

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

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Mr. John Hickman
Division of Waste Management
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SUBJECT: IN-PROCESS INSPECTION SURVEY RESULTS FOR SELECTED INSIDE AND OUTSIDE OPEN LAND AREA SURVEY UNITS AT THE YANKEE NUCLEAR POWER STATION, ROWE, MASSACHUSETTS [DOCKET NO. 50-29; RFTA NO. 05-008]

Dear Mr. Hickman:

The Oak Ridge Institute for Science and Education (ORISE) performed in-process confirmatory inspection survey activities on selected Inside Open Land (NOL) and Outside Open Land (OOL) Areas at the Yankee Nuclear Power Station in Rowe, Massachusetts during the period of June 21 and 22, 2006. These survey activities were requested and approved by the U.S. Nuclear Regulatory Commission (NRC). Enclosed are the in-process survey results documenting these survey activities. The survey activities included gamma surface scans and soil sampling within several survey units in the Open Land Areas.

If you have any questions or comments, please direct them to me at 865.576.0065 or J. Scott Kirk at 865.574.0685.

Sincerely,



Wade C. Adams
Health Physicist/Project Leader
Survey Projects

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Enclosure

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**IN-PROCESS INSPECTION SURVEY RESULTS
FOR SELECTED INSIDE AND OUTSIDE OPEN LAND AREA SURVEY UNITS
AT THE YANKEE NUCLEAR POWER STATION
ROWE, MASSACHUSETTS**

INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC) requested that the Oak Ridge Institute for Science and Education (ORISE) perform in-process inspection surveys of the selected Inside Open Land [(NOL) NOL-04-01 and NOL-05-01] and Outside Open Land [(OOL) OOL-09-01, OOL-09-02, OOL-07-02 and OOL-07-03] Area survey units (SU) at the Yankee Nuclear Power Station (YNPS). The in-process inspection surveys were performed during the period of June 21 and 22, 2006.

PROCEDURES

In-process inspection surveys were performed in accordance with a site-specific survey plan that was submitted to and approved by the NRC (ORISE 2005a). The site-specific survey plan follows the guidance provided in the ORISE Survey Procedures and Quality Assurance Manuals (ORISE 2004 and 2005b).

NOL-04-01, NOL-05-01, OOL-09-01, and OOL-09-02 Excavations

Gamma surface scans were performed on up to 80% of accessible portions of the four SU soil excavations using sodium iodide (NaI) scintillation detectors coupled to ratemeters with audible indicators. Due to the elevated gamma activity levels associated with the nearby independent spent fuel storage installation (ISFSI), a lead shield collimator was used to partially shield the NaI detectors during the gamma scans. Soil samples were collected from five locations in each SU. Figures 1 through 4 depict the soil excavation survey units that were part of these survey activities. Locations where soil samples were taken are depicted on these figures.

OOL-07-02 and OOL-07-03 Excavations

Gamma surface scans were performed on up to 50% of accessible portions of the two SU soil excavations using NaI scintillation detectors coupled to ratemeters with audible indicators. This area had previously been backfilled by YAEC to support the construction of a parking area and vehicles were parked in rows limiting gamma scan coverage. One soil sample was collected from the outer edge of SU OOL-07-03 from an area that was native soil. Figures 5 and 6 depict the soil excavation survey units that were part of these survey activities. The soil sample location is depicted on Figure 6.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Radiological data and sample media were returned to ORISE's laboratory in Oak Ridge, TN for analysis and interpretation. Radioanalyses were performed in accordance with the ORISE Laboratory Procedures Manual (ORISE 2006). Soil samples were analyzed by gamma spectroscopy for the primary radionuclides-of-concern [ROC (i.e., Co-60 and Cs-137)]. However, spectra were also reviewed for additional gamma-emitting fission and activation products associated with the

YNPS and other identifiable total absorption peaks. Soil sample results were reported in units of picocuries per gram (pCi/g).

