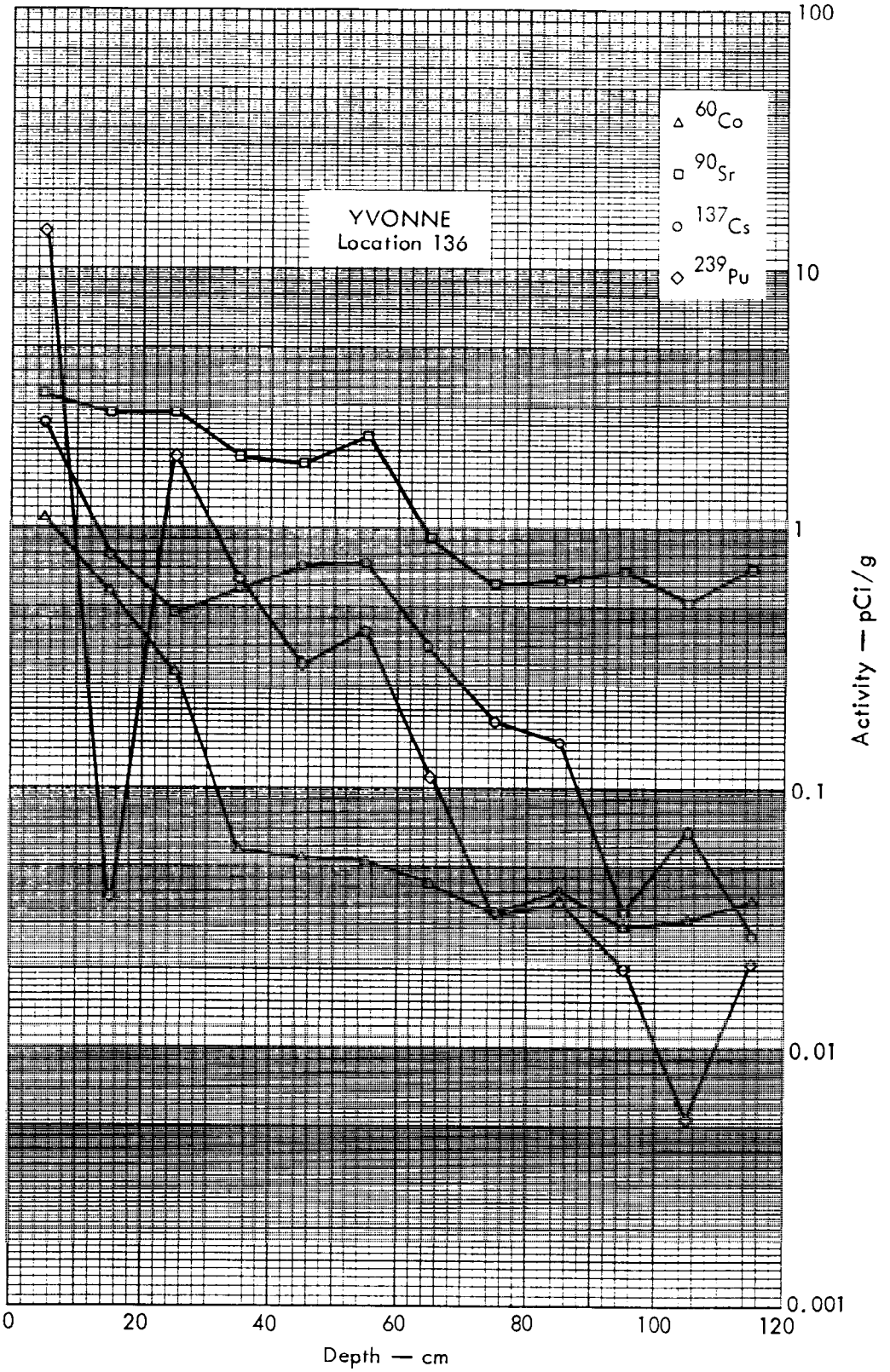



Fig. B. 23.2ii. Activities of selected radionuclides as a function of soil depth.

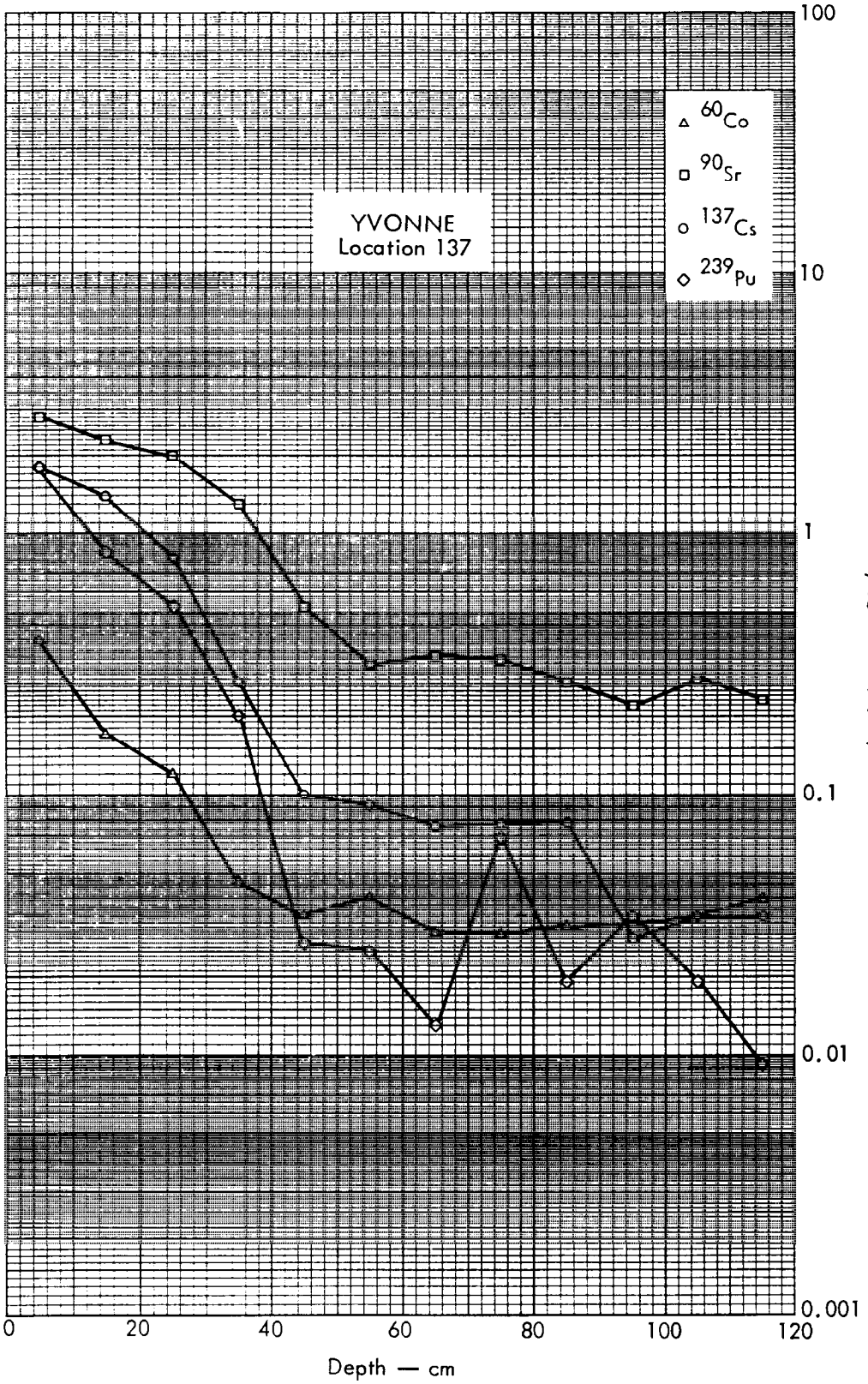



Fig. B.23.2jj. Activities of selected radionuclides as a function of soil depth.

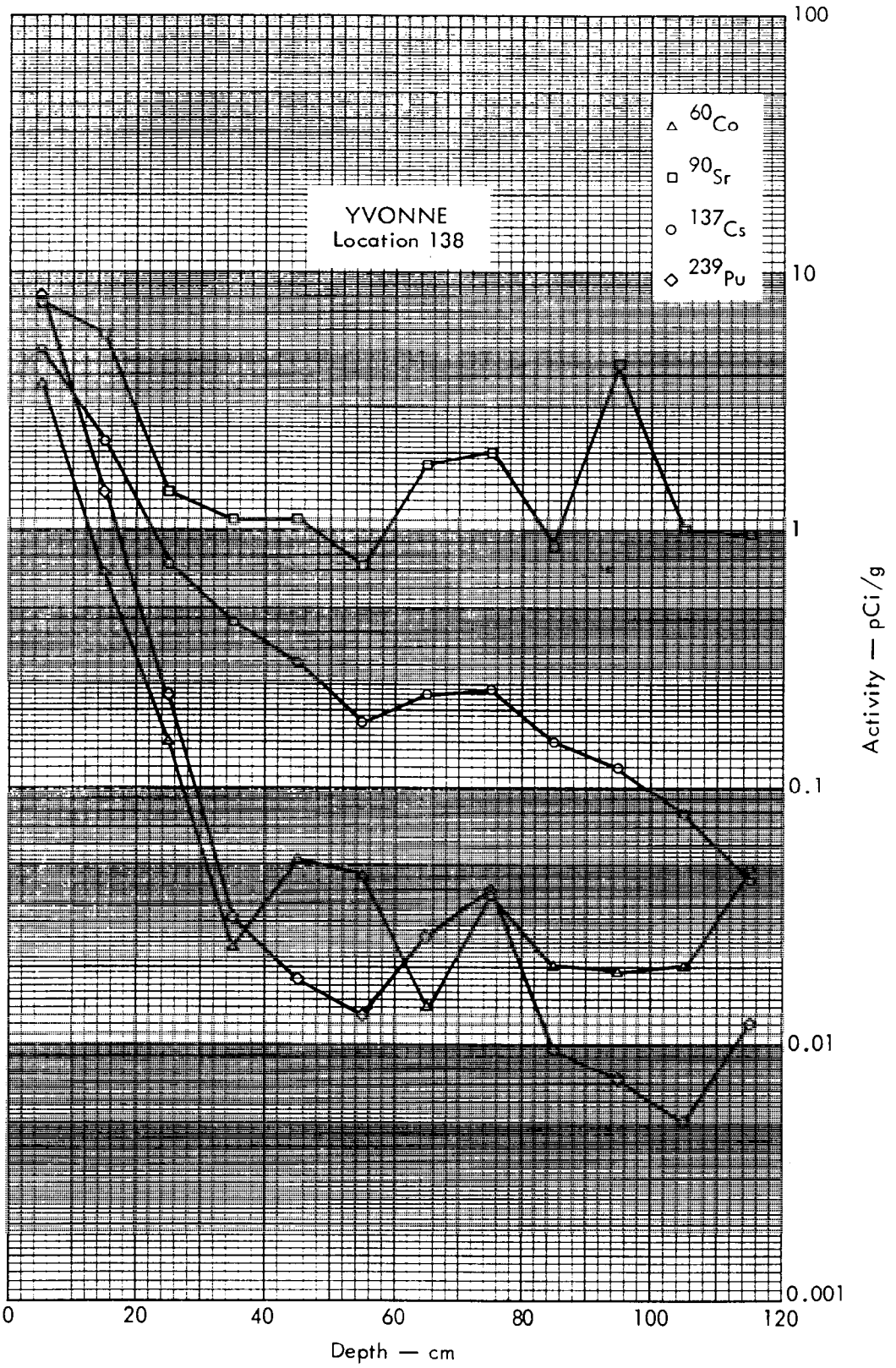



Fig. B. 23.2kk. Activities of selected radionuclides as a function of soil depth.

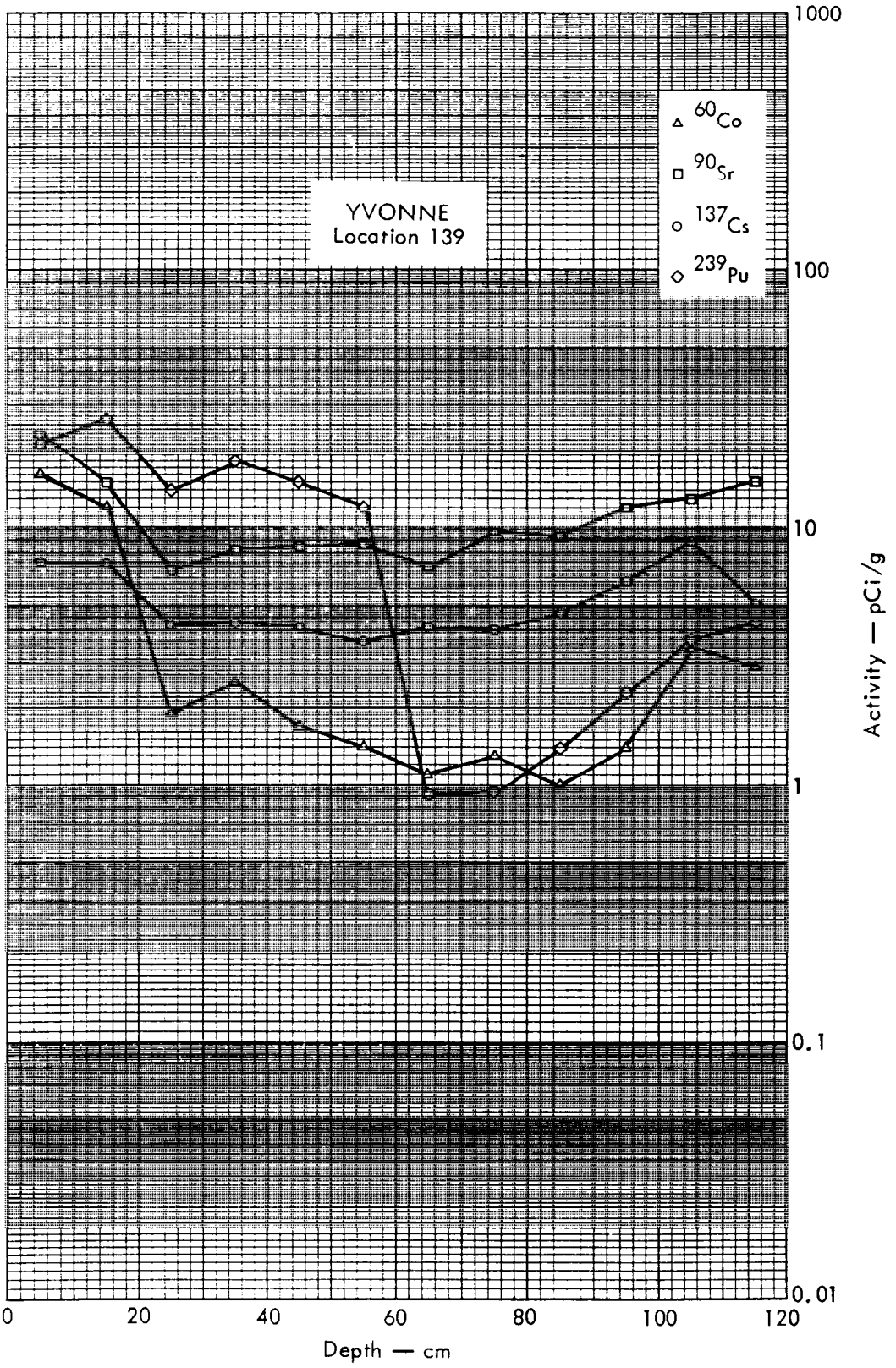



Fig. B. 23.211. Activities of selected radionuclides as a function of soil depth.

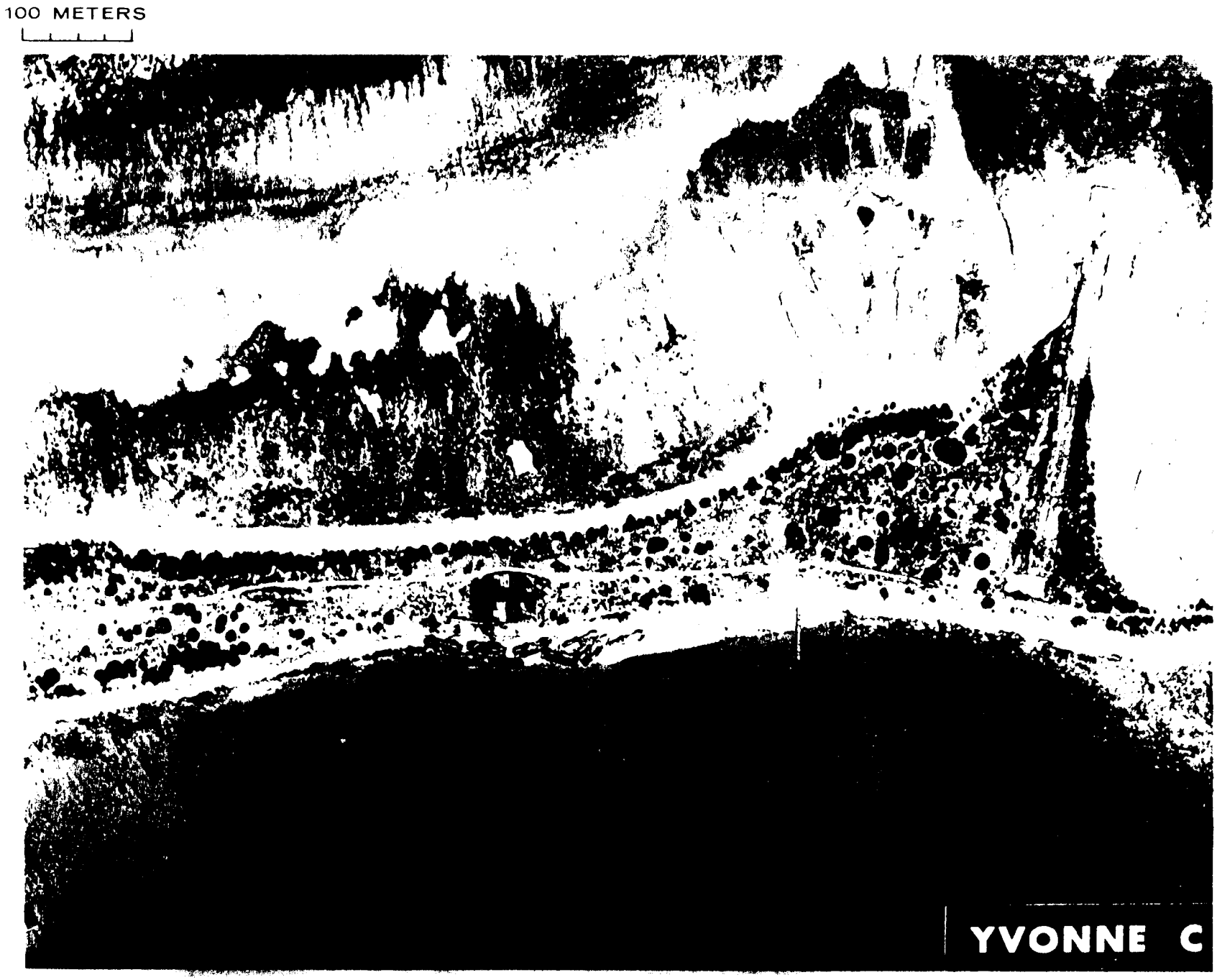



Fig. B.24.1.a.

