



## SUMMARY of KANSAS NORM LEVELS

### Oil Gas Drilling Waste Sample Study

#### Kansas Mississippian Lime Maximum Isotopic Concentrations

Kansas Department of Health & Environment  
Bureau of Environmental Health  
Updated December 31, 2013

Isotope	Highest pCi/g (Bq/kg)	Maximum pCi/g (Bq/kg)
Ra-226	1.9 (70.3)	2.85 (105.45)
Ra-228	1.55 (57.35)	2.325 (86.025)

**Requirements:**

K.A.R. 28-29-1602(d)(7)(A)(i)states: “[The operator shall certify that] The maximum predicted NORM level in the drilling waste is no more than 1.5 times the highest NORM level found in drilling waste samples collected from Kansas wells. A summary of NORM levels found in drilling waste samples collected from Kansas wells shall be maintained by the department and provided to any person upon request”.

The objective of this report is to provide the required information concerning NORM in drilling waste from oil and gas exploration in Kansas so that such drilling waste may be safely disposed of through land-spreading.

**About this study:**

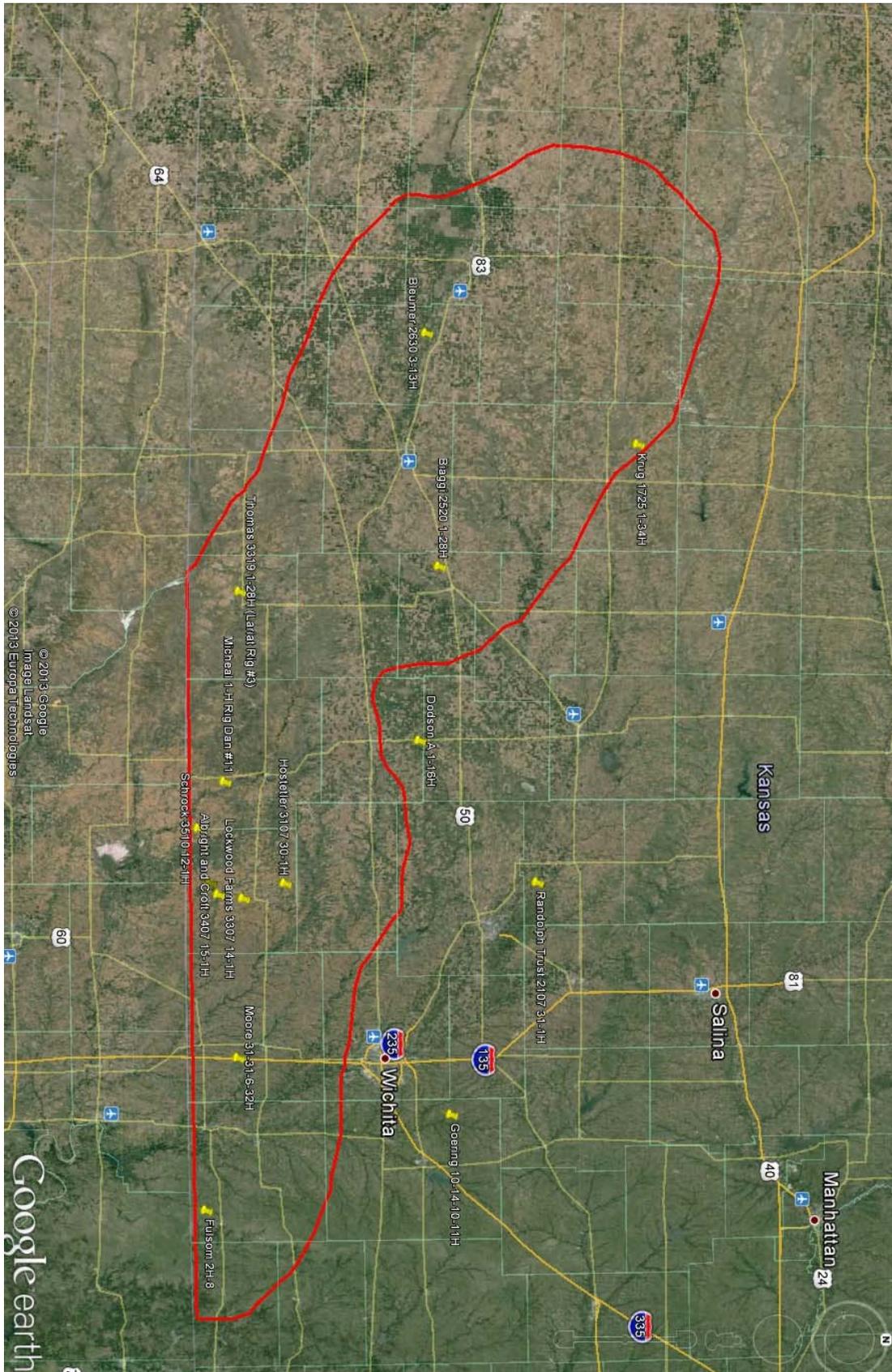
- This study reviews all NORM analysis data provided to KDHE through KCC.
- Analysis data is limited by the number of samples collected and analyzed.
- The MAXIMUM NORM level is 1.5 times the highest NORM level and is the maximum amount allowable for land-spreading in Kansas.
- These numbers are subject to change as additional data are received and analyzed, this publication will be updated twice annually in June and December.
- Figure 1, shows the locations of the wells for which there is data relative to the Mississippian formation.
- Further information is available in the document attached to this report.