FINDINGS AND RESULTS

Gamma surface scans identified one location of elevated direct gamma radiation on the soil surface in SU NOL-05-01; this activity was due to a discrete particle which was remediated by Yankee Atomic Electric Company (YAEC) personnel. ORISE requested that this particular soil sample be analyzed by the on-site YAEC radioanalytical laboratory. The radioanalytical results for this sample were 66,100 pCi/g of Co-60 and 476 pCi/g of Nb-94; the Cs-137 concentration was below the detection sensitivity of the radioanalytical procedure. The ranges of radionuclide concentrations for the 21 soil samples collected by ORISE were -0.02 to 0.42 pCi/g for Co-60 and 0.00 to 1.17 pCi/g for Cs-137. A complete listing of the soil sample results is presented in Table 1.

SUMMARY

ORISE conducted in-process surveys of selected open land SUs at YNPS during the period of June 21 and 22, 2006. An in-process confirmatory survey was implemented because the licensee did not have final status survey (FSS) data available for review. YNPS personnel provided ORISE with preliminary soil sample results while on site.

Gamma surface scans identified one location of elevated direct gamma radiation within the NOL-05-01 soil excavation. ORISE requested that YAEC personnel collect a soil sample from this location and had the sample analyzed by the YAEC on-site laboratory. The YAEC analytical results exceeded the site derived concentration guideline levels (DCGL's) as presented in Table 2 for Co-60 and Nb-94 and the site DCGL_{EMC} as presented in Table 1 of a technical basis document (TBD) that supports elevated measurement comparisons (EMC) for FSSs (YAEC 2005). ORISE collected 21 soil samples from judgmentally-selected locations. Gamma spectroscopy results for the 21 samples indicated that the ROC's were well below the DCGL's.

The in-process confirmatory surveys determined that detectable activity, in excess of the soil DCGLs (as presented in the LTP, Appendix 6J at 8.73 mrem/yr), was present in one soil sample collected by YAEC within Survey Unit NOL-05-01. However, this soil sample contained a discrete particle and the soil DCGL's do not address discrete particles. Currently, the NRC and ORISE are evaluating YAEC's TBD concerning discrete particles in soil; this information, which will be addressed in a later report to NRC, is needed to ascertain whether or not the SU is suitable for unrestricted release. All other soil samples met the unrestricted release criteria in accordance with clean up criteria cited in the licensee's LTP.

