



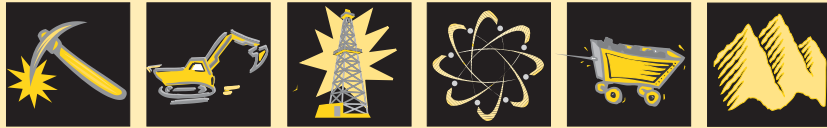
United States
Environmental Protection
Agency

Office of Radiation &
Indoor Air (6602J)
Washington, DC 20460

EPA 402-R-99-002
October 1999

Technologically Enhanced Naturally Occurring Radioactive Materials in the Southwestern Copper Belt of Arizona

TECHNOLOGICALLY ENHANCED NATURALLY OCCURRING RADIOACTIVE MATERIALS



T E N O R M

Levels of radioactivity in excess of federal MCLs or Arizona guidelines are shown in bold

Table 2
Surface Water Statistical Data (pCi/L)

Radiochemical	Mine Sites	Number	Min.	Max.	Avg.	Std. Dev.
Gross Alpha	MP,MM,CB,TR,AL,DF,HS,NC	54	0	1240	83.5	188.4
Gross Beta	CB,MP,MM,TR,NC	32	0	128	27.1	34
U-238	CB,TR,AL,HS,NC	19	0.1	678	83.8	168.2
U-234	CB,TR,AL,HS,NC	19	0.2	577	80	141.8
U-235	CB,TR,NC	9	0.04	2.9	1.1	0.9
Ra-226	CB,MP,NC	29	0	71.8	6.4	13.8
Ra-228	MP,CB,TR,AL,DF,HS,NC	18	0	55.5	5.6	13.1
Total-U	MP,CB,TR,NC	12	0.01	32.9	6.6	10.9
Rn-222	MP	3	39	120	68.3	44.9
Total	8 MINES	195				

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Table 3
Sediment and Soil Statistical Data (pCi/g)

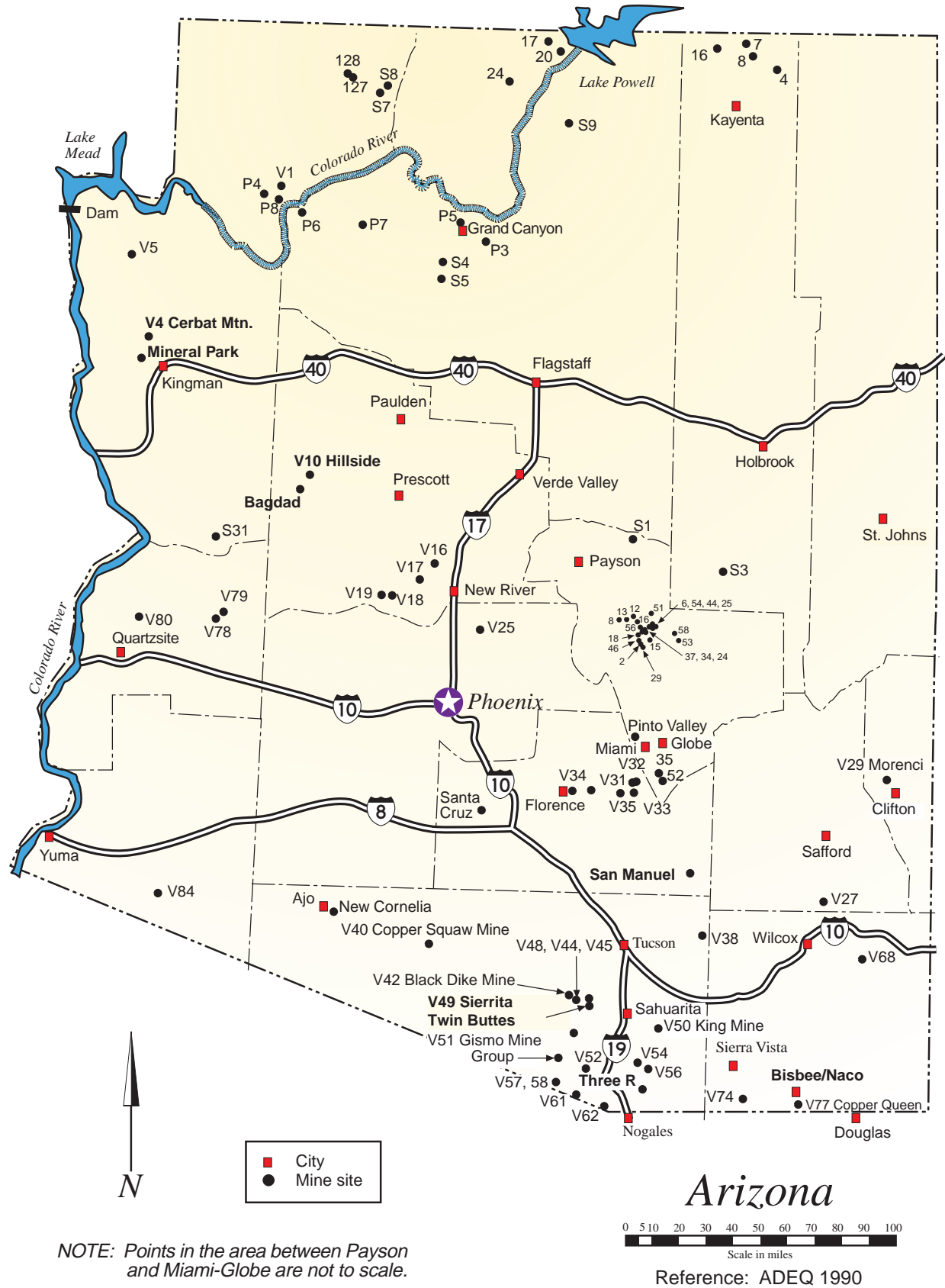
Radiochemical	Mine Sites	Number	Min.	Max.	Avg.	Std. Dev.
Gross Alpha	AL,DF,HS,MM	25	0.5	395	63.1	90.0
Gross Beta	AL,DF,HS,MM	25	22	248	69.4	52.3
U-238	AL,DF,HS	20	0.7	63.3	7.9	14.2
U-234	AL,DF,HS	20	0.9	60.8	10.0	16.6
Ra-226	AL,DF,HS	20	0.7	82.6	10.4	19.7
Totals	4 Mines	110				

