Radiological Remediation at the Department of Energy's Energy Technology Engineering Center

Presented at the Summer Health Physics Society Meeting
Spokane, Washington

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Ray McGinnis, Brian Sujata and Dan Trippeda

July 10-14, 2005

The Boeing Company

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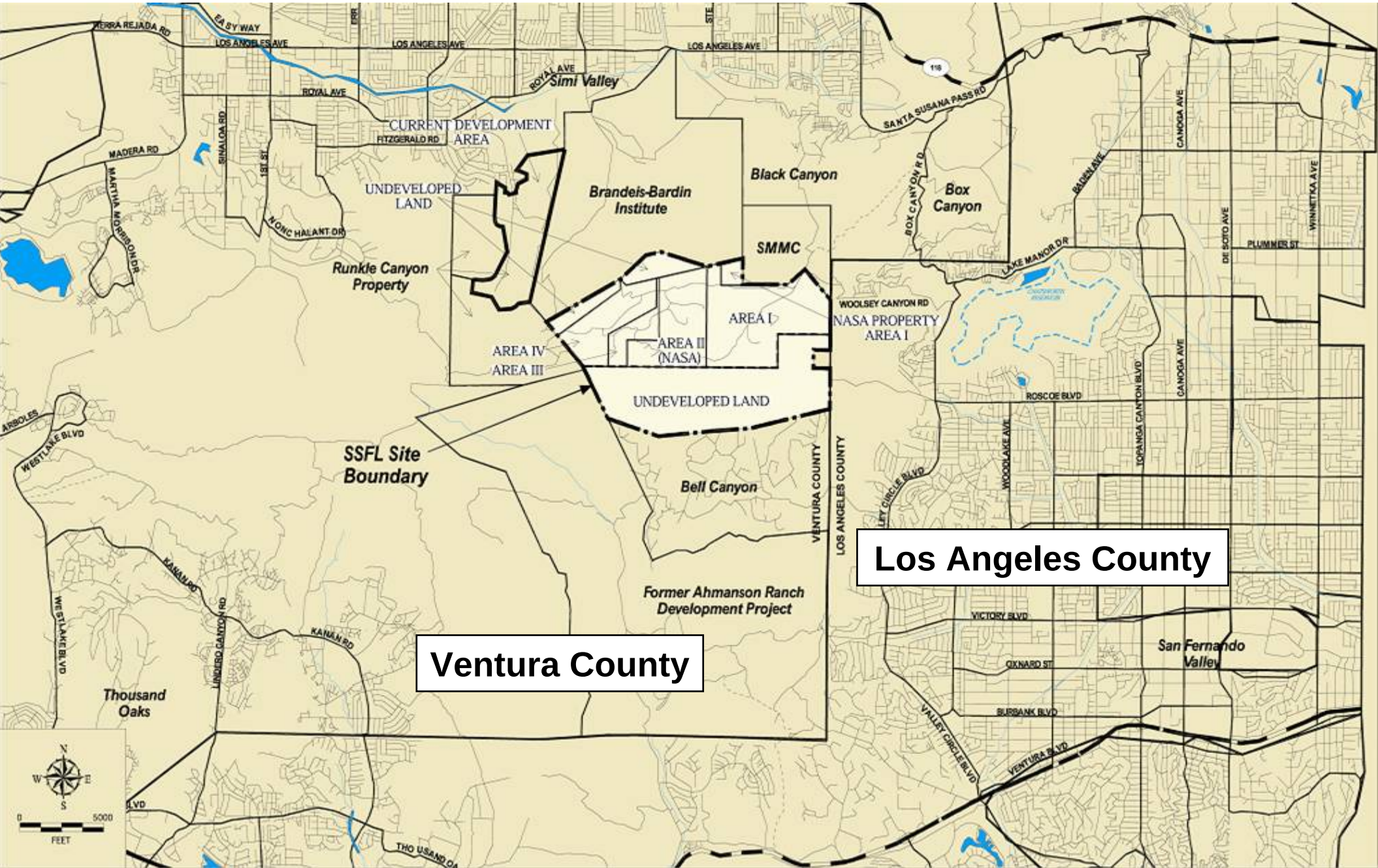
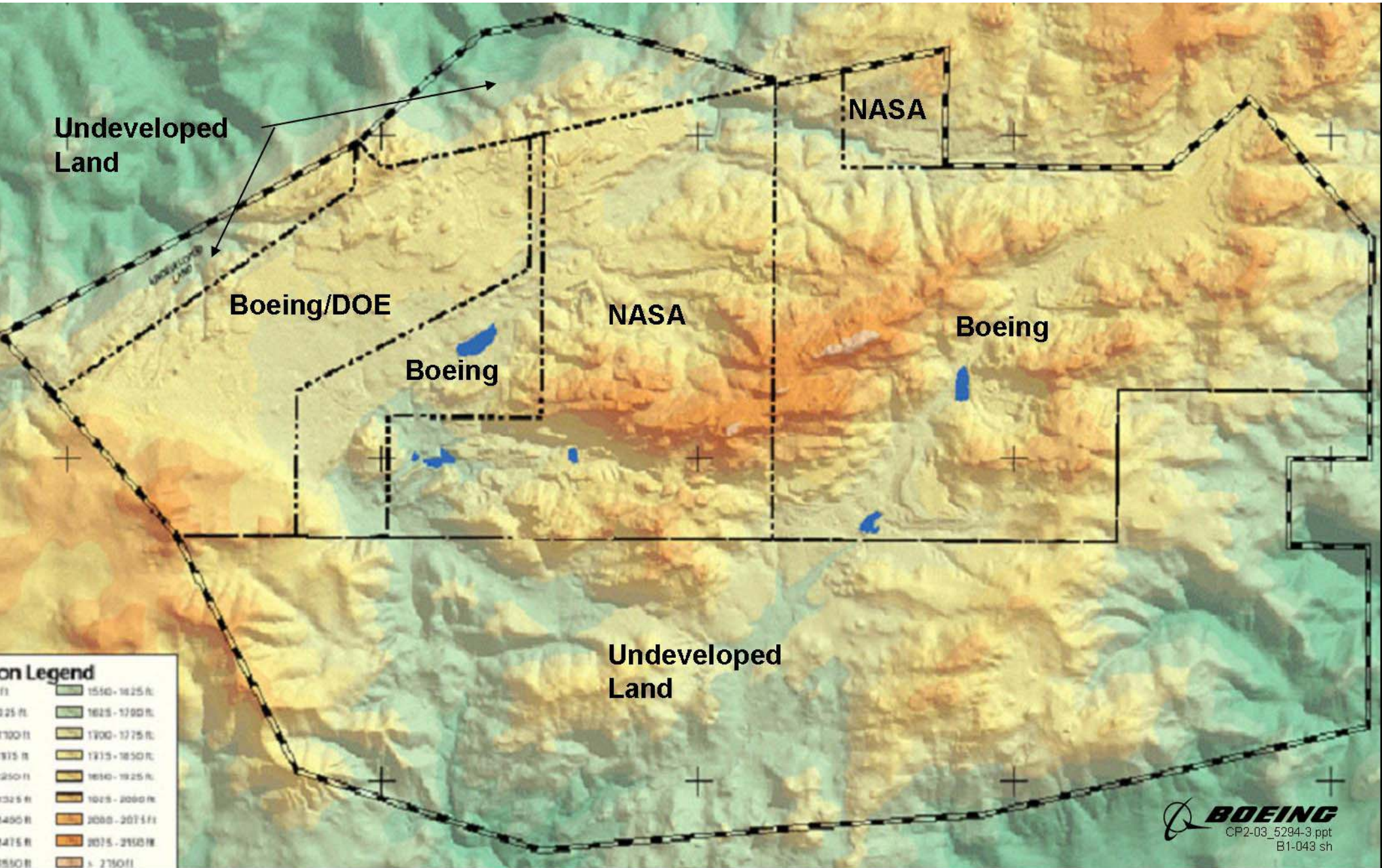
Santa Susana Field Laboratory (SSFL)