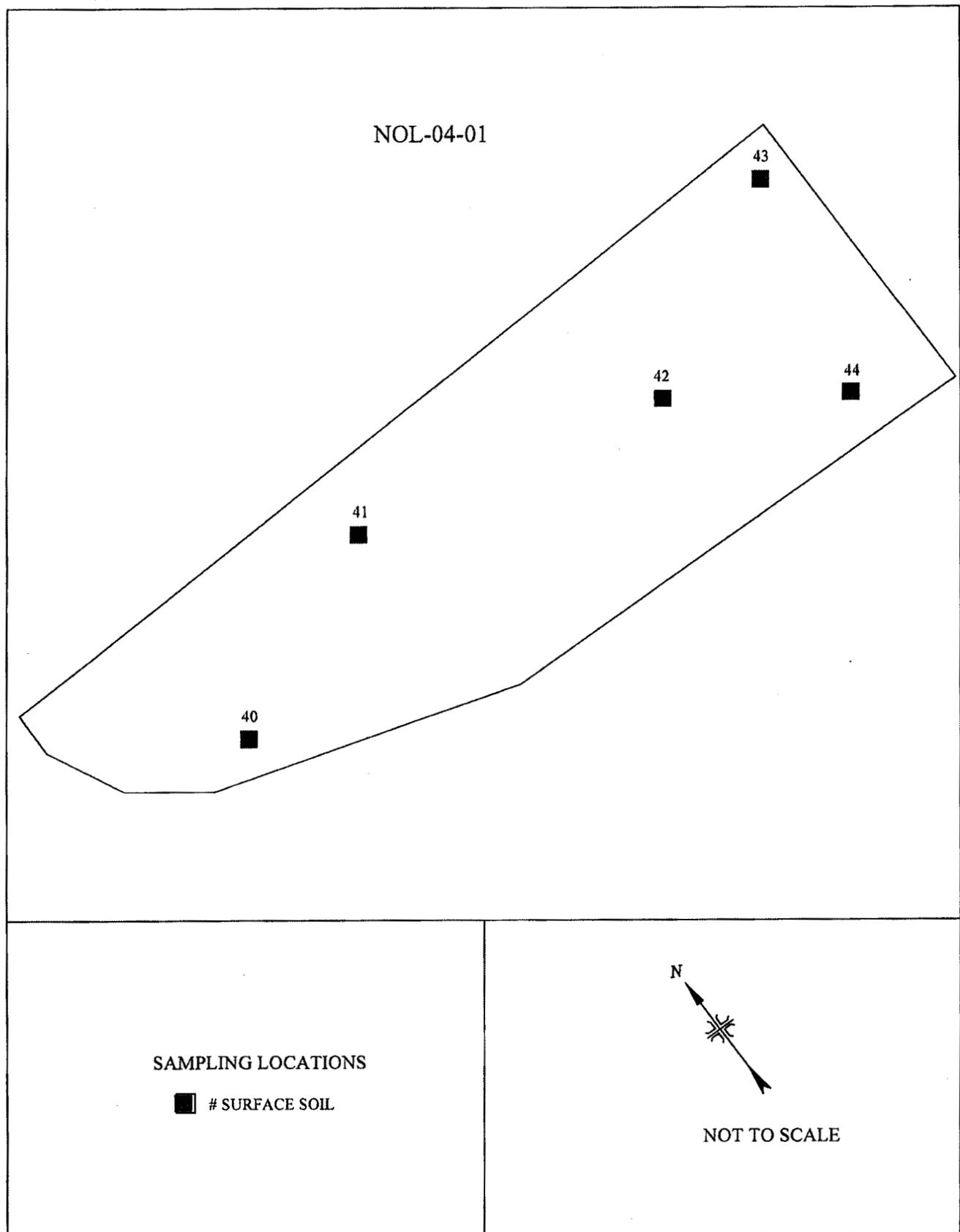


FIGURE 1: Yankee Nuclear Power Station, Survey Unit NOL-04-01 - Sampling Locations

