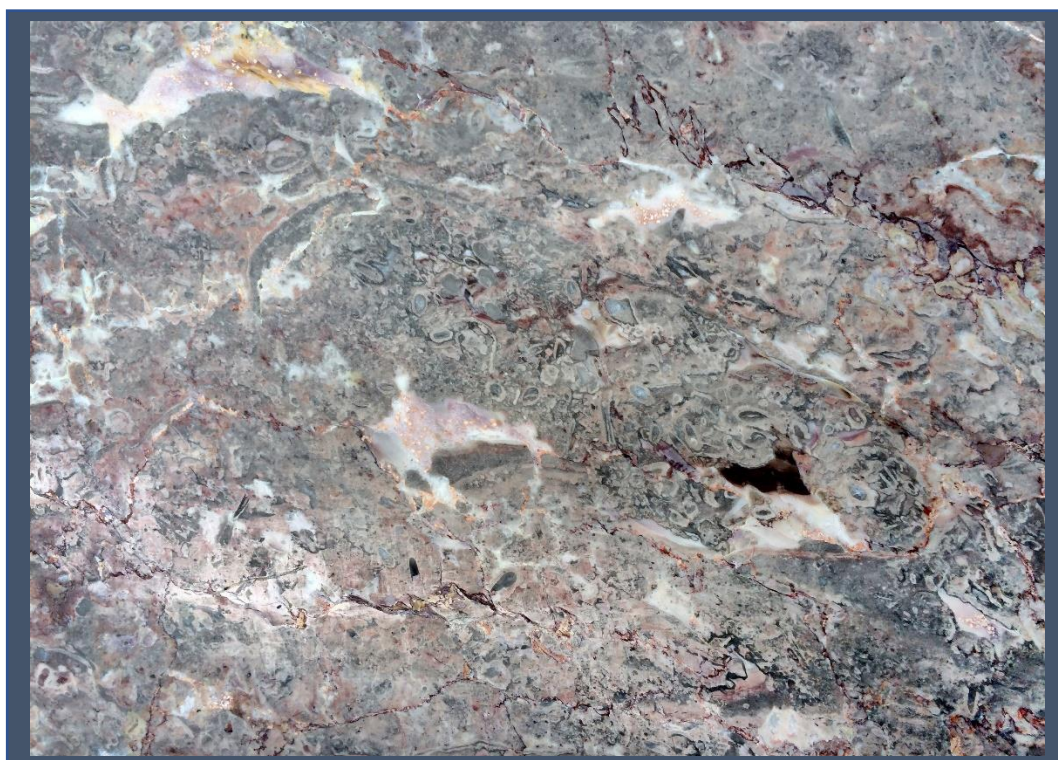


Lesno Brdo rdeči

Red Lesno Brdo limestone

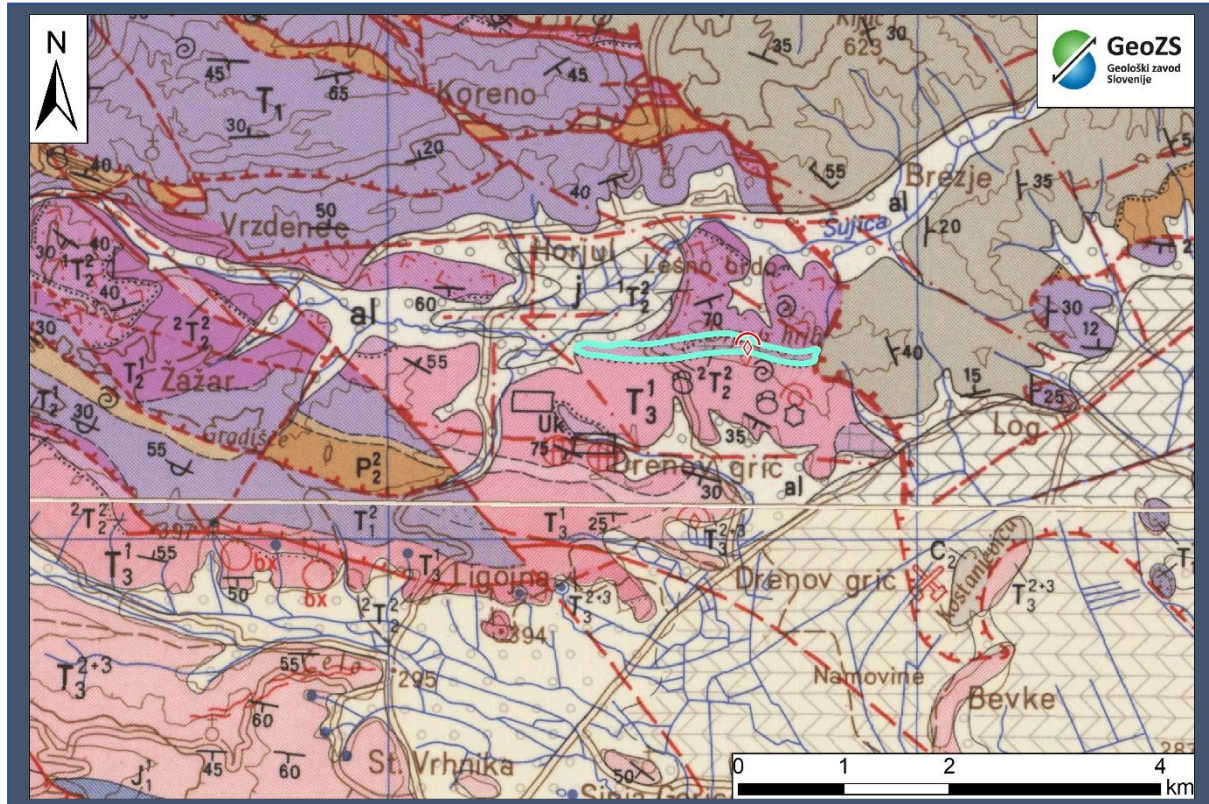


5 cm

Short description: Heterogeneous, variegated limestone with color transitions from grey and pinkish-grey to pink. Characteristic are frequent veins filled with reddish shale and claystone, and yellowish calcite. Larger nests are filled with lumps of bright calcite or yellowish dolomite crystals. The image displays a polished surface.

Commodity (vocabulary)	Lithology (vocabulary)	Typical colour (code list)	Place of origin			
			Country	County / District / Province	Municipality / Community	Place/town / Village
limestone	limestone	multicoloured, pink	Slovenia	Notranjska (traditional province)	Vrhnika	Lesno Brdo

Geological setting



Geology: Non-bedded, massive limestone with remains of shallow-marine organisms (cyanobacteria, algae, sponges, corals and sea urchins) formed in reef setting in the Tethys ocean. Lesno Brdo limestone belongs to the same geological unit as pink and red Hotavlje limestone, but with lower degree of recrystallization). The productive horizon lies on clastic sediments and ends with Upper Triassic (Julian, Tuvanian) thin-bedded black limestone and variegated clastic sediments.

Production: Active, concessionaire MINERAL, obdelava naravnega kamna, d.o.o., exploitation site Lesno Brdo, mining right to exploitation of natural stone - limestone.