SSFL Land Use and Ownership



Area IV, SSFL (1985)

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Area IV, SSFL (2005)

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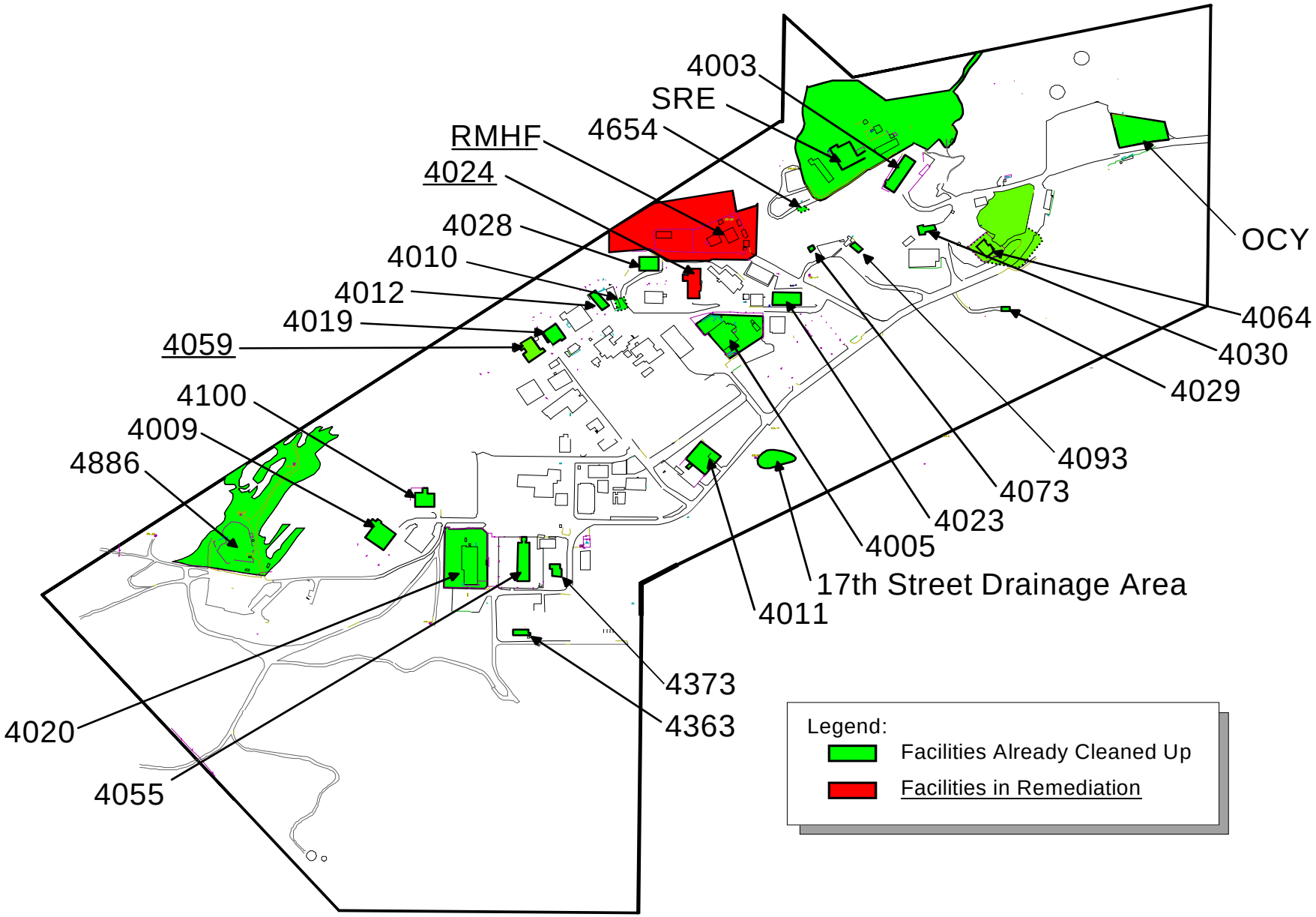
SSFL Area IV Radiological Facility Status