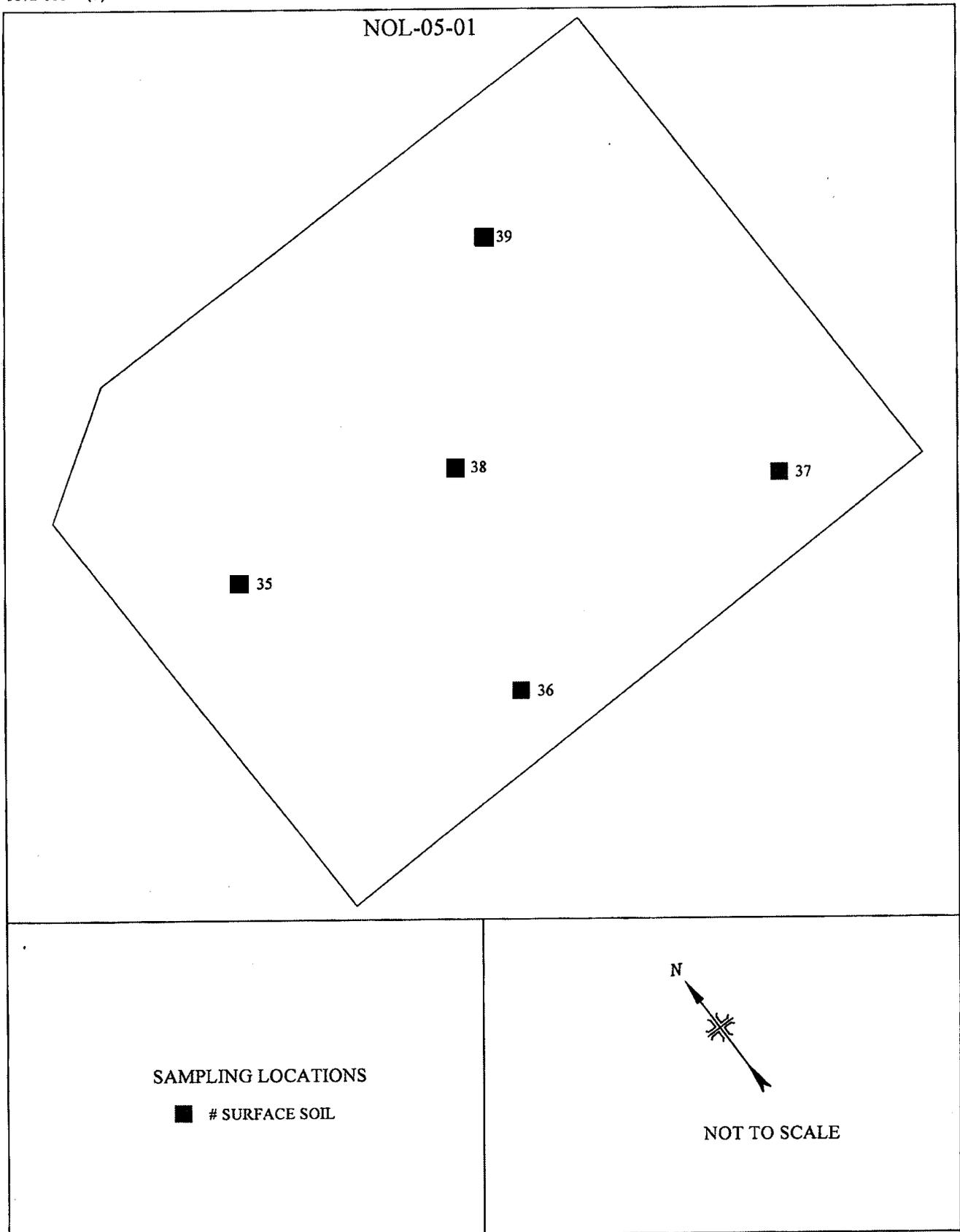


FIGURE 2: Yankee Nuclear Power Station, Survey Unit NOL-05-01 - Sampling Locations

