

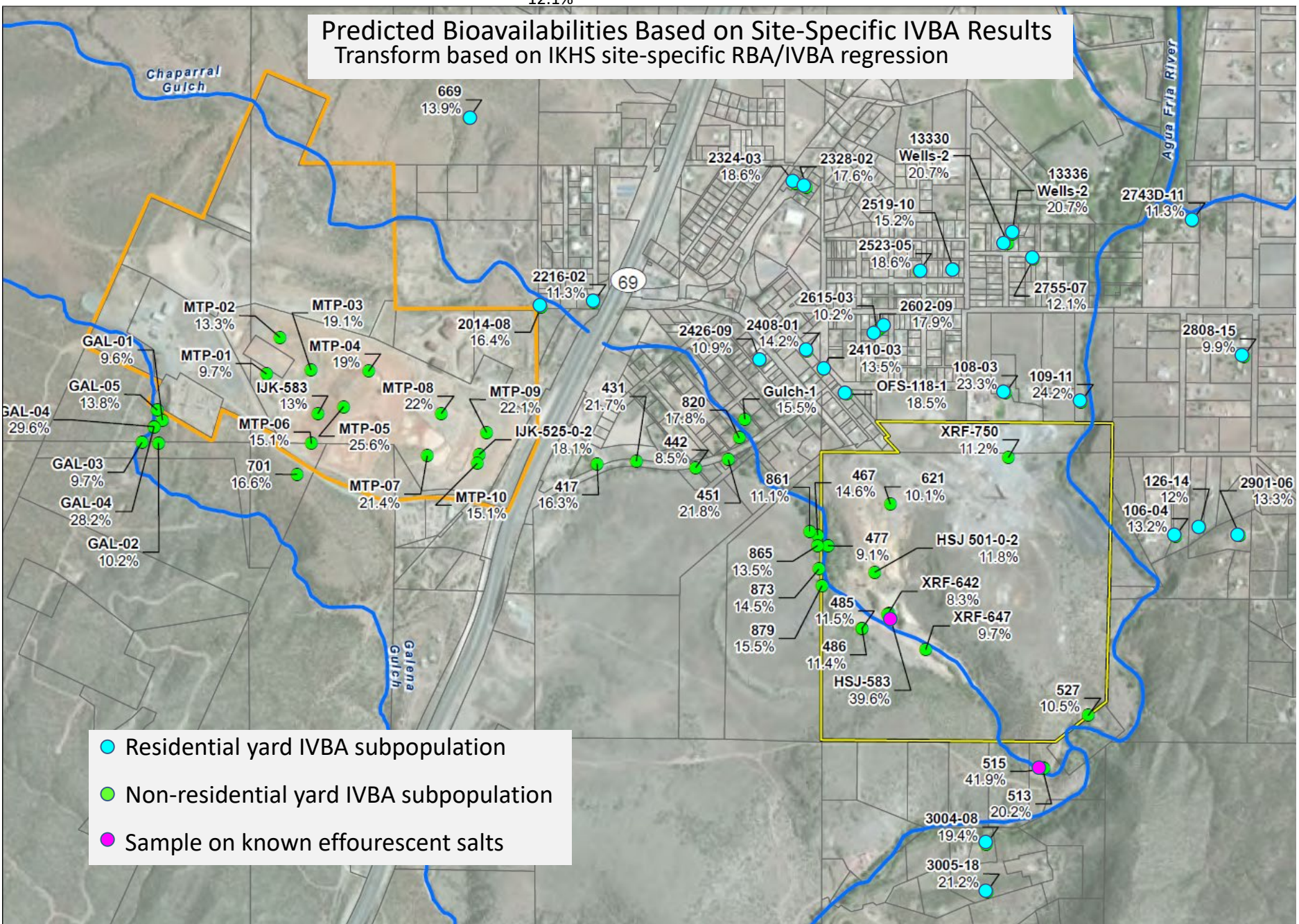
Estimates of Bioavailability of Arsenic in Soil  
Iron King  
Mine

