

# Biomonitoring studies and preventing the formation of biogenic H<sub>2</sub>S in the Wierchowice Underground Gas Storage facility

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**Table S1.** The content of sulphur compounds in natural gas from selected horizontal wells in clusters A and B of the Wierchowice Underground Gas Storage facility in the XXV exploitation cycle (I series – January 15, 2020; state of gas depletion from UGS: 255 million Nm<sup>3</sup>).

The content of sulphur compounds [mg/Nm <sup>3</sup> ]							
Well		CH <sub>3</sub> SH	C <sub>2</sub> H <sub>5</sub> SH	i-C <sub>3</sub> H <sub>7</sub> SH	CH <sub>3</sub> -S-CH <sub>3</sub>	n-C <sub>4</sub> H <sub>9</sub> SH	H <sub>2</sub> S
W-32	Sorg.	n.s.	0.03	0.03	0.03	n.s.	0.69
	Sel.	–	0.016	0.013	0.015	–	
WM-A1bH	Sorg.	0.02	0.03	0.03	0.04	n.s.	0.78
	Sel.	0.013	0.016	0.013	0.021	–	
WM-A2H	Sorg.	0.02	0.03	0.04	0.03	0.03	1.02
	Sel.	0.013	0.016	0.017	0.015	0.011	
WM-A3H	Sorg.	0.02	0.03	0.03	0.04	n.s.	0.84
	Sel.	0.013	0.016	0.013	0.021	–	
WM-A4H	Sorg.	0.02	0.03	0.03	0.03	0.03	0.92
	Sel.	0.013	0.016	0.013	0.015	0.011	
WM-A5H	Sorg.	0.02	0.03	0.03	0.03	n.s.	0.75
	Sel.	0.013	0.016	0.013	0.015	–	
WM-B1H	Sorg.	n.s.	0.03	0.03	n.s.	n.s.	0.65
	Sel.	–	0.016	0.013	–	–	
WM-B2H	Sorg.	n.s.	0.03	0.03	0.03	0.02	0.92
	Sel.	–	0.016	0.013	0.015	0.007	
WM-B3H	Sorg.	n.s.	n.s.	0.03	0.03	0.02	0.53
	Sel.	–	–	0.013	0.015	0.007	
WM-B4H	Sorg.	n.s.	0.03	0.03	0.03	0.03	0.82
	Sel.	–	0.016	0.013	0.015	0.011	
WM-B5H	Sorg.	0.02	0.03	0.04	0.03	0.03	1.08
	Sel.	0.013	0.016	0.017	0.015	0.011	
WM-B6H	Sorg.	0.03	0.03	0.05	0.04	0.03	1.79
	Sel.	0.020	0.016	0.021	0.021	0.011	
WM-B7H	Sorg.	0.02	0.04	0.04	0.03	0.02	0.86
	Sel.	0.013	0.021	0.017	0.015	0.007	
W-collective (natural gas from all wells)	Sorg.	0.02	0.03	0.03	0.03	0.02	0.88
	Sel.	0.013	0.016	0.011	0.015	0.007	

**Table S2.** The content of sulphur compounds in natural gas from selected horizontal wells in clusters A and B of the Wierchowice Underground Gas Storage facility in the XXV UGS exploitation cycle (II series - January 15, 2020; gas depletion from the UGS facility: 497 million Nm<sup>3</sup>).

The content of sulphur compounds [mg/Nm³]								
Well		CH <sub>3</sub> SH	C <sub>2</sub> H <sub>5</sub> SH	i-C <sub>3</sub> H <sub>7</sub> SH	CH <sub>3</sub> -S-CH <sub>3</sub>	n-C <sub>4</sub> H <sub>9</sub> SH	Total	H <sub>2</sub> S
WM-A1bH	Sorg.	0.02	0.03	0.03	0.04	0.03	0.074	0.98
	Sel.	0.013	0.016	0.013	0.021	0.011		
WM-A2H	Sorg.	0.02	0.03	0.04	0.03	0.03	0.072	1.07
	Sel.	0.013	0.016	0.017	0.015	0.011		
WM-A3H	Sorg.	n.s.	0.03	0.03	0.04	0.03	0.061	0.98
	Sel.	–	0.016	0.013	0.021	0.011		
WM-A4H	Sorg.	0.02	0.03	0.03	0.03	0.02	0.064	0.78
	Sel.	0.013	0.016	0.013	0.015	0.007		
WM-A5H	Sorg.	0.02	0.03	0.03	0.04	0.02	0.070	0.95
	Sel.	0.013	0.016	0.013	0.021	0.007		
WM-B1H	Sorg.	n.s.	0.03	0.03	0.03	0.03	0.055	0.79
	Sel.	–	0.016	0.013	0.015	0.011		
WM-B2H	Sorg.	0.02	0.03	0.04	0.04	0.04	0.081	1.18
	Sel.	0.013	0.016	0.017	0.021	0.014		
WM-B3H	Sorg.	0.02	0.03	0.03	0.03	0.03	0.068	0.99
	Sel.	0.013	0.016	0.013	0.015	0.011		
WM-B4H	Sorg.	n.s.	0.03	0.03	0.04	0.02	0.057	0.94
	Sel.	–	0.016	0.013	0.021	0.007		
WM-B5H	Sorg.	0.03	0.04	0.05	0.04	0.03	0.094	1.38
	Sel.	0.020	0.021	0.021	0.021	0.011		
WM-B6H	Sorg.	0.03	0.06	0.05	0.06	0.04	0.117	2.07
	Sel.	0.020	0.031	0.021	0.031	0.014		
WM-B7H	Sorg.	0.02	0.03	0.03	0.04	0.02	0.070	0.98
	Sel.	0.013	0.016	0.013	0.021	0.007		
W-collective (natural gas from all wells)	Sorg.	0.02	0.03	0.04	0.003	0.03	0.072	1.02
	Sel.	0.013	0.016	0.017	0.015	0.011		