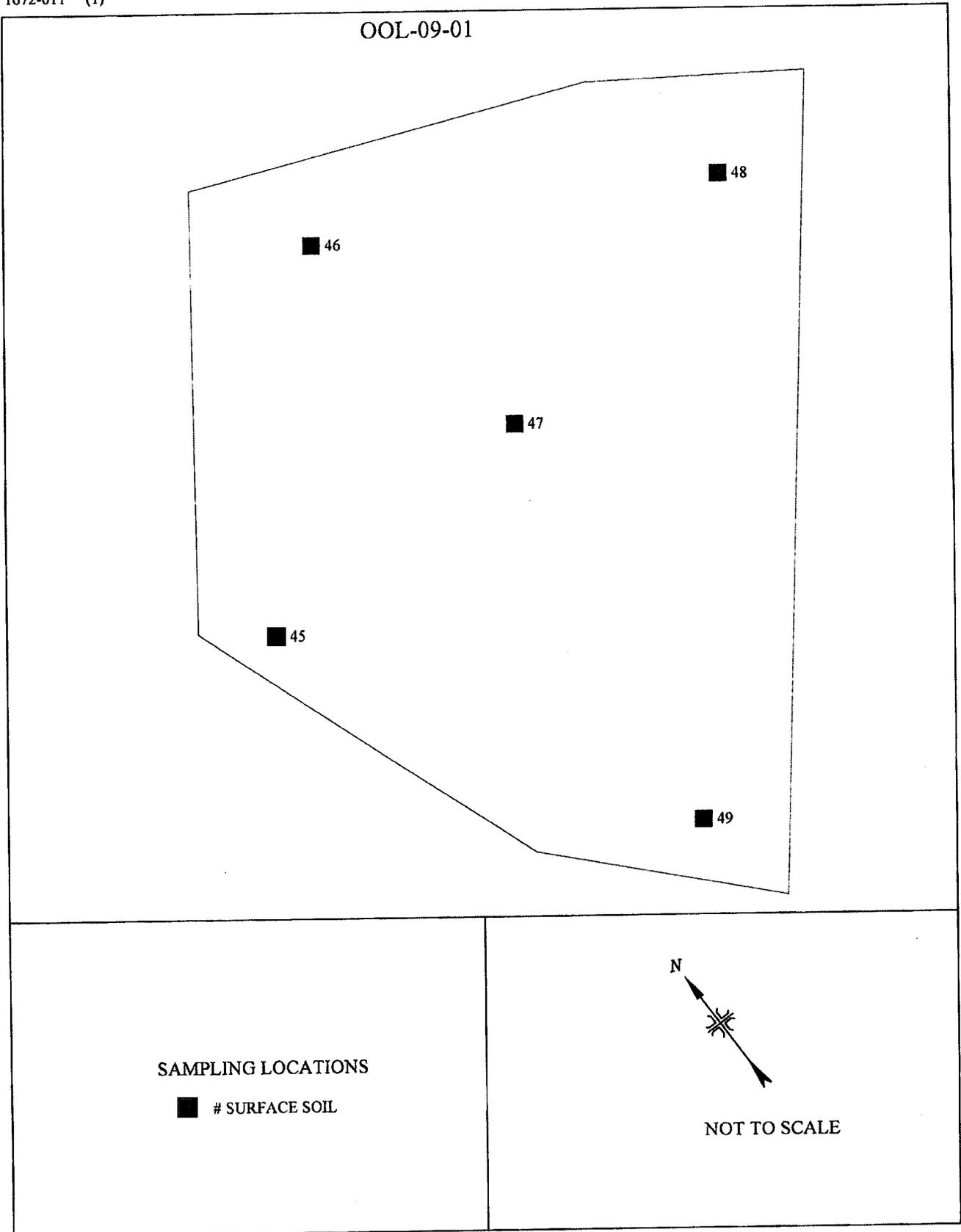


FIGURE 3: Yankee Nuclear Power Station, Survey Unit OOL-09-01 - Sampling Locations