Sample	Date	Total Sieved As mg/kg	Extractable As mg/kg	As IVBA %	% Bioavailable As		% Bioavailable As IKM Regression (N=5)
					Bradham Regression	% Bioavailable As Griffin Regression	
IJK-525-0-2	8/20/2008	6,899	NR	17.5	17.9	22.5	18.1
HSJ 501-0-2	9/4/2008	173	NR	6.80	10.2	16.1	11.8
OSF-118-1	9/18/2008	244	NR	18.1	18.3	22.9	18.5
HSJ-583	5/2/2009	280	NR	53.6	43.9	44.2	39.6
IJK-583	5/2/2009	4,495	NR	8.80	11.6	17.3	13.0
417	4/30/2013	2,550	369	14.5	15.7	20.7	16.3
431	4/30/2013	447	105	23.5	22.2	26.1	21.7
442	4/30/2013	2,990	37.9	1.27	6.17	12.8	8.5
451	4/30/2013	585	138	23.6	22.2	26.2	21.8
467	4/30/2013	1,480	170	11.5	13.5	18.9	14.6
477	4/30/2013	3,580	84.4	2.36	6.96	13.4	9.1
485	4/30/2013	4,180	267	6.39	9.86	15.8	11.5
486	4/30/2013	1,750	107	6.11	9.66	15.7	11.4
513	4/29/2013	888	186	20.9	20.3	24.6	20.2
515	4/29/2013	3,960	2,270	57.3	46.5	46.4	41.9
527	4/29/2013	6,730	312	4.64	8.60	14.8	10.5
621	4/30/2013	310	12.4	4.00	8.14	14.4	10.1
642	5/1/2013	240	ND	1.00	5.98	12.6	8.3
647	5/2/2013	190	6.40	3.37	7.69	14.0	9.7
648	5/3/2013	220	16.0	7.27	10.5	16.4	12.1
669	5/1/2013	305	31.4	10.3	12.7	18.2	13.9
701	5/2/2013	841	125	14.9	16.0	20.9	16.6
750	5/4/2013	29	1.70	5.86	9.48	15.5	11.2
753	5/5/2013	300	110	36.7	31.7	34.0	29.6
820	5/1/2013	660	112	17.0	17.5	22.2	17.8
861	5/1/2013	497	28.1	5.65	9.33	15.4	11.1
865	5/1/2013	649	62.7	9.66	12.2	17.8	13.5
873	5/1/2013	680	77.4	11.4	13.5	18.8	14.5
879	5/1/2013	892	116	13.0	14.6	19.8	15.5
978	5/6/2013	240	ND	1.00	5.98	12.6	8.3
979	4/29/2013	480	15.0	3.13	7.51	13.9	9.6
980	4/30/2013	3,700	510	13.8	15.2	20.3	15.9
13330WellsSt	7/11/2013	441	95.9	21.7	20.9	25.0	20.7
13336WellsSt	7/12/2013	387	84.2	21.8	20.9	25.1	20.7
GulchYard	7/13/2013	330	43.0	13.0	14.6	19.8	15.5
106-04	2/26/2014	250	23.0	9.20	11.9	17.5	13.2
108-03	2/24/2014	420	110	26.2	24.1	27.7	23.3
