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**WORKSHOP ON GEOTHERMAL ENERGY**  
**Status and Future in the Peri-Adriatic Area**  
25. – 27. August 2014, Veli Lošinj, Croatia

# District heating of Benedikt

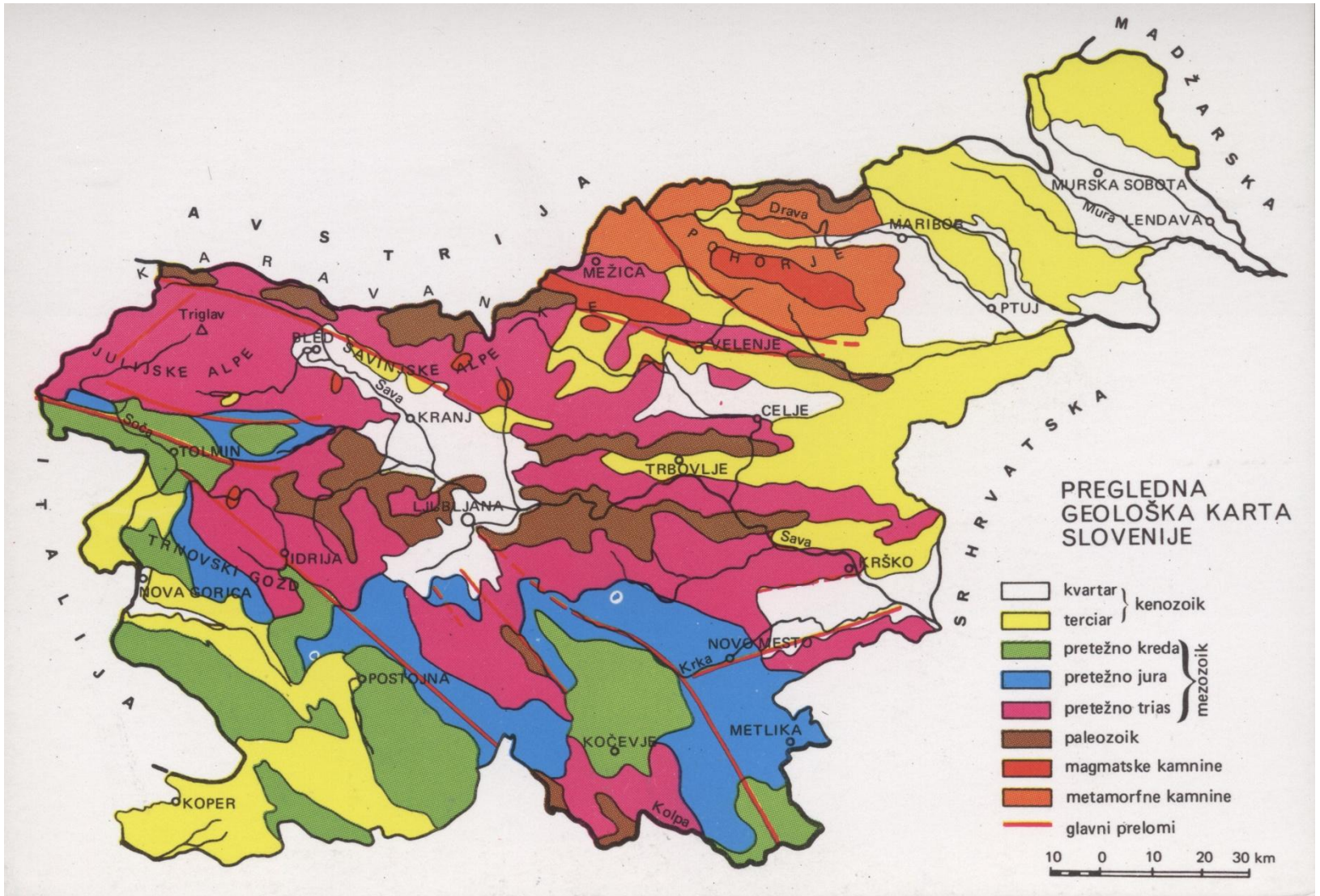
## 1<sup>st</sup> stage (Northeast Slovenija)