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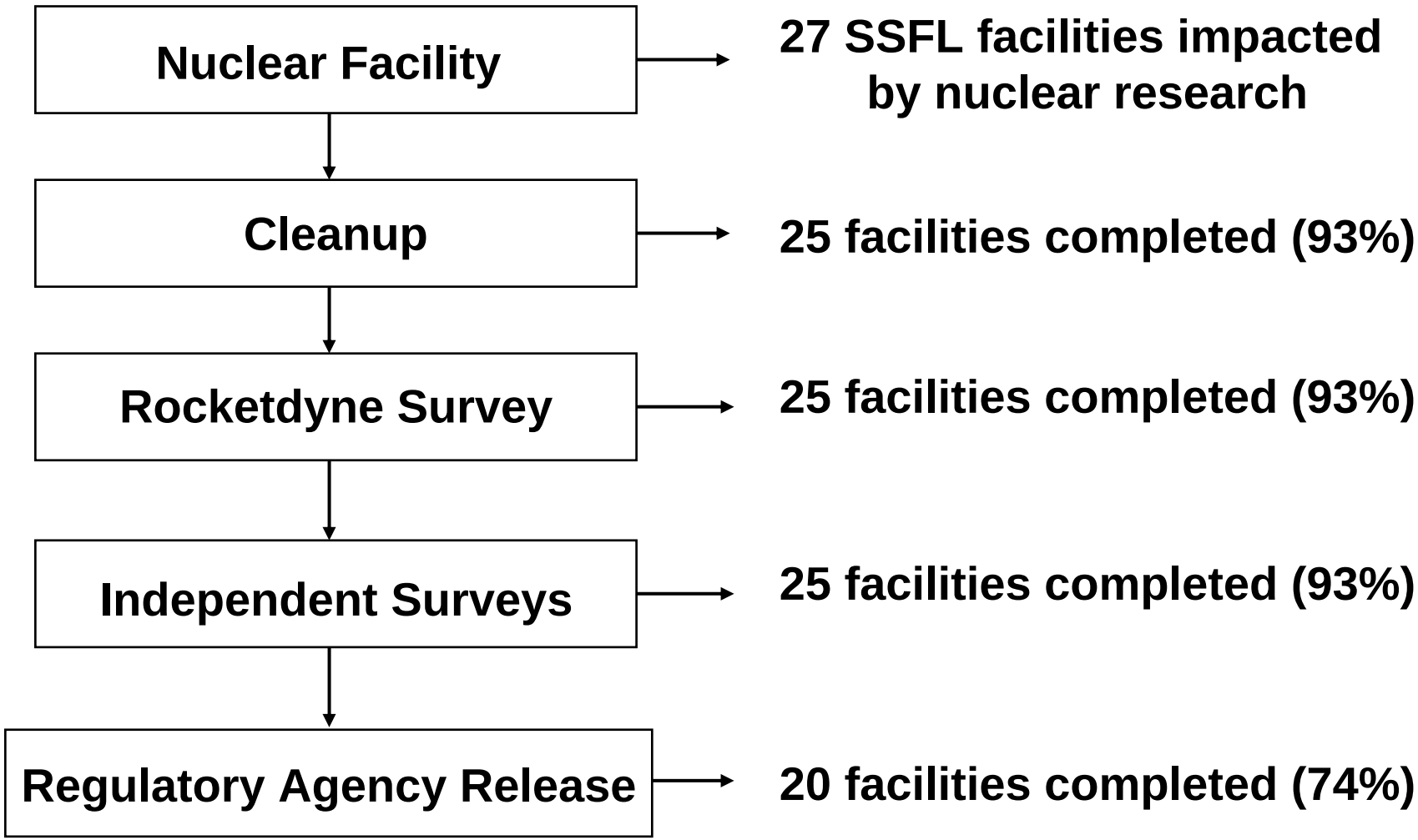
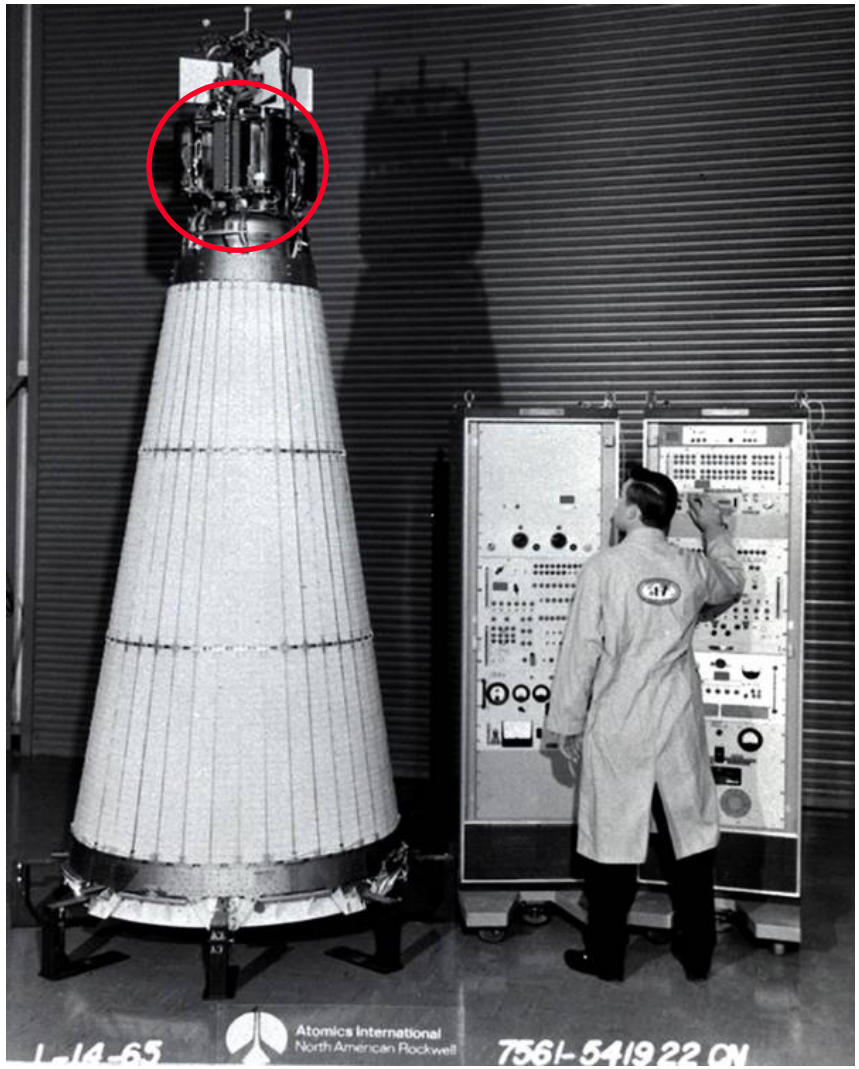
SSFL Cleanup - Survey - Release Process