109-11	2/19/2014	170	47.0	27.6	25.2	28.6	24.2
126-14	2/27/2014	180	13.0	7.22	10.5	16.3	12.0
2014-08	1/31/2014	310	45.0	14.5	15.7	20.7	16.4
2216-02	3/5/2014	280	17.0	6.07	9.63	15.6	11.3
2324-03	2/5/2014	230	42.0	18.3	18.4	23.0	18.6
2328-02	2/5/2014	780	130	16.7	17.3	22.0	17.6
2408-01	3/10/2014	220	24.0	10.9	13.1	18.5	14.2
2410-03	3/10/2014	290	28.0	9.66	12.2	17.8	13.5
2426-09	2/5/2014	340	18.0	5.29	9.07	15.2	10.9
2519-10	3/10/2014	160	20.0	12.5	14.3	19.5	15.2
2523-05	2/19/2014	170	31.0	18.2	18.4	22.9	18.6
2602-09	2/13/2014	140	24.0	17.1	17.6	22.3	17.9
2615-03	2/20/2014	1,200	49.0	4.08	8.20	14.5	10.2
2743D-11	2/24/2014	650	39.0	6.00	9.58	15.6	11.3
2755-07	2/22/2014	150	11.0	7.33	10.5	16.4	12.1
2808-15	2/21/2014	410	15.0	3.66	7.89	14.2	9.9
2901-06	2/26/2014	160	15.0	9.38	12.0	17.6	13.3
3004-08	3/3/2014	260	51.0	19.6	19.4	23.8	19.4
3005-18	3/4/2014	230	52.0	22.6	21.5	25.6	21.2
GAL-01	2/28/2014	1,300	41.0	3.15	7.53	13.9	9.6
GAL-02	2/28/2014	170	7.10	4.18	8.27	14.5	10.2
GAL-03	2/28/2014	710	24.0	3.38	7.69	14.0	9.7
GAL-04	2/28/2014	2,700	930	34.4	30.1	32.7	28.2
GAL-04	2/28/2014	2,500	920	36.8	31.8	34.1	29.6
GAL-05	2/28/2014	650	66.0	10.2	12.6	18.1	13.8
MTP-01	2/27/2014	5,100	170	3.33	7.66	14.0	9.7
MTP-02	2/27/2014	4,300	400	9.30	12.0	17.6	13.3
MTP-03	2/27/2014	310	59.0	19.0	19.0	23.4	19.1
MTP-04	2/27/2014	1,800	340	18.9	18.9	23.3	19.0
MTP-05	2/27/2014	1,300	390	30.0	26.9	30.0	25.6
MTP-06	2/27/2014	2,100	260	12.4	14.2	19.4	15.1
MTP-07	2/27/2014	1,000	230	23.0	21.8	25.8	21.4
MTP-08	2/27/2014	1,500	360	24.0	22.5	26.4	22.0
MTP-09	2/27/2014	2,700	650	24.1	22.6	26.4	22.1
MTP-10	2/27/2014	890	110	12.4	14.2	19.4	15.1
		Number	72	72	72	72	
		Minimum	1.00	5.98	12.6	8.32	
		Maximum	57.3	46.5	46.4	41.9	
		Average	14.3	15.6	20.6	16.3	
		UCL (low)	16.77	17.17	21.82	17.50	
		UCL (high)	20.09	17.26	22.07	17.62	

