Polish Geological Institute
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Polish Geological Survey
Polish Hydrogeological Survey

POLISH GEOLOGICAL INSTITUTE

HYDROCARBON PROSPECTIVE OF POLAND

KRÓLÓWKA
TENDER AREA
ENGLISH ABSTRACT

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CONCESSIONS FOR HYDROCARBON
PROSPECTION, EXPLORATION AND PRODUCTION
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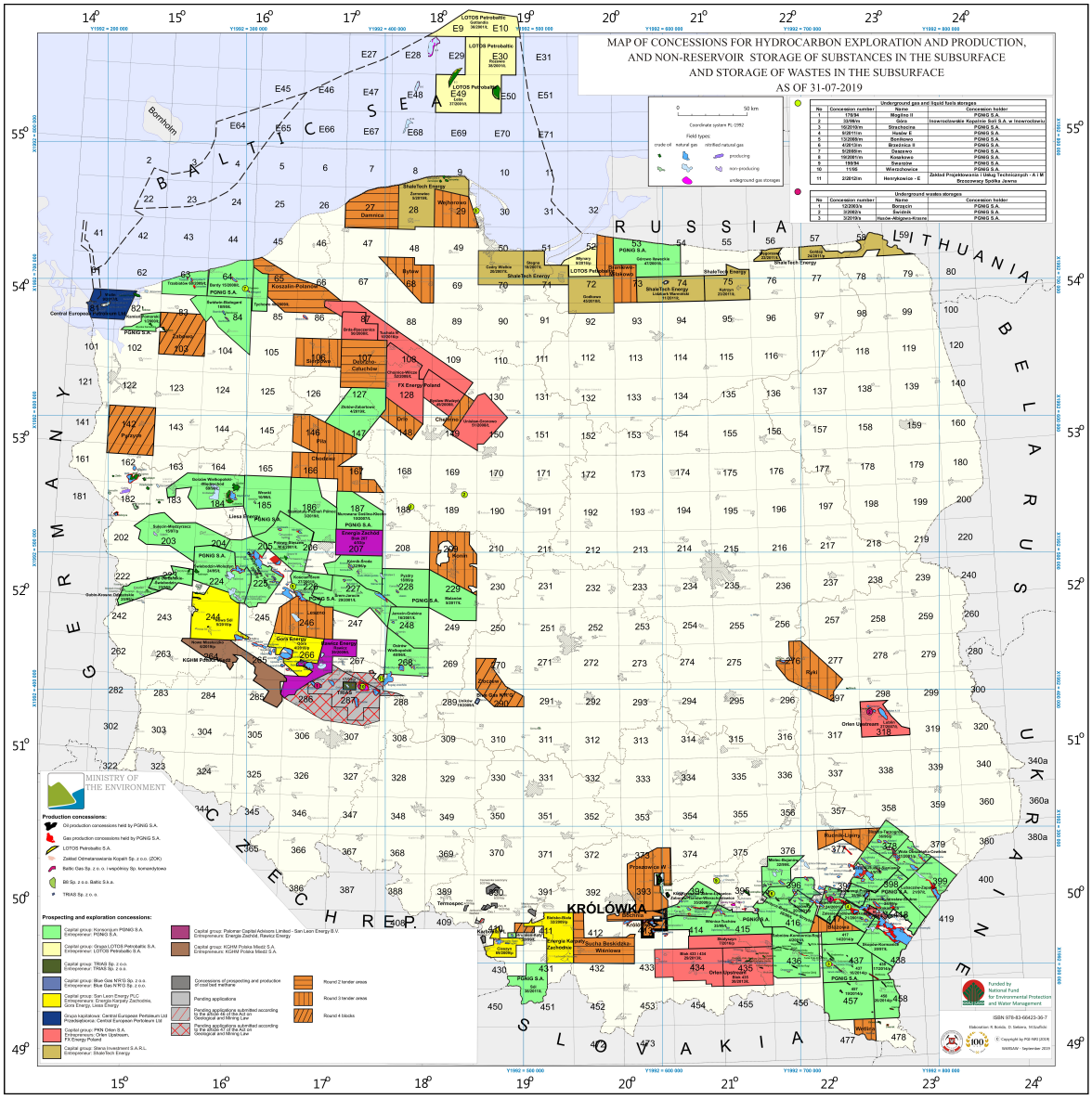


Location of the Królówka tender area on the map of concessions for hydrocarbon exploration and production, and non-reservoir storage of substances in the subsurface and storage of wastes in the subsurface as of 31-07-2019.

1. GENERAL INFORMATION

The Królówka tender area is located onshore in the southern Poland, in the 393 and 413 concession blocks (Fig. 1). The precise location is defined by geographical coordinates listed below.

Border points	1992 coordinate system	
	X	Y
1	219 222.83	593 635.80
2	219 097.84	585 896.39
3	230 574.94	585 908.57
4	230 387.33	586 612.41
5	230 129.81	587 578.58
6	230 695.48	588 000.81
7	231 480.47	587 931.12
8	231 722.24	587 909.65
9	232 471.03	593 346.94
10	231 307.28	593 379.29
11	231 483.34	599 704.92
12	232 886.19	599 665.94
13	232 987.60	601 605.37
14	235 643.89	601 614.75
15	238 239.18	593 185.13
16	238 495.59	597 181.46
17	240 244.08	603 139.26
18	232 835.11	603 321.97
19	224 314.01	603 486.16
20	224 307.00	594 218.00
21	224 312.00	593 148.00
22	223 753.00	592 883.00
23	222 376.00	593 612.00
excluding the area defined by 1992 coordinates:		
24	231 205.68	593 057.09
25	229 896.05	590 812.71
26	229 522.45	591 422.53
27	228 259.24	592 785.91
28	227 577.81	593 473.94
29	227 414.69	594 478.02
30	227 631.19	595 471.97
31	228 047.61	596 090.68
32	228 616.59	594 935.78
33	228 919.08	594 657.77

Tab. 1. Border points coordinates of the Królówka tender area (Fig. 1).

Administrative centre:

- Małopolskie province; Bochnia county, communes: Bochnia (participation in the tender area 25.78%), Drwina (1.59%), Nowy Wiśnicz (8.57%), Łapanów (22.89%), Trzcinana (0.12%); Myślenice county, commune: Raciechowice (6.47%); Wieliczka county, communes: Gdów (27.34%), Kłaj (0.29%).