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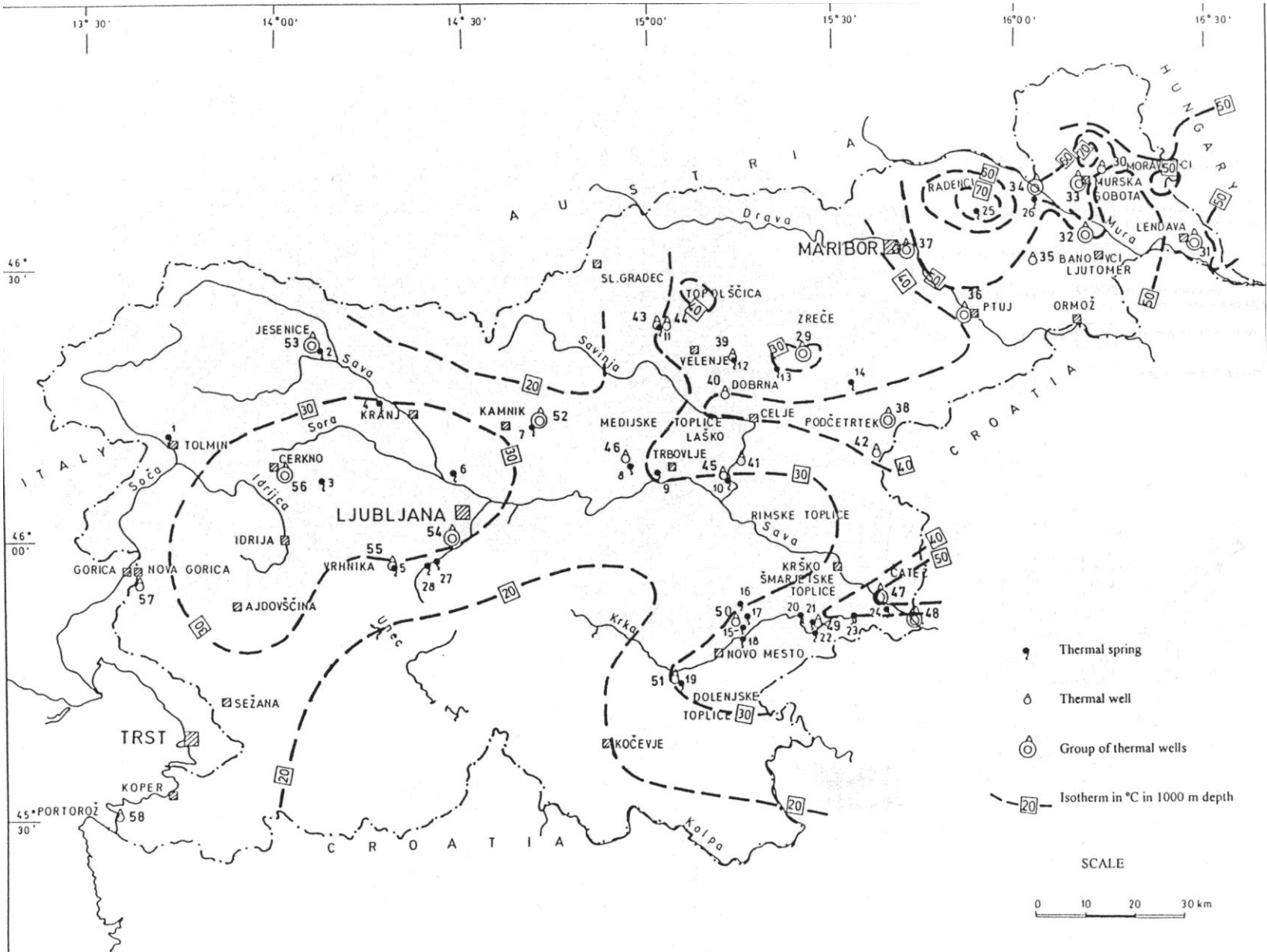