Systems for Nuclear Auxiliary Power (SNAP)

- SNAP 2, 4, 8 and 10
- Designed fabricated and tested by Atomics International from 1956 – 1971
- 50 to 600 kWth systems
- 93% enriched UZrH fuel
- SNAP 10A only U.S. reactor launched into space



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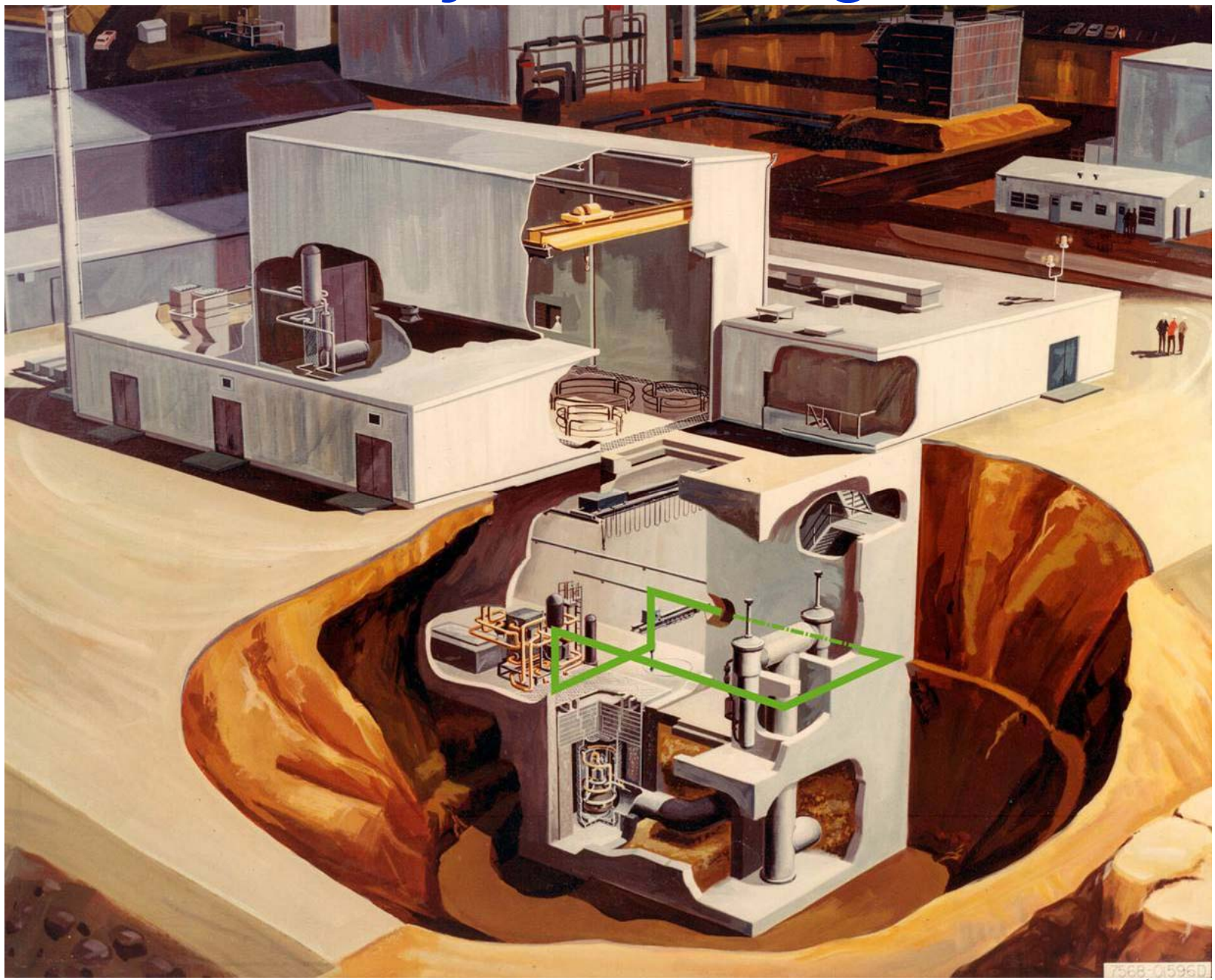
Cut-Away of Building 4059



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Demolition of SNAP 8 Facility (Building 4059)

- Upper building remediated and surveyed in 1999-2000
  - Boeing (MARSSIM protocols)
  - ORISE (DOE)
  - California Dept. of Health Services
  - US EPA
- Excavation sampled and surveyed in 2004
  - Boeing (MARSSIM protocols)
  - ORISE
  - California Dept. of Health Services

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Prior to Demolition (May, 2003)