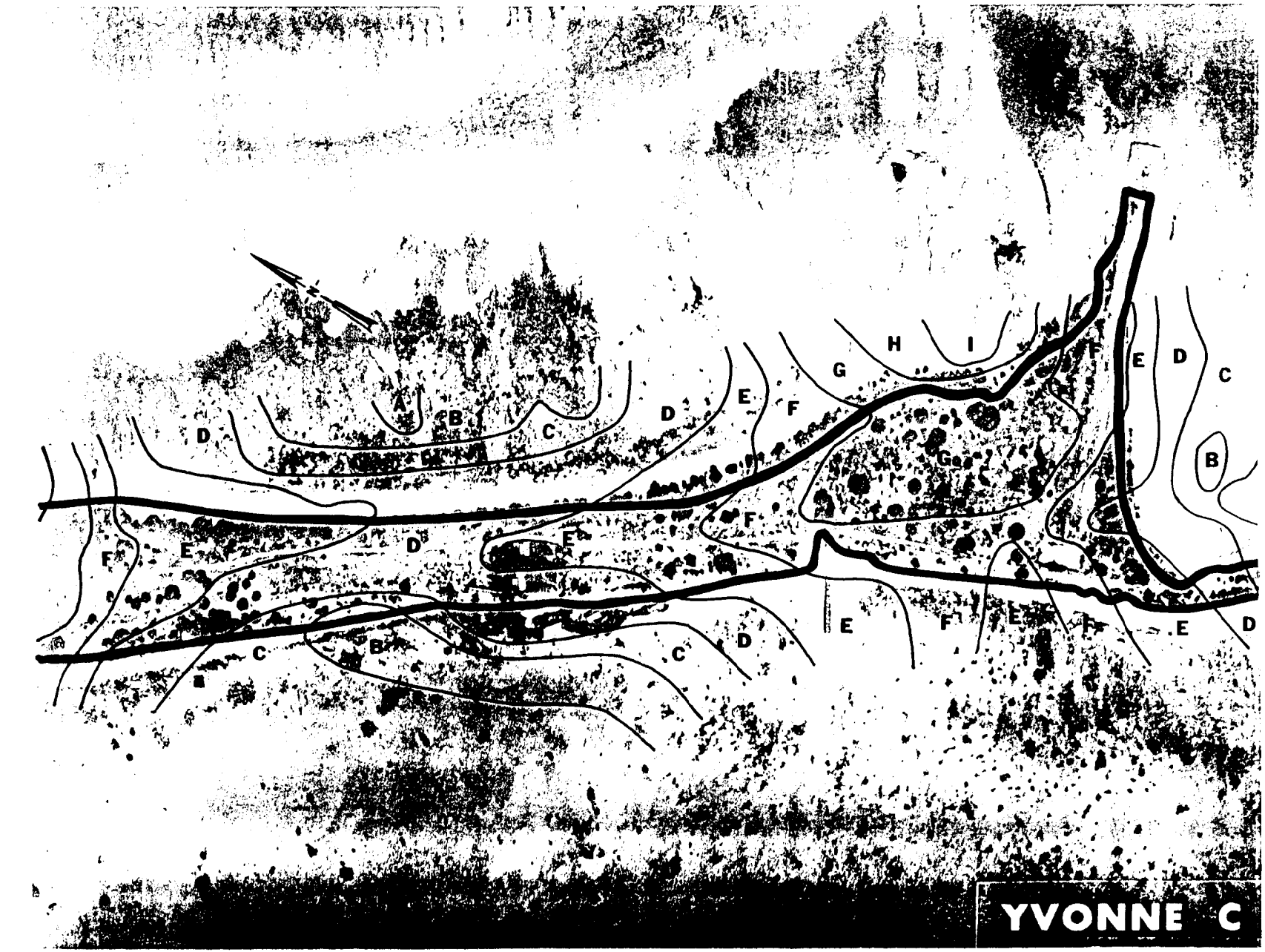



Fig. B.24.1.b. **Gross count isoexposure contours.** (Refer to alphabetic symbol key in this appendix.)

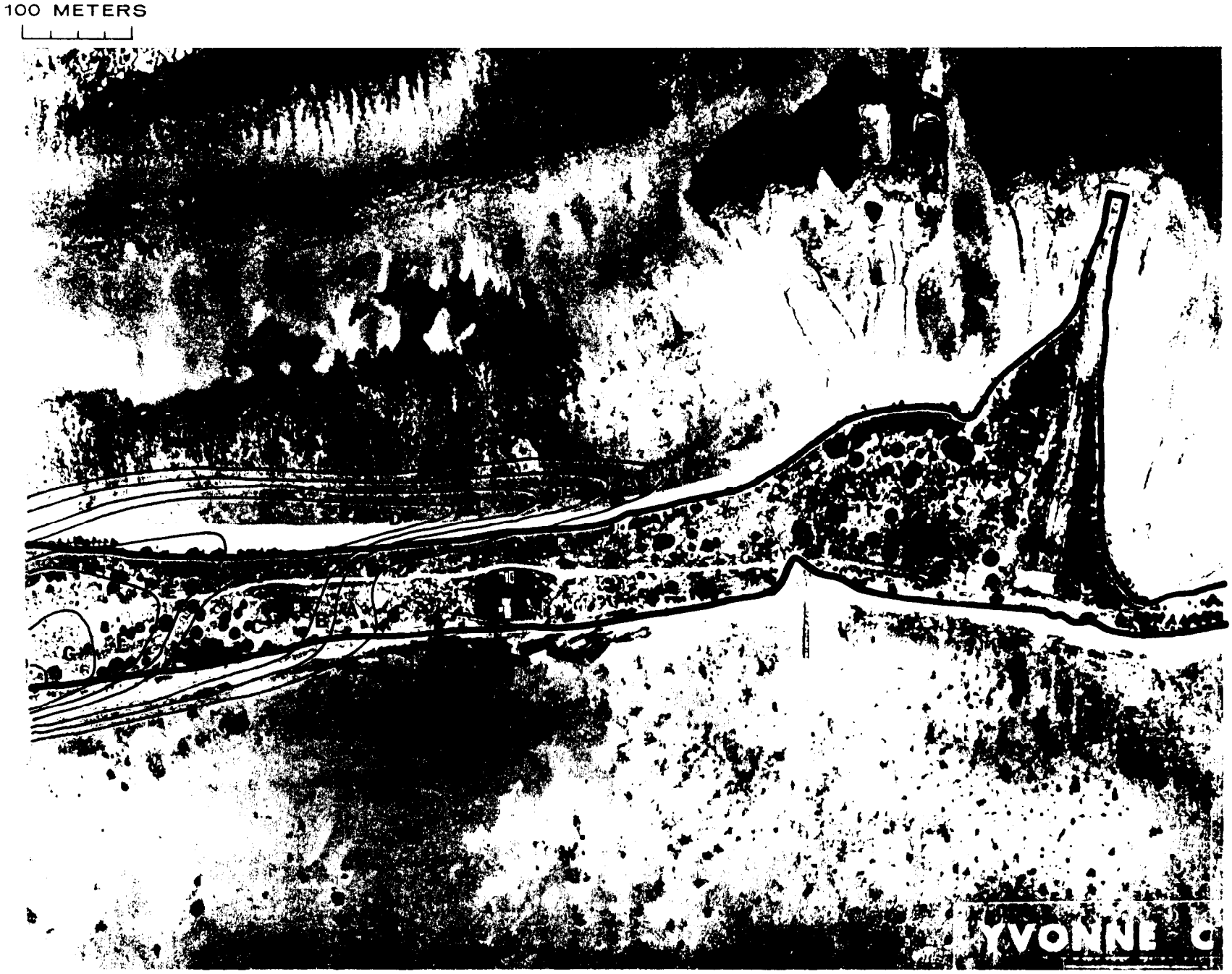



Fig. B.24.1.c. $^{241}$Am isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

Fig. B.24.1.d. The gamma background exposure rate (μR/hr) at 1 m above the ground, measured with a portable NaI scintillation counter.

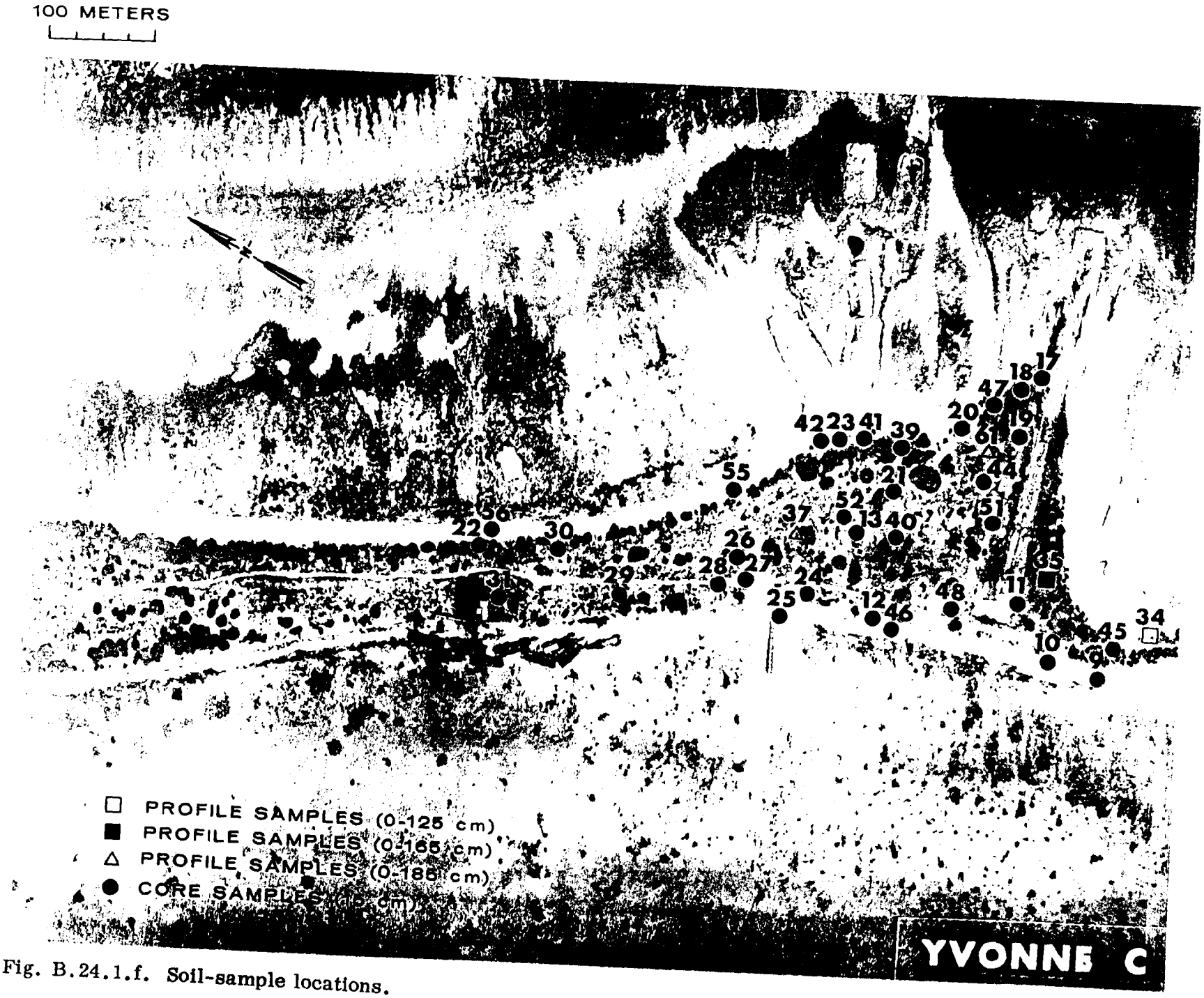



Fig. B.24.1.f. Soil-sample locations.

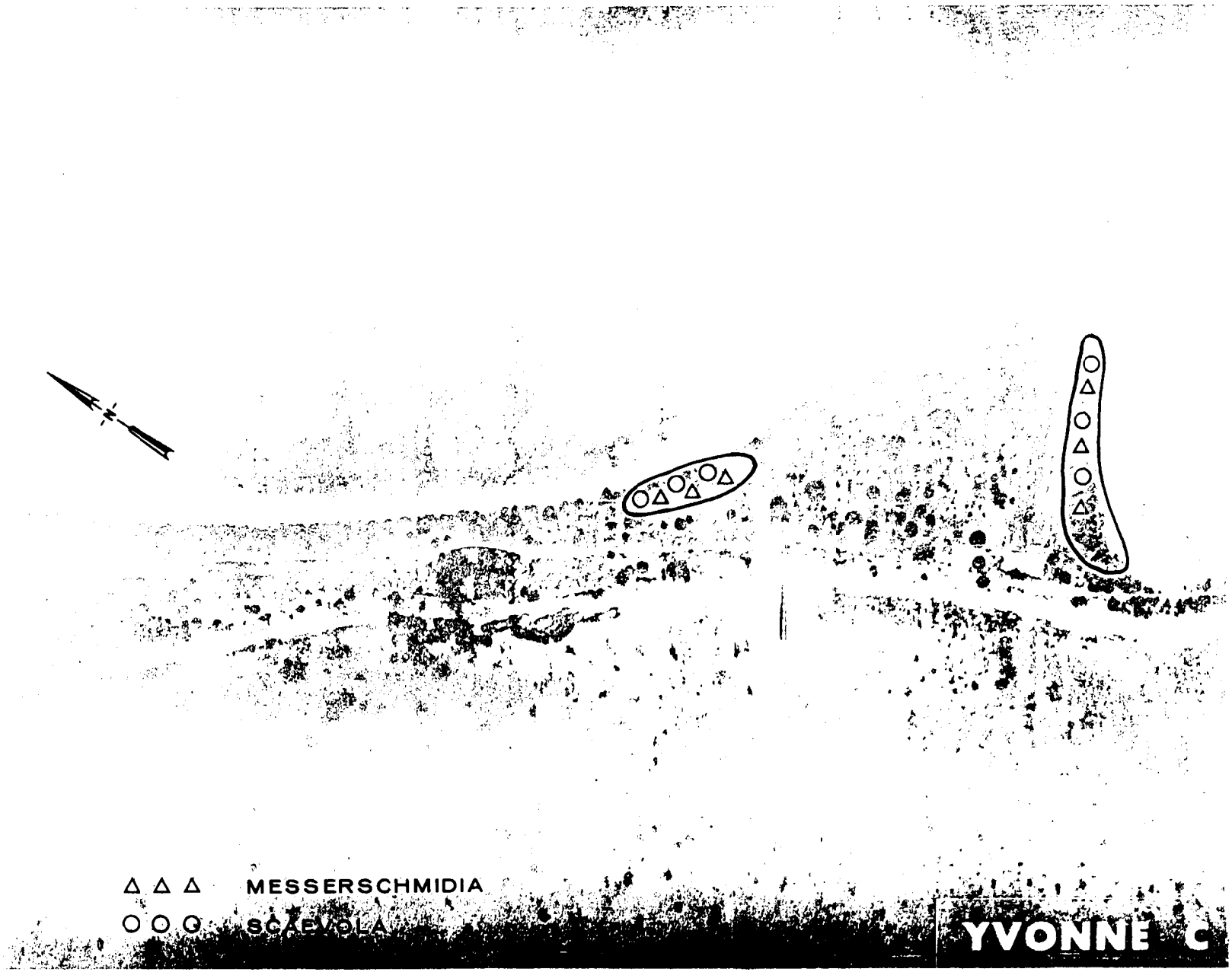



Fig. B.24.1.g. Vegetation sample locations.

Fig. B.24.1.i. The average $^{239}Pu$ activities (pCi/gm) in soil samples collected to a depth of 15 cm.

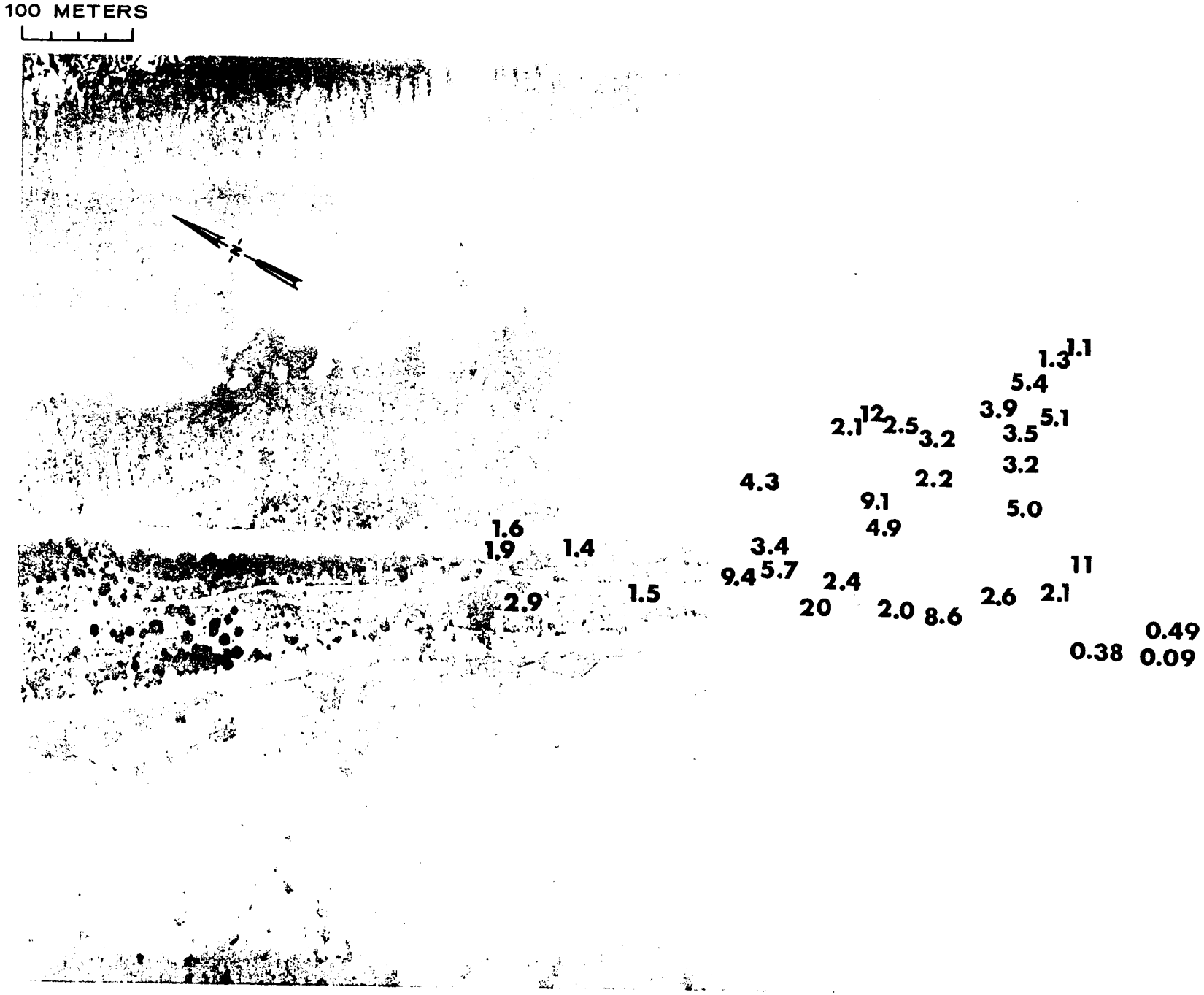



Fig. B.24.1.j. The average $^{90}Sr$ activities (pCi/gm) in soil samples collected to a depth of 15 cm.

Fig. B.24.1.k. $^{137}Cs$ isoexposure and isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

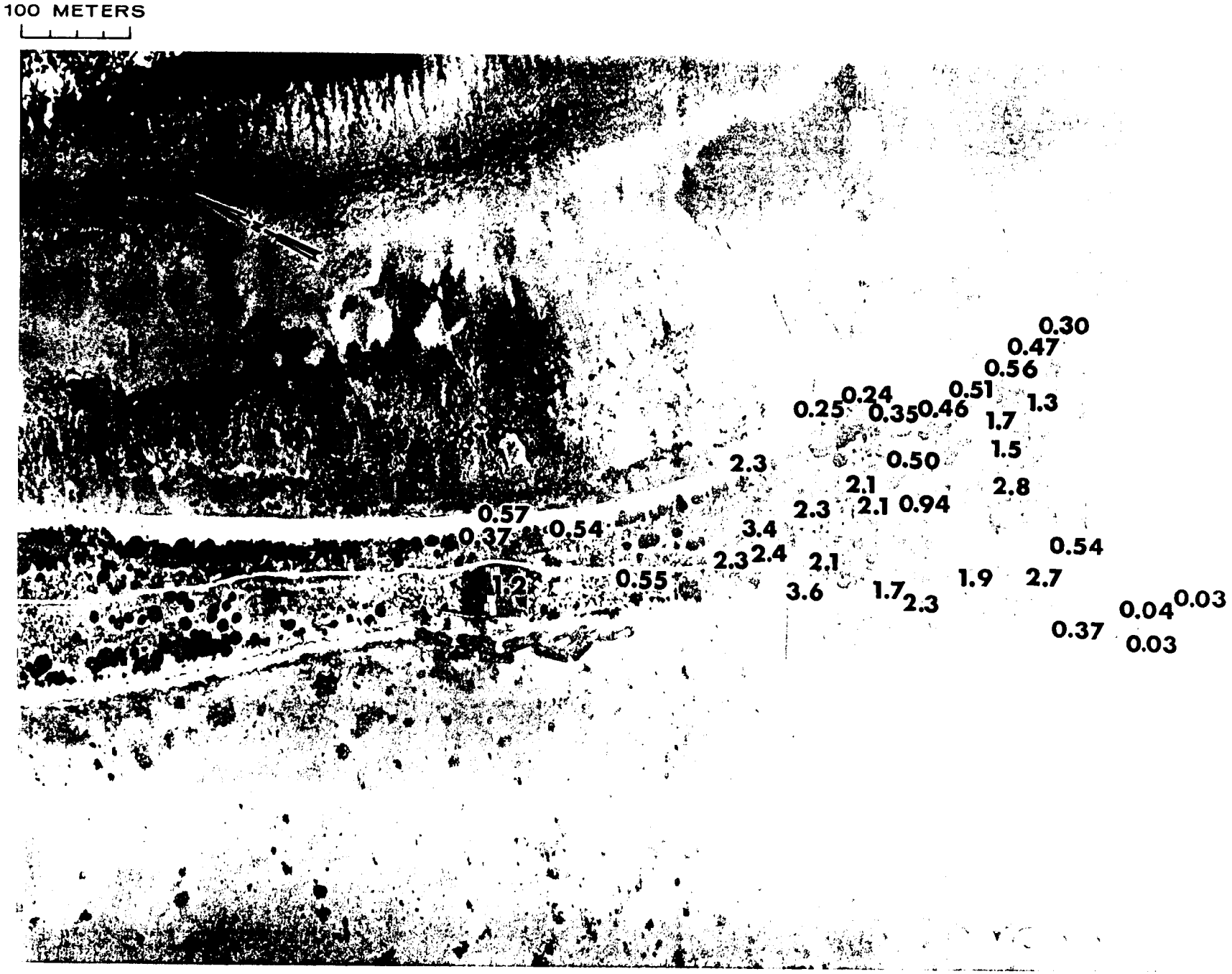



Fig. B.24.1.1. The average $^{137}Cs$ activities (pCi/gm) in soil samples collected to a depth of 15 cm.