Levels of radioactivity in excess of federal MCLs or Arizona guidelines are shown in bold

Table 4
Process Solutions Statistical Data (pCi/L)

Radiochemical	Mine Sites	Number	Min.	Max.	Avg.	Std. Dev.
Gross Alpha	MP,MM,MF,SC	43	1.3	8649	1841	1850
Gross Beta	MP,MM,MF	41	3.0	3683	975.6	881.7
U-238	MF	2	248	1611	929.5	963.8
U-234	MF	2	254	1745	999.5	1054.3
U-235	MF	2	11.6	598	304.8	414.7
Ra-226	MF,SC	4	19.5	193	86.3	79.1
Ra-228	MF,SC	4	2.0	19	7.8	8.0
Total-U	MF,CS,TB	6	0.8	4362	1895.9	1532.9
Rn-222	MF,SC	4	243	3760	1805.7	1593.5

Figure A: Location Map of TENORM Sites



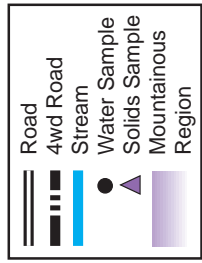
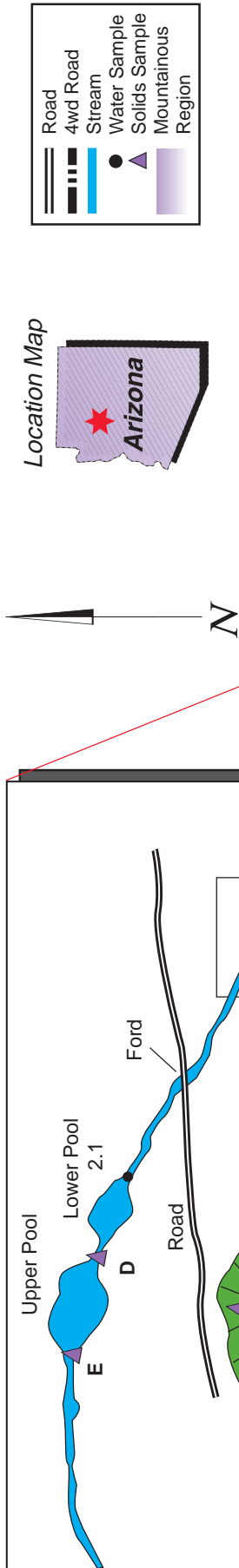
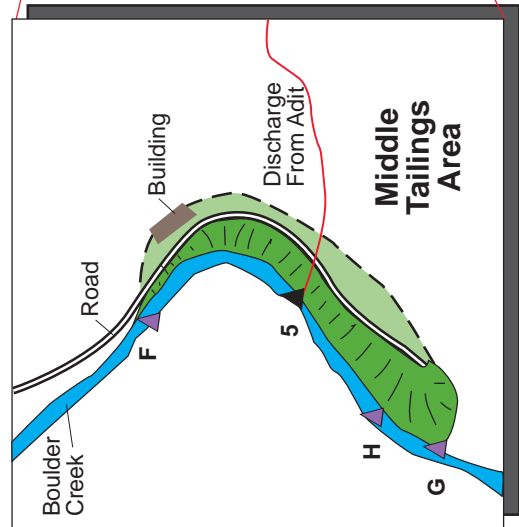
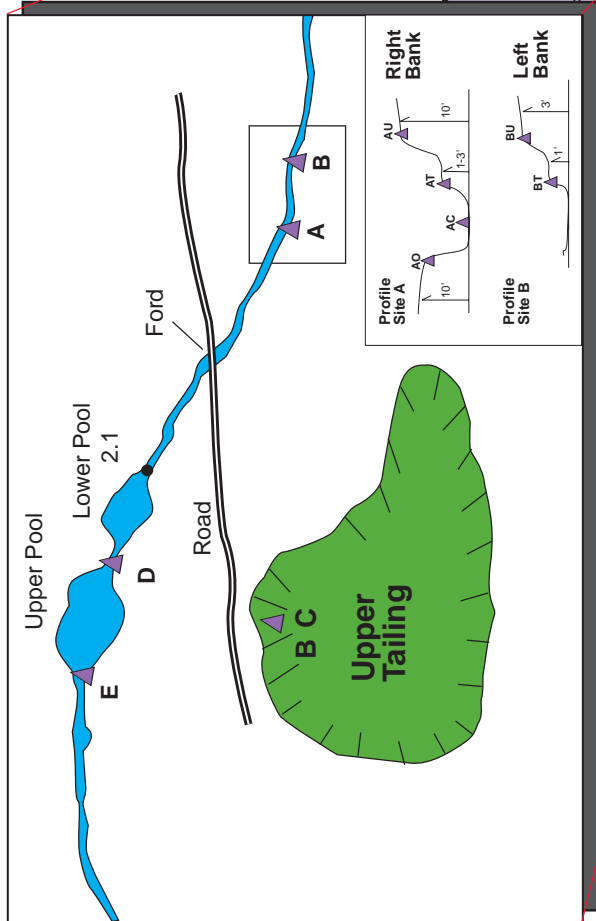
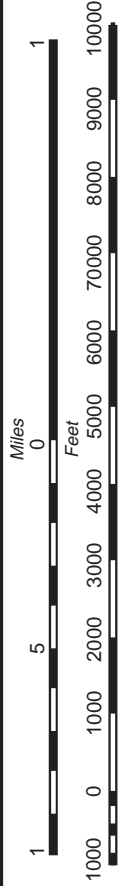
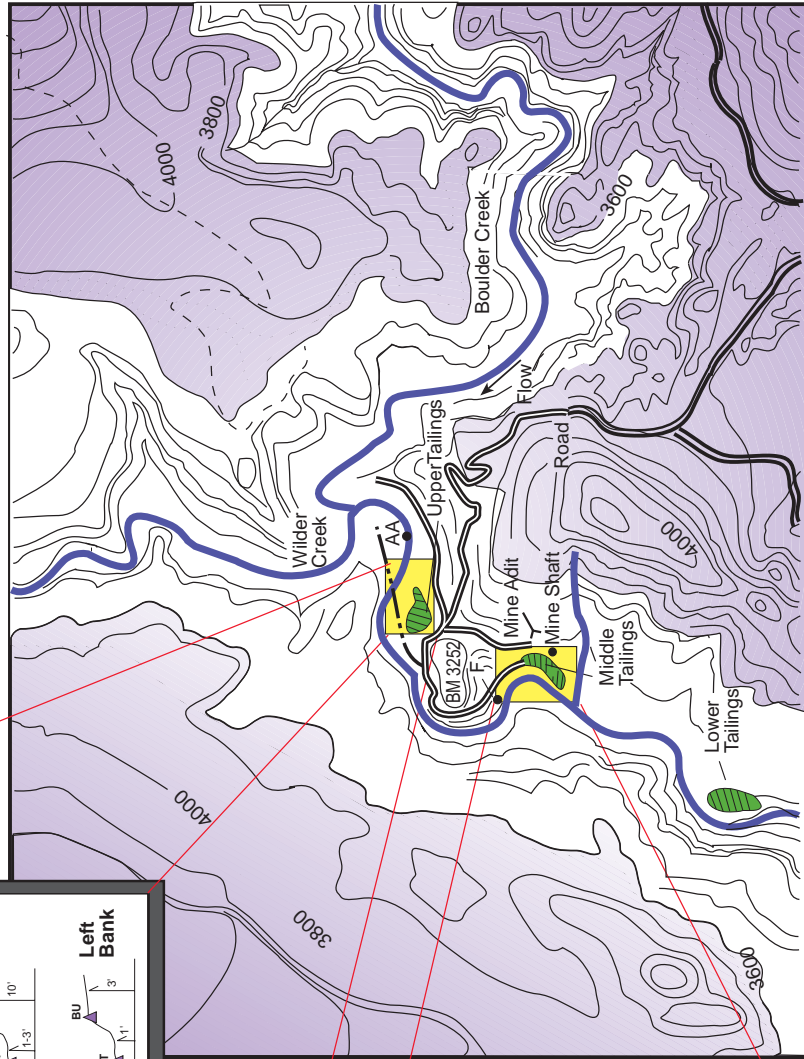


Figure B: Hillside Mine/Boulder Creek, Sample Location Map



Reference: ADEQ 4/1993

**Figure E:
Three R Mine,
Sample Location Map**