Geological age: Late Triassic (early Carnian, Cordevolian substage) (237-235 million years)

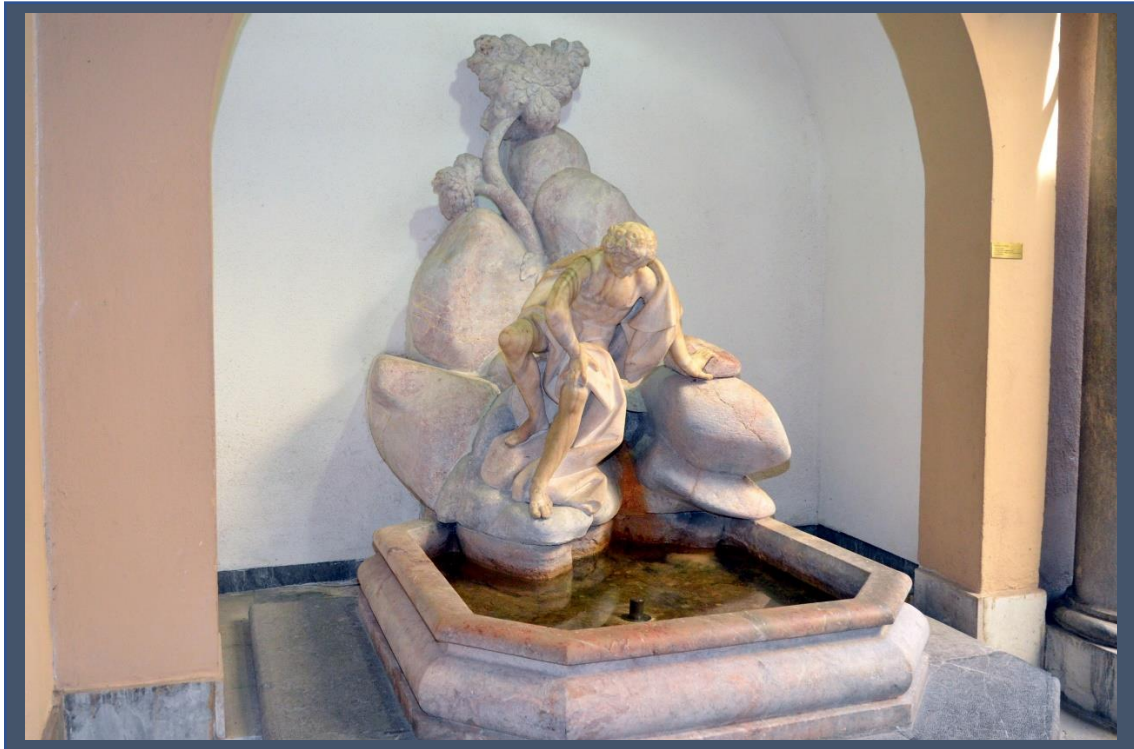
Geological unit: Cordevolian limestone of Outer Dinarides