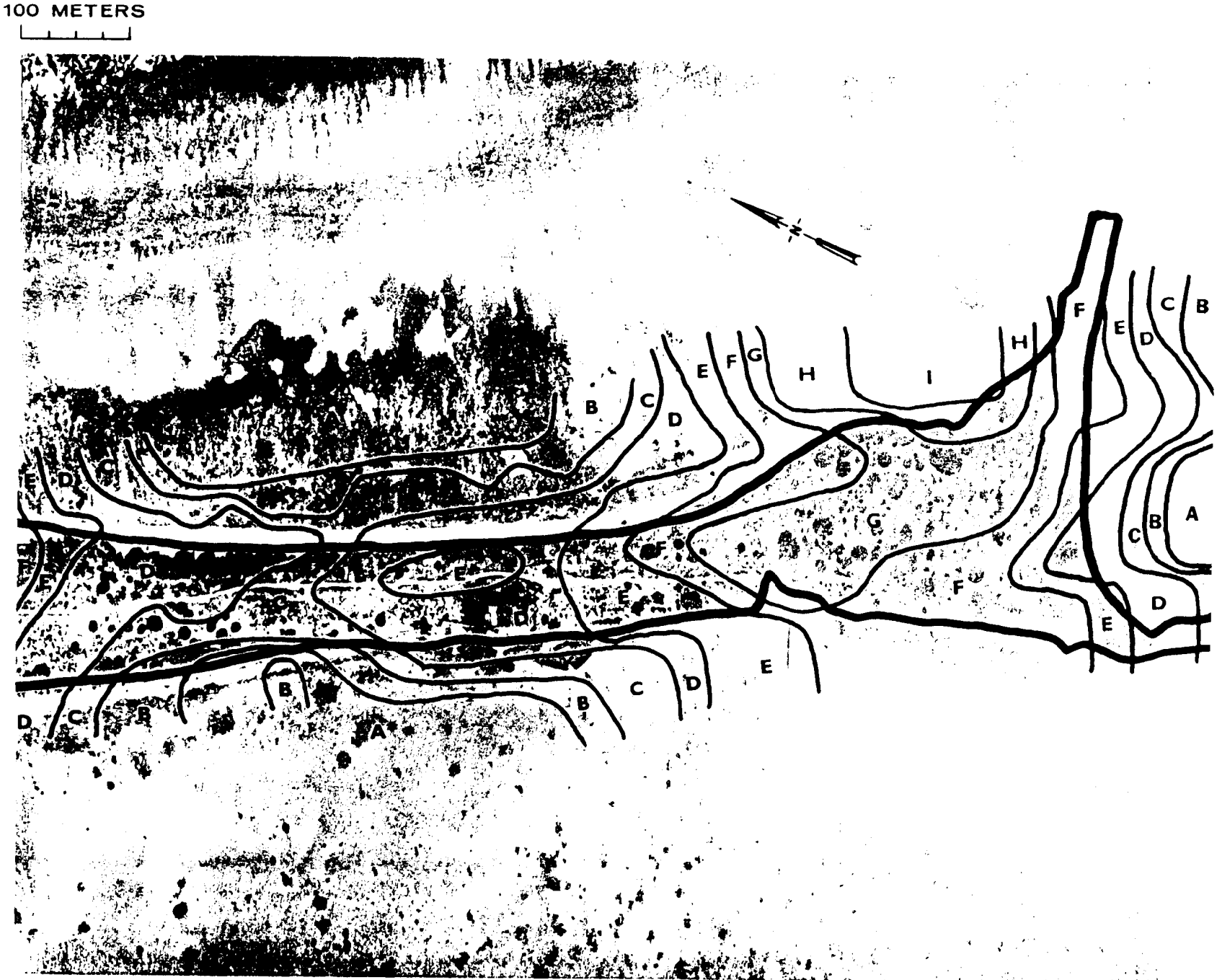



Fig. B.24.1.m. $^{60}Co$ isoexposure and isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

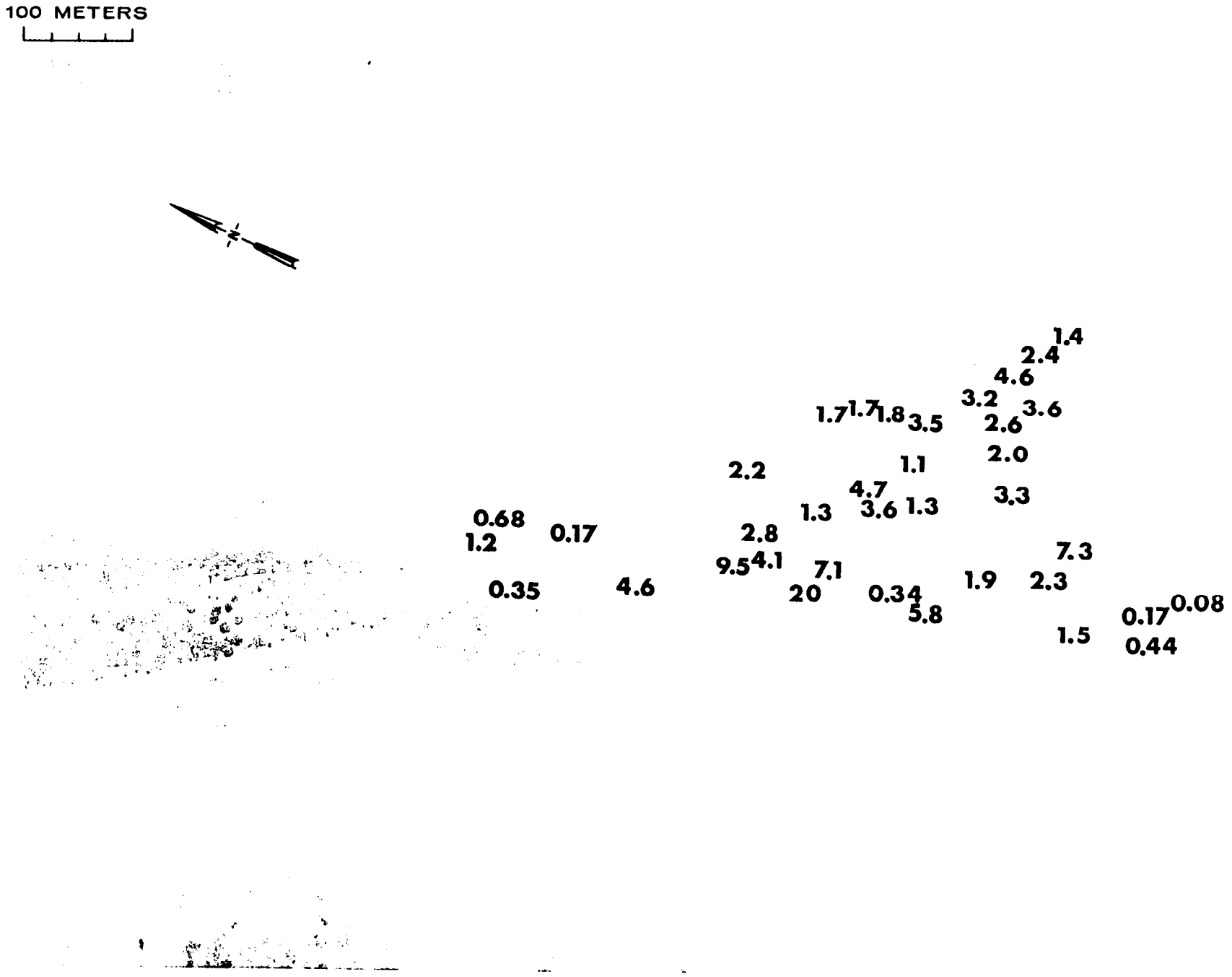



Fig. B.24.1.n. The average $^{60}Co$ activities (pCi/gm) in soil samples collected to a depth of 15 cm.

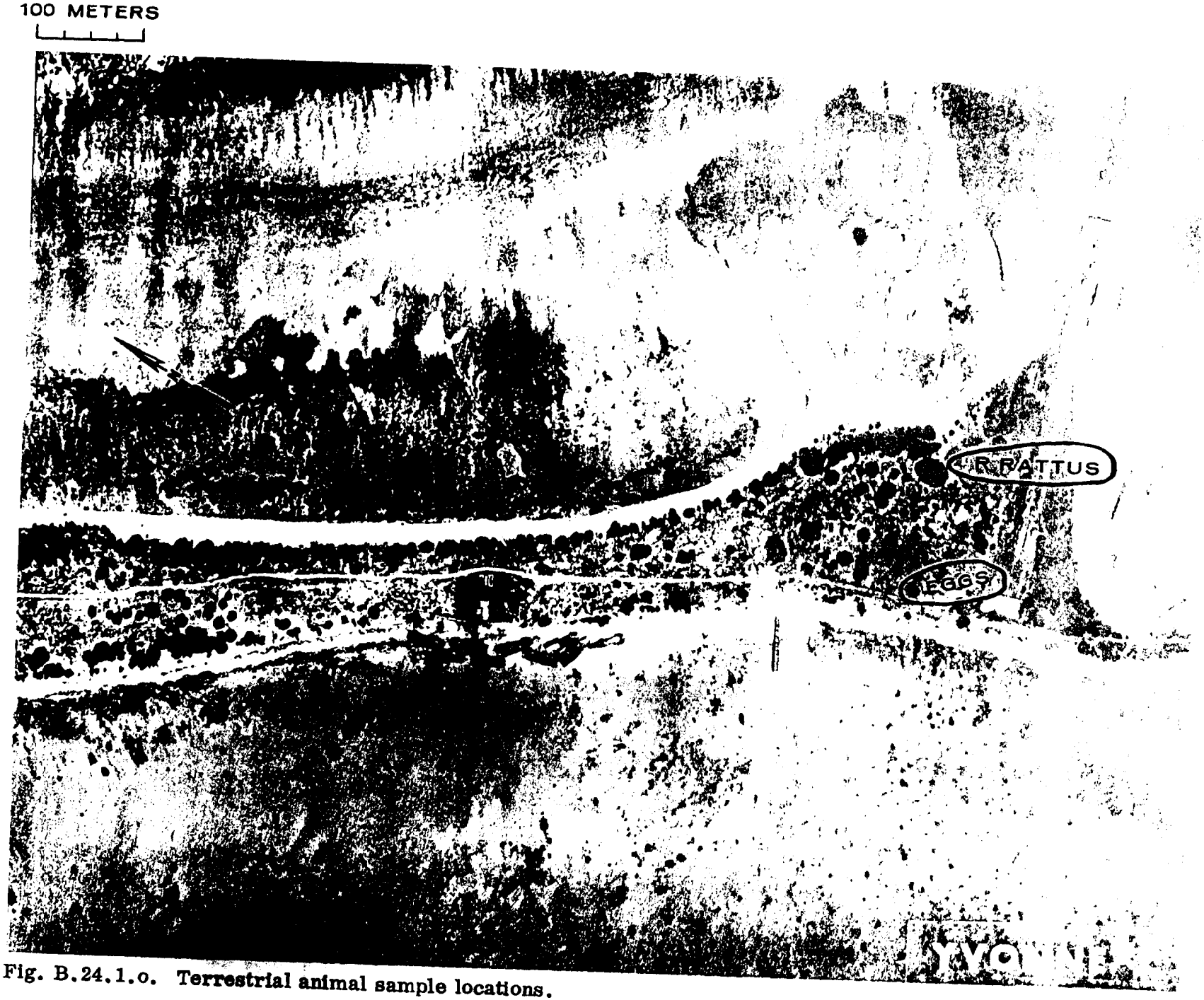



Fig. B.24.1.o. Terrestrial animal sample locations.

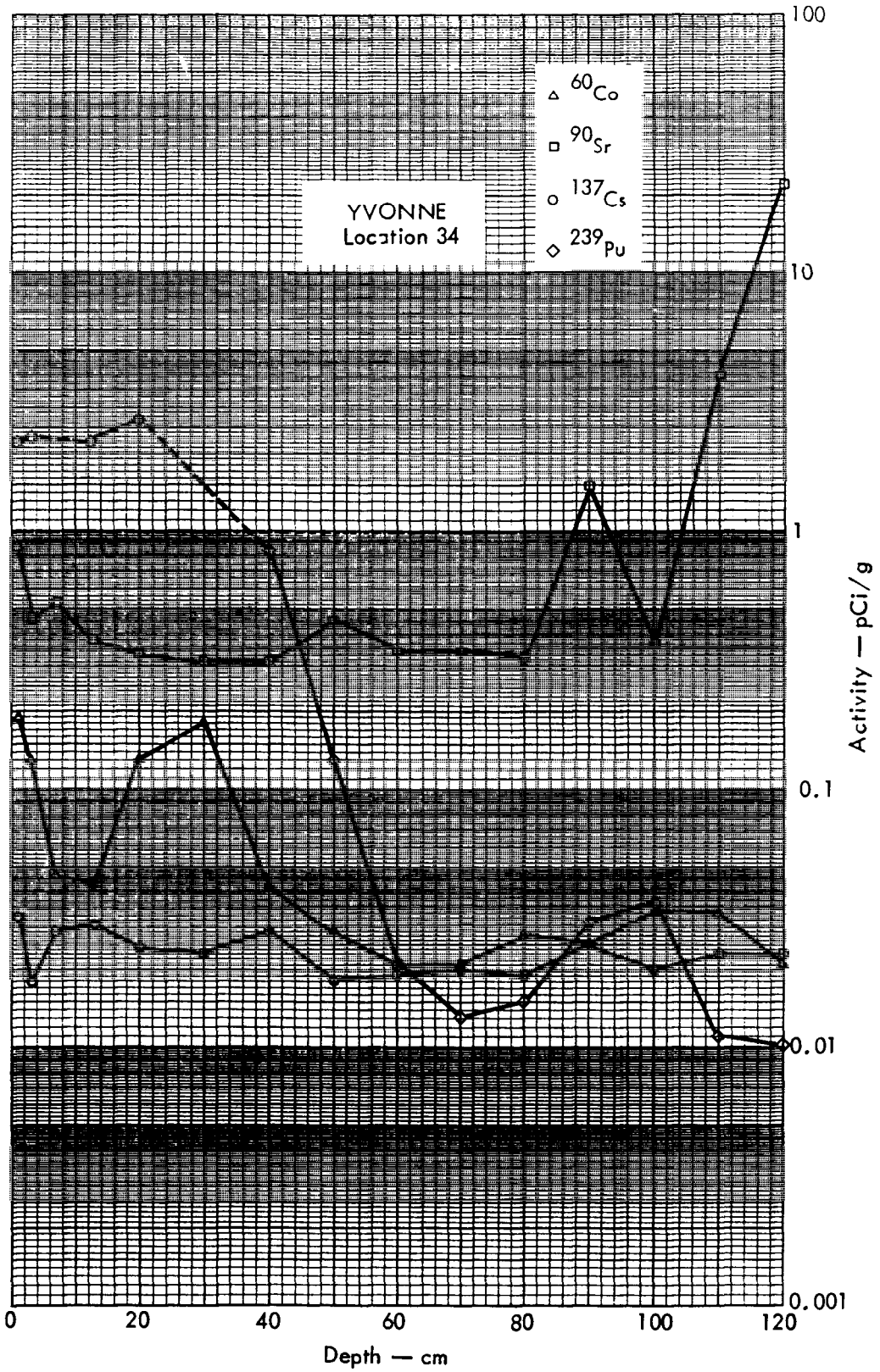



Fig. B. 24.2a. Activities of selected radionuclides as a function of soil depth.

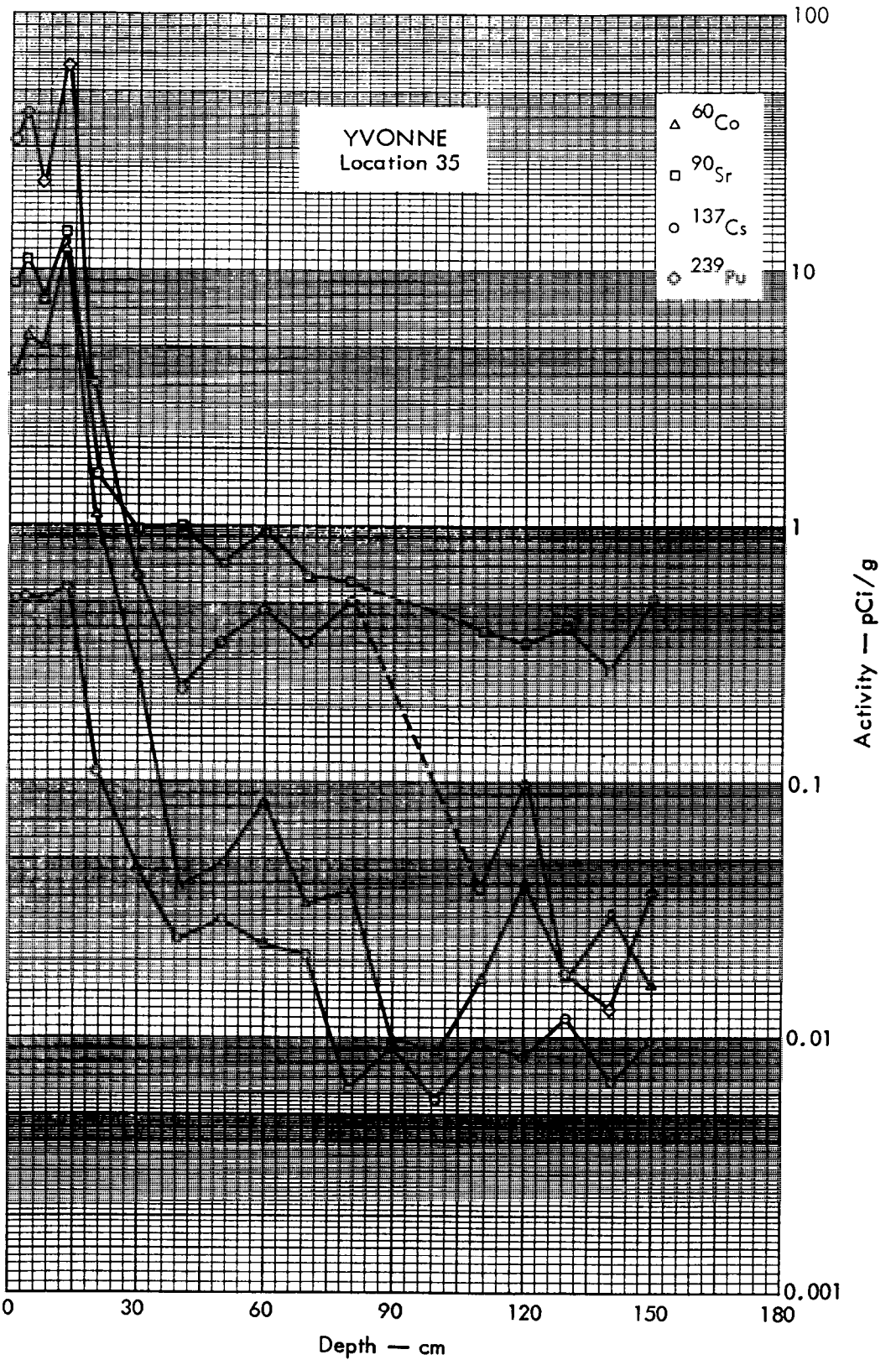



Fig. B. 24.2b. Activities of selected radionuclides as a function of soil depth.