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Office Areas Demolished (February 11, 2004)

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Ready to Drop Frame (March 30, 2004)

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Down (March 30, 2004)

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Concrete Pad (April 5, 2004)

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Excavation Starts (June 15, 2004)

Phase 1 Non-radioactive Demolition

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Excavation Continues (July 2, 2004)

Phase 1 Non-radioactive Demolition

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Cutting of Reactor Cells (August 6, 2004)
Radioactive Phase 2

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Wet Saw Cutting of Cell Walls

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Hoisting Activated Concrete Blocks

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Concrete Blocks Checked for Radiation

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Concrete Blocks Wrapped Ready for Transport to NTS

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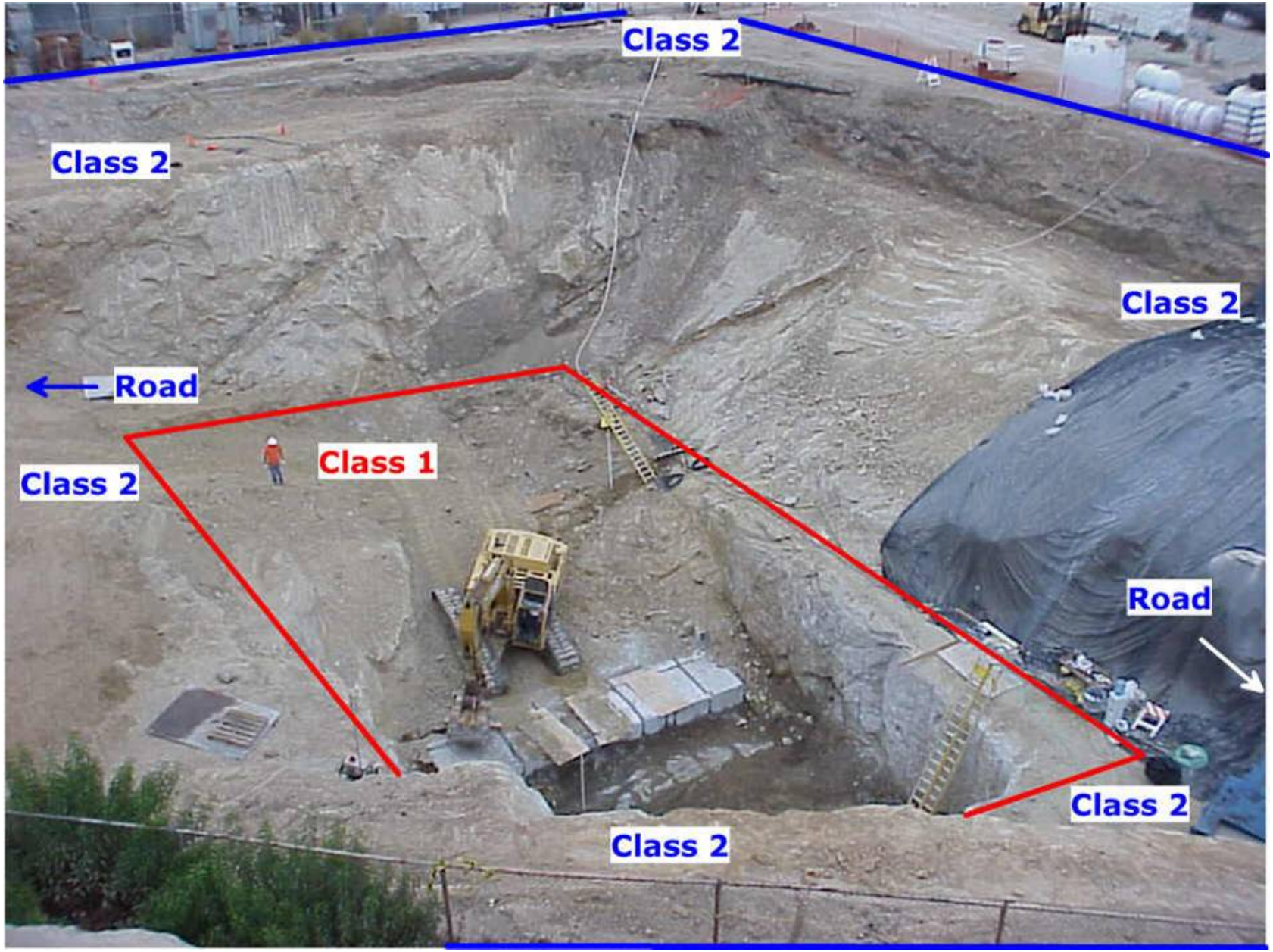
Survey Units to be Surveyed and Sampled (Sept. 15, 2004)



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Excavation Complete (Sept 22, 2004)