- 71 IVBA Sample Points
- Transformed by 3 different regressions to predicted bioavailability
- Overall predicted results vary between 17 and 22%
- At bottom, results are based on UCL of values...subsequent slides show an alternate percentile approach

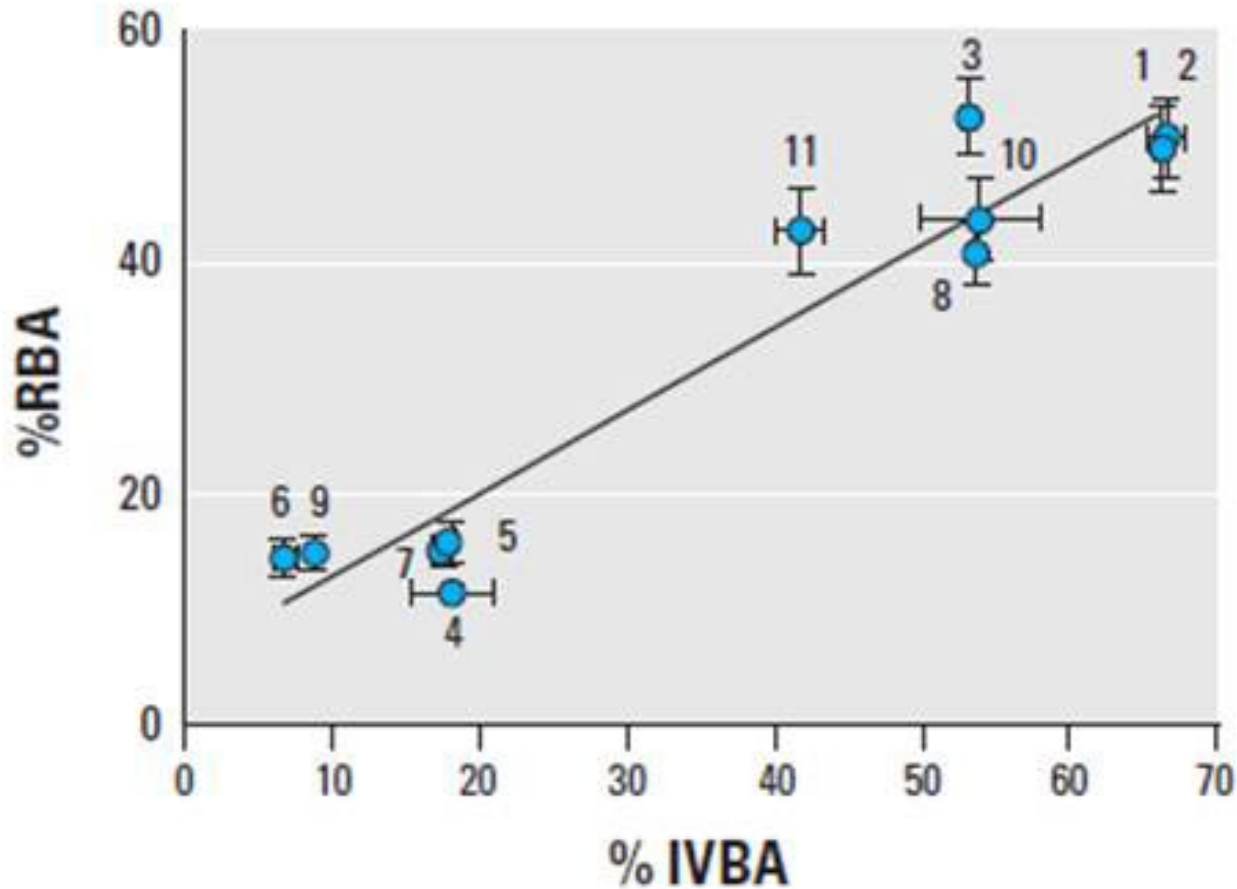