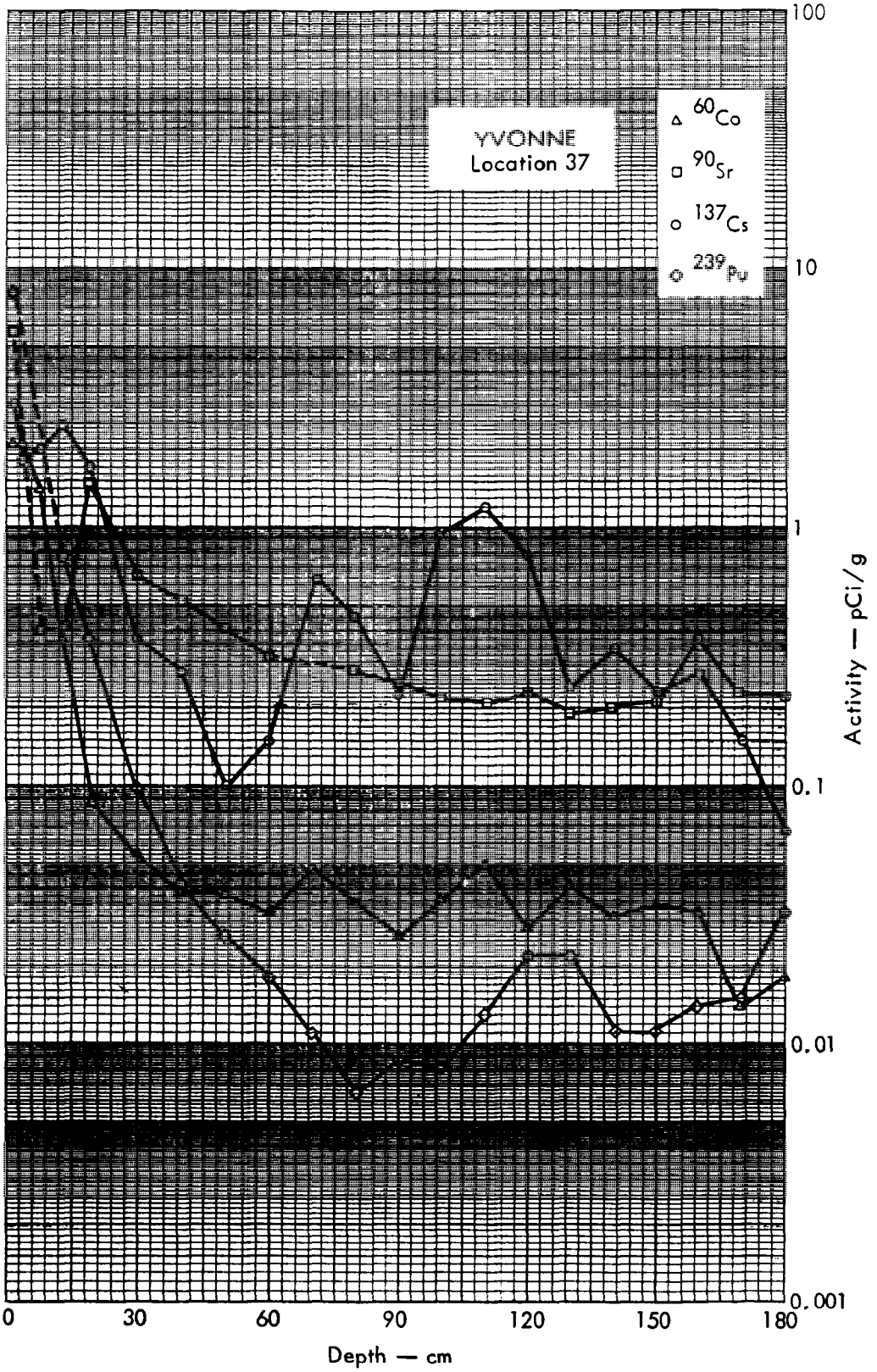



Fig. B. 24.2c. Activities of selected radionuclides as a function of soil depth.

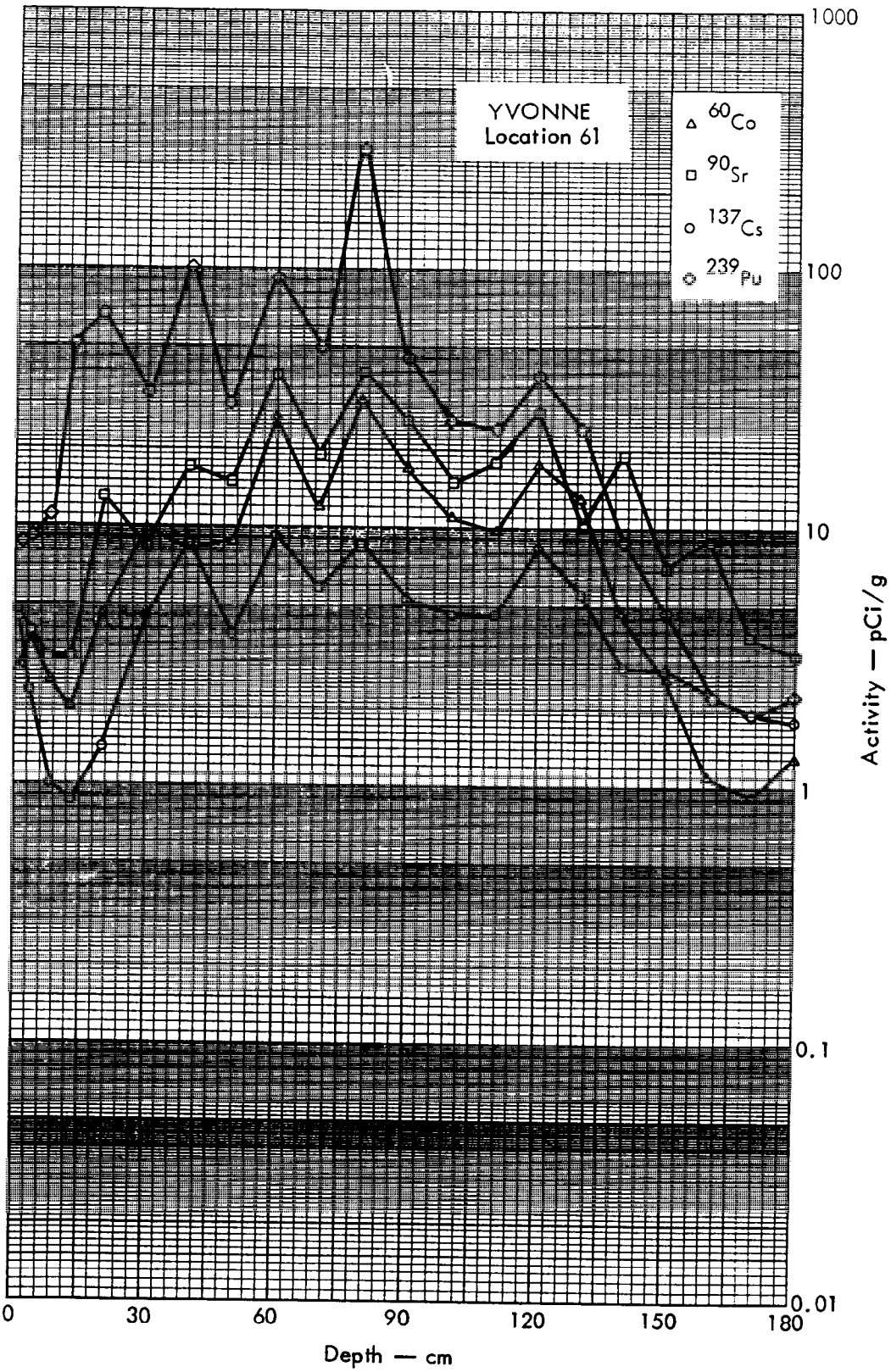



Fig. B. 24.2d. Activities of selected radionuclides as a function of soil depth.

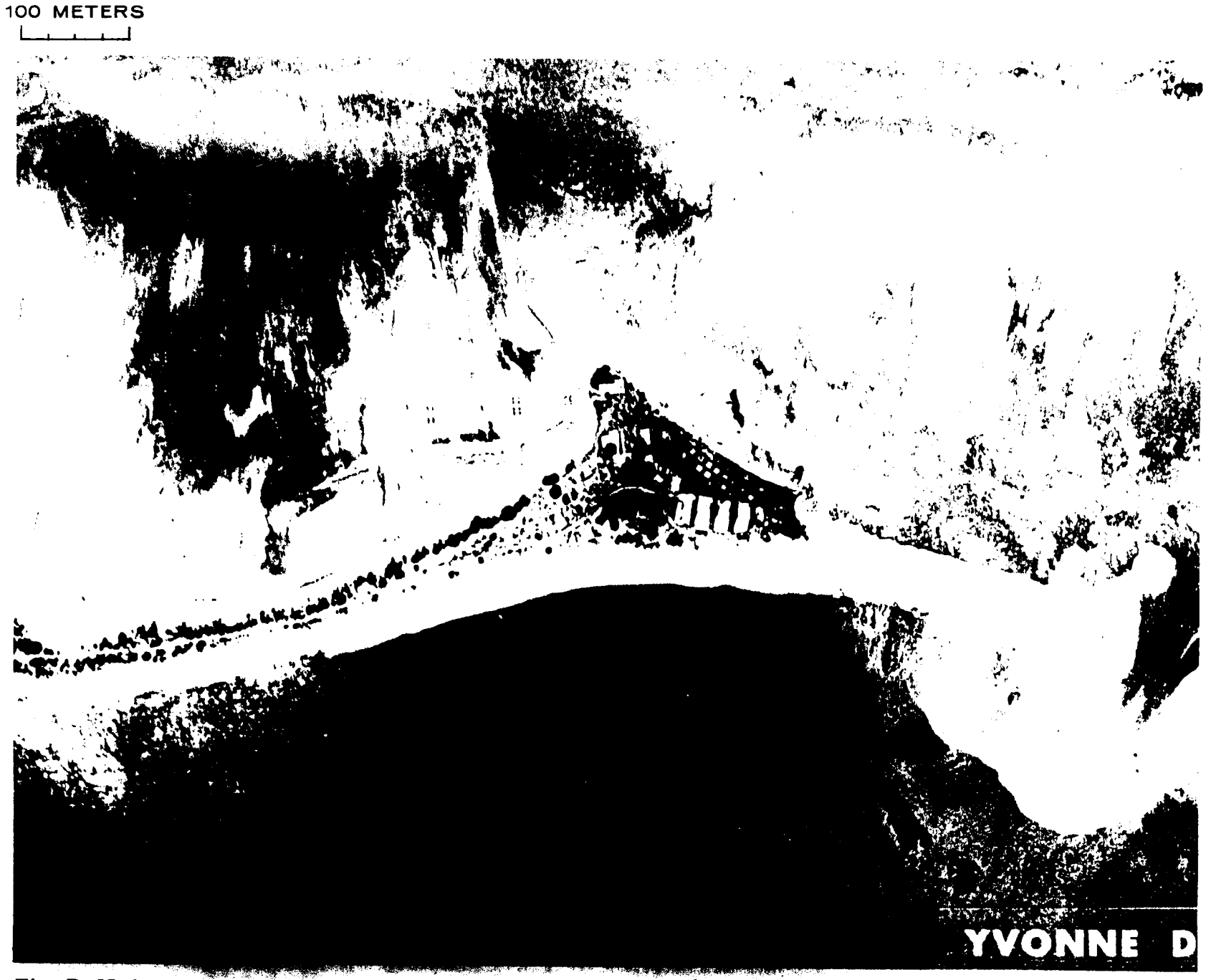



Fig. B.25.1.a.

Fig. B.25.1.b. Gross count isoexposure contours. (Refer to alphabetic symbol key in this appendix.)

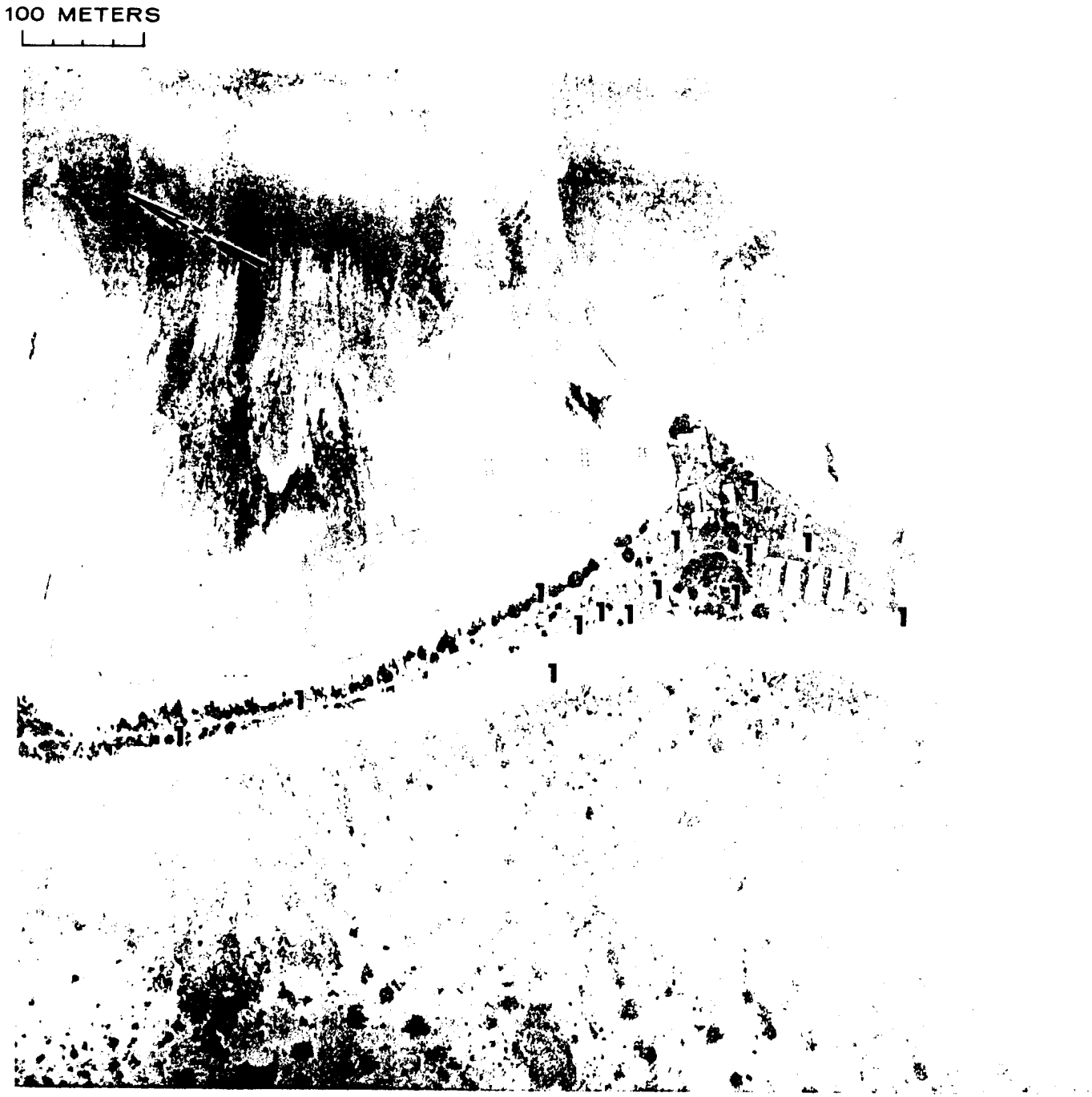



Fig. B.25.1.d. The gamma background exposure rate (μR/hr) at 1 m above the ground, measured with a portable NaI scintillation counter.

Fig. B.25.1.f. Soil-sample locations.

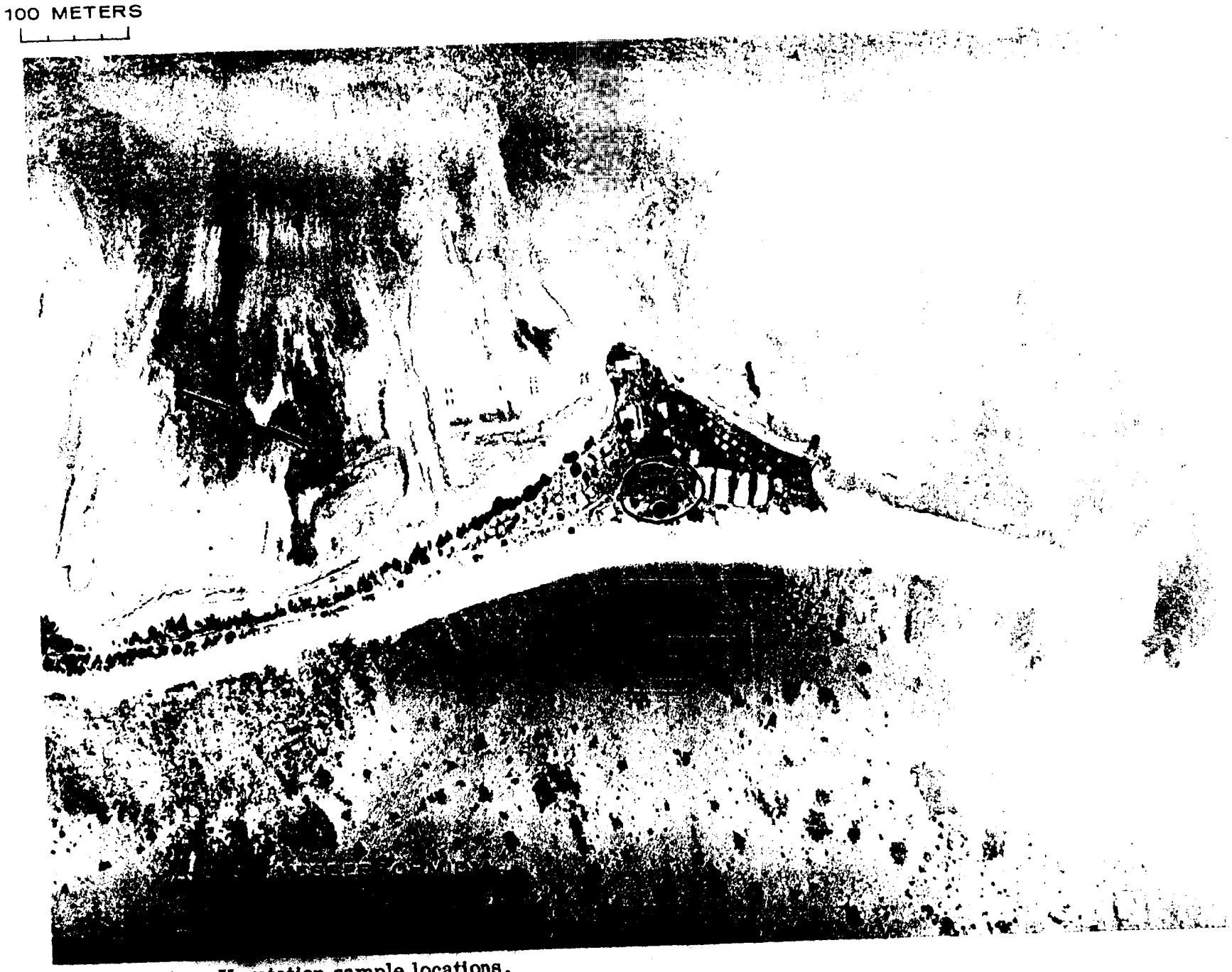



Fig. B.25.1.g. Vegetation sample locations.

Fig. B.25.1.1. The average $^{239}$Pu activities (pCi/gm) in soil samples collected to a depth of 15 cm.

Fig. B.25.1.j. The average $^{90}Sr$ activities (pCi/gm) in soil samples collected to a depth of 15 cm.