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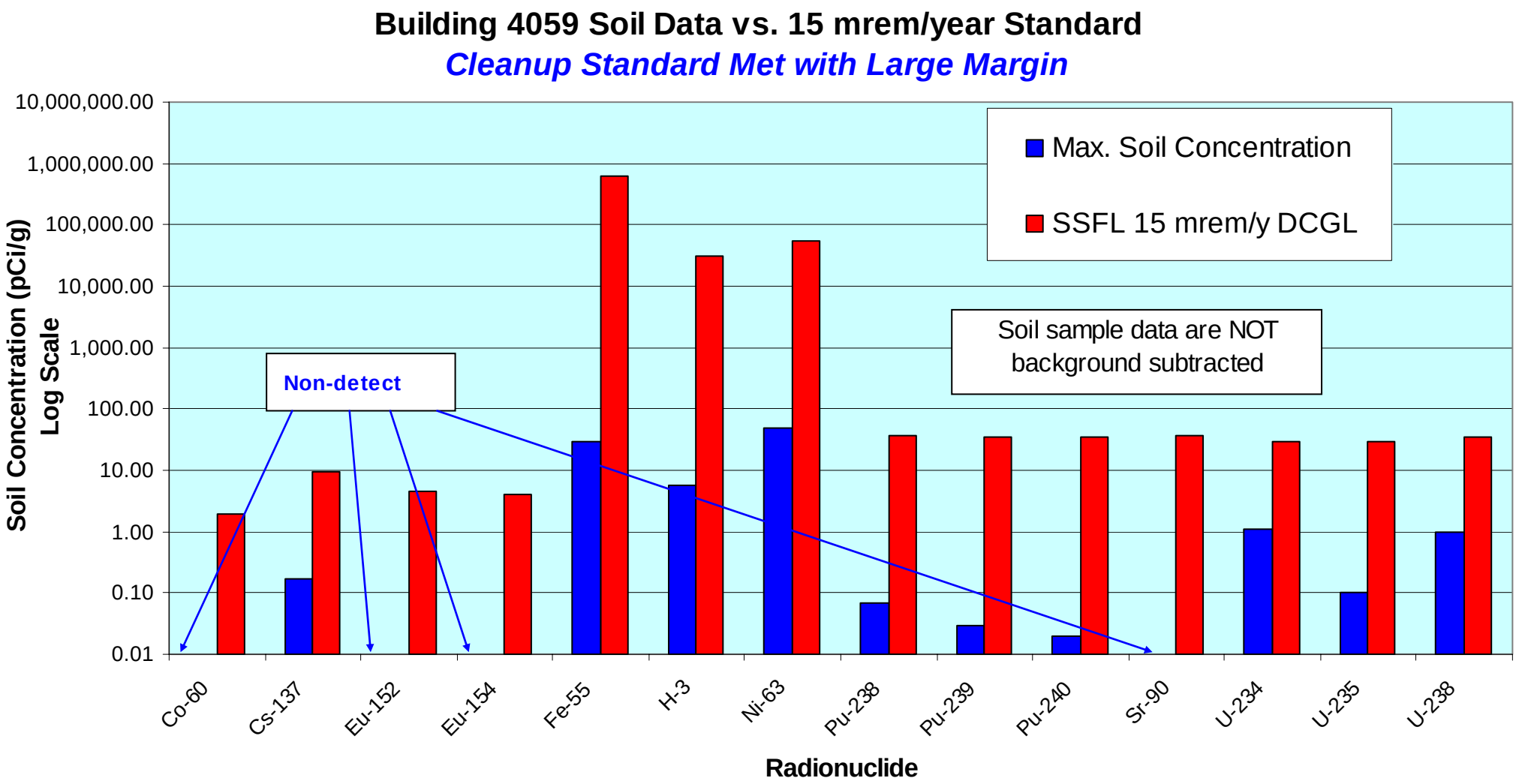
Soil Sample Results

BUILDING 4059 POST-REMEDIATION FINAL STATUS SURVEY RESULTS (PHASE A)

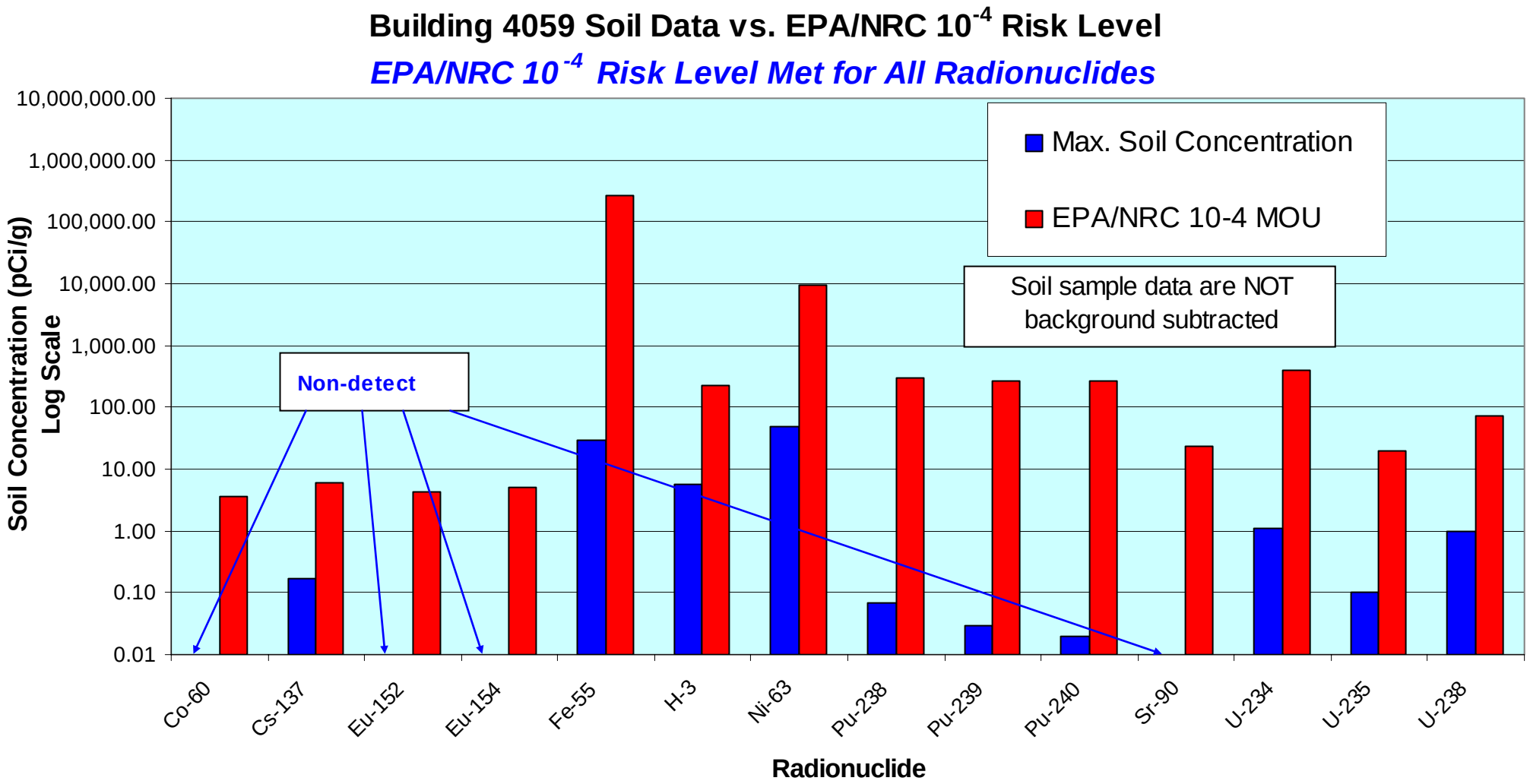
Nuclide	MARSSIM Soil Samples from 4059[7]			RESRAD SSFL DCGLs[1]	EPA PRG[2]	EPA/NRC MOU[6]	EPA DCC[2]
	Range (pCi/g)			15 mrem/yr incl. ARARs	10^{-6} Risk	10^{-4} Risk	15 mrem/yr (ICRP-60)
	Minimum		Maximum	pCi/g	pCi/g	pCi/g	pCi/g
Am-241	NDA[5]	to	0.09	5.4	1.9	187	295
Co-60	NDA	to	NDA	1.9	0.036	3.6	13
Cs-134	NDA	to	NDA	3.3	0.16	16	56
Cs-137	NDA	to	0.17	9.2	0.060	6.0	21
Eu-152	NDA	to	NDA	4.5	0.042	4.2	15
Eu-154	NDA	to	NDA	4.1	0.050	5.0	18
Fe-55	NDA	to	30	629,000	2,690	269,000	1,710,000
H-3	NDA	to	5.8	31,900	2.3	228	3,130
Mn-54	NDA	to	NDA	6	0.69	69.0	249
Na-22	NDA	to	NDA	2	0.087	8.7	31
Ni-63	NDA	to	49	55,300	95.0	9,480	42,600
Pu-238	NDA	to	0.07	37	3.0	298	358
Pu-239	NDA	to	0.03	34	2.6	260	293
Pu-240	NDA	to	0.02	34	2.6	261	294
Pu-241	NDA	to	NDA	230	408	40,800	28,700
Ra-226	NDA	to	NDA	5[3]	0.012	1.2	4.0
Sr-90	NDA	to	NDA	36	0.23	23	49
Th-228	0.70	to	1.6	5[3]	0.15	15	56
Th-232	0.51	to	1.4	5[3]	3.1	312	318
U-234	0.29	to	1.1	30[4]	4.0	402	1,090
U-235	NDA	to	0.10	30[4]	0.2	20	71
U-238	0.25	to	1	35[4]	0.74	74	254