Application, use and heritage

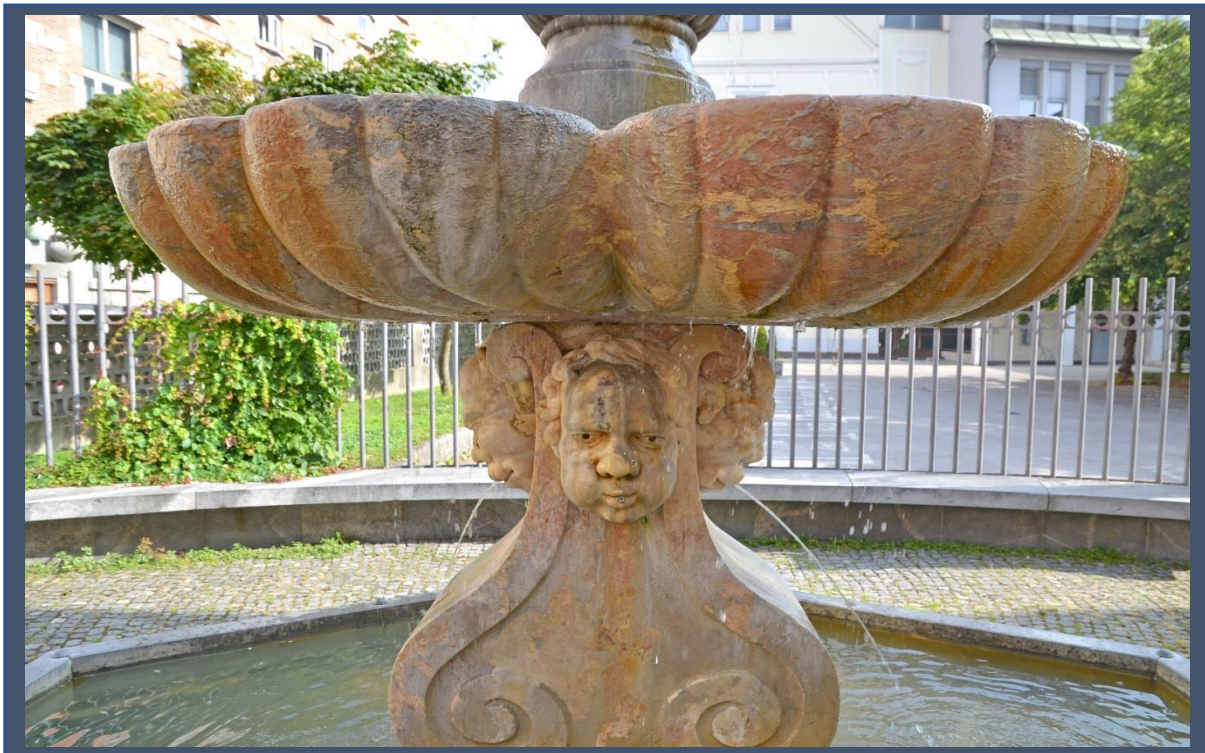
Description: The stones nice colour, high shine of polished surface and a very attractive appearance make the Lesno Brdo limestone a highly appreciated natural stone at home and abroad. Use: ornamental (internal and external) and building stone.



The renovated column of baroque Fountain of the Three Carniolan Rivers by Francesco Robba (1751) in Ljubljana is carved from Red Lesno Brdo limestone monolite. Renovated Plague Column (1890) in Ljubljana.