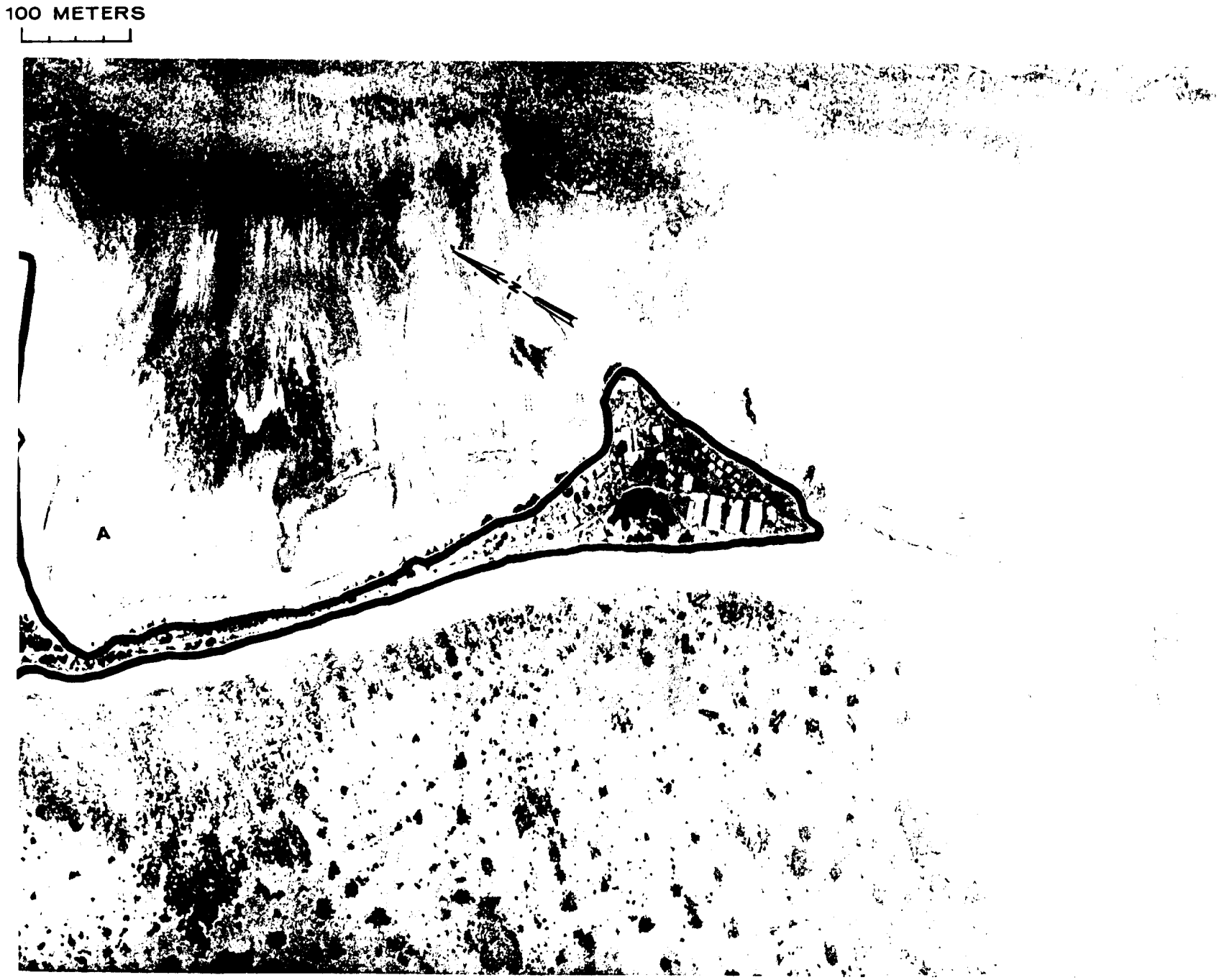



Fig. B.25.1.k. $^{137}Cs$ isoexposure and isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

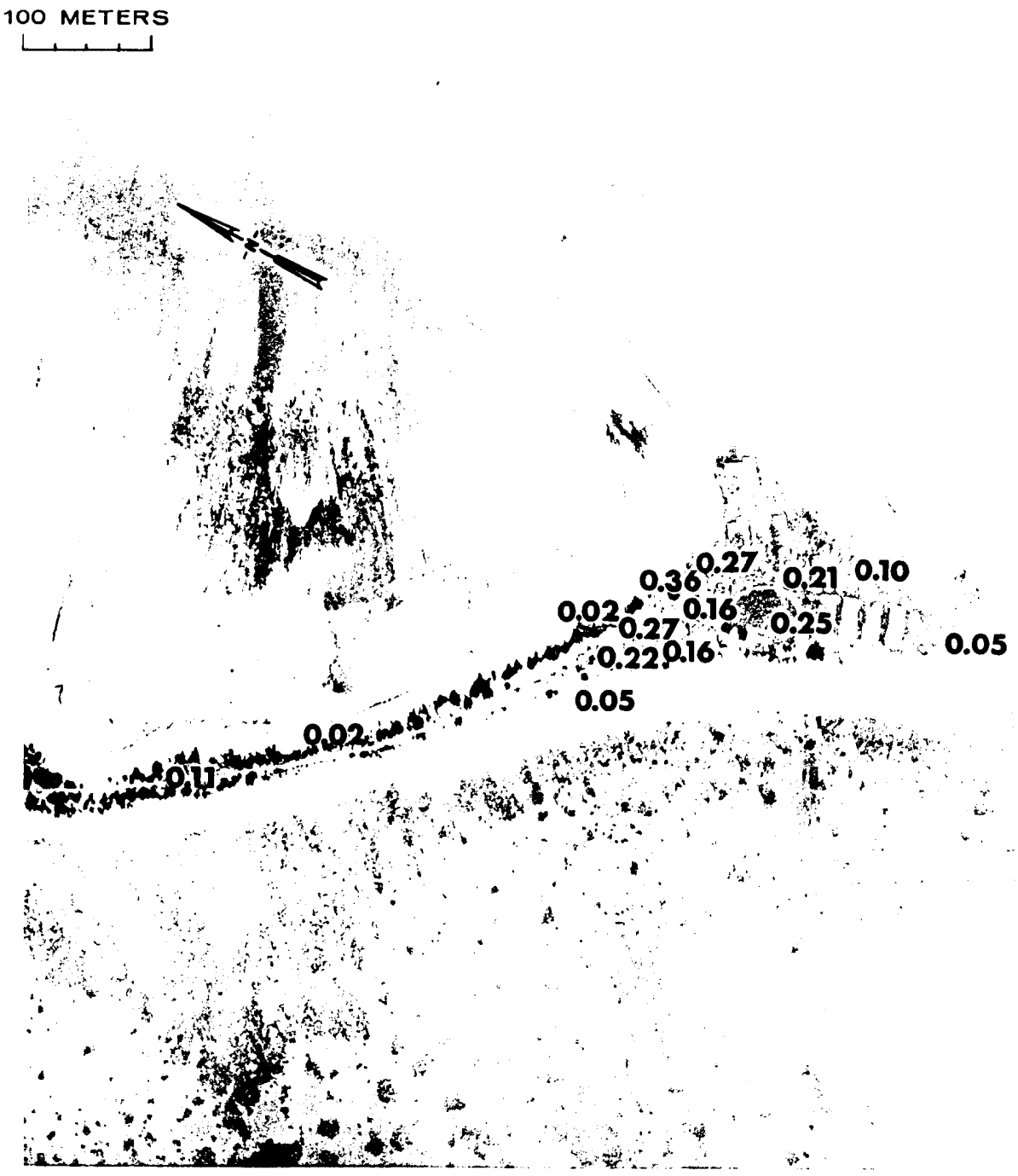



Fig. B.25.1.1. The average $^{137}Cs$ activities (pCi/gm) in soil samples collected to a depth of 15 cm.

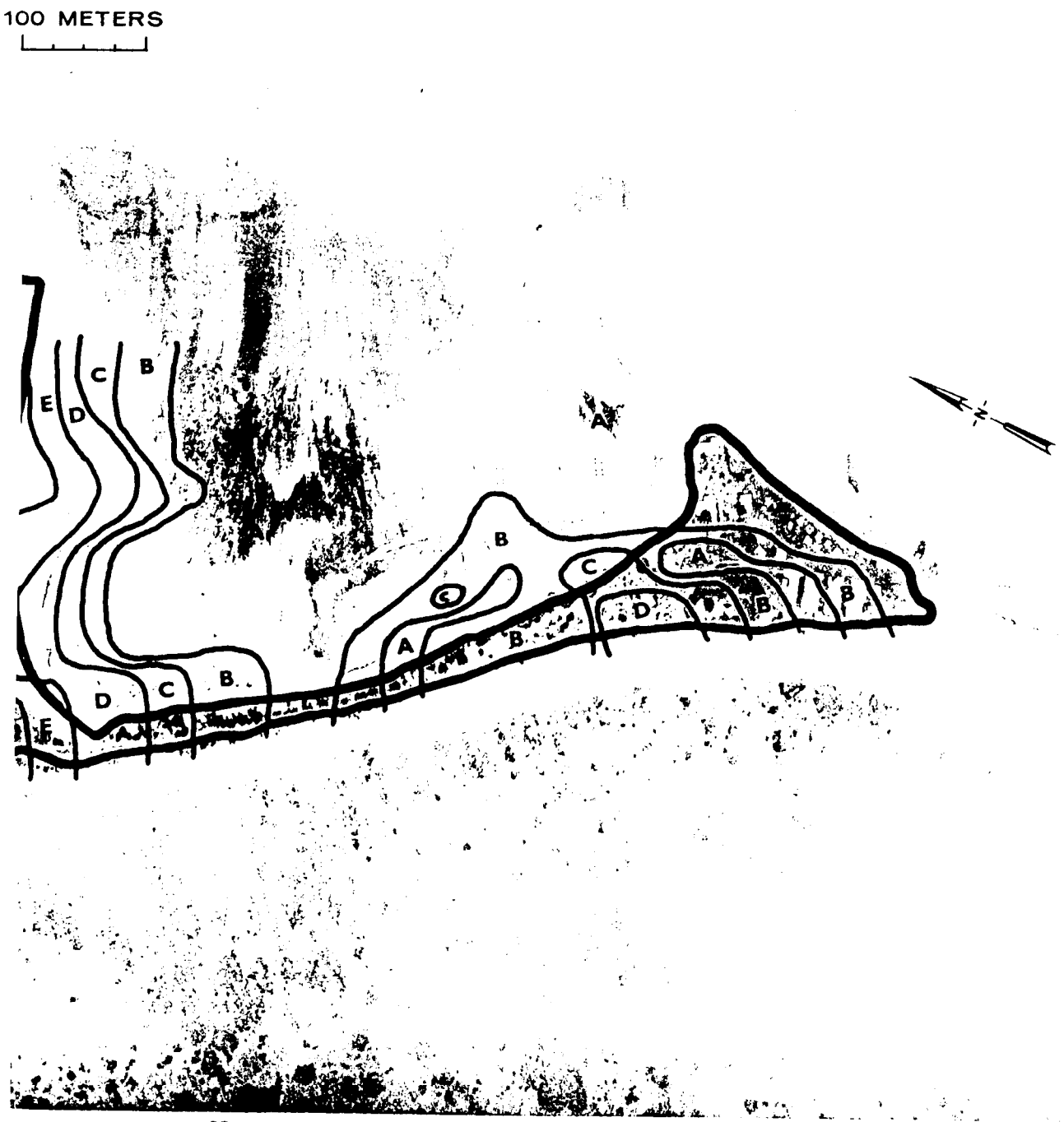



Fig. B.25.1.m. $^{60}$Co isoexposure and isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

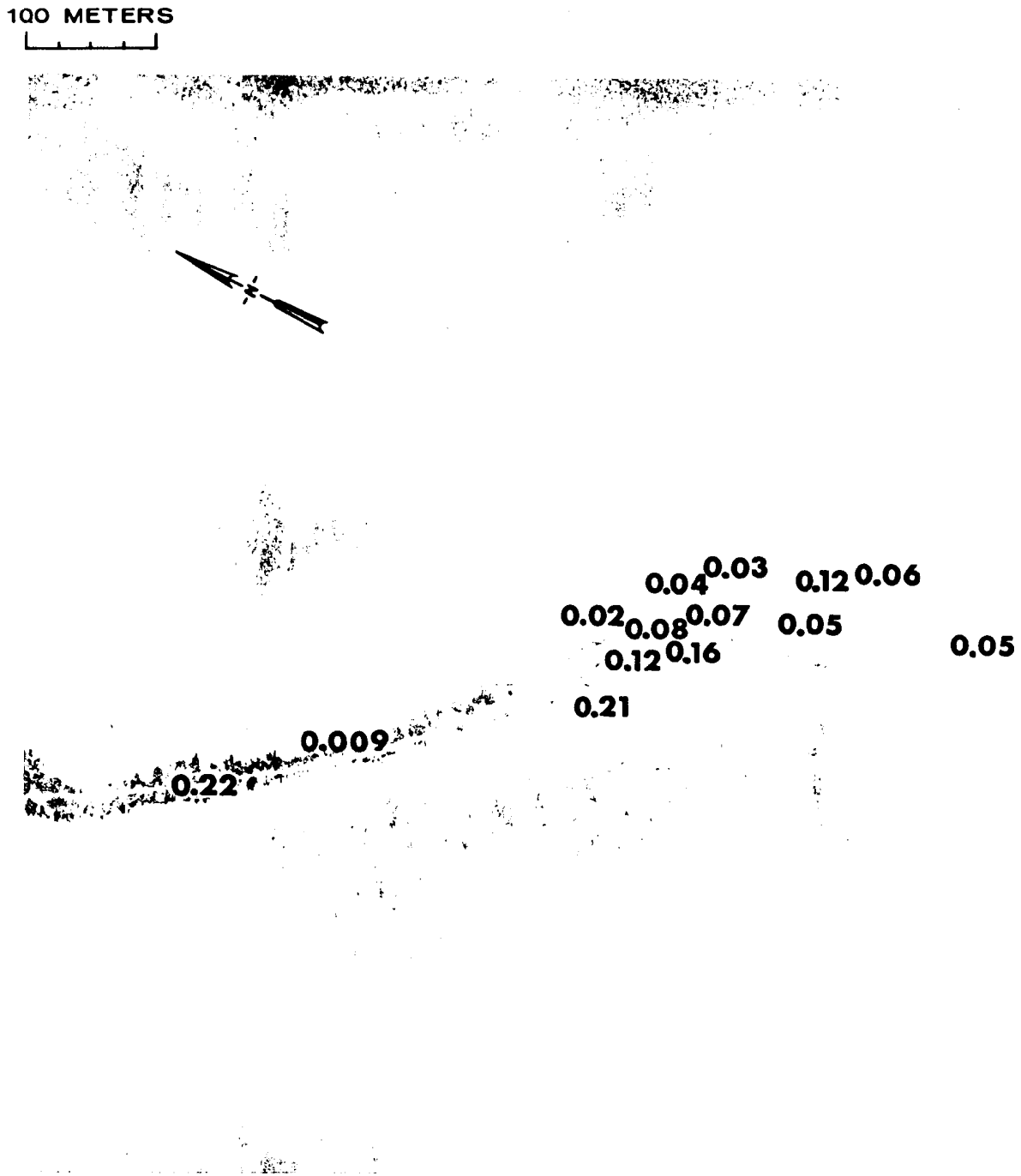



Fig. B.25.1.n. The average $^{60}Co$ activities (pCi/gm) in soil samples collected to a depth of 15 cm.

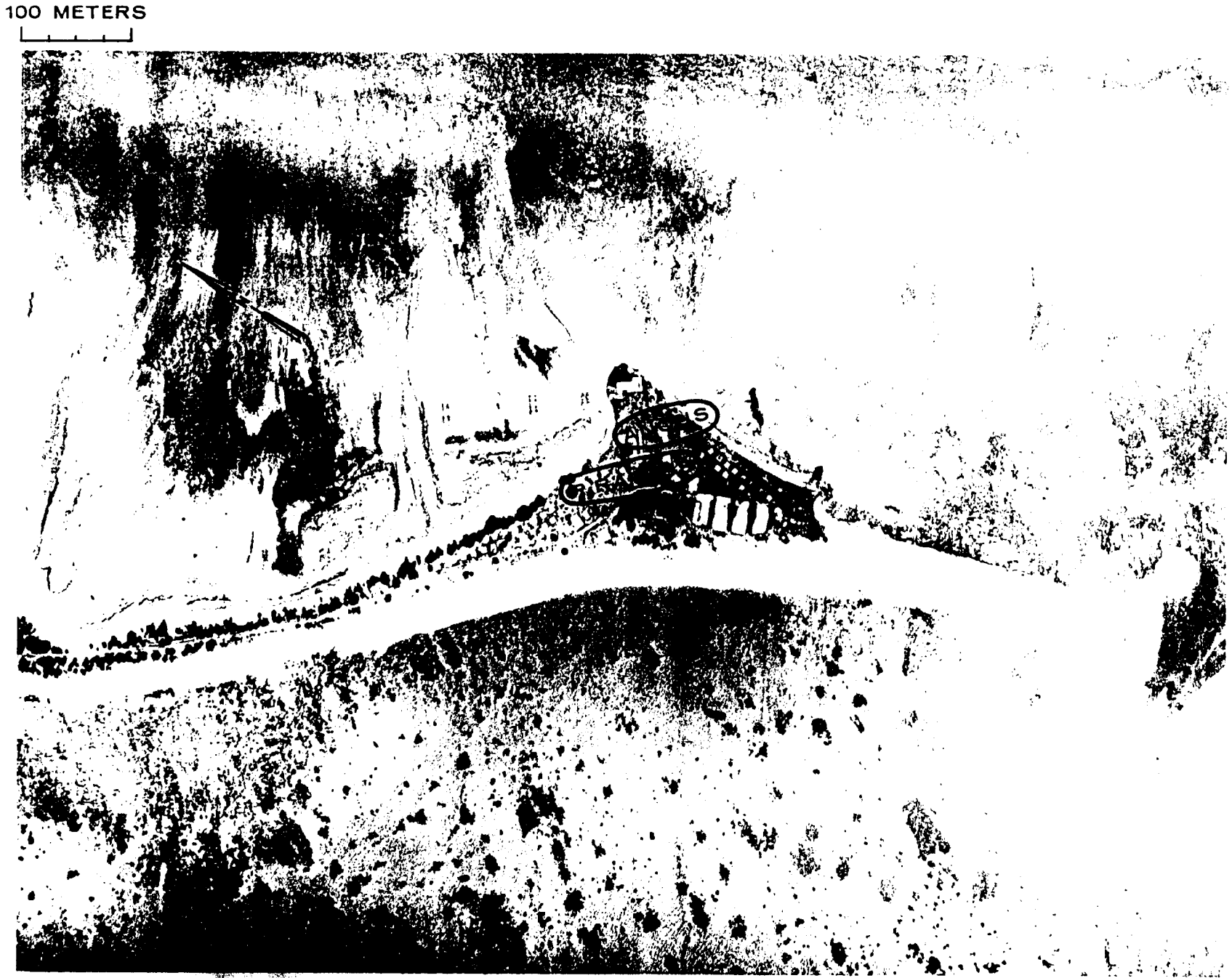



Fig. B.25.1.o. Terrestrial animal sample locations.

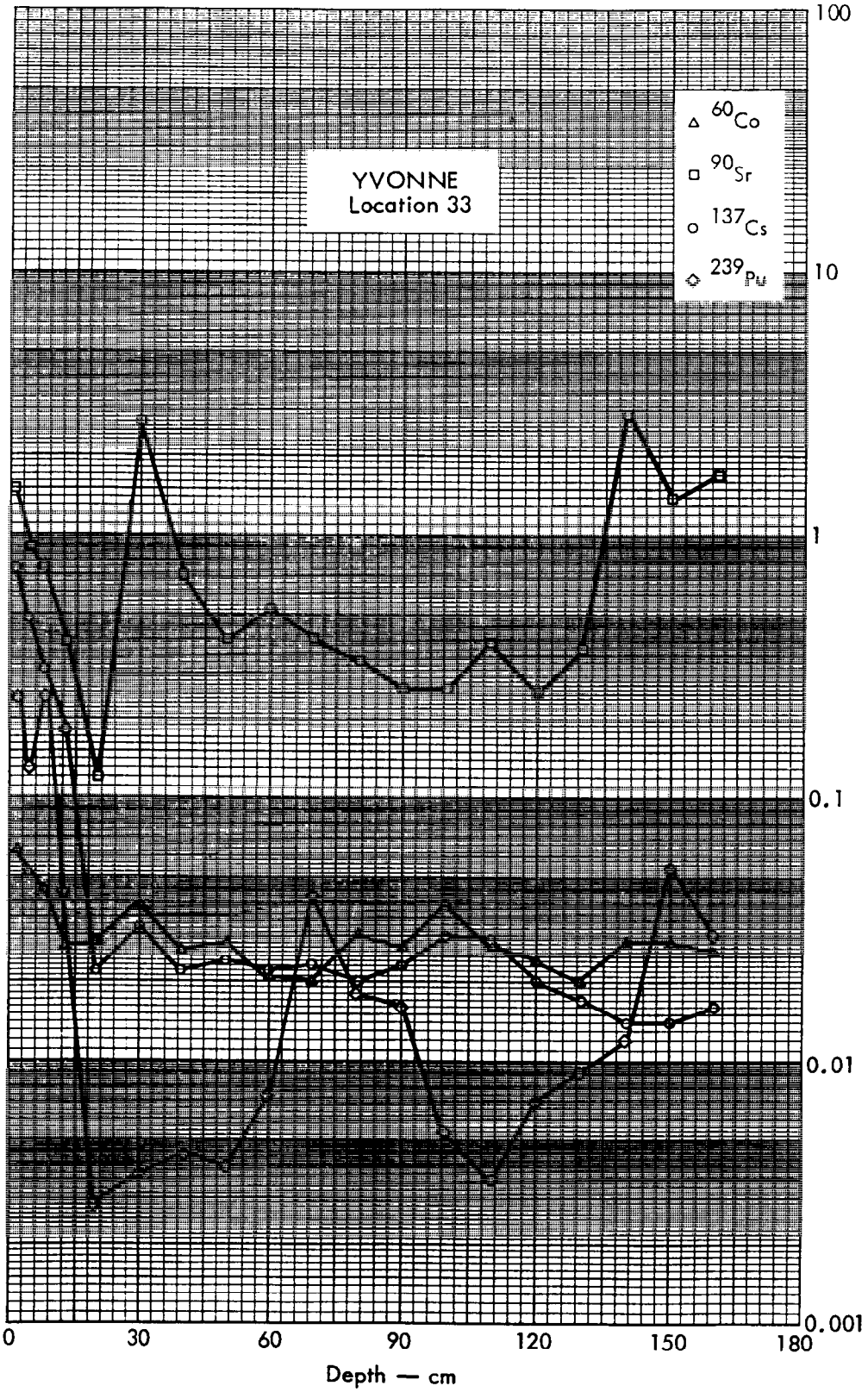



Fig. B. 25.2a. Activities of selected radionuclides as a function of soil depth.