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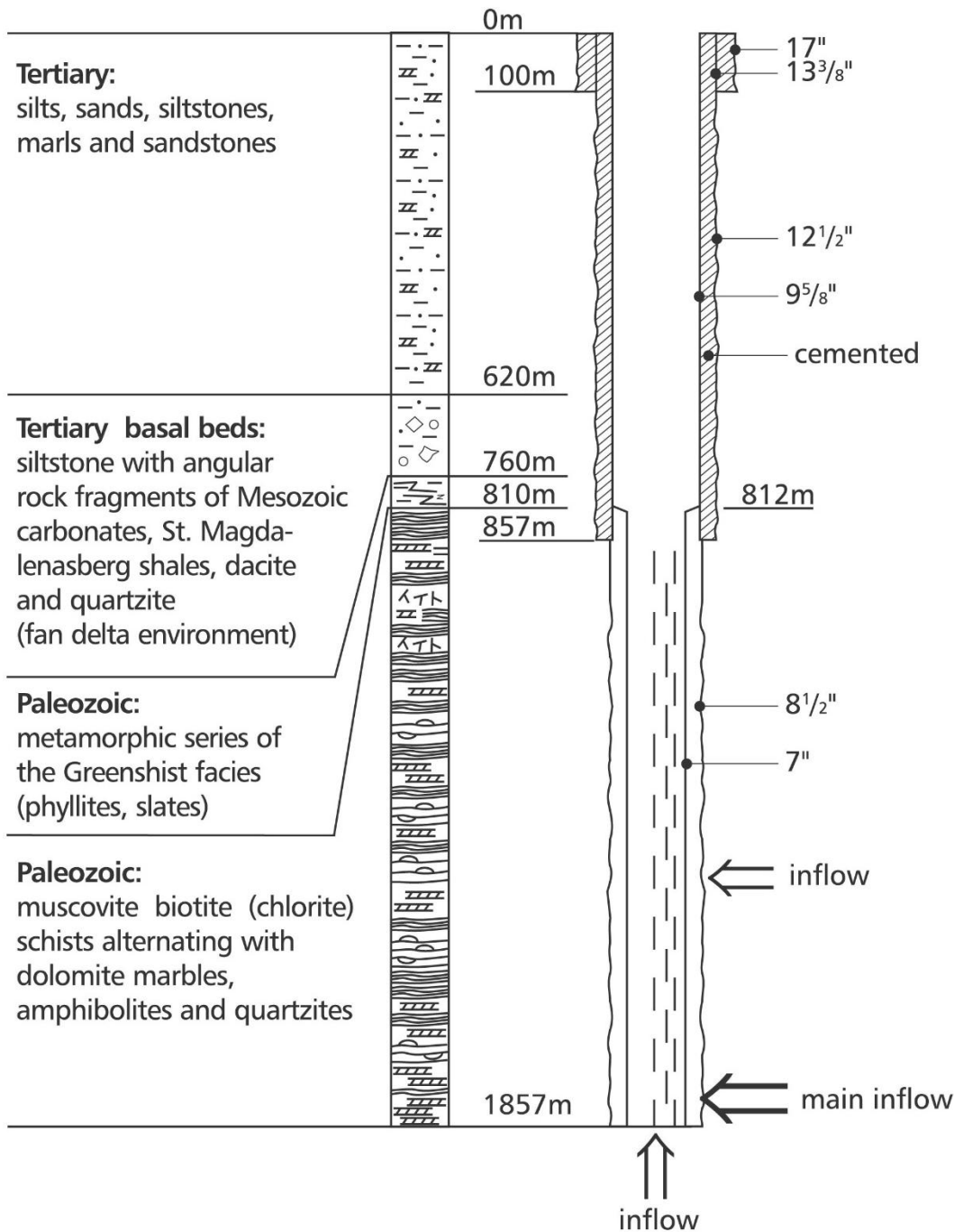




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# Geological and technical profile of the geothermal well Benedikt-2/03



