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A fluoride risk assessment GIS for Central Europe – Hungary, Moldova, Slovakia and Ukraine

F M Fordyce¹, K Vrana², E Zhovinsky³, G Toth⁴, B Hope¹, V Povorozhuk⁵, U Iljinsky⁶ and J Baker⁷

1 British Geological Survey, West Mains Road, Edinburgh EH9 3LA, UK

2 HYDEKO-KV, Planckova 4, 851 01 Bratislava, Slovakia

3 Institute of Geochemistry, Mineralogy and Ore Formation, National Academy of Sciences of Ukraine, 3 4 Palladin Prospect, Kiev 142, 252680 Ukraine

4 Niobium BT, Mimoza ut 14, H-1146 Budapest, Hungary

5 Institute of Gerontology AMS Ukraine, 67 Vyshgorodska Street, Kiev, 254114 Ukraine

6 Association of State Geologists, Moldova, 156 Metropolitna Dorofeja Street, Chisinau, Moldova

7 Selor eeg, Saffierstraat 101c, 1074 GP Amsterdam, The Netherlands

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Like many elements, fluoride is beneficial to human health in small doses but can be toxic in excess. The links between low intakes of fluoride and dental protection are well known, however, fluoride is a powerful calcium-seeking element and can interfere with the calcified structure of bones and teeth in the human body at higher concentration causing dental or skeletal fluorosis. One of the main exposure routes is via drinking water and the World Health Organisation currently set the following water quality health criteria: < 0.5 mg/lF no dental protection; 0.5 – 1.5 mg/lF dental benefits are evident; > 1.5 mg/lF dental fluorosis may occur and > 3-5 mg/lF skeletal fluorosis may occur. In Central Europe, groundwater resources that exceed the guideline value of 1.5 mg/l are widespread and health effects associated with high fluoride in water have been reported. On the other hand, much of the area has very low fluoride concentrations in water and fluoridation is being discussed. The aim of the current project was to develop a geographic information system (GIS) to aid the identification of areas where high fluoride waters and fluorosis may be a problem, hence where water treatment technologies should be targeted. The GIS development was based upon the collation and digitisation of existing information relevant to fluoride risk in Ukraine, Moldova, Hungary and Slovakia assembled for the first time in a readily accessible form. In addition, innovative geochemistry and health studies to examine in more detail the relationships between high-fluoride drinking waters and health effects in the population were carried out in Moldova and Ukraine demonstrating dental fluorosis prevalence rates of 60 – 90% in children consuming water containing 2 – 7 mg/lF. The rationale for the final fluoride risk assessment scheme for Central Europe involving, water quality, water supply, fluoride sources and dietary factors will be presented.