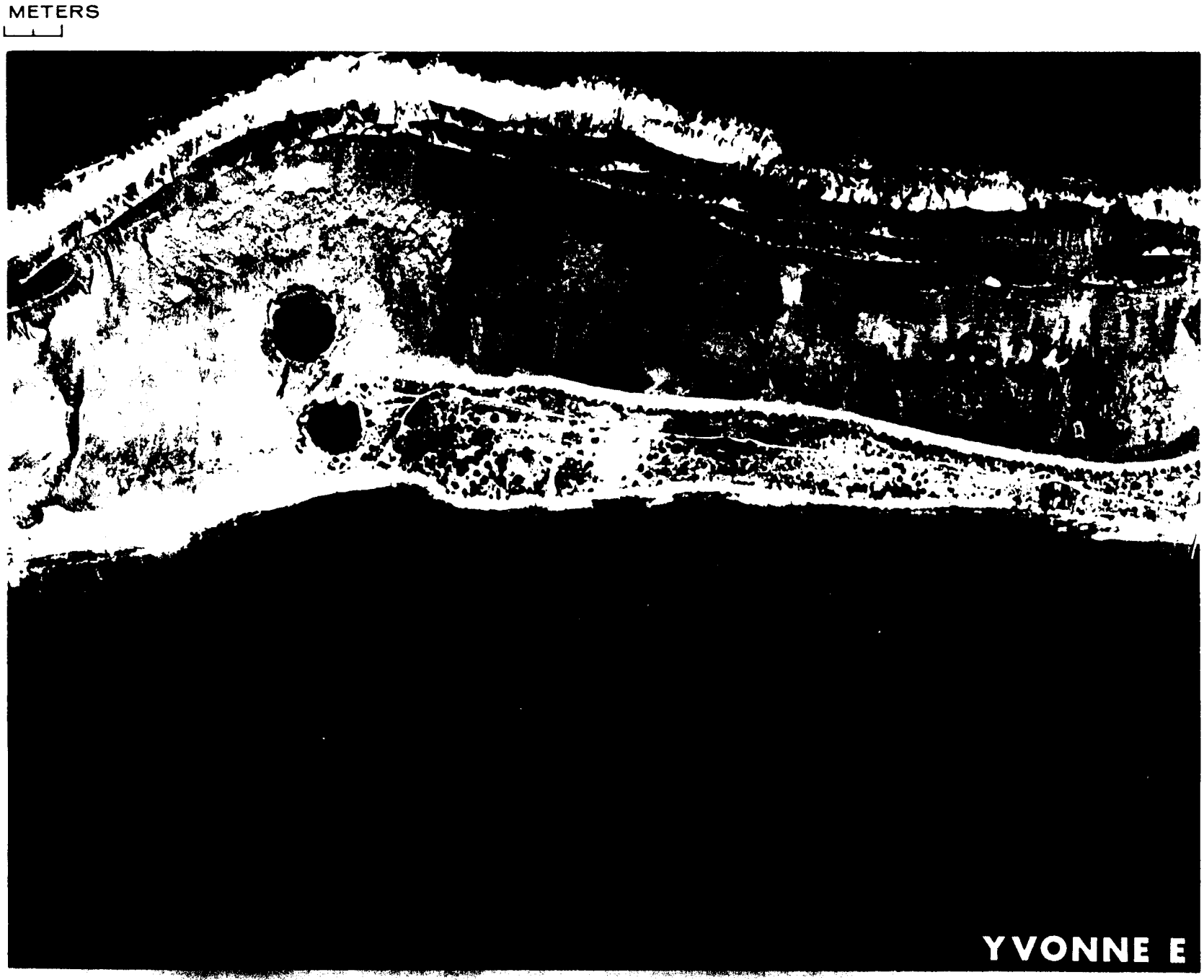



Fig. B.26.1.a.

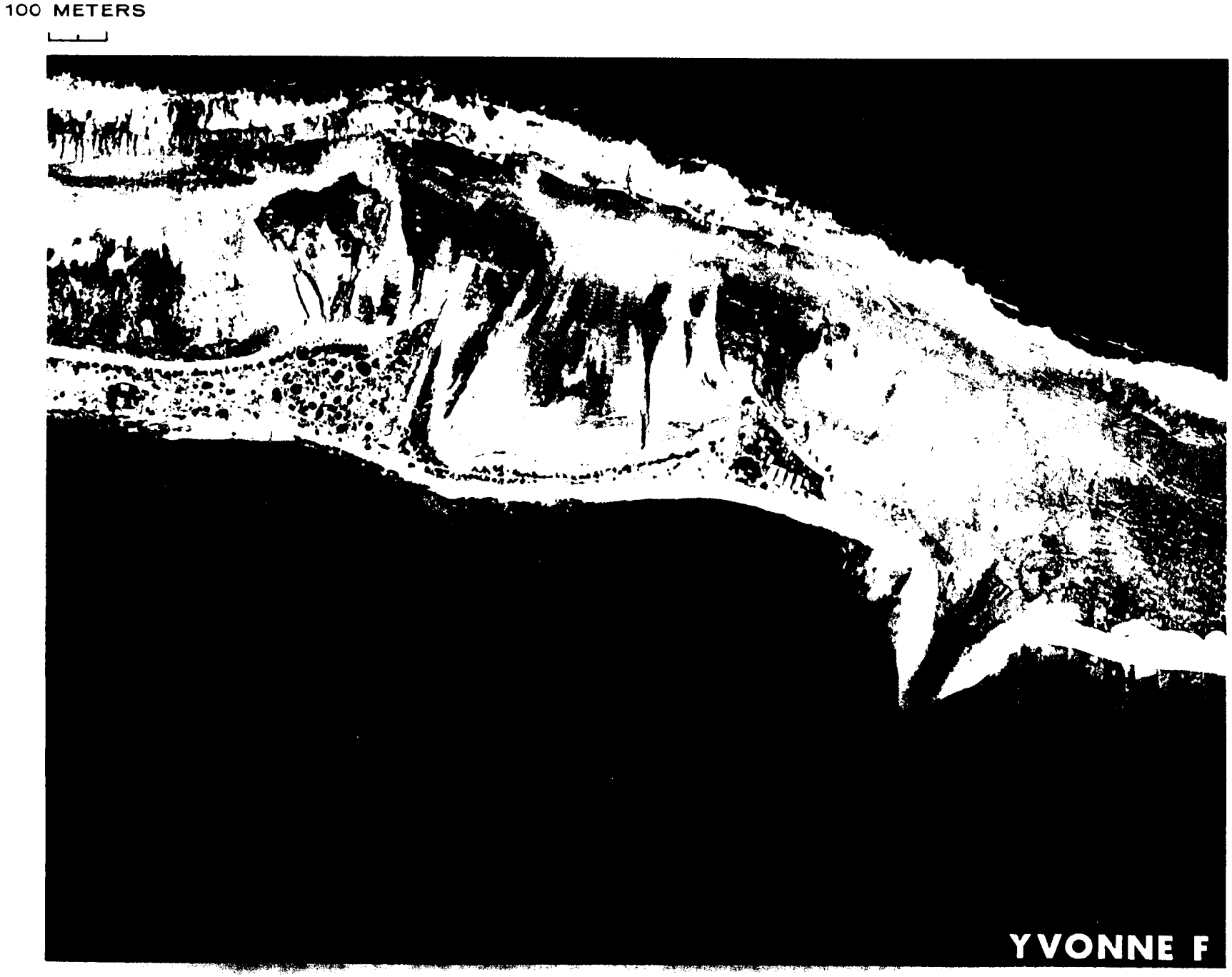



Fig. B.27.1.a.

Fig. B.28.1.a.

Fig. B.28.1.d. The gamma background exposure rate (μR/hr) at 1 m above the ground, measured with a portable NaI scintillation counter.

Fig. B.28.1.f. Soil-sample locations.

Fig. B.28.1.b. Gross count isoexposure contours. (Refer to alphabetic symbol key in this appendix.)

Fig. B.28.1.g. Vegetation sample locations.

Fig. B.28.1.i. The average $^{239}Pu$ activities (pCi/g) in soil samples collected to a depth of 15 cm.

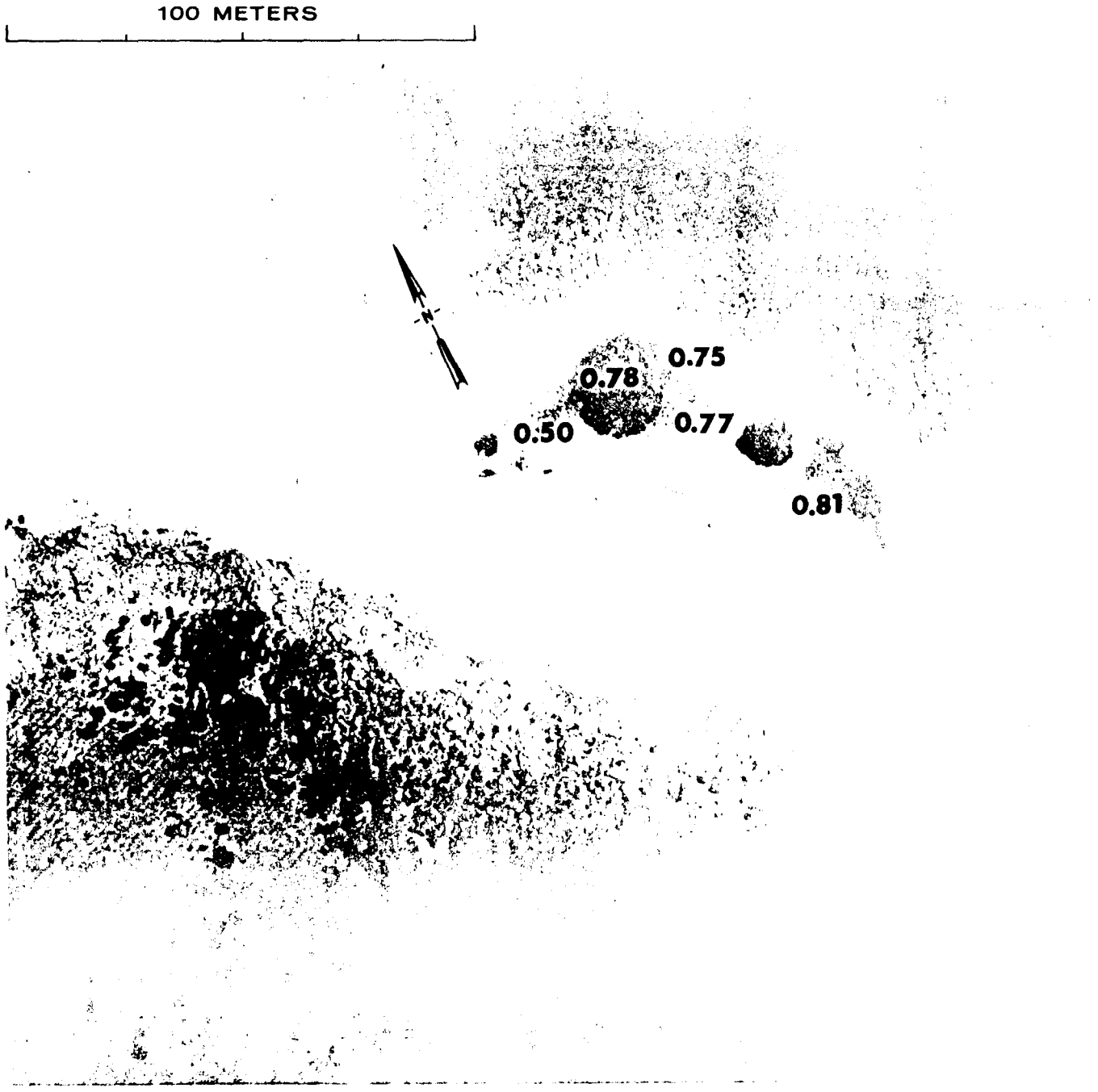



Fig. B.28.1.j. The average $^{90}Sr$ activities (pCi/g) in soil samples collected to a depth of 15 cm.

Fig. B.28.1.k. $^{137}Cs$ isoexposure and isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

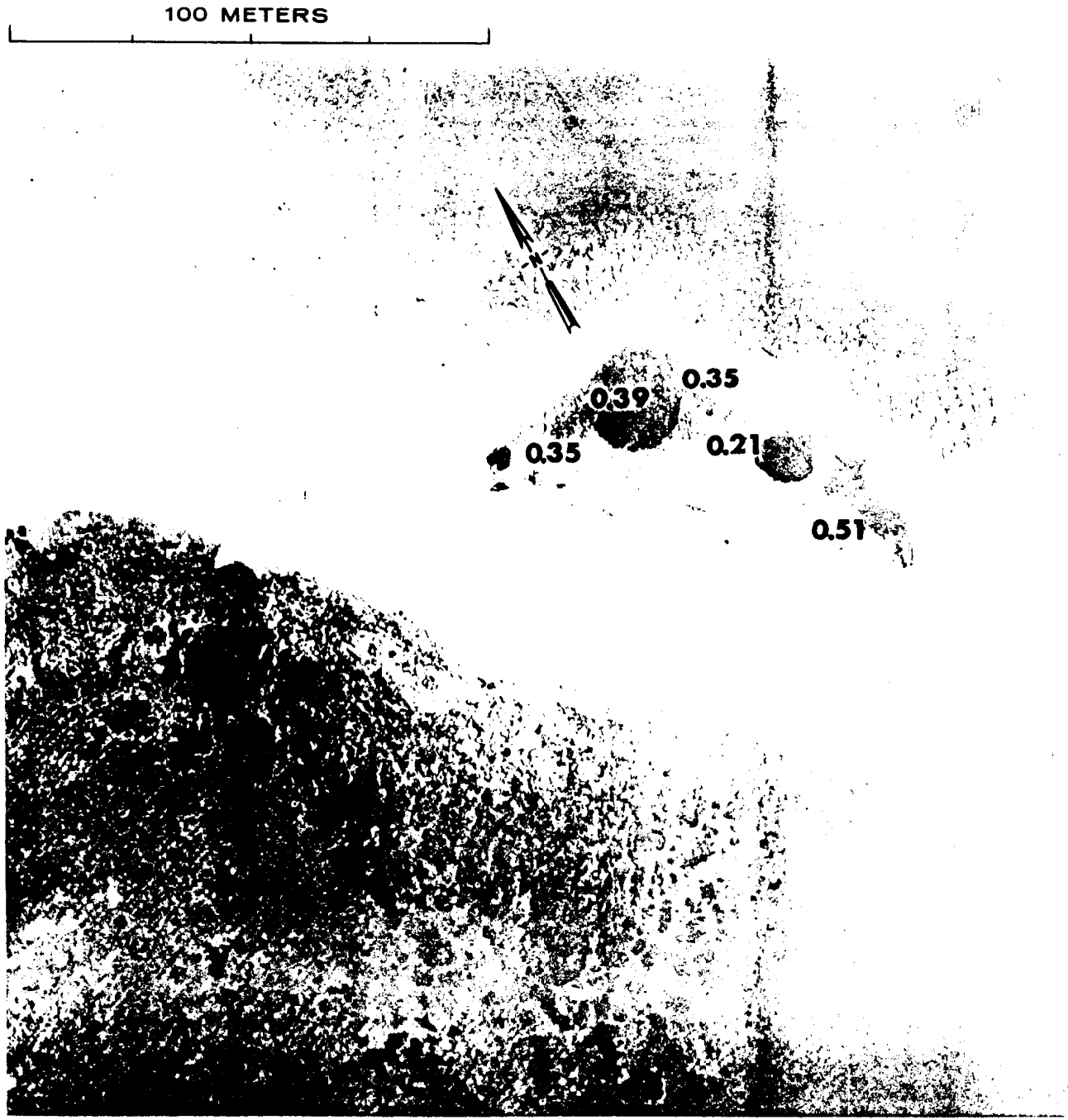



Fig. B.28.1.1. The average $^{137}Cs$ activities (pCi/g) in soil samples collected to a depth of 15 cm.

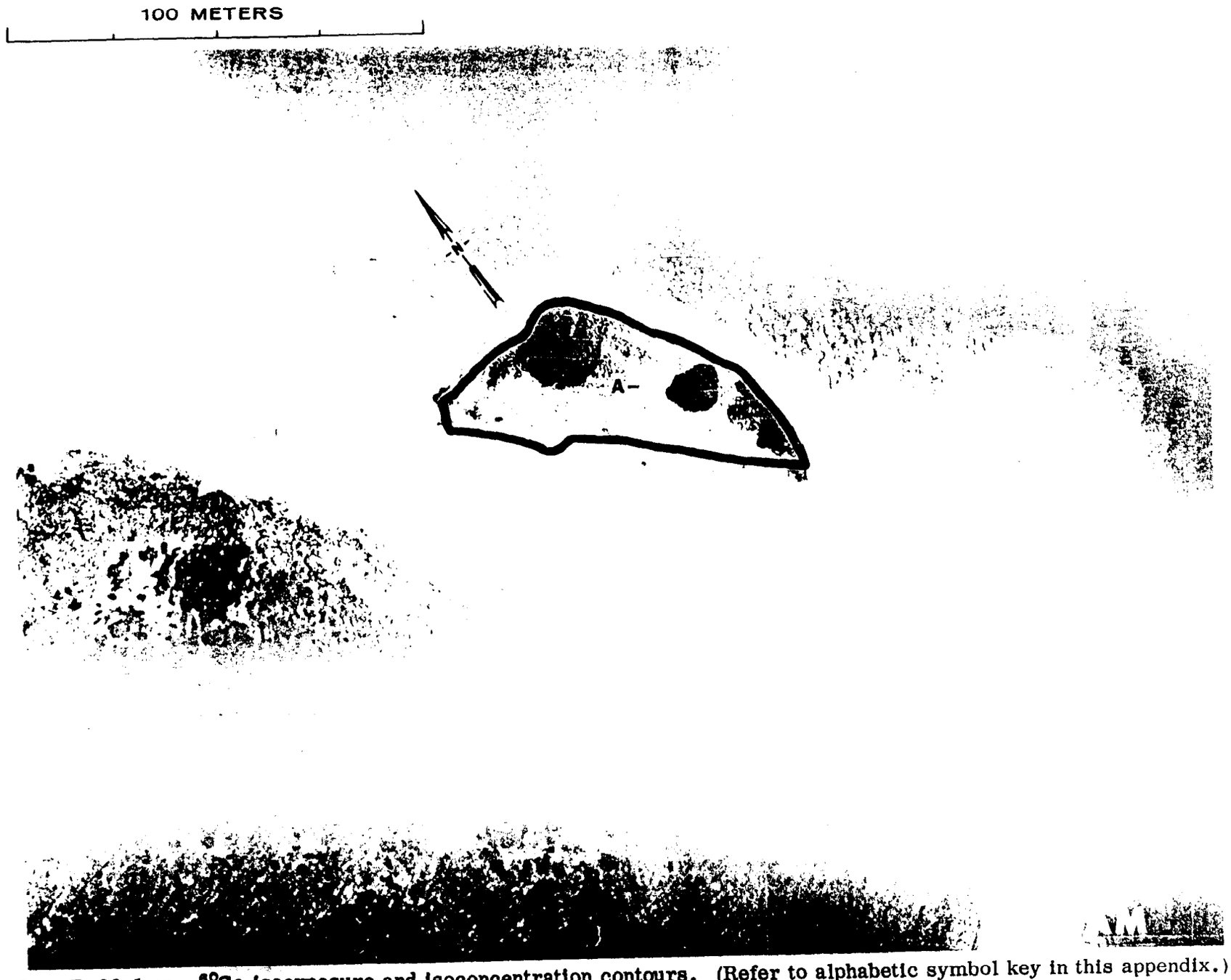



Fig. B.28.1.m. $^{60}Co$ isoexposure and isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

Fig. B.28.1.n. The average $^{60}Co$ activities (pCi/g) in soil samples collected to a depth of 15 cm.