## Activation:

Static level = 40 m

Tubing  $\text{Ø } 2 \frac{5}{8}''$   
0 – 1850 m

$Q = 4 \text{ L/s}$

$T_w = 68 \text{ }^\circ\text{C}$

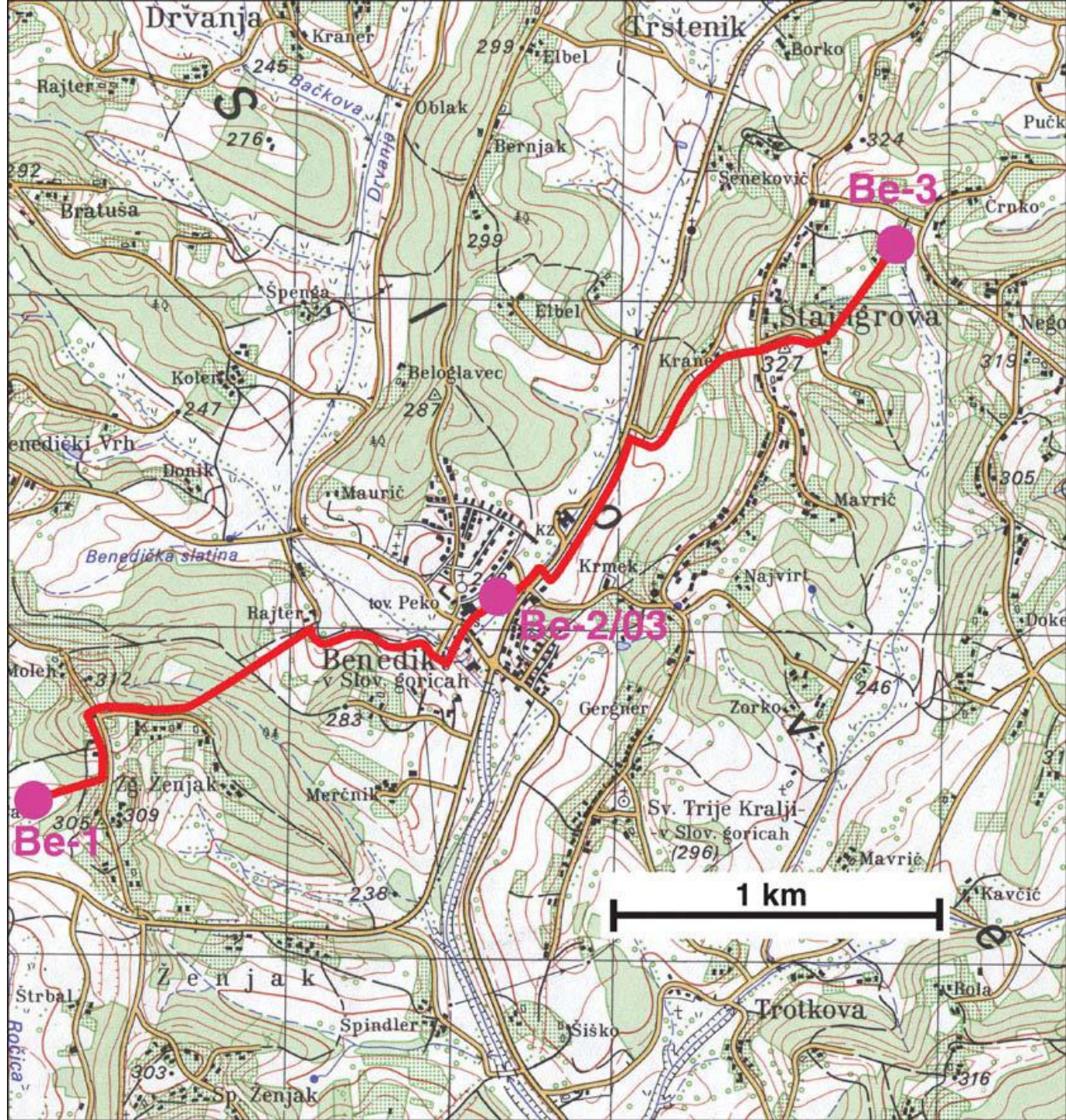
$P_{\text{head}} = 4 \text{ Bar}$

# Cemical composition



Na <sup>+</sup> (mg/l)	<b>1750</b>
K <sup>+</sup> (mg/l)	<b>176</b>
Ca <sup>2+</sup> (mg/l)	<b>119</b>
Mg <sup>2+</sup> (mg/l)	<b>59,4</b>
Fe <sup>2+</sup> (mg/l)	<b>1,57</b>