The Królówka tender area was previously subjected to hydrocarbon prospection and exploration concession No. 39/99/p "Wysoka-Łapanów" (PGNiG – Polish Oil and Gas Company). Currently, two concessions No. 35/99/p „Wiśnicz-Tuchów" and No. 35/2000/p „Kłaj-Krzeczów-Żabno-Łętowice-Zaborów-Tarnów-Wierzchosławice" (PGNiG – Polish Oil and Gas Company), as well as the Bochnia tender area from 2nd licensing round and the Proszowice W tender area from 3rd licensing round are adjacent to the Królówka tender area (Fig. 1).

The main exploration targets in the Królówka tender area are related to conventional oil and gas accumulations in the:

- Carpathian Silesian and Sub-Silesian units,
- autochthonous Miocene of the Carpathian Foredeep,
- Paleozoic-Mesozoic (Devonian, Carboniferous, Jurassic and Cretaceous) basement of the Carpathian units.

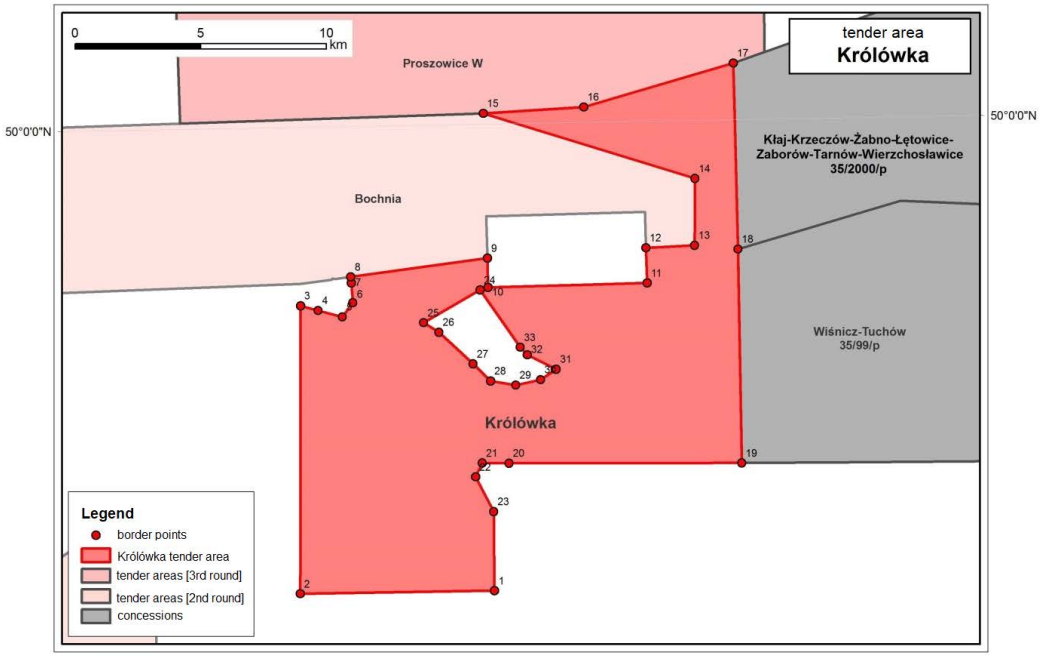


Fig. 1. Border points of the Królówka tender area and location of the hydrocarbon concessions in the neighborhood as of 31-07-2019 (CBDG, 2019).

2. GEOLOGY

2.1. GENERAL GEOLOGICAL DESCRIPTION

The Królówka tender area is located in the southern Poland. It lies at the border of the Outer Carpathians and Carpathian Foredeep (Fig. 2–4). The Precambrian of the Upper Silesian Block and Małopolska Block with its Paleozoic-Mesozoic (Cambrian, Silurian, Devonian, Mississippian, Permian-Triassic, Jurassic and Cretaceous) sedimentary cover occur below the Carpathian units (Fig. 5–11).

The stratigraphy and lithology of the Outer Carpathian units and its basement are recognized in numerous wells located within the Królówka tender area and its close neighborhood. These are: Bochnia E, Cichawa 1, 2, 8, Dołuszyce 1, 5, Dziewin 2, Gdów 2, 4, Grabina 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, Grobla 28, Jaroszówka 1, 2, Jawczyce 1, Kamyk 1, 2, Kawki 1, 2, Królówka 1, Krzeczów 2, 5, Książnice 1, 2, 3, 4, 6, 7, 8, Liplas 1, 2, 3, Niewiarów 1, 2, Nieznanowice 1, 2, 3, 4, 5, 5A, 6, Pierzchów 1, 2, 3, Przebieczany XXI, Puszcza 1, 3, 10, 12, Stanisławice 2, Sułków XVII, Szczytniki 2, Świątniki 2, Tarnawa 1, Trąbki 1, Wiatowice 1, 3, Wiśnicz Nowy 2, 3, Zabłocie 1, Zabłocie 2 (see Fig. 22 for location; wells located within the tender area are highlighted).

2.2. TECTONIC

Several structural stages are distinguished in the Królówka tender area. The Precambrian and Paleozoic basement is divided into Upper Silesian and Małopolska Blocks. In the Upper Silesian Block, the Precambrian metamorphic and crystalline rocks (Precambrian structural stage) are covered by the Cambrian, Silurian and Devonian–Carboniferous sedimentary rocks (Variscan structural stage). In the Małopolska Block, the metamorphosed Precambrian sandstones (Precambrian structural stage) are covered by the Silurian (Caledonian structural stage) and Devonian–Mississippian (Variscan structural stage) sedimentary successions, which are separated by the Caledonian unconformity. The Upper Silesian Block and Małopolska Block are separated by the Kraków-Lubliniec Fault Zone. Above, the continuous Permian-Mesozoic sedimentary cover occurs. This Precambrian–Cretaceous basement is overlain by the Carpathian units: Carpathian Foredeep and Outer Carpathians.