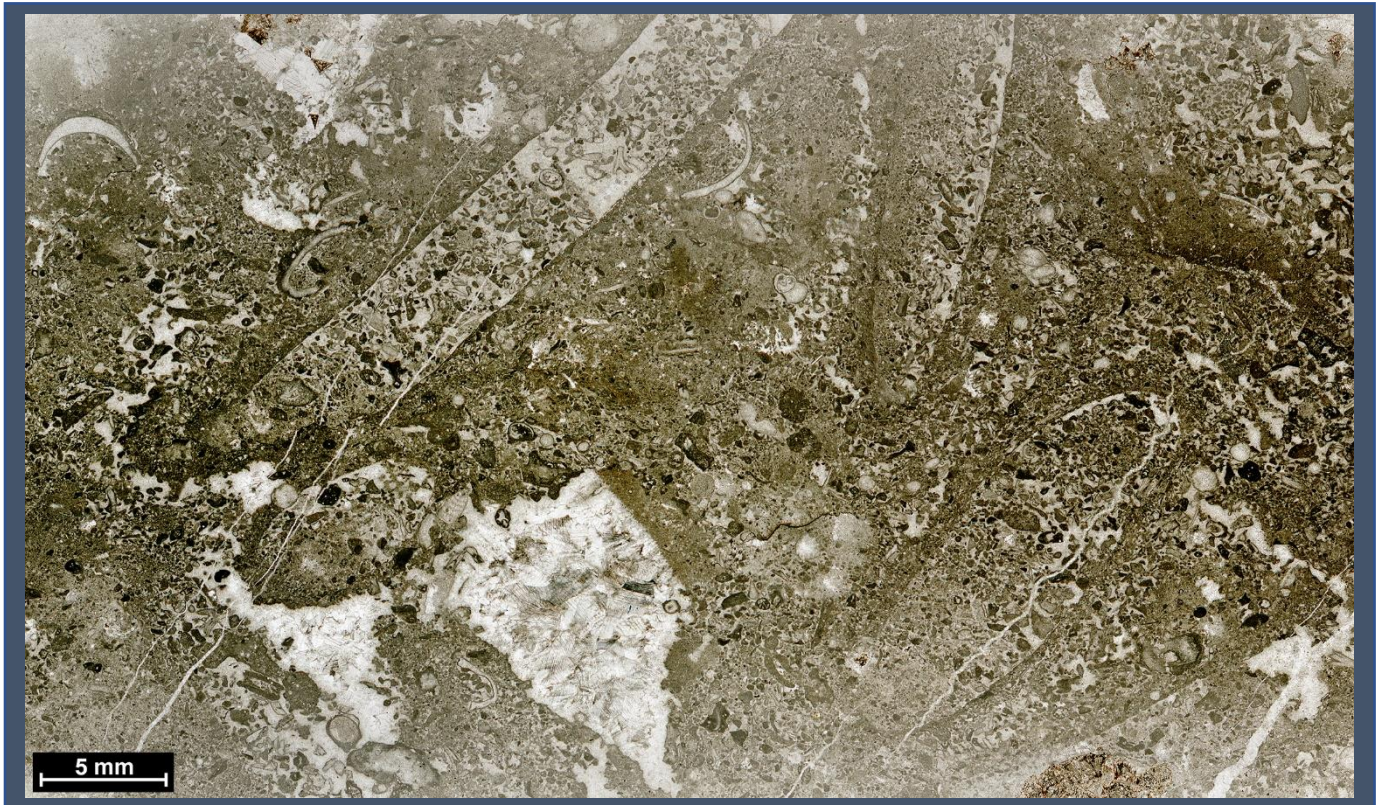


Narcissus Fountain by Francesco Robba in Ljubljana.



The bowl and its base with figures of the renovated Fountain of Neptune (1678) in Ljubljana are made of Red Lesno Brdo limestone.

Petrography



Description: Intrabiomicrosparite - mostly calcite grains in microsparite, Fe-oxides and hidrooxides give red, rose and yellow color, green from tuffs. Many veins and lenses of white and yellow sparite calcite, and red, rose, green or white accumulations of dolomite, often partly or complitely calcitised. Veins filled with red and green marlstone, many fossil remains of algae, sponges, corals, gastropods, also intraclasts and pelets, some stylolites.

Source of information: Geological Survey of Slovenia, Mirtič et al., 1999; Ramovš, 2000.

Mineral composition

If no accurate number, use MM=main minerals, SM = Subordinate minerals, AM=accessory minerals

Calcite (%)	Dolomite (%)	Clay minerals (%)	Quartz (%)	Limonite minerals (%)	Pyrite (%)	Albite (%)
98	in traces	in traces	in traces	in traces	In traces	In traces

Source of information: Mirtič et al., 1999; Kramar et al., 2010.

Physical properties

Apparent density (EN 1936) kg/m ³	Open porosity (EN 1936) % vol	Water absorption at atmospheric pressure (EN 13755) % wt	Uniaxial Compressive strength (EN 1926) MPa	Flexural strength under concentrated load (EN 12372) MPa

Real density (EN 1936) kg/m ³	Total porosity (EN 1936) % vol	Water absorption coefficient by capillary (EN 1925) (g/m ² x s ^{0,5})	Flexural strength under constant moment (EN 13161) MPa

Frost resistance (EN 12371)				
Technological Test (Test A)				Identification Test (Test B): Number of cycles completed prior to stone failure
Flexural strength (EN 12372) after freeze-thaw cycling, MPa	Number of cycles	Uniaxial compressive strength (EN 1926) after freeze-thaw cycling, MPa	Number of cycles	