**Table S3.** The content of sulphur compounds in natural gas from selected horizontal wells in clusters A and B of the Wierzchowiec Underground Gas Storage facility in the XXV exploitation cycle (II series - January 15, 2020; gas depletion from the UGS facility: 750 million Nm<sup>3</sup>).

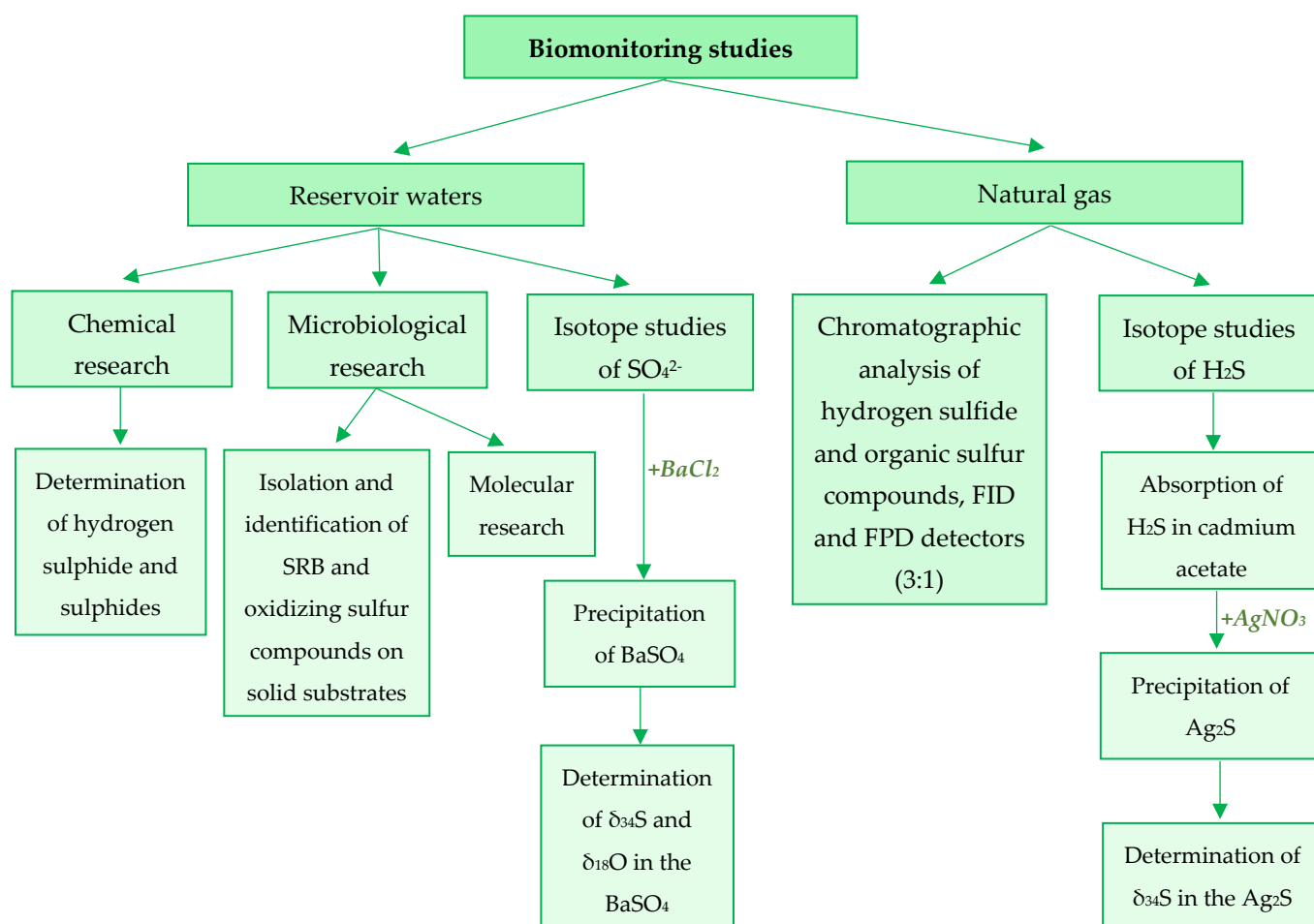
The content of sulphur compounds [mg/Nm <sup>3</sup> ]							
Well		CH <sub>3</sub> SH	C <sub>2</sub> H <sub>5</sub> SH	i-C <sub>3</sub> H <sub>7</sub> SH	CH <sub>3</sub> -S-CH <sub>3</sub>	n-C <sub>4</sub> H <sub>9</sub> SH	H <sub>2</sub> S
WM-A1bH	Sorg.	0.03	0.04	0.04	0.04	0.02	1.48
	Sel.	0.020	0.021	0.017	0.021	0.007	
WM-A2H	Sorg.	0.03	0.03	0.05	0.04	0.04	1.82
	Sel.	0.020	0.016	0.021	0.021	0.014	
WM-A3H	Sorg.	0.03	0.03	0.04	0.04	0.04	1.03
	Sel.	0.020	0.016	0.017	0.021	0.014	
WM-A4H	Sorg.	0.02	0.03	0.04	0.04	0.03	0.98
	Sel.	0.013	0.016	0.014	0.021	0.011	
WM-A5H	Sorg.	0.03	0.04	0.05	0.03	0.05	1.24
	Sel.	0.020	0.021	0.021	0.015	0.018	
WM-B1H	Sorg.	0.02	0.03	0.04	0.03	0.04	1.10
	Sel.	0.013	0.016	0.017	0.015	0.014	
WM-B2H	Sorg.	0.03	0.03	0.05	0.03	0.04	1.21
	Sel.	0.020	0.016	0.021	0.015	0.014	
WM-B3H	Sorg.	0.02	0.03	0.04	0.03	0.04	1.19
	Sel.	0.013	0.016	0.017	0.015	0.014	
WM-B4H	Sorg.	0.02	0.03	0.03	0.03	0.02	1.17
	Sel.	0.013	0.016	0.013	0.015	0.007	
WM-B5H	Sorg.	0.03	0.04	0.05	0.04	0.04	1.59
	Sel.	0.020	0.021	0.021	0.021	0.014	
WM-B6H	Sorg.	0.03	0.07	0.06	0.05	0.05	2.46
	Sel.	0.020	0.036	0.025	0.026	0.018	
WM-B7H	Sorg.	0.02	0.03	0.04	0.04	0.04	1.26
	Sel.	0.013	0.016	0.014	0.021	0.014	
W-collective (natural gas from all wells)	Sorg.	0.02	0.04	0.04	0.03	0.04	1.32
	Sel.	0.013	0.021	0.017	0.015	0.014	