The Carpathian Foredeep includes the Miocene sediments, which occur in four tectonic positions:

- as unfolded autochthonous Miocene at the front of the Carpathians,
- as unfolded autochthonous Miocene below the Carpathians,
- as paraautochthonous Miocene of the Gdów Embayment (in which the Miocene sediments of the Carpathian Foredeep were detached together with a part of the Paleozoic-Mesozoic basement and thrusted northwardly),
- as allochthonous Miocene (in which the Miocene sediments of the Carpathian Foredeep were detached and folded at the front of and below the Carpathian Overthrust).

The Outer Carpathians in the Królówka tender area includes the Cretaceous to Lower Miocene flysch successions of the Sub-Silesian and Silesian units. They are thrusted northwardly over the Miocene sediments of the Carpathian Foredeep. Thrusting of the Carpathians caused the Miocene sediments below the overthrust could be completely shear in some places. Therefore, in the Królowka tender area, the Outer Carpathian flysch succession can lie directly on the Paleozoic-Mesozoic basement.

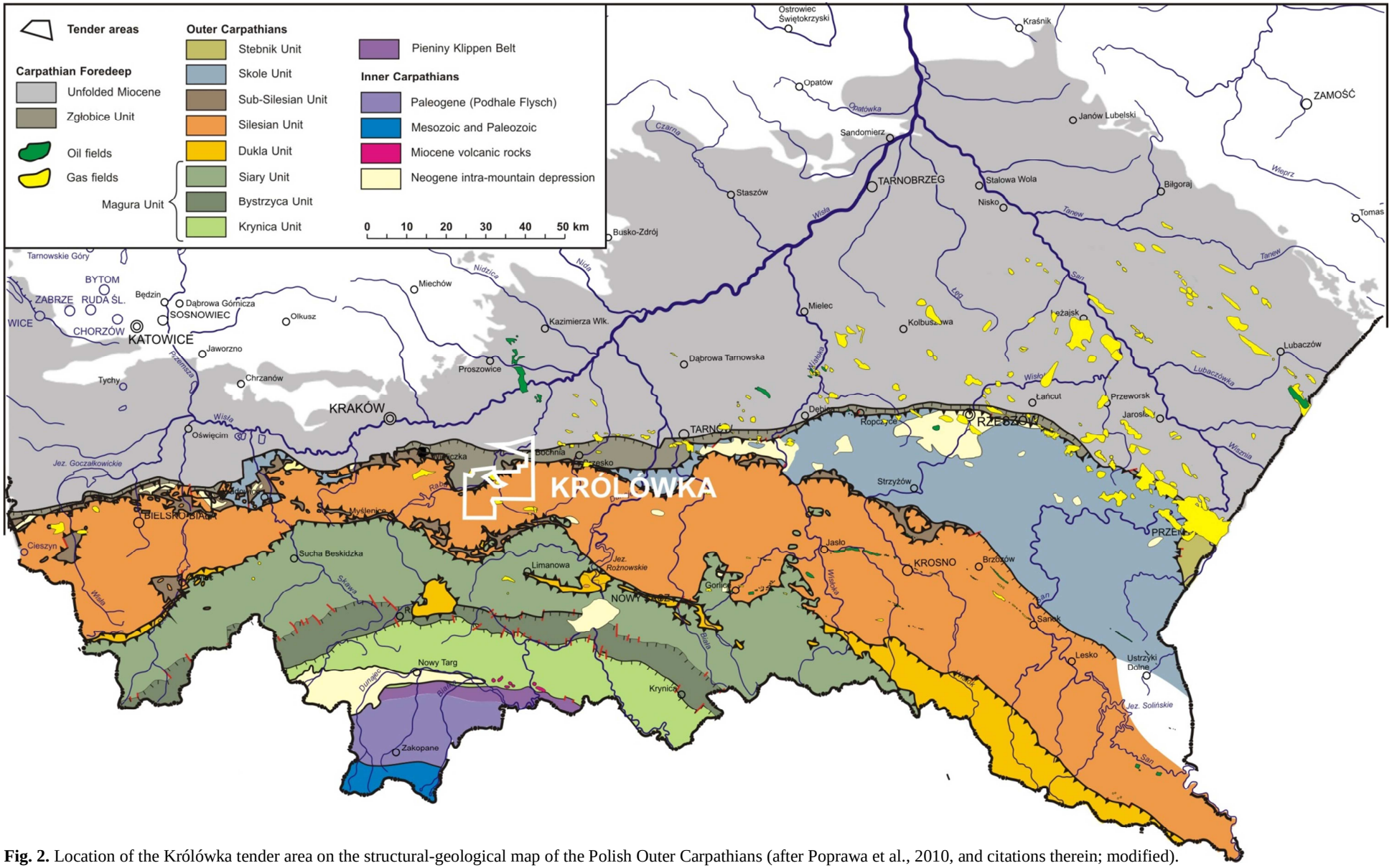


Fig. 2. Location of the Królówka tender area on the structural-geological map of the Polish Outer Carpathians (after Poprawa et al., 2010, and citations therein; modified).

