

# ReSoil

Remediation case #3

Reclamation of heavy metal contaminated  
soil for vegetable production in city of  
Celje, Slovenia

October 2021 –

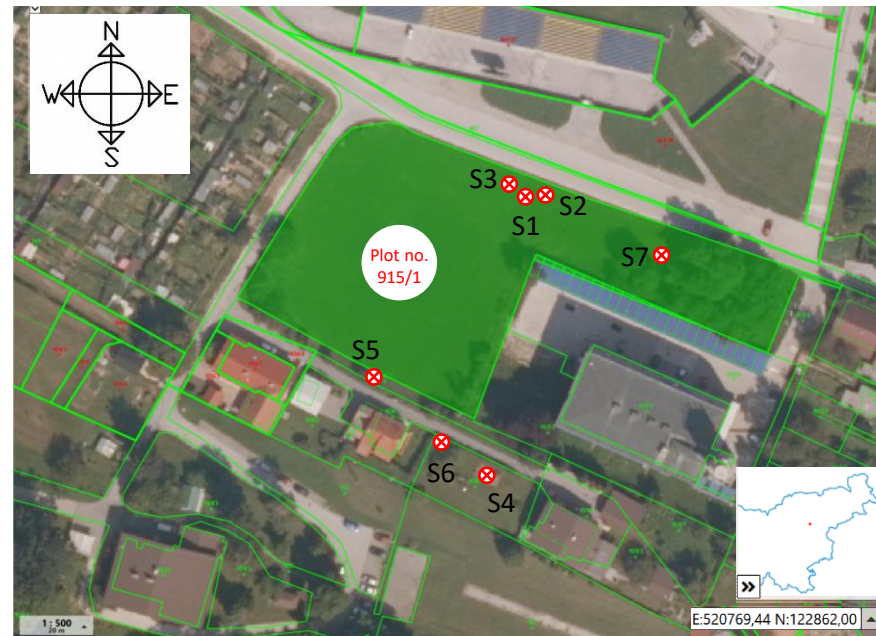
# Contaminated site characterization



Photo: Grega E. Voglar



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Orto-photo of the plot no. 915/1 with locations of sampling points (S1-S7).

The area is located in the northern part of Golovec, along Samova ulica on plot no. 915/1, cadastral municipality of Lower Hudinja, near Central stadium. The area of the whole plot measures about 5100 m<sup>2</sup>. Since the eastern part, between Samova ulica and the business building, is narrow and steep, the actual usable area is 3760 m<sup>2</sup>. The current area of use is natural meadow with a slight slope to the south. On the south side, near the bank, the terrain is steeper at first, then the slope decreases. The height difference is about 5 m.



# Initial soil sampling

Meadow soil from the upper 30 cm soil layer was taken near Central Stadium in Celje, Slovenia (lat. 46,245216; long. 15,269356). City Municipality of Celje is planning to establish urban gardens in this site. According to the previous sampling results we collected 7 samples which showed elevated concentrations of toxic metals.



Allocation of sampling points at ReSoil® demonstration site 915/1.



Soil profile at sampling point S1.



Soil properties:

- silty clay type of soil,
- 4.3% of organic matter
- C/N ratio 10.9

# XRF soil analysis

We performed soil analysis using handheld X-Ray Fluorescence analyser (XRF). The soil sample from a sampling point (S1) was combined with the soil sample of three soil horizons / depths.

Sample	Pb (mg kg <sup>-1</sup> )	Zn (mg kg <sup>-1</sup> )	Cu (mg kg <sup>-1</sup> )	Cd (mg kg <sup>-1</sup> )
S1	185	626	47	LOQ
S2	121	432	39	LOQ
S3	156	604	52	LOQ
S4	230	1311	137	LOQ
S5	195	867	68	LOQ
S6	420	1205	47	LOQ
S7	81.5	320.5	32	LOQ

Concentration of toxic elements in soil (0-25cm), sampled at Celje test site (plot no. 915/1), measured with XRF.



Photo: Grega E. Voglar



# ReSoil<sup>®</sup> technology feasibility test & Remediation efficiency

Location of the site identified for the performance of the ReSoil<sup>®</sup> efficiency

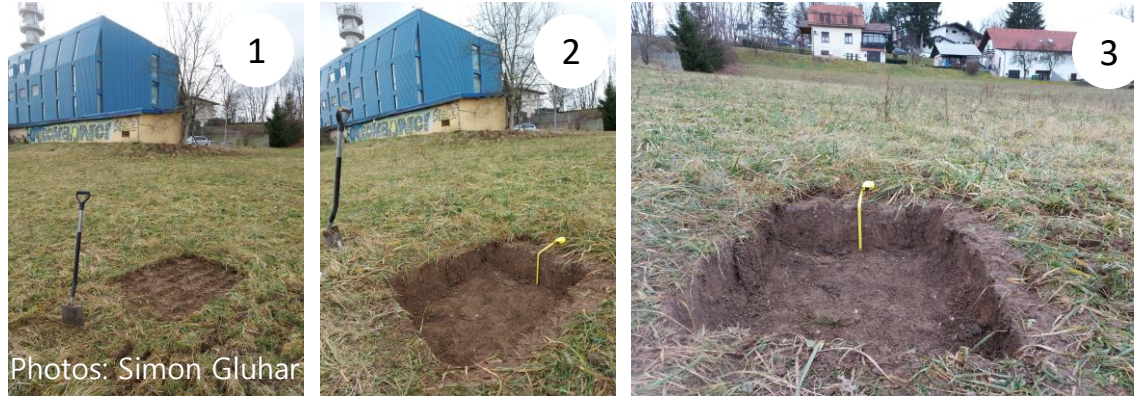
The area is located in the northern part of Celje – Golovec area, along Samova ulica on plot no. 915/1, cadastral municipality of Lower Hudinja, near Central stadium.

DMS coordinates:  
46°14'43.0"N | 15°16'10.1"E

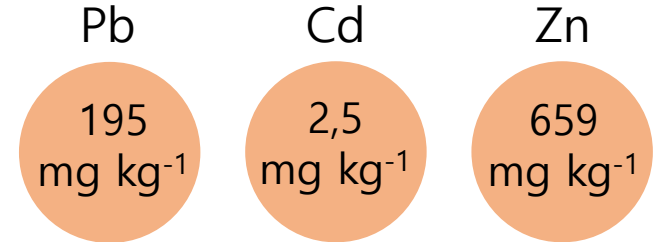
Pseudo-total concentration in soil samples and soil type

The average concentrations of heavy metals in soil (0-30 cm) were 195 mg kg<sup>-1</sup> for lead, 2,5 mg kg<sup>-1</sup> for cadmium, and 659 mg kg<sup>-1</sup> for zinc, which is above the warning limits of Slovenian legislation set at 100 mg kg<sup>-1</sup>, 2 mg kg<sup>-1</sup> and 300 mg kg<sup>-1</sup> for lead, cadmium, and zinc respectively.

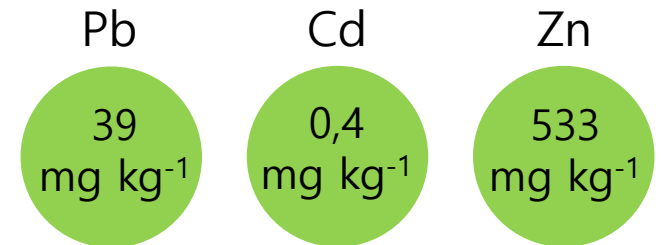
Soil type: Fertile eutric brown soils developed on gravel deposits



## Initial metal concentration



## Metal concentration after remediation



## Reduction in metal concentration

