OIL POLLUTION IN THE VICINITY OF A HEATING PLANT IN NEW BELGRADE (SERBIA) – INFLUENCE ON THE QUALITY OF THE SURROUNDING SOIL AND SEDIMENTS

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INTRODUCTION

Petroleum products have been used for decades in the plants for district heating in Belgrade (Capital of Serbia). The most used derivative for this purpose is a heavy oil fuel. Additionally, raw petrol and eco-diesel are in use as well.

During the months of May and June 2015 an extensive investigation of the pollution of the soil and sediments in the vicinity of a heating plant in New Belgrade (Serbia) was conducted. This area has a long history of oil pollution due to: NATO bombing of reservoirs (1999), break-down of mazut reservoirs (2009), and accidental spillage from reservoirs over the years.

According to the geologic and hydro geologic characteristics, the research area is located in the alluvial plains of the Sava River, close to its confluence to the Danube (Figure 1). Because of that, the significance of this research is not only local but also regional.

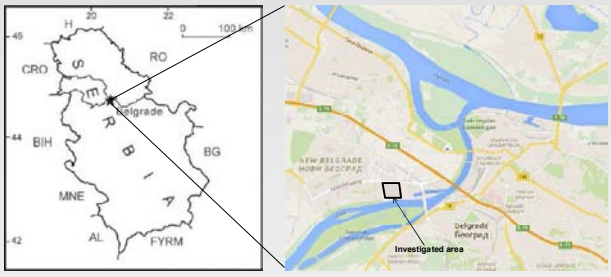

Figure 1. Location of the investigated area.

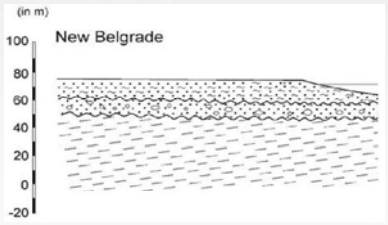

Figure 2. A simplified geologic crossection of the Sava river bank in the investigated area (modified after Knežević *et al.*, 2012.).

EXPERIMENTAL

The soil and sediments were sampled from 20 micro locations and 5 different depths making in total 100 of samples. Extractable petroleum hydrocarbons were isolated with hexane using a Soxhlet apparatus. The extracts were precleaned on the column packed with Florisil® and analyzed by gas chromatography–mass spectrometry (GC–MS) techniques.

An Agilent 7890N gas chromatograph fitted with a HP5-MS capillary column (30 × 0.25 mm, 0.25 μm film; temperature range: 40 °C for 1 min; then 15 °C min^{-1} to 100 °C for 1 min; then 10 °C min^{-1} to 310 °C for 15 min and held for 15 min; with helium as the carrier gas (flow rate 1 cm^3 min^{-1}) was used. The GC was coupled to a Hewlett- Packard 5972 MSD operated at 70 eV in the 45–550 scan range.

The peaks were identified according to the literature data (Peters et al., 2005., and references therein) or based on the total mass spectra, using mass spectra databases (NIST/EPA/NIH mass spectral library NIST2000, Wiley/NBS registry of mass spectral data, 7th ed., electronic versions.

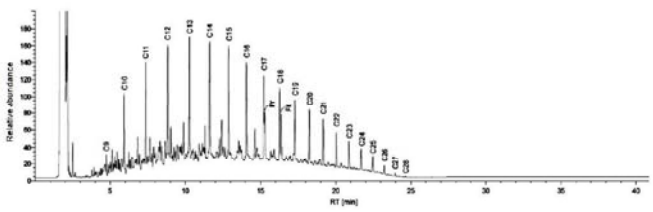

Figure 3. Gas chromatogram of a desulphurized disel fuel.

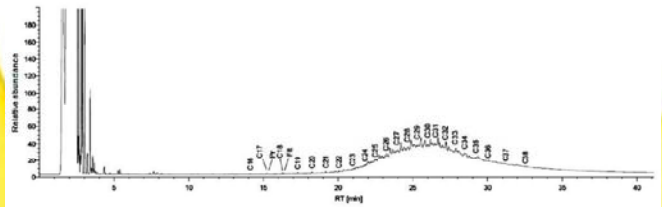

Figure 4. Gas chromatogram of a heavy oil fuel .

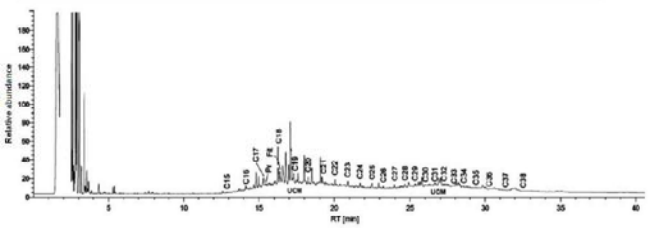

Figure 5. Gas chromatogram of an extract from a soil sample typical for this locality.

RESULTS

The results showed that the whole investigated area was contaminated with diesel and a heavy oil fuel which have been used for decades in this heating plant. Although the results did not indicate a significant contamination, the presence of these oil pollutants in the investigated samples indicates that this area should be under continuous monitoring.

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Knežević S., Rundić Lj., Ganić M., The subsurface geology along the route of the new bridge at Ada Ciganlija Island (Belgrade, Serbia) (2012). ANNALES GÉOLOGIQUES DE LA PÉNINSULE BALKANIQUE, 73, 9-19.
Peters, K. E., Walters, C. C. & Moldowan, J. M. 2005. The Biomarker Guide. Volume 2: Biomarkers and Isotopes in Petroleum Exploration and Earth History. Second Edition. University Press, Cambridge, New York, Melborne.

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