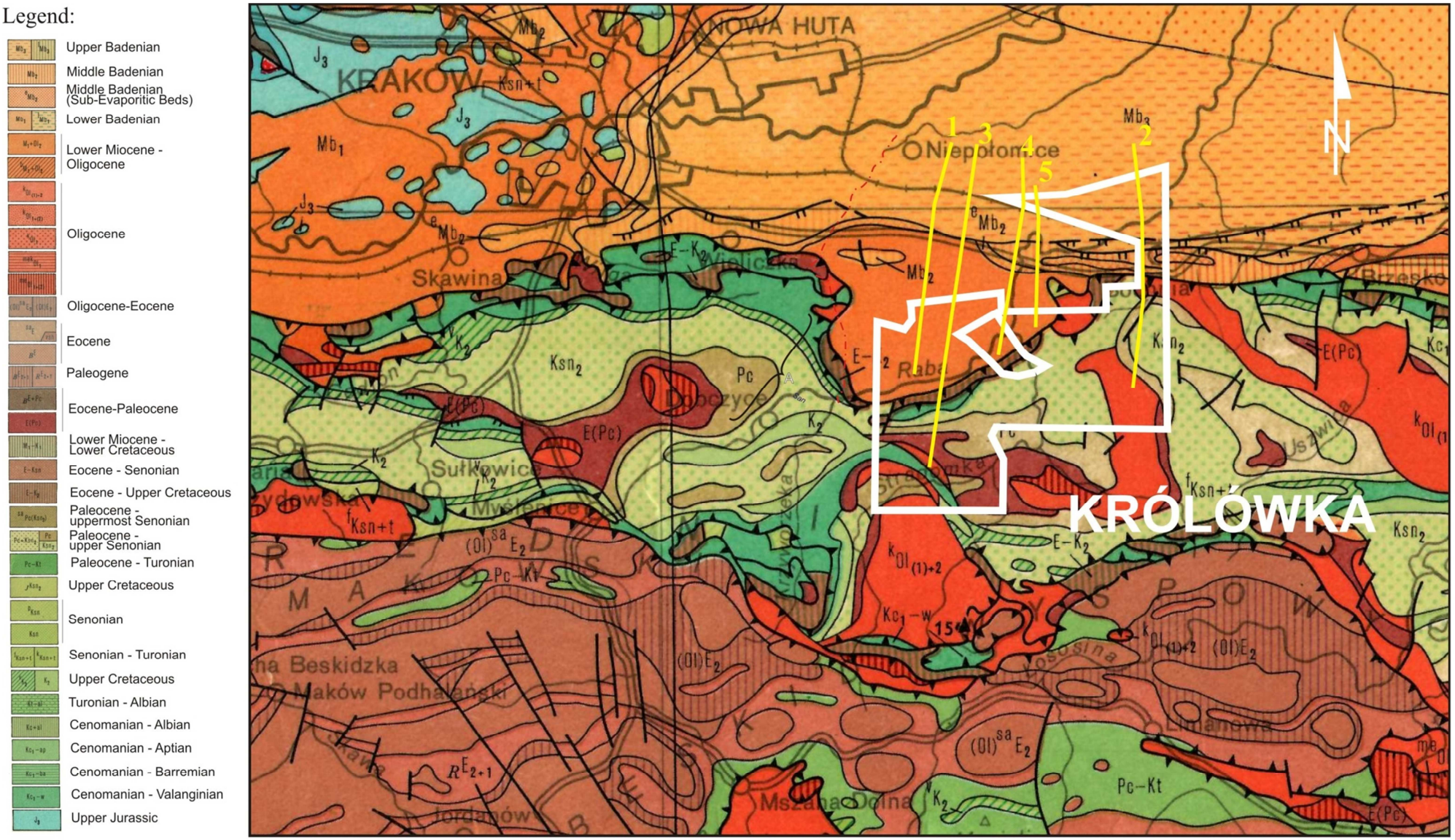


Fig. 3. Location of the Królówka tender area on the geological map of the Outer Carpathians (Żytko et al., 1989; modified).
Yellow lines – seismic profiles (see Fig. 4).

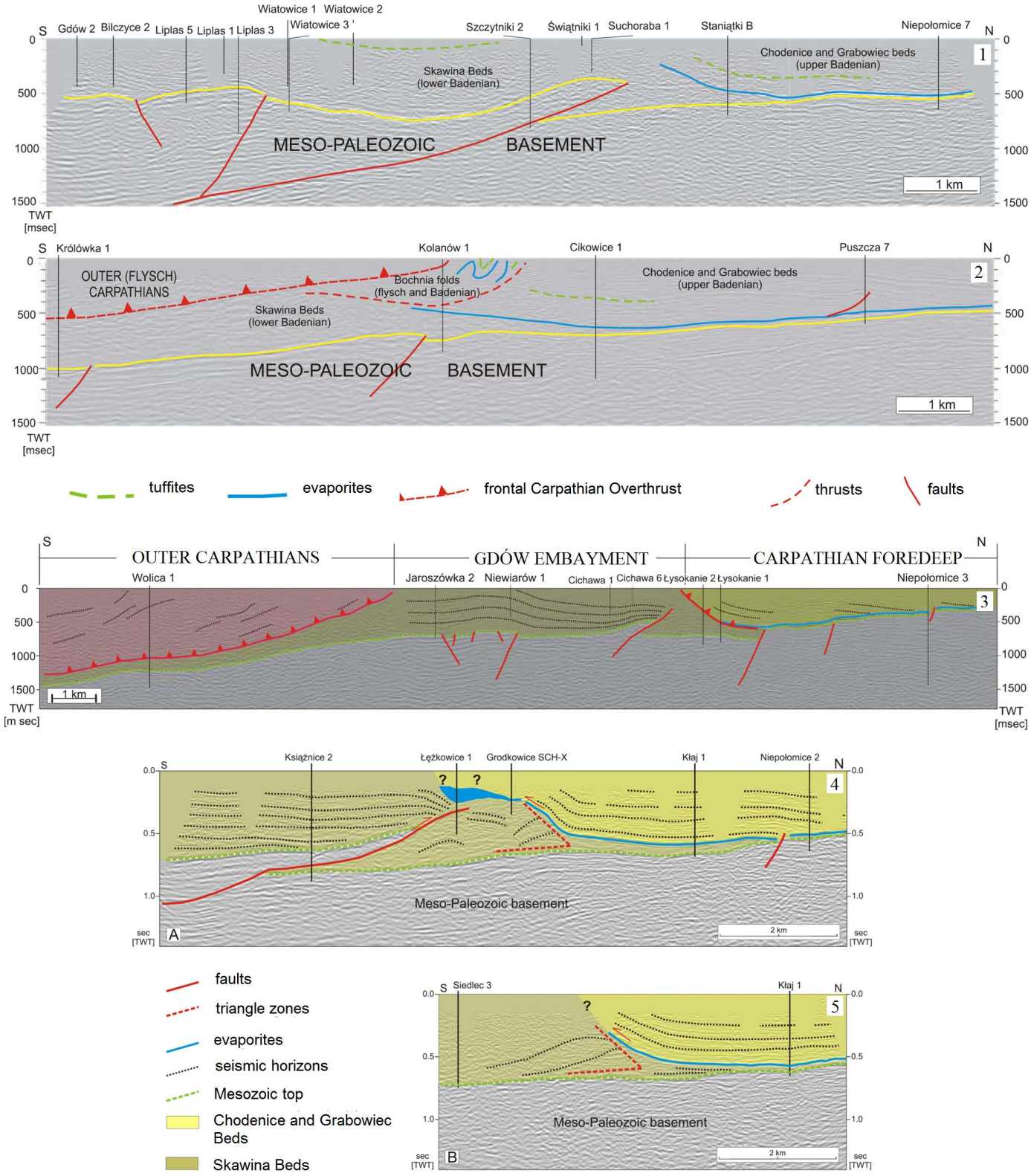


Fig. 4. Geological interpretations of the seismic profiles through the front of the Outer Carpathians and Carpathian Foredeep (1–2: Bukowski et al., 2012; 3–5: Krzywiec et al., 2012 modified). See Fig. 3 for location.