● XRF-648  
12.1%

# Predicted Bioavailabilities Based on Site-Specific IVBA Results Transform based on IKHS site-specific RBA/IVBA regression



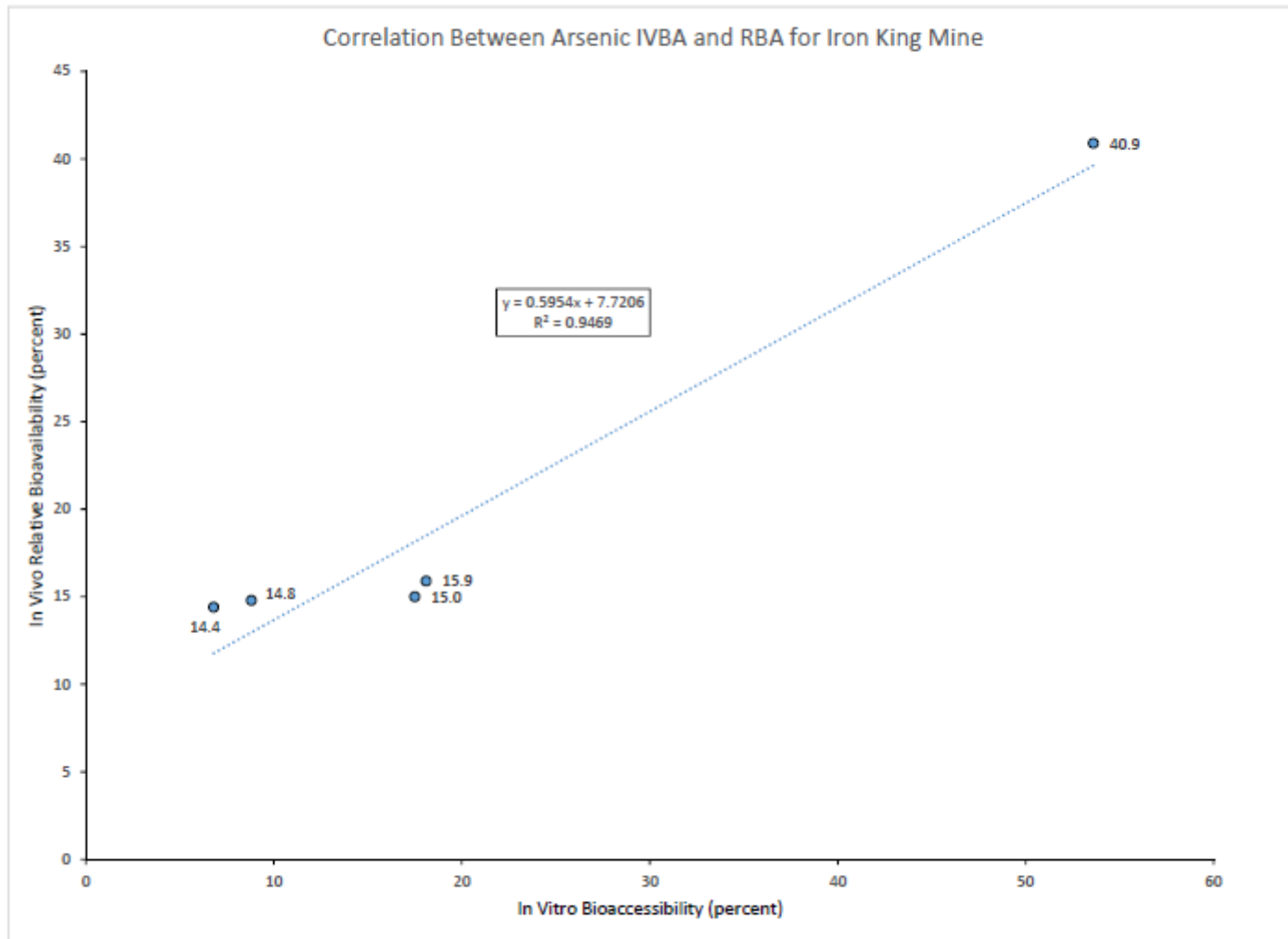
- Residential yard IVBA subpopulation
- Non-residential yard IVBA subpopulation
- Sample on known effluents