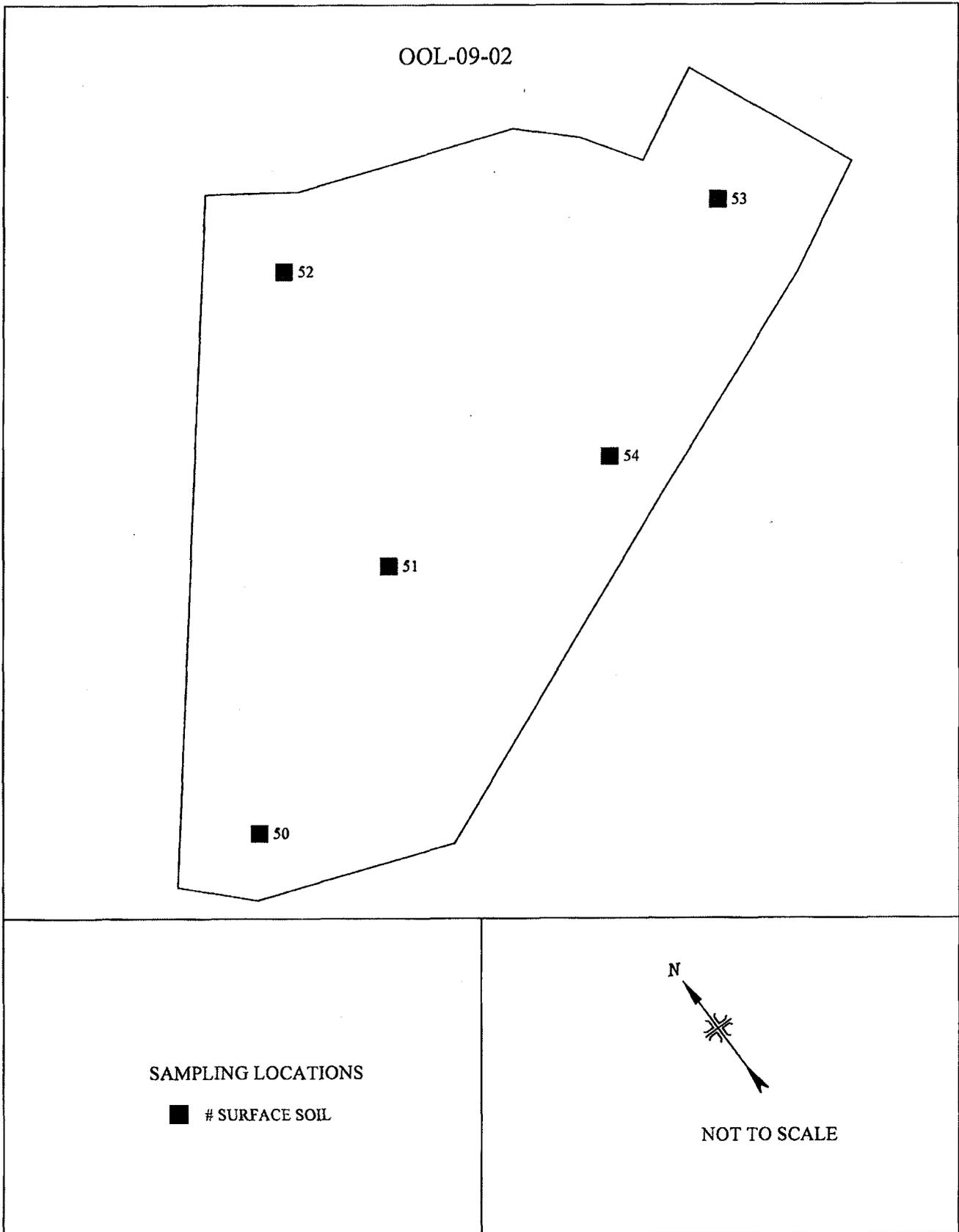
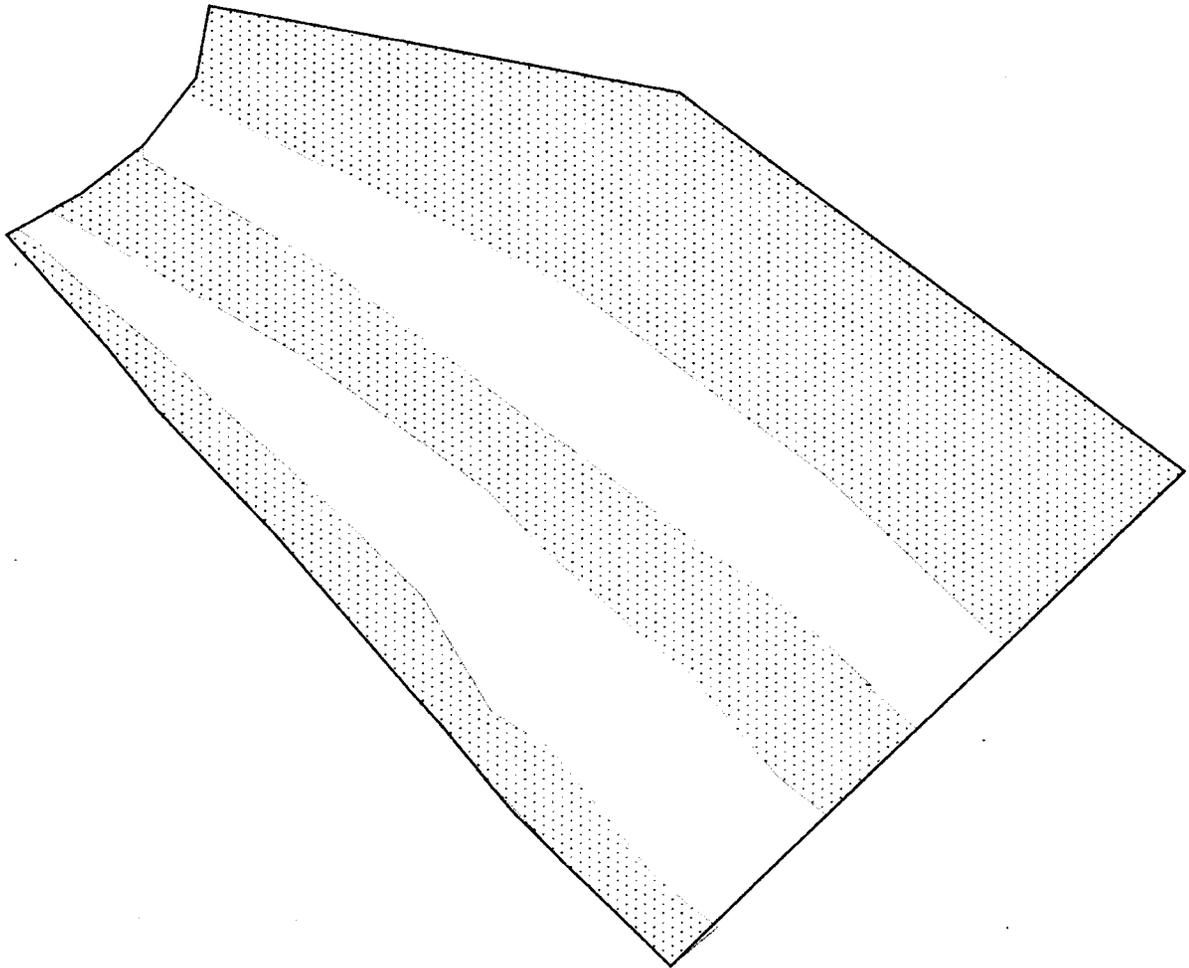
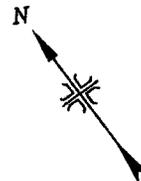