**Additional Considerations:**

- Always follow the requirements for proper completion of your land-spreading application as found in K.A.R. 28-29-1600 et seq. A copy of these regulations is attached to this report.

# Figure 1 – Sampled Well Locations

(Red outline is the approximate location of the Mississippian formation)



# Kansas Mississippian Lime Maximum Isotopic Concentrations

Data compiled by  
Thomas A. Conley, CHP

Data source  
Kansas Corporation Commission

Updated December 31, 2013

## Discussion:

This data is from samples collected from various horizontal wells by both well operators and KCC contractors and analyzed by certified laboratories.

Samples were taken in the horizontal section of the well from the drilling cuttings. None of the samples are from production waste.

The background samples were taken at undisturbed locations near the wells.

Due to the low number of samples and the large volume encompassed by the Mississippian Lime formation, caution should be used in interpreting or using this data.

# Kansas Mississippian Lime Maximum Isotopic Concentrations

SampleType	Isotope	Average pCi/g (Bq/kg)		Maximum pCi/g (Bq/kg)		1.5 * pCi/g (Bq/kg)		# data points
<b>Background</b>								
	Bi-212	1.82	(67.34)	4.4	(162.8)	6.6	(244.2)	15
	Bi-214	1.10	(40.80)	1.68	(62.16)	2.52	(93.24)	15
	K-40	15.85	(586.57)	29.7	(1098.9)	44.55	(1648.35)	15
	Pb-212	1.15	(42.70)	2.51	(92.87)	3.765	(139.305)	15
	Pb-214	1.17	(43.29)	2.12	(78.44)	3.18	(117.66)	15
	Ra-226	1.45	(53.58)	2.01	(74.37)	3.015	(111.555)	15
	Ra-228	1.25	(46.30)	2.11	(78.07)	3.165	(117.105)	15
	Th-227	-0.41	(-15.02)	0.54	(19.98)	0.81	(29.97)	15
	Th-234	0.82	(30.44)	1.7	(62.9)	2.55	(94.35)	15
	Tl-208	0.42	(15.47)	0.67	(24.79)	1.005	(37.185)	15
	U-232	3.15	(116.65)	3.85	(142.45)	5.775	(213.675)	11
	U-234	0.71	(26.16)	0.91	(33.67)	1.365	(50.505)	11
	U-235	0.02	(0.81)	0.62	(22.94)	0.93	(34.41)	15
	U-238	0.78	(28.79)	1.07	(39.59)	1.605	(59.385)	11
<b>Well</b>								
	Be-7	0.11	(3.91)	0.228	(8.436)	0.342	(12.654)	3
	Bi-212	0.64	(23.86)	2.1	(77.7)	3.15	(116.55)	15
	Bi-214	0.85	(31.53)	1.65	(61.05)	2.475	(91.575)	15
	Co-60	0.00	(-0.17)	0.001	(0.037)	0.0015	(0.0555)	2
	Cs-137	0.00	(-0.07)	0.004	(0.148)	0.006	(0.222)	2
	K-40	7.92	(292.99)	22	(814)	33	(1221)	15
	Pb-210	1.45	(53.53)	1.994	(73.778)	2.991	(110.667)	3
	Pb-212	0.59	(21.76)	1.62	(59.94)	2.43	(89.91)	12
	Pb-214	0.77	(28.36)	1.58	(58.46)	2.37	(87.69)	15
	Ra-226	1.19	(44.12)	1.9	(70.3)	2.85	(105.45)	15
	Ra-228	0.53	(19.73)	1.55	(57.35)	2.325	(86.025)	15
	Sc-46	0.01	(0.49)	0.025	(0.925)	0.0375	(1.3875)	3
	Th-227	0.05	(1.69)	0.78	(28.86)	1.17	(43.29)	9
	Th-228	0.51	(18.94)	0.641	(23.717)	0.9615	(35.5755)	3
	Th-234	0.47	(17.45)	2.5	(92.5)	3.75	(138.75)	12
	Tl-208	0.20	(7.23)	0.47	(17.39)	0.705	(26.085)	15
	Total Gamma	14.87	(550.10)	15.651	(579.087)	23.477	868.6305	3
	U-232	3.09	(114.37)	4.03	(149.11)	6.045	(223.665)	9
	U-234	0.81	(29.81)	1.63	(60.31)	2.445	(90.465)	9
	U-235	0.13	(4.64)	0.449	(16.613)	0.6735	(24.9195)	15
	U-238	0.81	(29.81)	1.68	(62.16)	2.52	(93.24)	9