Mn <sup>2+</sup> (mg/l)	<b>0,41</b>
Cl <sup>-</sup> (mg/l)	<b>207</b>
HCO <sub>3</sub> <sup>-</sup> (mg/l)	<b>4700</b>
SO <sub>3</sub> <sup>2-</sup> (mg/l)	<b>358</b>
CO <sub>2</sub> (mg/l)	<b>14000</b>
TDI (mg/l)	<b>7374</b>
pH	<b>6,61</b>

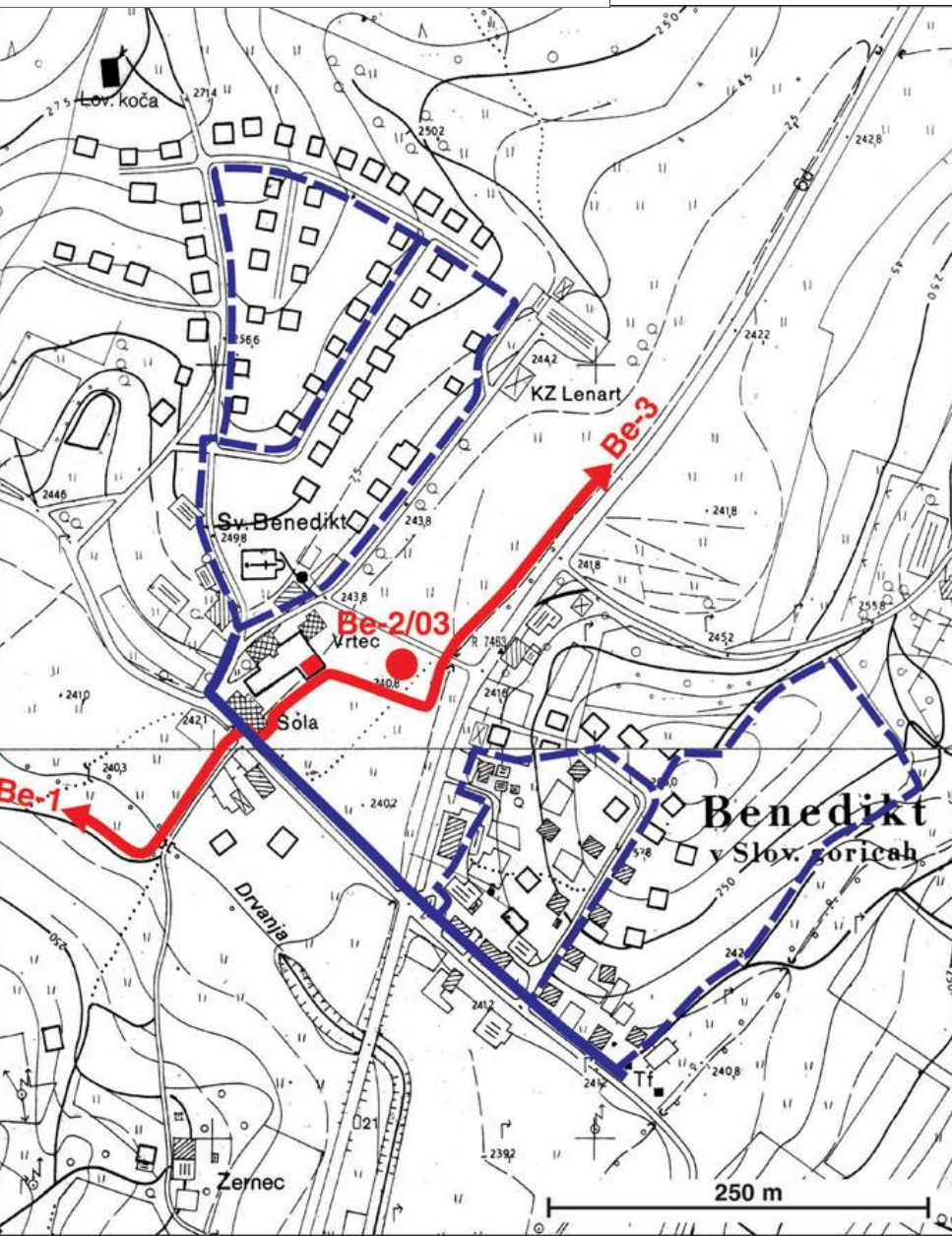








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**Stage I:** Public buildings (kindergarden, primary school, municipality building and gymnasium) - 700 kW.