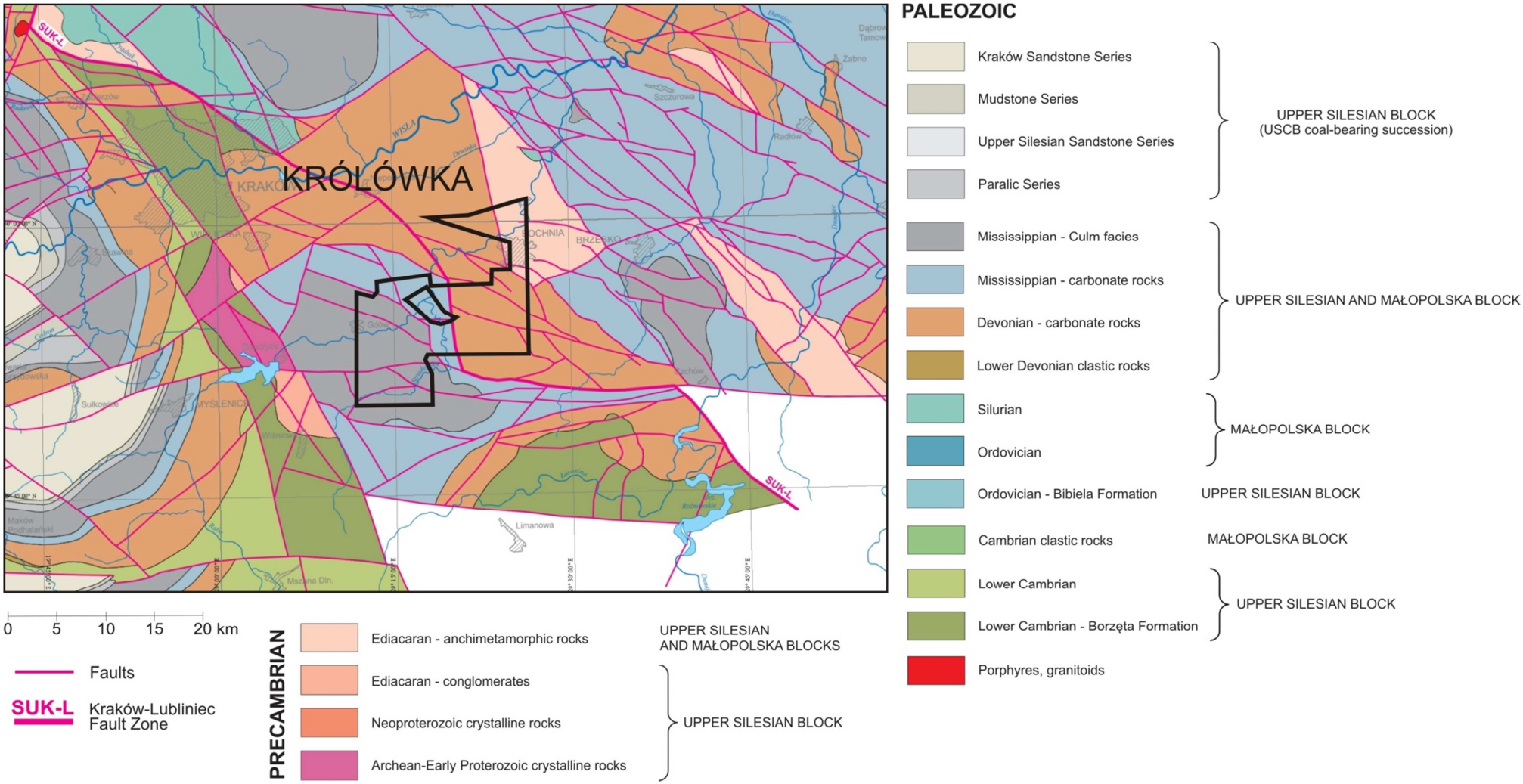


Fig. 5. Location of the Królówka tender area on the geological map of the Upper Silesian and Małopolska Blocks without formations younger than the Carboniferous (Buła and Habryn, 2008; modified).

2.3. STRATIGRAPHY AND LITHOLOGY

Precambrian (Figs 5–6)

Lithology: slightly metamorphosed mudstones and claystones.
Wells and depth: Dołuszyce 1 (1442.0–1485.3 m).
References: Oszczypko et al., 1989; Kamiński and Piotrowska, 2014.

Silurian (Figs 5, 7)

Lithostratigraphy: Łapczyca Formation.
Lithology: conglomerates with intercalations of sandy mudstones and mudstones.
Wells and depth: none.
References: Buła, 2000; Buła and Habryn, 2008.

Devonian–Carboniferous carbonate complex and Carboniferous (Mississippian) clastic complex – Culm facies, undivided (Figs 5, 8–9)

Lithology: dolomites and limestones with rare intercalations of marls, mudstone, tuffites and lydites.
Wells and depth: Liplas 2 (2491.9–2942.8 m),
Dziewin 2 (1203.0–3005.8 m),
Grobla 28 (1109.5–3005.0 m),
Tarnawa 1 (access to data is not allowed).
Thickness (according to wells): >1125.8–1345.0 m.
References: Kotas, 1982; Buła and Habryn, 2008.

Permian–Triassic undivided (Fig. 10)

Lithology: sandstones, mudstones and claystones with variegated series in the lower (Permian) part of the succession.
Wells and depth: Liplas 2 (1123.0–2491.9 m),
Gdów 4 (1105.0–1219.0 m).
Thickness (according to wells): 114.0–1368.9 m.
References: Moryc and Senkowiczowa, 1968; Moryc, 1971; Szyperko-Teller and Moryc, 1988; Szyperko-Teller, 1997; Buła, 2001; Dybova-Jachowicz and Filipiak, 2001; Kiersnowski, 2001; Moryc, 2006b.