## Regression in Original Bradham Paper (includes IKHS Points)

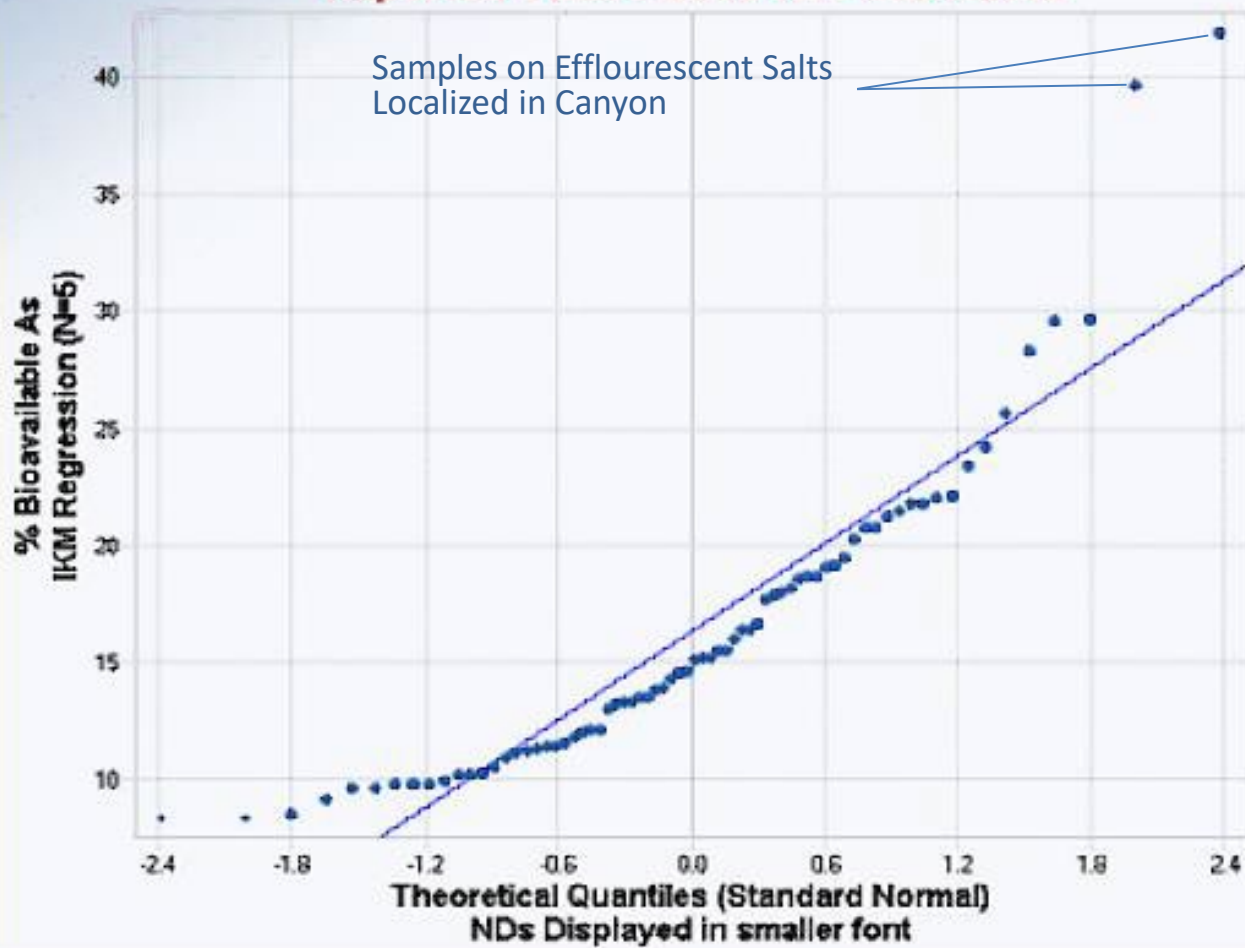


**Figure 3.** Correlation between estimates of As bio-accessibility and bioavailability (mean  $\pm$  SD). %RBA =  $0.72(\%IVBA) + 5.64$  ( $R^2 = 0.92$ ).

# IKHS Site-Specific Regression



# Q-Q Plot for % Bioavailable As IKM Regression (N=5) Reported values used for nondetects



$\pm$  Bioavailable As  
IKM Regression (N=5)  
Total Number of Data = 72  
Number of Non-Detects = 2  
Number of Detects = 70  
Detected Mean = 16.48  
Detected Std = 6.621  
Slope (displayed data) = 8.277  
Intercept (displayed data) = 16.25  
Correlation, R = 0.929

■ Best Fit Line

% Bioavailable As IKM Regression (N=5)

All IVBA Values (n=71)			
	95%UCL	90th percentile	95th percentile
Risk Target	17.44	22.05	27.57
Arsenic RBC @ 10-6 risk (mg/kg)	1.74	1.48	1.26
Arsenic RBC @ 10-5 risk (mg/kg)	17.4	14.8	12.6
Arsenic RBC @ 10-4 risk (mg/kg)	174	148	126
Arsenic RBC @ HQ=1 (mg/kg)	287	245	209
Excluding 2 Highest IVBA Values (n=69)			
	95%UCL	90th percentile	95th percentile
Risk Target	16.39	21.81	23.83
Arsenic RBC @ 10-6 risk (mg/kg)	1.81	1.49	1.40
Arsenic RBC @ 10-5 risk (mg/kg)	18.1	14.9	14.0
Arsenic RBC @ 10-4 risk (mg/kg)	181	149	140
Arsenic RBC @ HQ=1 (mg/kg)	299	247	232
Only Residential IVBA Values (n=26)			
	95%UCL	90th percentile	95th percentile
Risk Target	17.18	20.93	22.78
Arsenic RBC @ 10-6 risk (mg/kg)	1.76	1.54	1.45
Arsenic RBC @ 10-5 risk (mg/kg)	17.6	15.4	14.5
Arsenic RBC @ 10-4 risk (mg/kg)	176	154	145
Arsenic RBC @ HQ=1 (mg/kg)	290	254	240

All  
Transformed  
IVBA

Transformed  
IVBA without  
2 Samples on  
Efflorescent  
Salts

Residential  
Yard  
Transformed  
IVBA ONLY