FIGURE 4: Yankee Nuclear Power Station, Survey Unit OOL-09-02 - Sampling Locations

OOL-07-02



 SURVEYED AREA



NOT TO SCALE

FIGURE 5: Yankee Nuclear Power Station, Survey Unit OOL-07-02 - Surveyed Areas

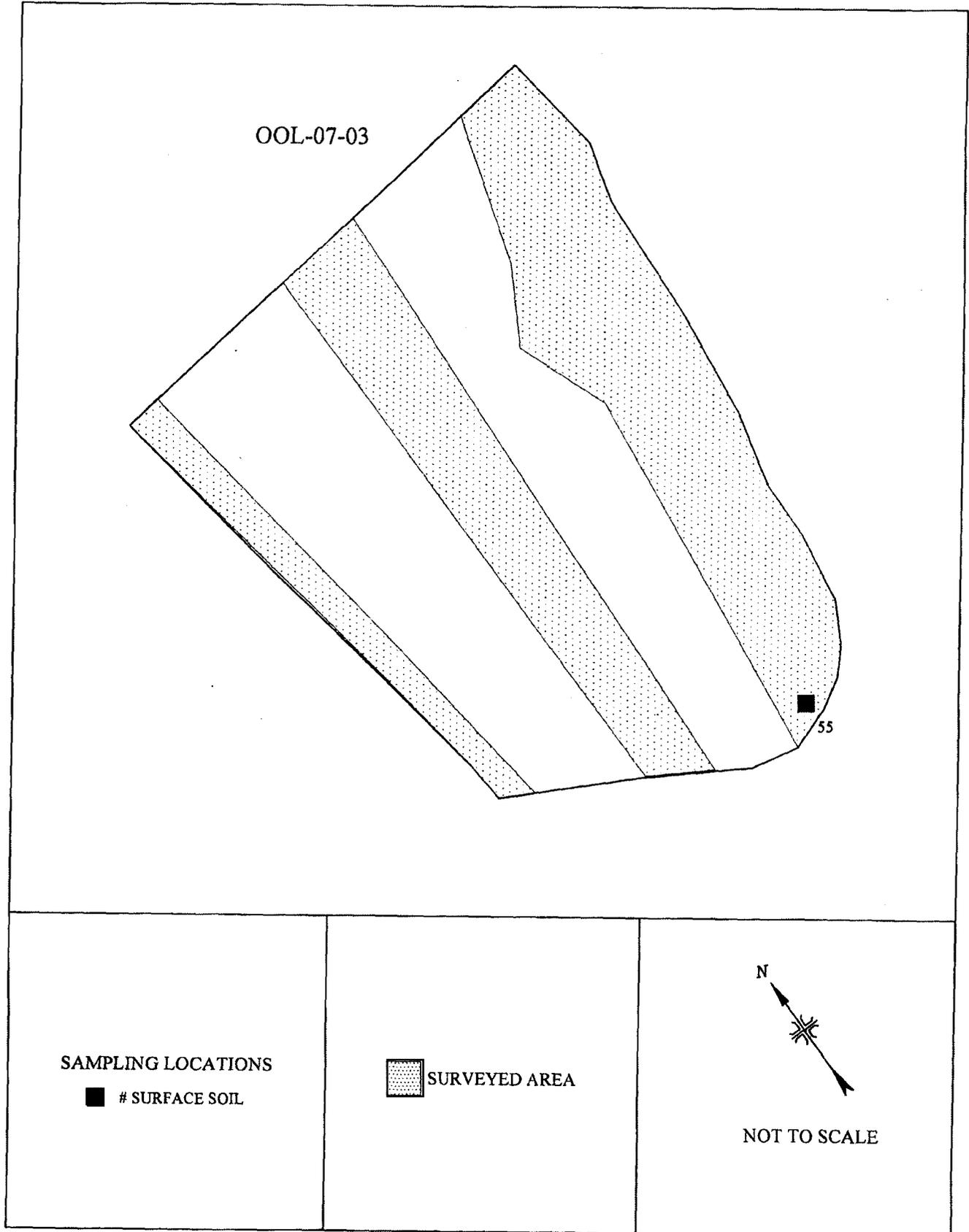


FIGURE 6: Yankee Nuclear Power Station, Survey Unit OOL-07-03 - Surveyed Areas and Sampling Locations