**Table S4.** A comparison of hydrogen sulphide content in natural gas from horizontal wells in clusters A and B of the Wierzychowice Underground Gas Storage facility (III series of tests).

Well	cycle XIX	cycle XX	cycle XXI	cycle XXII	cycle XXIII	cycle XXIV	cycle XXV
	III series	III series	III series	III series	III series	III series	III series
	26.02.2014	26.02.2015	02.03.2016	07.03.2017	06.03.2018	06.03.2019	09.03.2020
	527 million Nm <sup>3</sup>	527 million Nm <sup>3</sup>	746 million Nm <sup>3</sup>	759 million Nm <sup>3</sup>	758 million Nm <sup>3</sup>	750 million Nm <sup>3</sup>	750 million Nm <sup>3</sup>
WM-A1bH	1.08	1.21	2.99	1.75	1.61	1.58	1.48
WM-A2H	1.12	1.02	2.48	1.98	1.89	1.92	1.82
WM-A3H	0.95	0.98	1.19	1.52	1.45	1.32	1.03
WM-A4H	0.87	0.87	1.28	1.20	1.23	1.19	0.98
WM-A5H	n.t.	n.t.	1.08	1.31	1.29	1.31	1.24
WM-B1H	1.22	1.27	1.63	1.26	1.12	1.08	1.10
WM-B2H	0.99	1.11	0.95	0.99	0.95	1.19	1.21
WM-B3H	1.11	1.09	1.49	1.24	1.18	1.21	1.19
WM-B4H	n.t.	n.t.	1.01	1.19	1.24	1.15	1.17
WM-B5H	1.25	1.35	1.63	1.65	1.71	1.68	1.59
WM-B6H	2.99	2.89	3.03	2.98	2.85	2.65	2.46
WM-B7H	0.87	0.96	1.82	1.78	1.59	1.35	1.26
W-collected water	1.33	1.31	1.79	1.67	1.55	1.41	1.32

n.t. – not tested

**Figure S1.** Scheme of biomonitoring studies.



**Figure S2.** Diagram illustrating the theoretical possibilities of hydrogen sulphide formation.