1. DOE and DHS approved cleanup standards for residential exposures from
2. Using EPA online calculators for Preliminary Remediation Goals (PRGs) and Dose Compliance Concentrations (DCCs) for residential exposures
3. EPA and DOE ARARs for Ra-226 and thorium isotopes
4. NRC ARARs for uranium isotopes
5. NDA = No detectable activity
6. EPA/NRC Memorandum of Understanding (MOU) for residential exposures
7. Gross measurements. Not background subtracted.

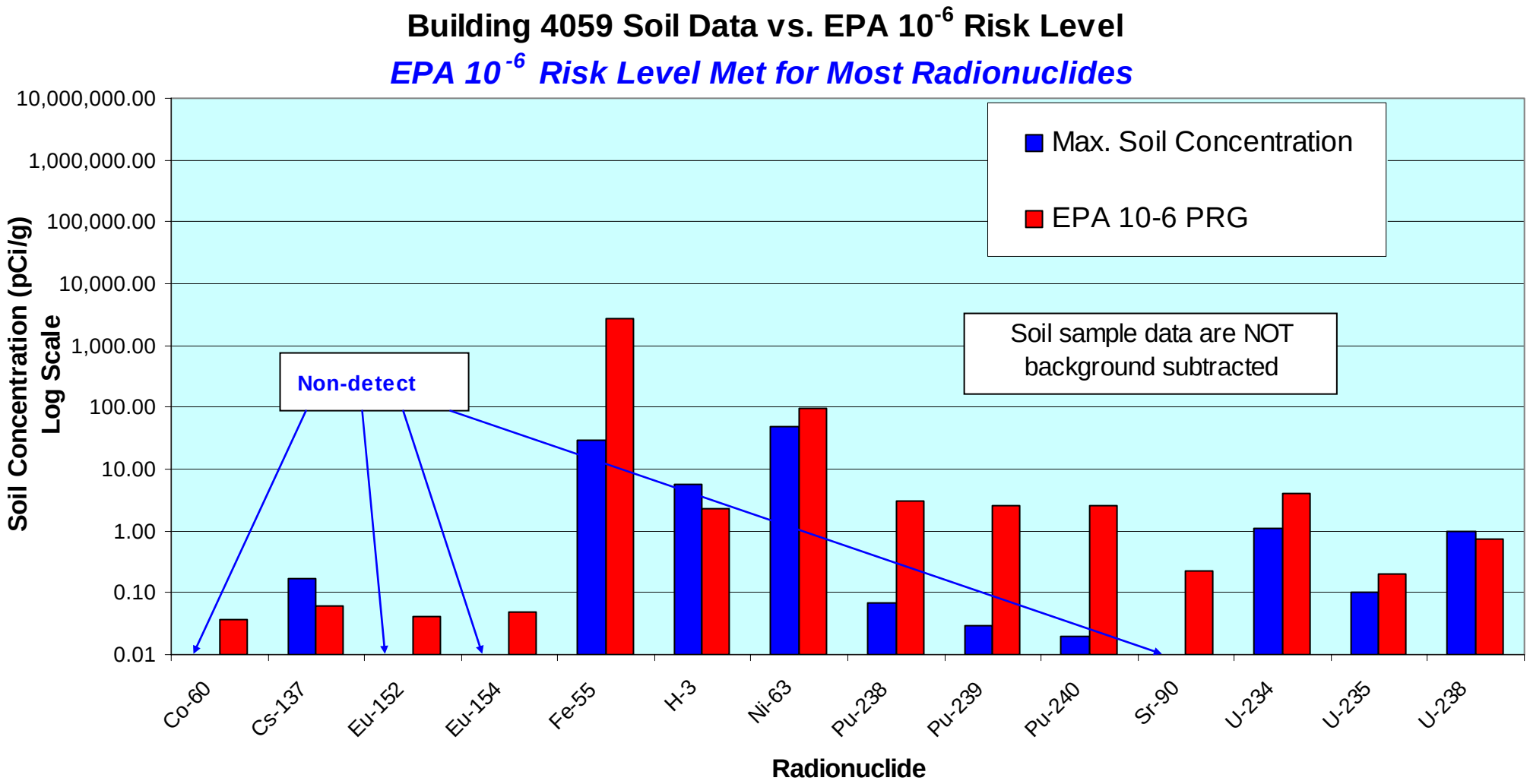
4059 Soil Data vs. 15 mrem/year Standard