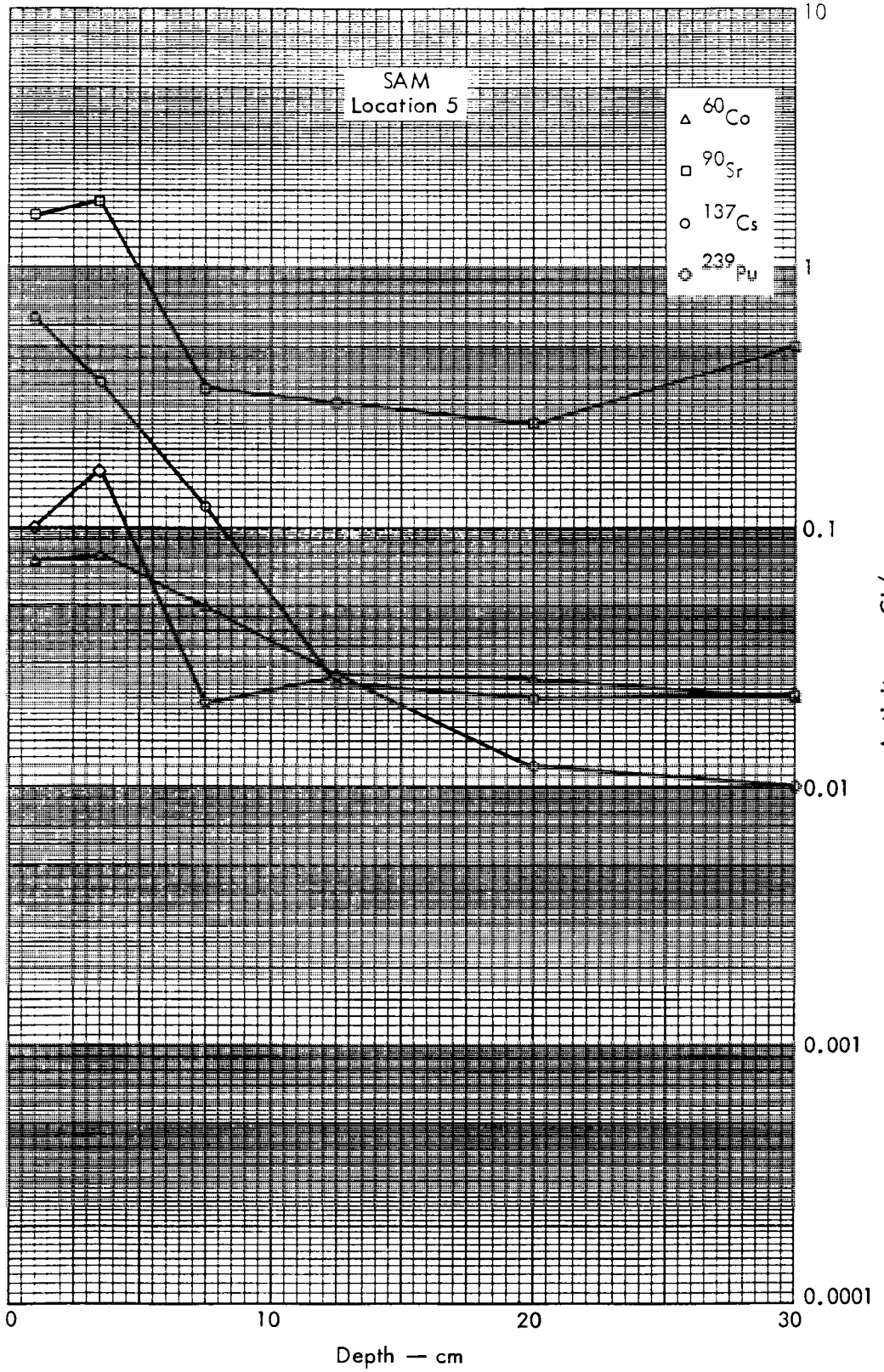



Fig. B. 28. 2a. Activities of selected radionuclides as a function of soil depth.

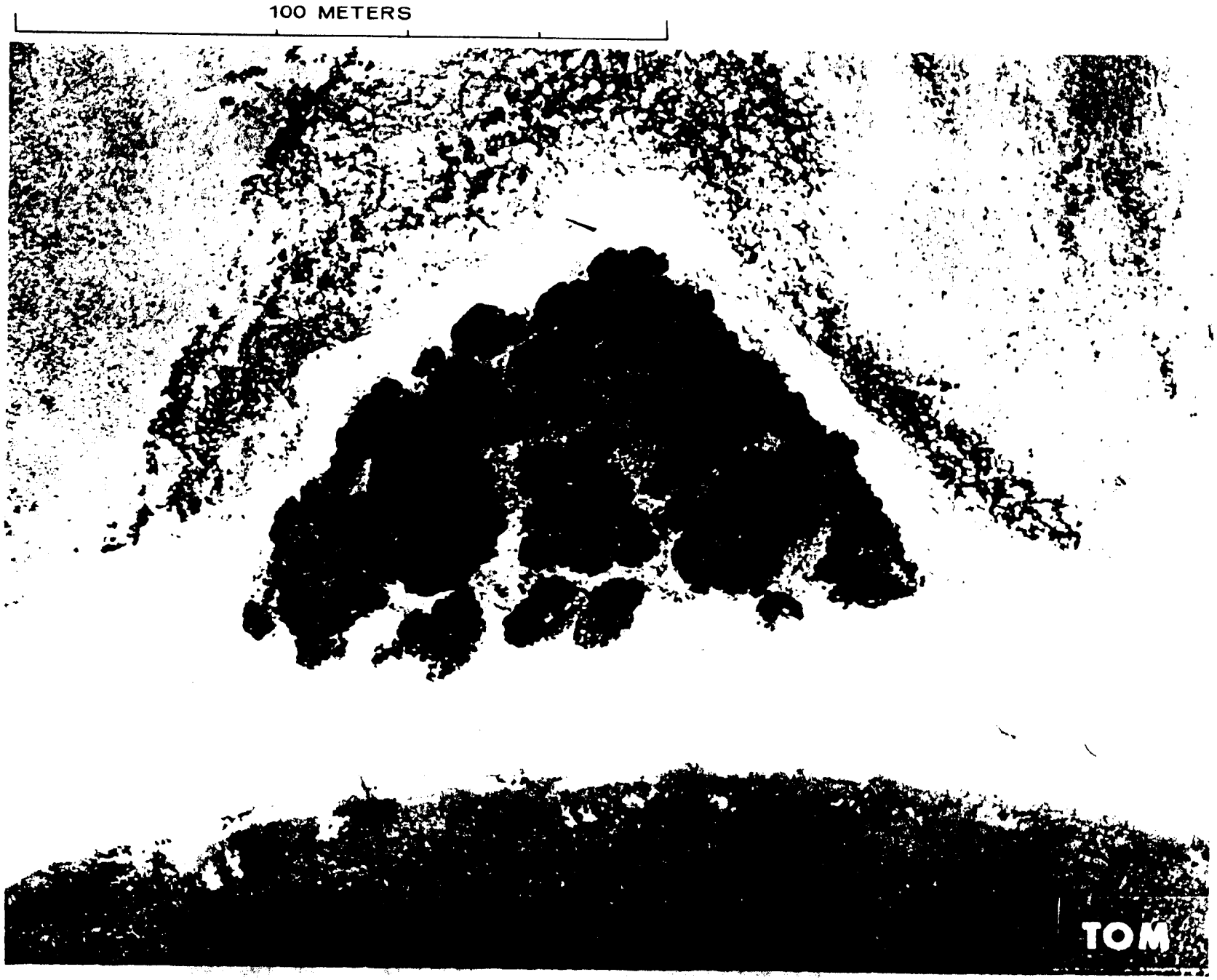



Fig. B.29.1.a.

Fig. B.29.1.b. Gross count isoexposure contours. (Refer to alphabetic symbol key in this appendix.)

Fig. B.29.1.d. The gamma background exposure rate (μR/hr) at 1 m above the ground, measured with a portable NaI scintillation counter.

Fig. B.29.1.f. Soil-sample locations.

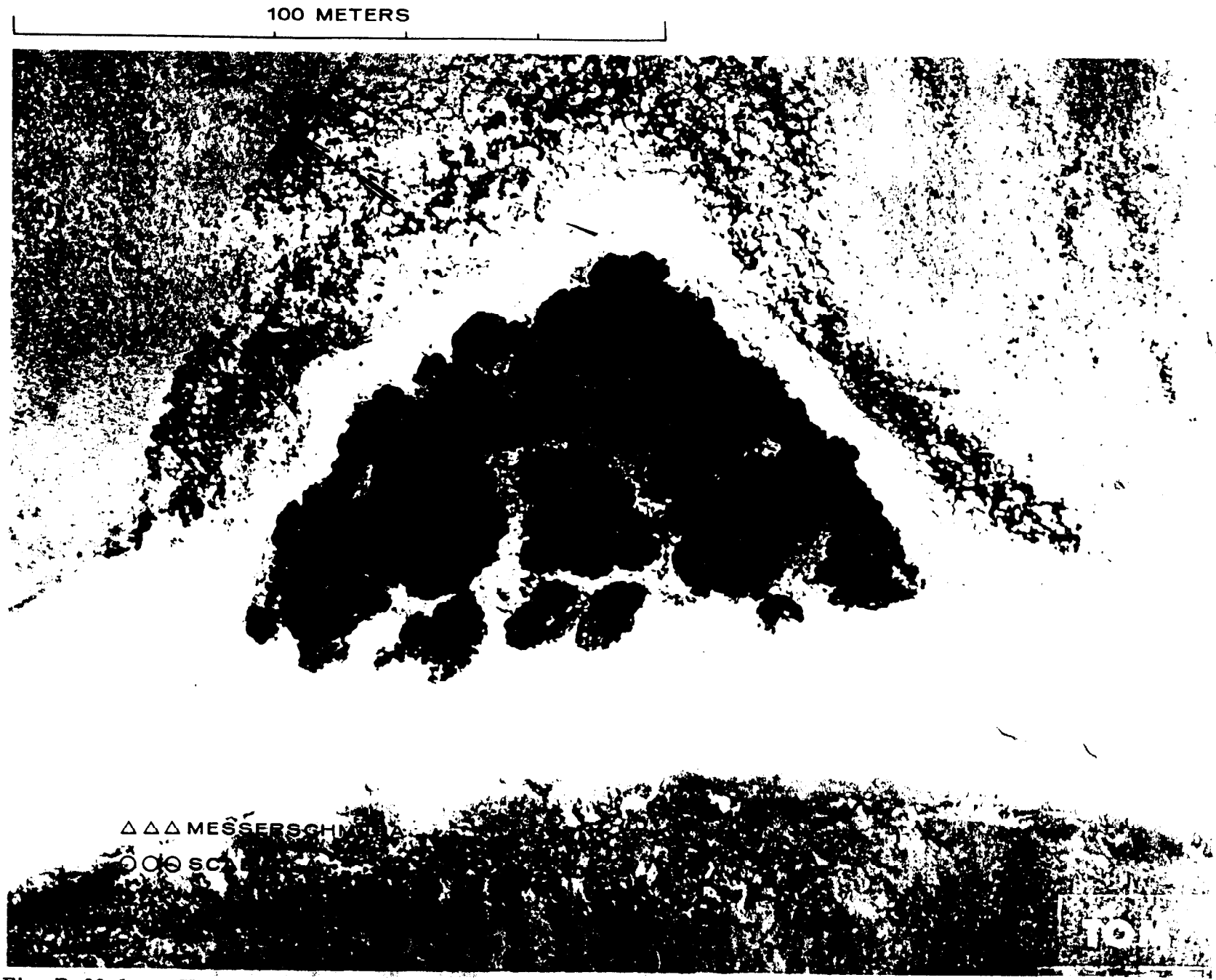



Fig. B.29.1.g. Vegetation sample locations.

Fig. B.29.1.1. The average $^{239}Pu$ activities (pCi/g) in soil samples collected to a depth of 15 cm.

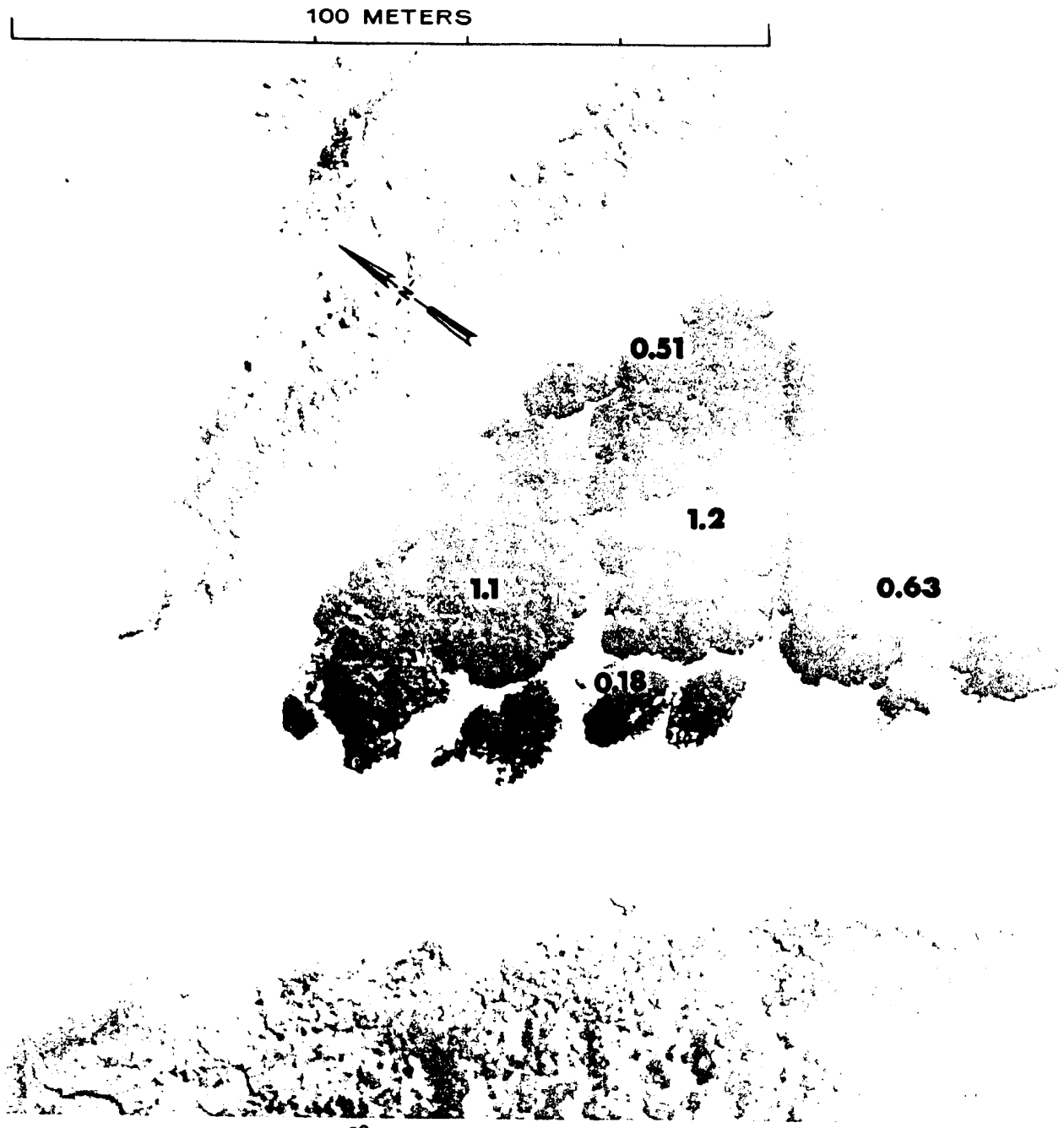



Fig. B.29.1.j. The average $^{90}Sr$ activities (pCi/g) in soil samples collected to a depth of 15 cm.

Fig. B.29.1.k. $^{137}Cs$ isoexposure and isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

Fig. B.29.1.1. The average $^{137}Cs$ activities (pCi/g) in soil samples collected to a depth of 15 cm.

Fig. B.29.1.m. $^{60}Co$ isoexposure and isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

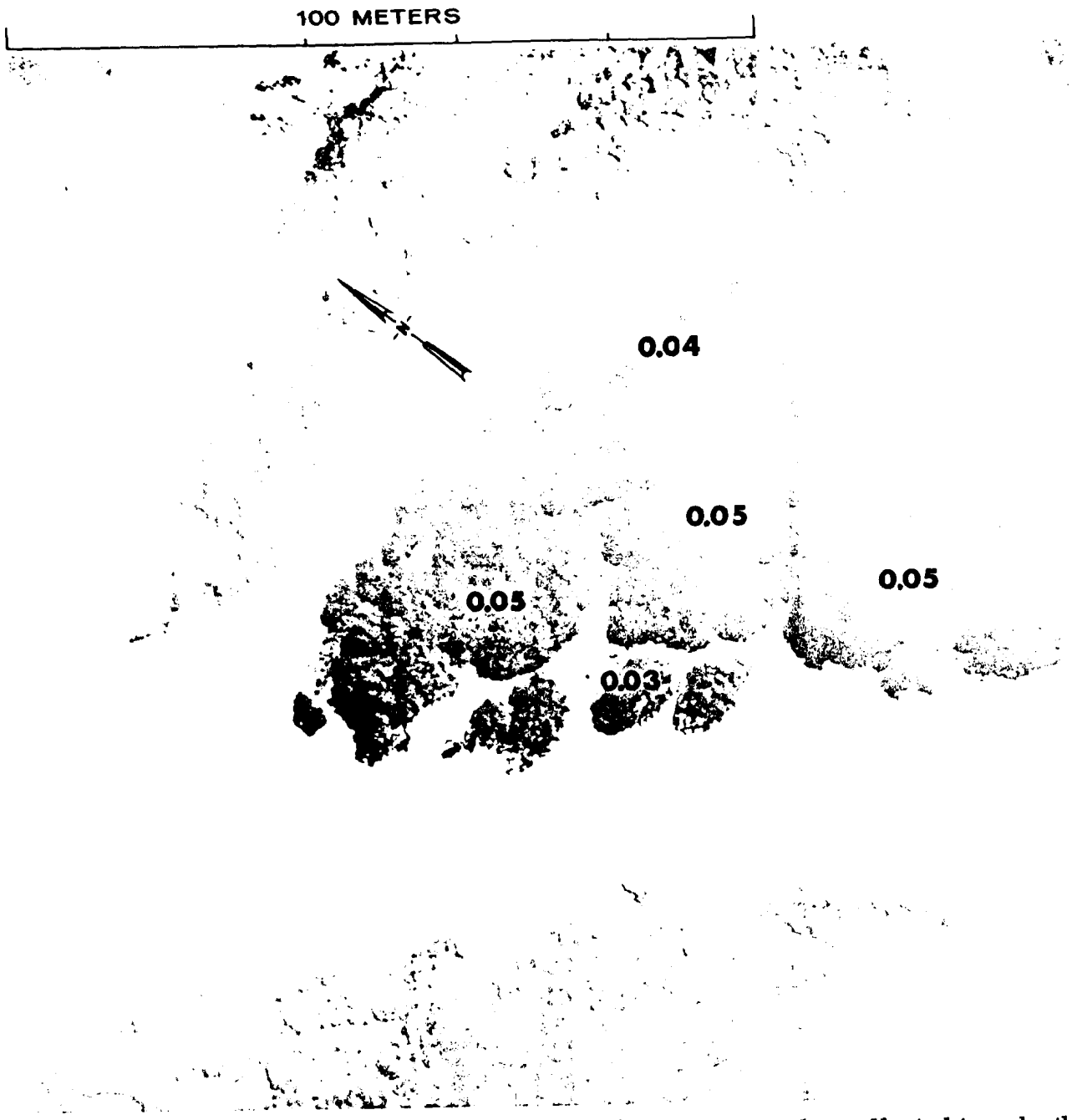



Fig. B.29.1.n. The average $^{60}Co$ activities (pCi/g) in soil samples collected to a depth of 15 cm.

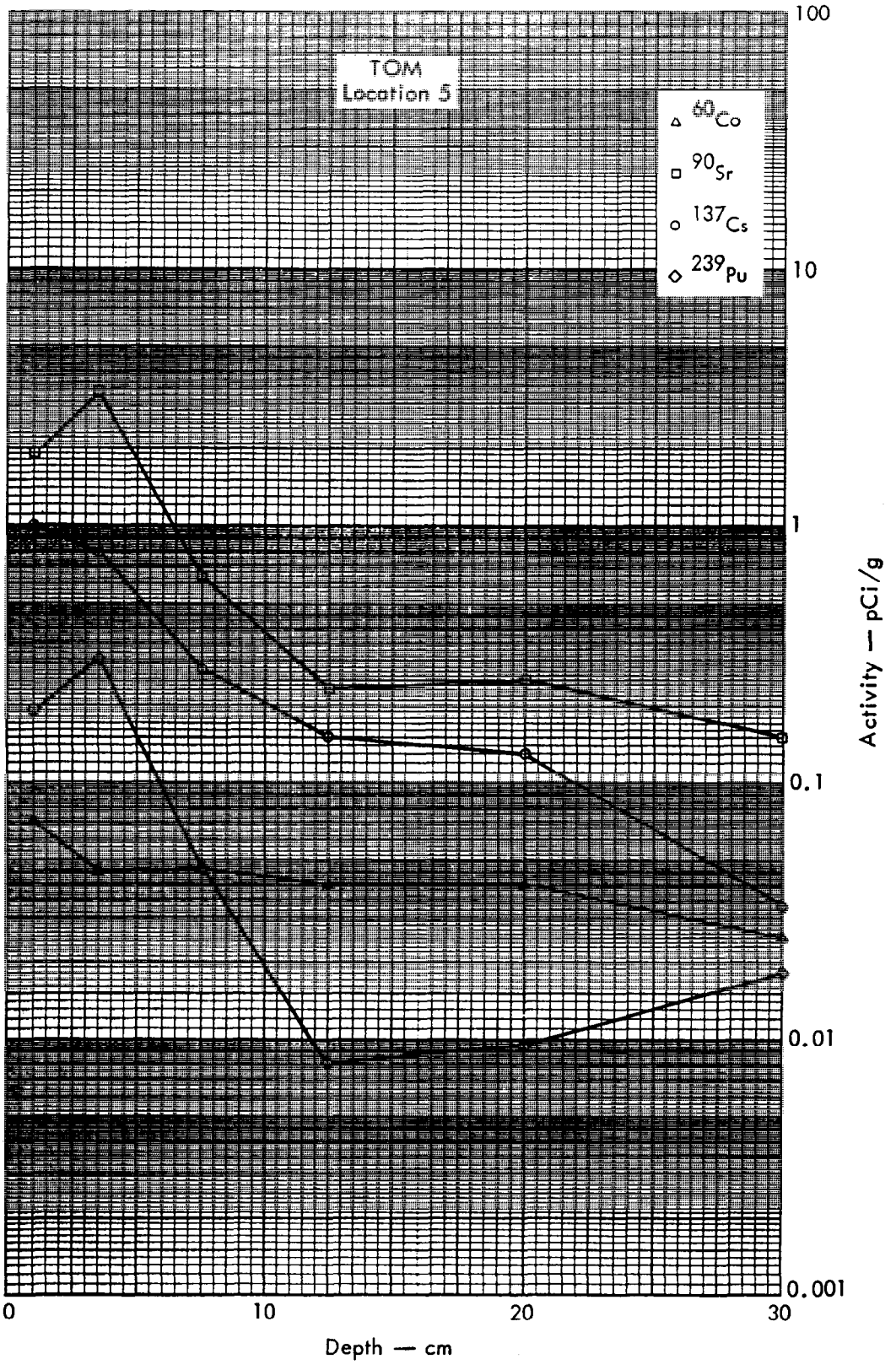



Fig. B. 29. 2a. Activities of selected radionuclides as a function of soil depth.