Upper Jurassic (Fig. 11)

Lithology: dolomites, limestones, marly limestones and marls.
Wells and depth: Liplas 2 (722.0–1123.0 m),
Gdów 4 (806.0–1105.0 m),
Jaroszówka 1 (1530.0–1745.4 m),
Jaroszówka 2 (1008.0–1037.0 m),
Królówka 1 (access to data is not allowed),
Krzeczów 2 (829.5–961.0 m),
Puszcza 10 (810.0–901.5 m),
Puszcza 12 (874.0–909.2 m),
Dołuszyce 1 (1075.0–1442.0 m),
Wiśnicz Nowy 2 (1396.0–1607.0 m).
Thickness (according to wells): 29.0–401.0 m.
References: Karnkowski and Głowacki, 1961; Moryc, 1961, 1992, 1996; Obuchowicz, 1963; Stemulak and Jawor E., 1963; Karnkowski and Ołtuszyk, 1968; Jawor E., 1970; Morycowa and Moryc, 1976; Golonka, 1978; Garlicka and Tarkowski, 1980.

Upper Cretaceous (Fig. 11)

Lithology: glauconitic sands and sandstones, limestones and marls.
Wells and depth: Książnice 2 (901.0–907.6 m),
Puszcza 1 (463.0–513.8 m),
Puszcza 3 (568.0–660.5 m).
Thickness (according to wells): 6.6 m.
References: Moryc, 2006b.

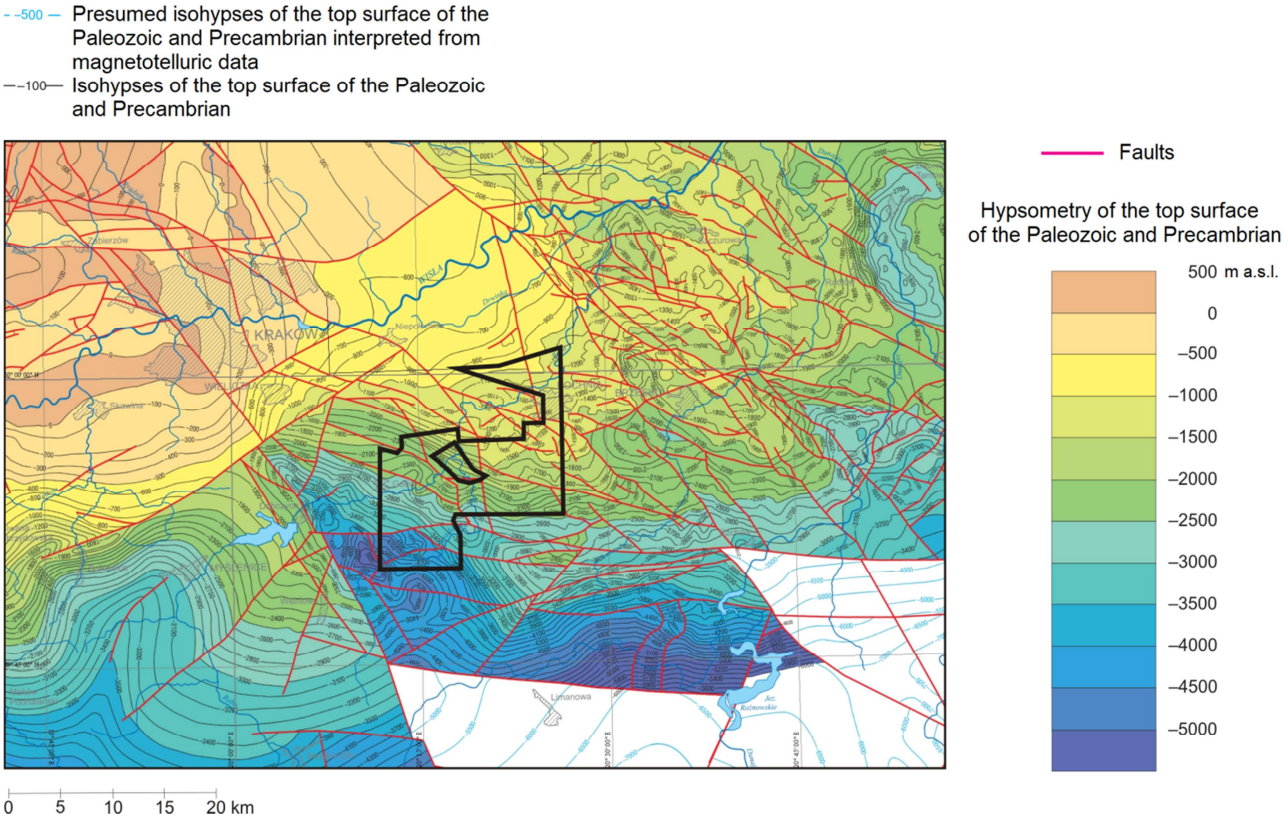


Fig. 6. Location of the Królówka tender area on the structural map of the top surface of the Paleozoic (excluding the Permian) and Precambrian (Buła and Habryn, 2008; modified).