TABLE 1

**RADIONUCLIDE CONCENTRATIONS
IN SOIL SAMPLES COLLECTED FROM SELECTED
INSIDE AND OUTSIDE OPEN LAND AREA SURVEY UNITS
YANKEE NUCLEAR POWER STATION
ROWE, MASSACHUSETTS**

Sample Location ^a	Radionuclide Concentrations (pCi/g) ^b	
	Co-60	Cs-137
Survey Unit NOL-04-01		
1672S0040	-0.02 ± 0.03 ^c	0.01 ± 0.02
1672S0041	0.00 ^d ± 0.03	0.02 ± 0.03
1672S0042	0.42 ± 0.12	1.17 ± 0.16
1672S0043	0.01 ± 0.02	0.02 ± 0.02
1672S0044	-0.01 ± 0.03	0.01 ± 0.02
Survey Unit NOL-05-01		
1672S0035	0.00 ± 0.02	0.02 ± 0.02
1672S0036	0.02 ± 0.02	0.11 ± 0.03
1672S0037	-0.01 ± 0.03	0.00 ± 0.02
1672S0038	0.01 ± 0.03	0.04 ± 0.02
1672S0039	0.09 ± 0.03	0.08 ± 0.02
Survey Unit OOL-09-01		
1672S0045	0.01 ± 0.06	0.06 ± 0.05
1672S0046	0.01 ± 0.02	0.57 ± 0.06
1672S0047	-0.01 ± 0.03	0.16 ± 0.03
1672S0048	-0.02 ± 0.03	0.03 ± 0.03
1672S0049	0.01 ± 0.03	0.07 ± 0.03
Survey Unit OOL-09-02		
1672S0050	0.03 ± 0.04	0.08 ± 0.03
1672S0051	0.04 ± 0.03	0.02 ± 0.03
1672S0052	-0.01 ± 0.02	0.03 ± 0.02
1672S0053	0.01 ± 0.04	0.13 ± 0.05
1672S0054	0.01 ± 0.03	0.02 ± 0.03
Survey Unit OOL-07-03		
1672S0055	0.02 ± 0.02	0.06 ± 0.02

^aRefer to Figures 1 through 6.

^bThe LTP DCGL values are 3.0 pCi/g for Cs-137 and 1.4 pCi/g for Co-60.

^cUncertainties represent the 95% confidence level, based on total propagated uncertainties.

TABLE 2

SUMMARY OF SOIL DCGLs
 FROM TABLE IN FINAL STATUS SURVEY PLANNING WORKSHEET
 YANKEE NUCLEAR POWER STATION
 ROWE, MASSACHUSETTS

Radionuclide	Radionuclide Concentration (pCi/g)
H-3	1.3 E+02
C-14	1.9 E+00
Fe-55	1.0 E+04
Co-60	1.4 E+00
Ni-63	2.8 E+02
Sr-90	6.0 E-01
Nb-94	2.5 E+00
Tc-99	5.0 E+00
Ag-108m	2.5 E+00
Sb-125	1.1 E+01
Cs-134	1.7 E+00
Cs-137	3.0 E+00
Eu-152	3.6 E+00
Eu-154	3.3 E+00
Eu-155	1.4 E+02
Pu-238	1.2 E+01
Pu-239	1.1 E+01
Pu-241	3.4 E+02
Am-241	1.0 E+01
Cm-243/244	1.1 E+01

*Soil DCGL's based on annual doses 8.73 mrem/yr (the 10 mrem/yr DCGL, adjusted for the dose contributions from sub-surface concrete structures and tritium in ground water.

REFERENCES

Oak Ridge Institute for Science and Education (ORISE). Survey Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; September 2, 2004.

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