**Stage II:** Stage I will be extended in the centre of Benedikt (rectory, church, fire station, culture house and 93 detached houses).

**Stage III:** north-west side of Benedikt - 75 detached houses.

**Stage IV:** south-west side of Benedikt - 30 detached houses.



## Investment costs

Construction works	Costs (k€)	Share (%)
Three wells	2.850	24,1
Two geothermal power plants 2,5 MWe each	3.900	33,0
Connection of GeoPP to the electric network	170	1,4
Reinjection pipeline network	2.300	19,4
Reinjection station	260	2,2
Heat station and the pipeline network	2.350	19,9
<b>ALTOGETHER</b>	<b>11.830</b>	<b>100,0</b>



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## Financial construction of the investment

Source	Amount (k€)	Share (%)
Company's own funds	3.830	32,4
Grants	3.000	25,4
Credits	5.000	42,2
<b>ALTOGETHER</b>	<b>11.830</b>	<b>100,0</b>





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## Predicted annual operation costs

Cost	Amount (€)	Share (%)
Energy (500 MWh/a)	29.500	25,1
Employees (4 persons)	76.200	64,9
Other (0,1% of investment costs)	11.800	10,0
<b>ALTOGETHER</b>	<b>117.500</b>	<b>100,0</b>



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## Annual income structure

Income	Amount (k€)	Share (%)
Electricity production (35.000 MWh/a)	2.065	93,5
Heat production (4.100 MWh/a)	0.143	6,5
<b>ALTOGETHER</b>	<b>2.208</b>	<b>100,0</b>



# TECHNICAL DATA FOR THE PHASE 1

Installed power: 700 kW; Annual heat demand: 600 MWh<sub>th</sub>.

Temperature control

The installation should be sufficient to support all phases

Installed power: 3,3 MW<sub>th</sub>;

Annual heat demand: 4.200 MWh<sub>th</sub>



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## **TIME CONTRACT (10 YEARS)**

**Annual rate: 38.500 L EL oil/a  
5 L/s Thermal water**

**Free acces to the well**



# TECHNICAL DATA FOR THE PHASE 1

Heat exchanger 700 kW :

$T_{\text{geo -inlet}} = 80^{\circ}\text{C}$   
 $T_{\text{geo - outlet}} = 45^{\circ}\text{C}$   
 $Q_{\text{geo}} = 5 \text{ liter/s}$

$T_{\text{hs. - inlet}} = 70^{\circ}\text{C}$   
 $T_{\text{hs. outlet}} = 42^{\circ}\text{C}$   
 $Q_{\text{hs.}} = 6,0 \text{ liter/s}$   
 $dt_{\text{log}} = 7.6^{\circ}\text{C}$























During the 8–year operation  
no failure occurred that would  
not be repaired in warranty.

# Sesonal energy production (calculated)

Year	Flowrate (L/s)	Temperature (° C)	Wellhead pressure (bar)	Thermical power (kW)	Energy (MWh/a)
2006/07	4,543	78	7,4	817	1,8
2007/08	4,543	79	7,4	837	4,3
2008/09	4,850	80	7,6	913	4,6
2009/10	4,938	80	7,7	930	4,7
2010/11	4,792	80	7,5	902	4,5
2011/12	4,688	79	7,5	864	4,4
2012/13	4,710	79	7,5	868	4,5
2013/14	4,691	79	7,5	864	4,4



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To use geothermal resources  
the following criteria should be fulfilled:

- **professional**
- **political**, and
- **economical**





or





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## **MAIN REFERENCES**

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**THANK YOU**  
*for your attention*



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