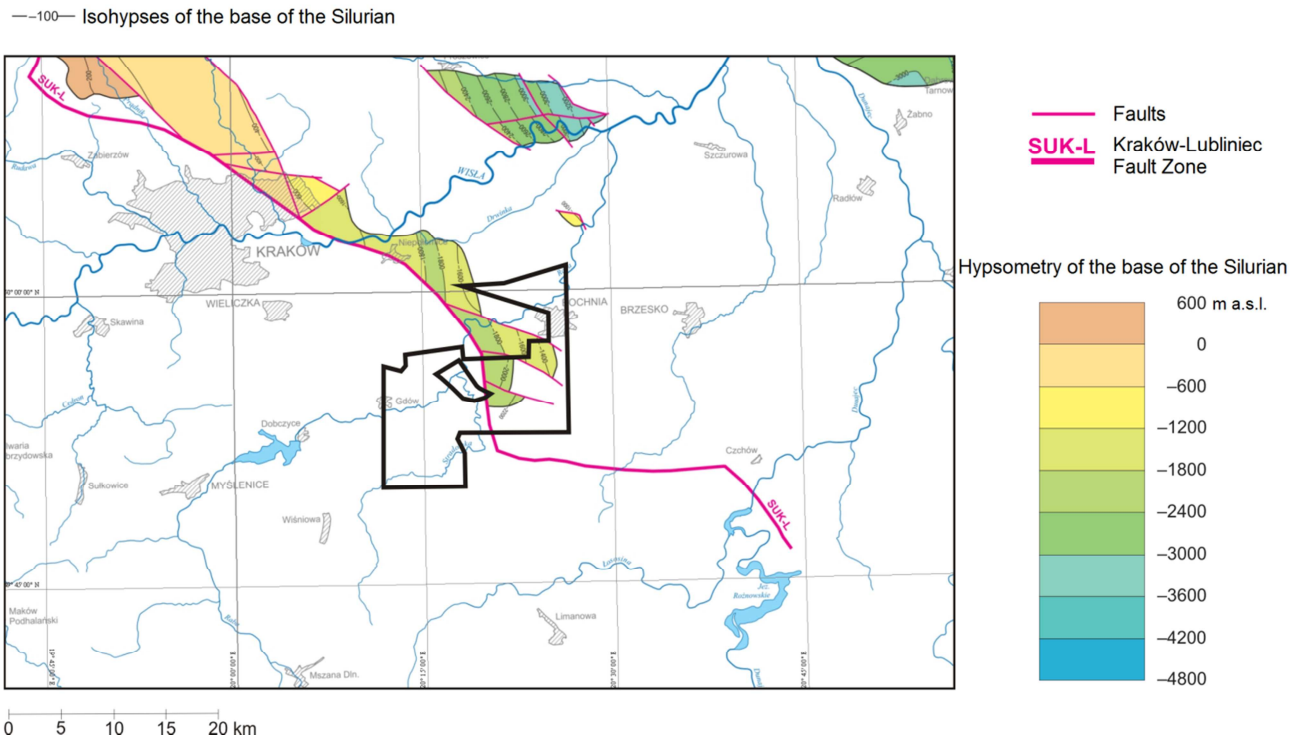


Fig. 7. Location of the Królówka tender area on the structural map of the base of the Silurian in the Małopolska Block (Buła and Habryn, 2008; modified).

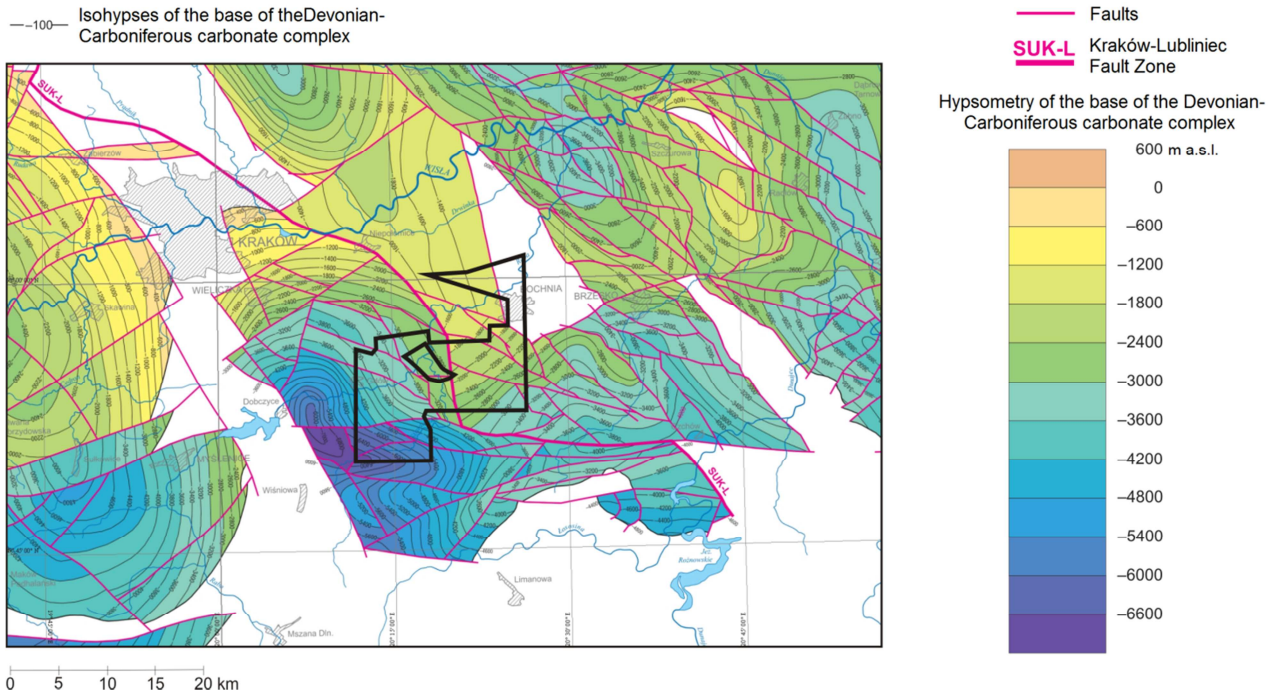


Fig. 8. Location of the Królówka tender area on the structural map of the base of the Devonian-Carboniferous carbonate complex (Buła and Habryn, 2008; modified).