Resistance to ageing by thermal shock (EN 14066)			
Change in dynamic modulus of elasticity (increase: +; decrease: -) %	Change in open porosity (increase: +; decrease: -) %	Change in ultrasound pulse velocity (increase: +; decrease: -) %	Change in flexural strength under conc. load (increase: +; decrease: -) %

Abrasion resistance (EN 14157)			Resistance to salt crystallisation (EN 12370)	Breaking load at dowel hole (EN 13364)	
Method A - Wide Wheel Abrasion Test, mm	Method B - Böhme Abrasion Test, cm ³ / 50cm ²	Method C - Amsler Abrasion Test, mm	Change in mass (increase: +; decrease: -), %	Breaking load, N	Thickness of the test specimens, mm

Slip resistance by means of the pendulum tester (EN 14231 / CEN/TS 16165)			Rupture energy (EN 14158), Joule	Thermal Conductivity (EN 1745), W/m·K
Tested surface finish	Slip Resistance Value — SRV			
	Dry test condition	Wet test condition		

Methods applied and source of information:

Chemical properties

Main elements

SiO ₂ (%)	Al ₂ O ₃ (%)	Fe ₂ O ₃ (%)	TiO ₂ (%)	MgO (%)	CaO (%)	Na ₂ O (%)	K ₂ O (%)	MnO (%)	P ₂ O ₅ (%)	SO ₃ (%)	LOI (%)
-	-	-	-	up to 1,5	52-55	-	-	-	-	-	up to 43

Trace elements

V (ppm)	Cr (ppm)	Mn (ppm)	Co (ppm)	Ni (ppm)	Cu (ppm)	Zn (ppm)	As (ppm)
Sr (ppm)	Cd (ppm)	Ba (ppm)	Pb (ppm)	Be (ppm)	Rb (ppm)	Bi (ppm)	U (ppm)
Sc (ppm)	Y (ppm)	Th (ppm)	Sb (ppm)	Ta (ppm)	Nb (ppm)	Zr (ppm)	Sn (ppm)
Ag (ppm)	B (ppm)	Mo (ppm)	W (ppm)	Ga (ppm)	Ge (ppm)	Se (ppm)	Cs (ppm)
Tl (ppm)							

REE

La (ppm)	Ce (ppm)	Pr (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Gd (ppm)	Tb (ppm)
Dy (ppm)	Ho (ppm)	Er (ppm)	Tm (ppm)	Yb (ppm)	Lu (ppm)		

Methods applied and source of information: Guidelines of the Lime Industry and the JUS B.H 360 to 369 standards are used for the chemical analysis of carbonate rocks. Chemical composition of certain limestones is determined by complexometric analysis (for CaO and MgO) according to G. Mueller's method. Mirtič et al., 1999.

Sources of more information

Type of information	Name of provider	URL
This data sheet		
Non-commercial directory	Geological Survey of Slovenia: Mining Registry Book	https://www.ms.geo-zs.si/en-GB
Commercial directory		
Scientific publication	MIRTIČ, B., MLADENVIČ, A., RAMOVŠ, A., SENEGAČNIK, A., VESEL, J., & VIŽINTIN, N. 1999. Slovenski naravni kamen. Ljubljana, Geological Survey of Slovenia, Slovenian National Building and Civil Engineering Institute, University of Ljubljana Geology department. 131 pg. RAMOVŠ, A. 2000. Podpeški in črni ter pisani lesnobraški apnenec skozi čas. Ljubljana, Mineral. 115 pp. KRAMAR, S., MLADENVIČ, A., UROŠEVIČ, M., MAUKO PRANJIČ, A., PRISTACZ, H., MIRTIČ, B. 2010. Deterioration of Lesno Brdo limestone on monuments (Ljubljana, Slovenia). RMZ - Materials and geoenvironment : periodical for mining, metallurgy and geology, 57/1, 53-73.	
Other publication		

Compiled by:	Geological Survey of Slovenia (GeoZS) www.geo-zs.si	Logo  GeoZS Geološki zavod Slovenije
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