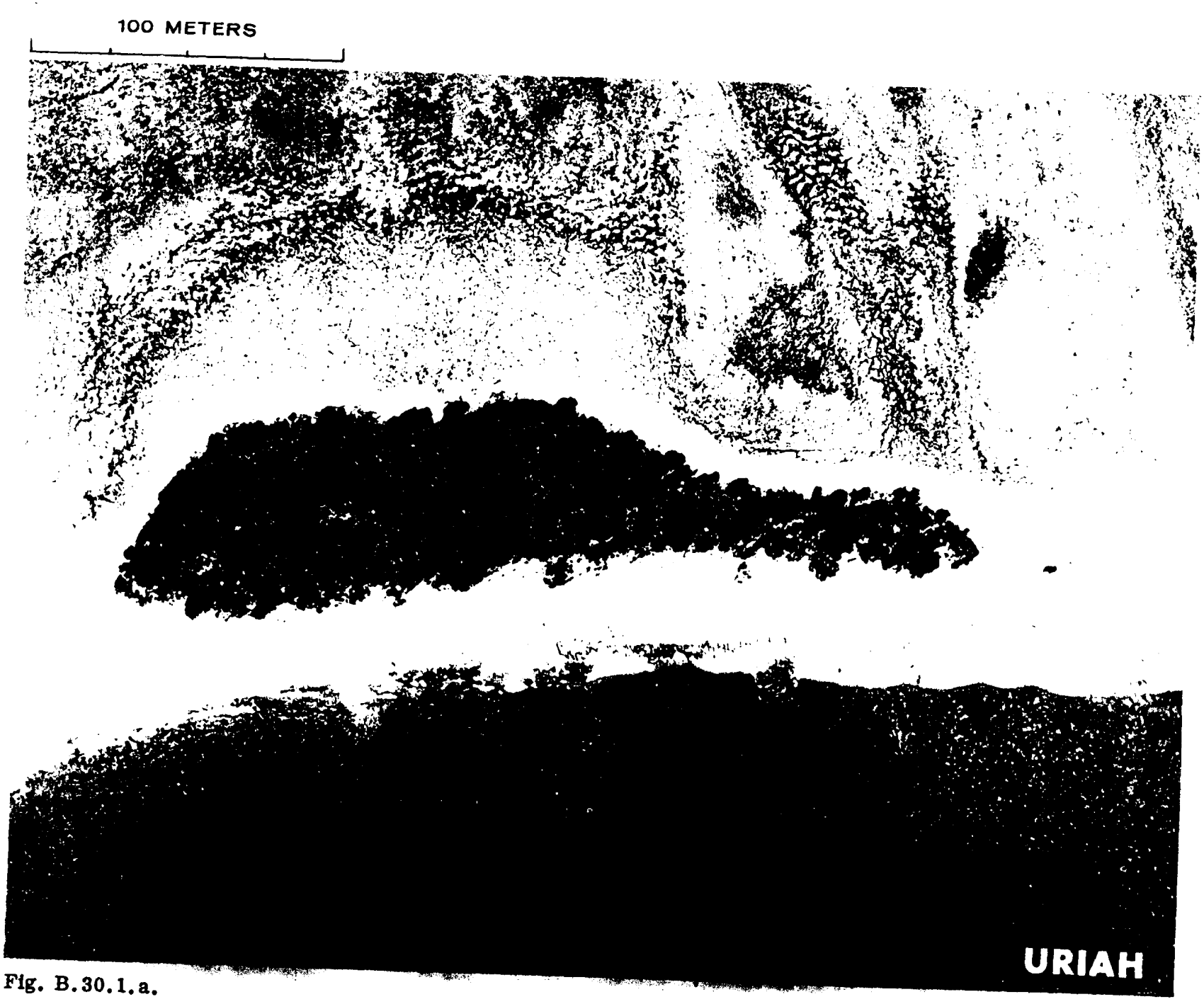



Fig. B.30.1.a.

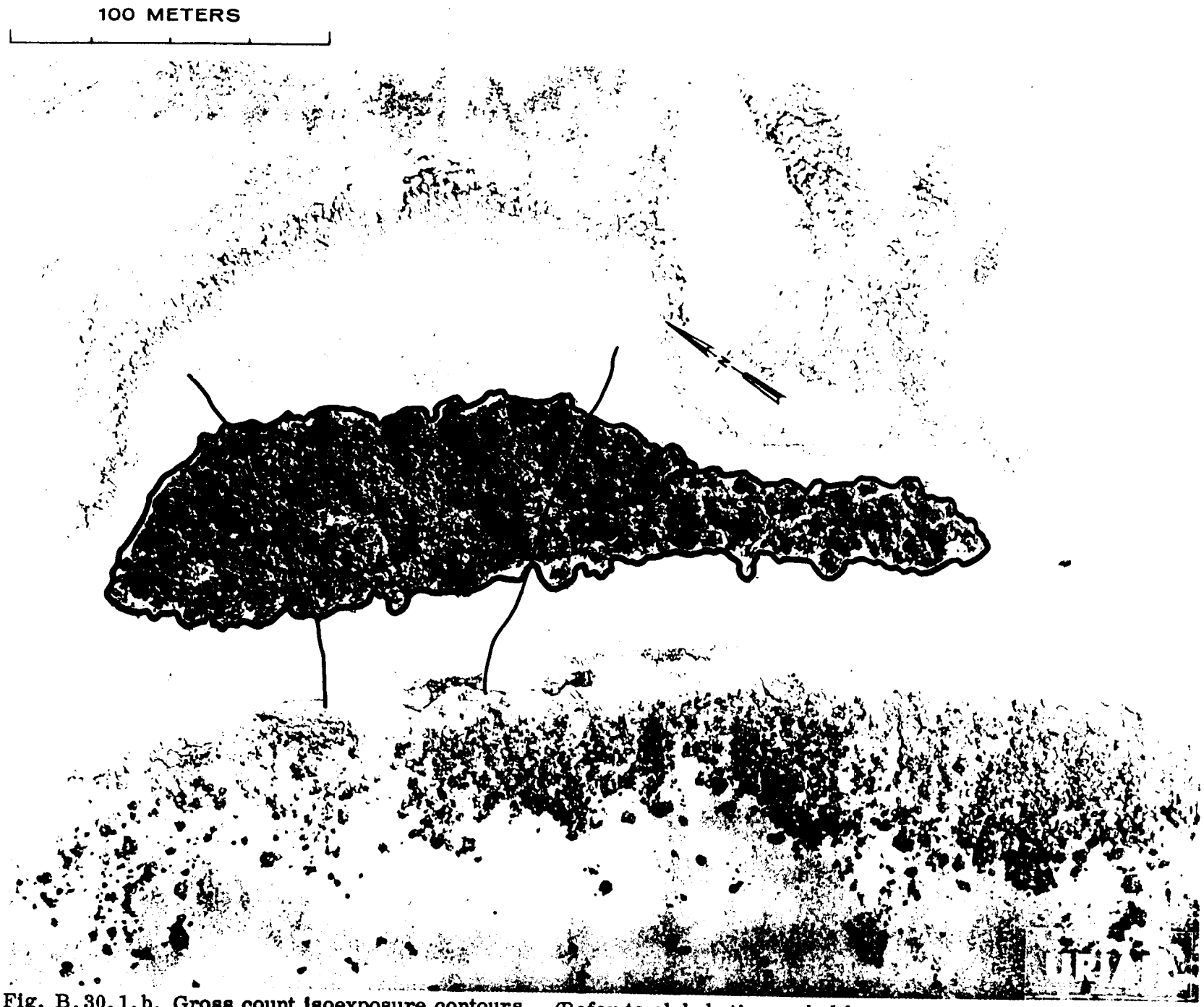



Fig. B.30.1.b. Gross count isoexposure contours. (Refer to alphabetic symbol key in this appendix.)

Fig. B.30.1.d. The gamma background exposure rate (μR/hr) at 1 m above the ground, measured with a portable NaI scintillation counter.

Fig. B.30.1.f. Soil-sample locations.

Fig. B.30.1.i. The average $^{239}Pu$ activities (pCi/g) in soil samples collected to a depth of 15 cm.

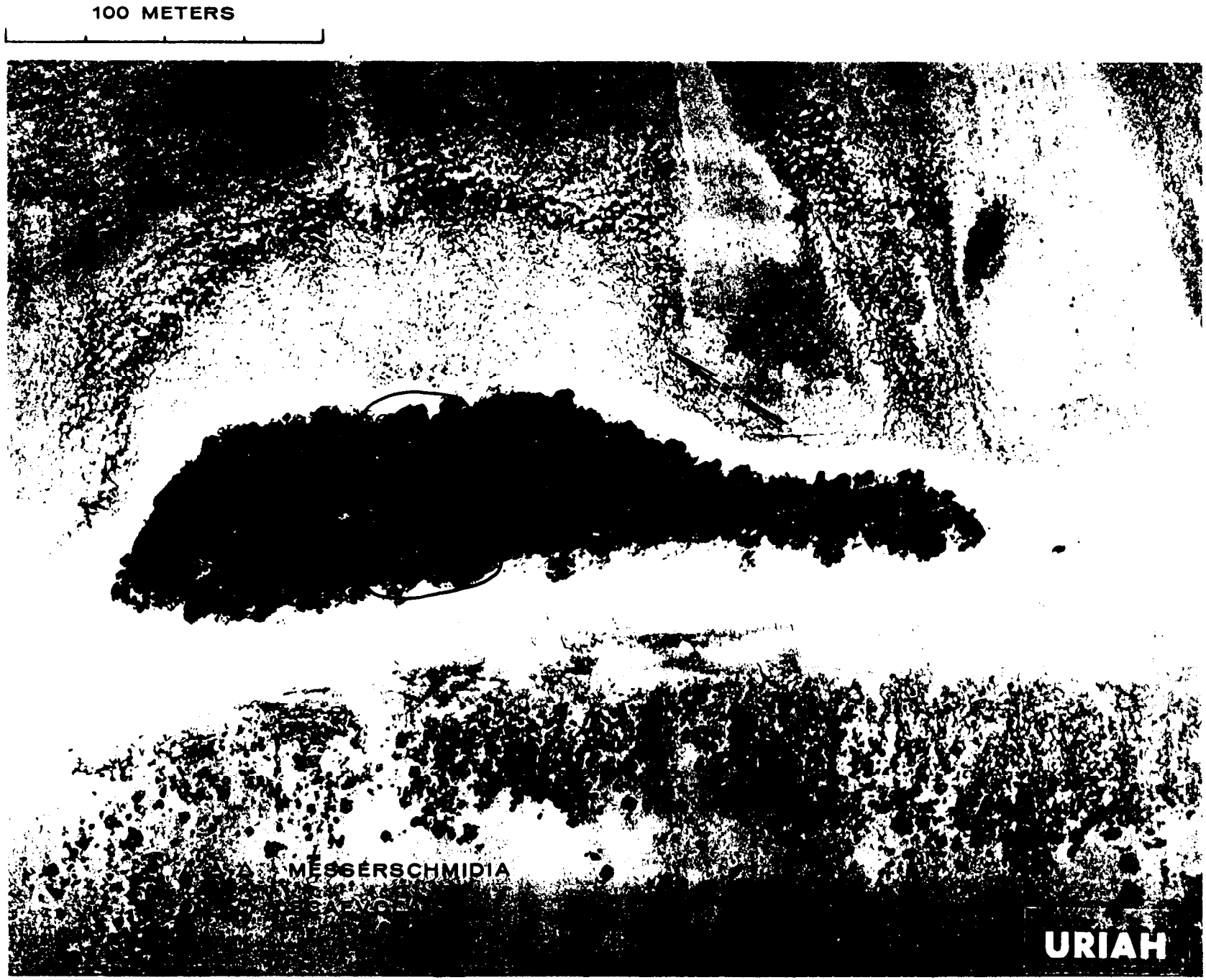



Fig. B.30.1.g. Vegetation sample locations.

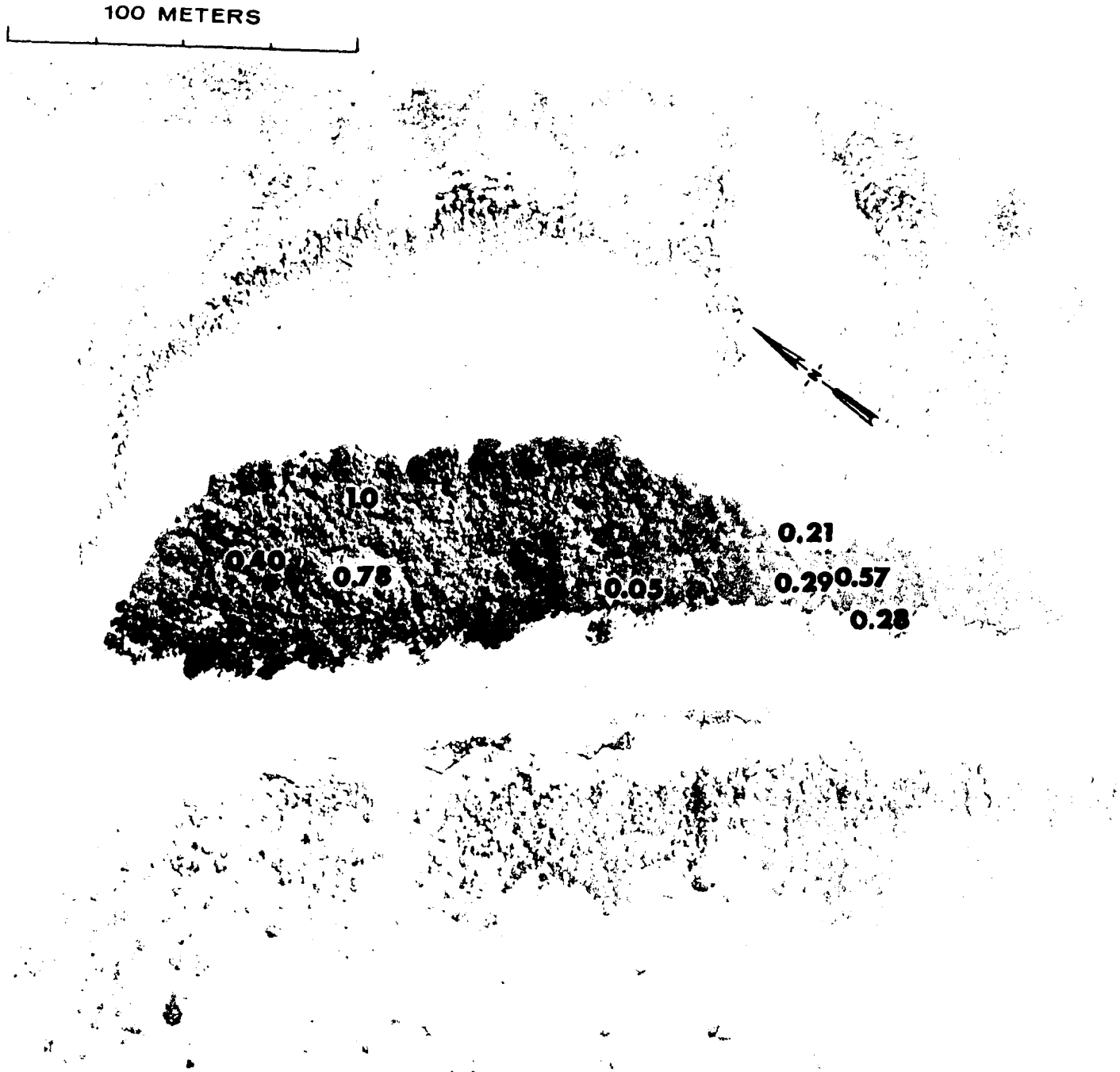



Fig. B.30.1.j. The average $^{90}Sr$ activities (pCi/g) in soil samples collected to a depth of 15 cm.

Fig. B.29.1.k. $^{137}Cs$ isoexposure and isoconcentration contours. (Refer to alphabetic symbol key in this appendix.)

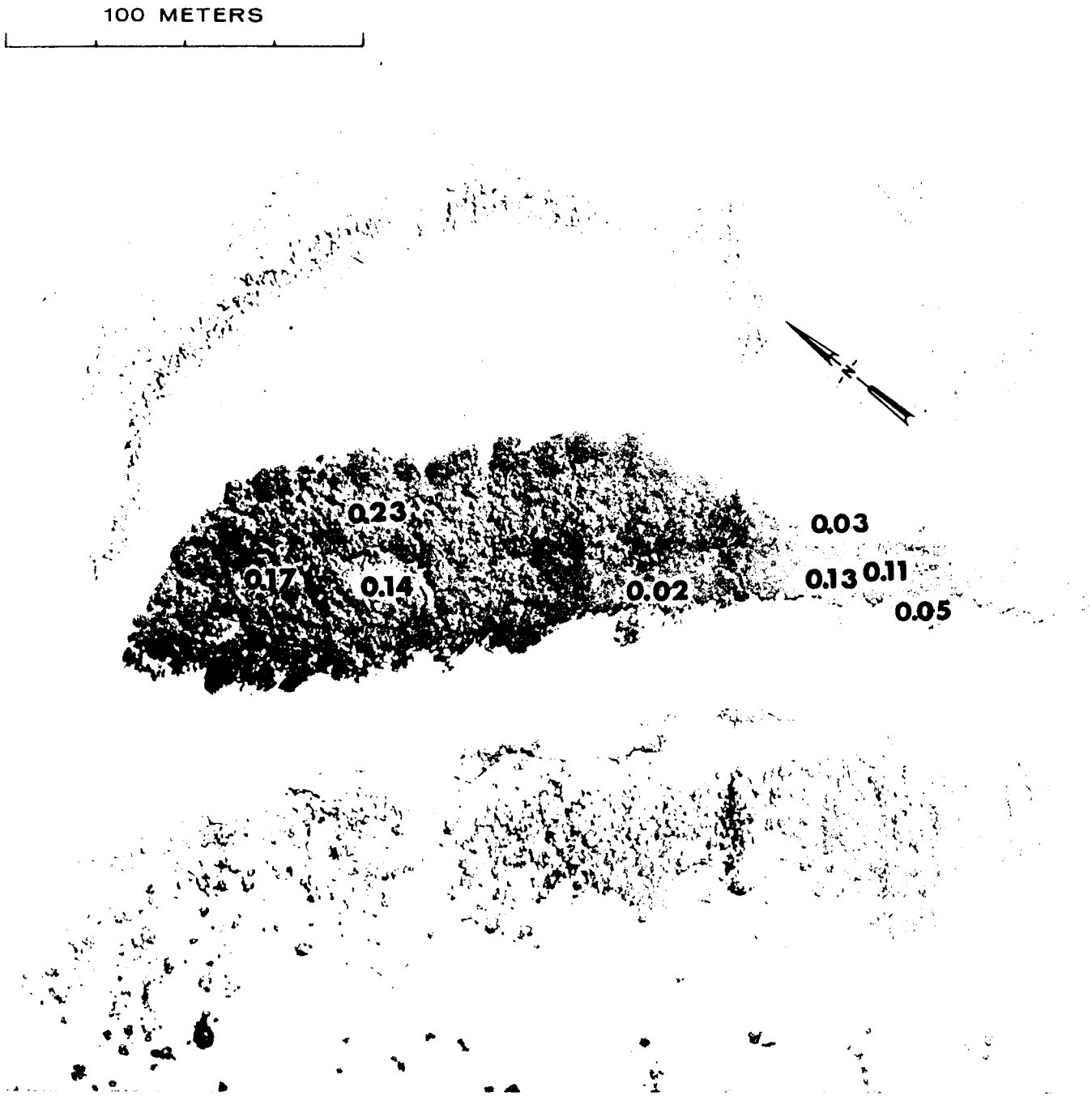



Fig. B.30.1.1. The average $^{137}Cs$ activities (pCi/g) in soil samples collected to a depth of 15 cm.