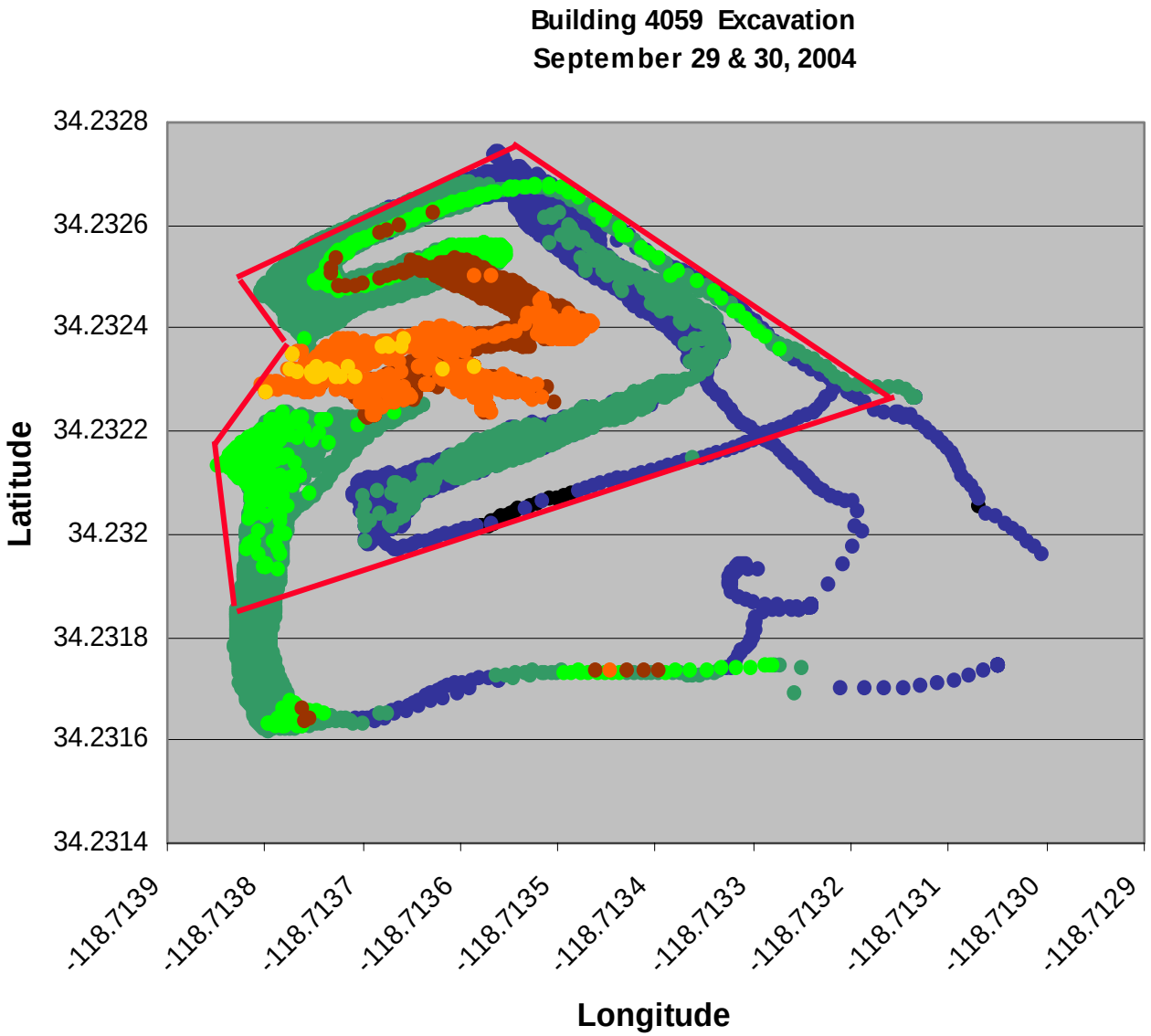
4059 Soil Data vs. EPA/NRC 10^{-4} Risk Level



4059 Soil Data vs. EPA 10^{-6} Risk Level



Radiation Map of 4059 Excavation



- < 7.5 microR/hr
- 7.5 - 10 microR/hour
- 10 - 12.5 microR/hour
- 12.5 - 15 microR/hour
- 15 - 17.5 microR/hour
- 17.5 - 20 microR/hour
- 20 - 22.5 microR/hour

Average = 12.4 microR/hour
Std. Dev. = 3.3 microR/hour
Minimum = 5.1 microR/hour
Maximum = 22.0 microR/hour
No. of measurements = 12,787

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What's Next for 4059?

- Perform Phase B MARSSIM survey of graded land including block transfer location
- Phase B ORISE and DHS verification surveys

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ETEC Remediation

http://apps.em.doe.gov/etec