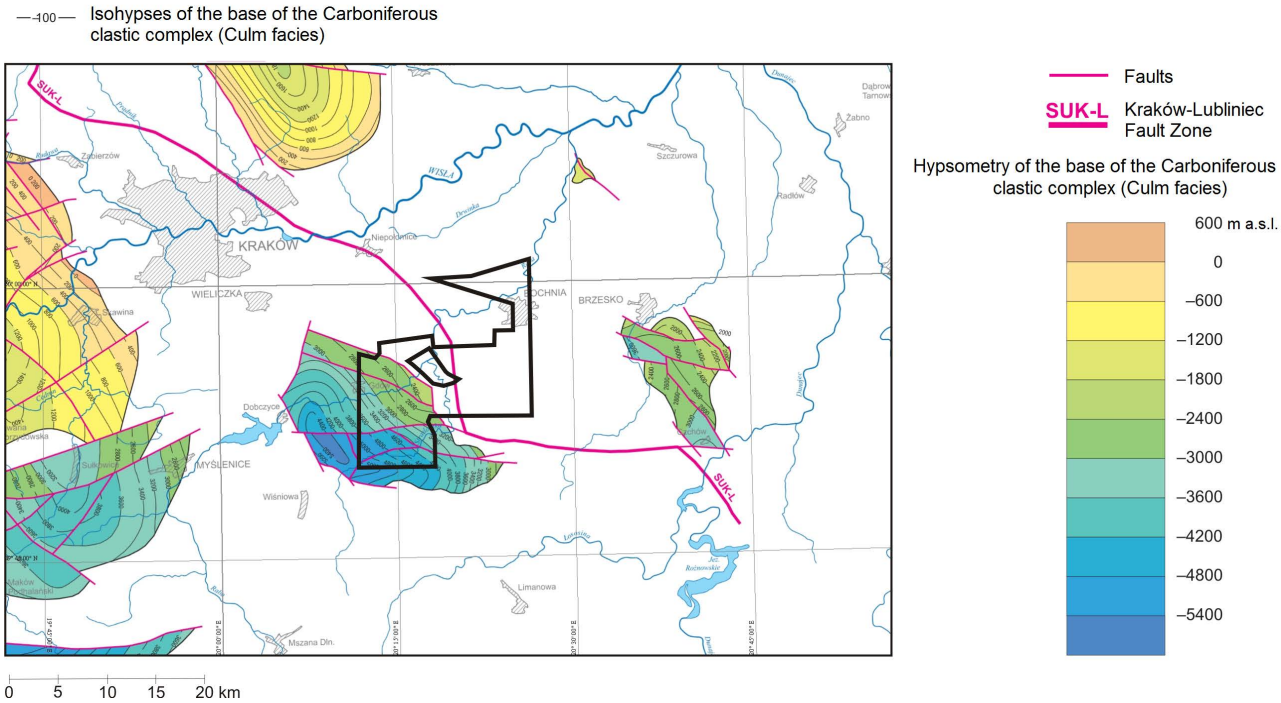


Fig. 9. Location of the Królówka tender area on the structural map of the base of the Carboniferous clastic complex – Culm facies (Buła and Habryn, 2008; modified).

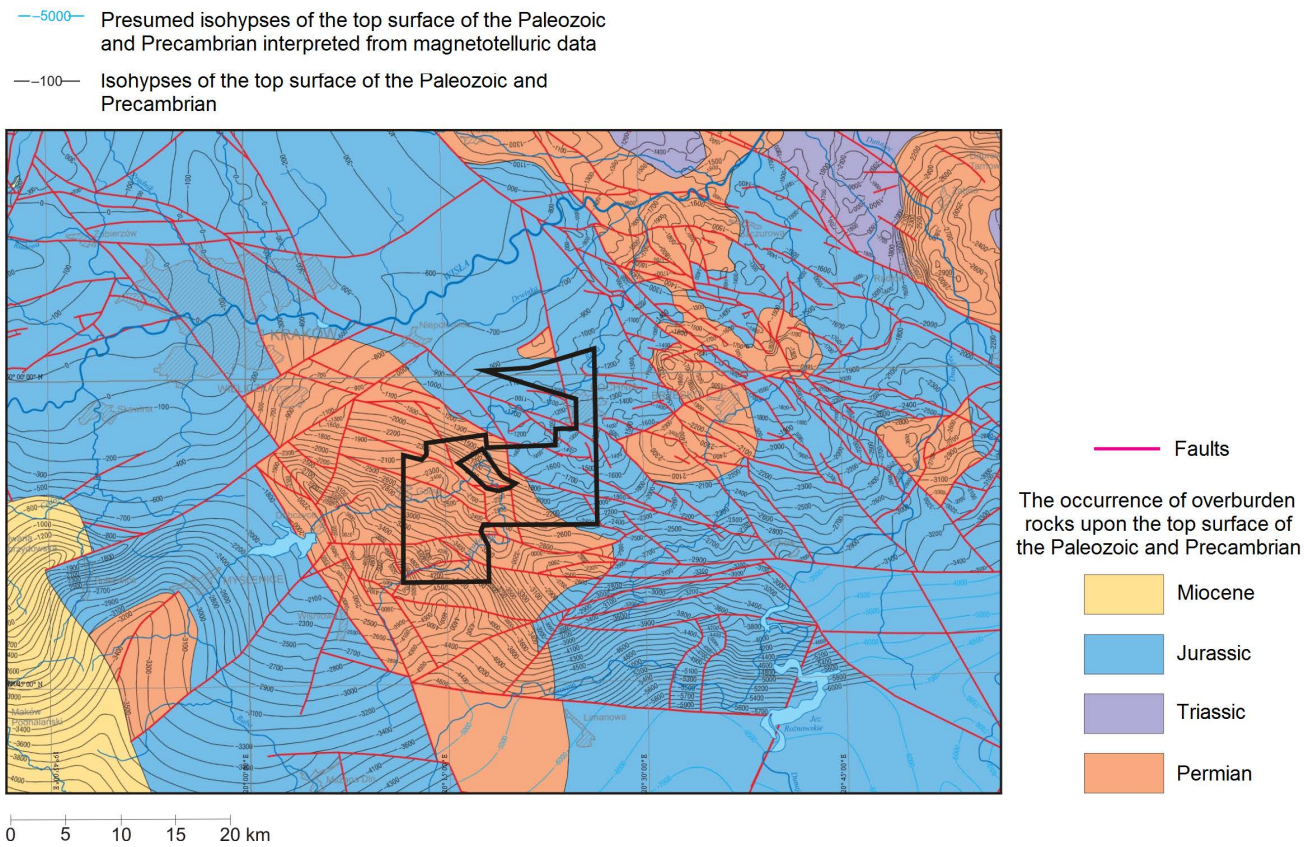


Fig. 10. Location of the Królówka tender area on the geological-structural map of thetop surface of the Paleozoic (excluding the Permian) and Precambrian (Buła and Habryn, 2008; modified).

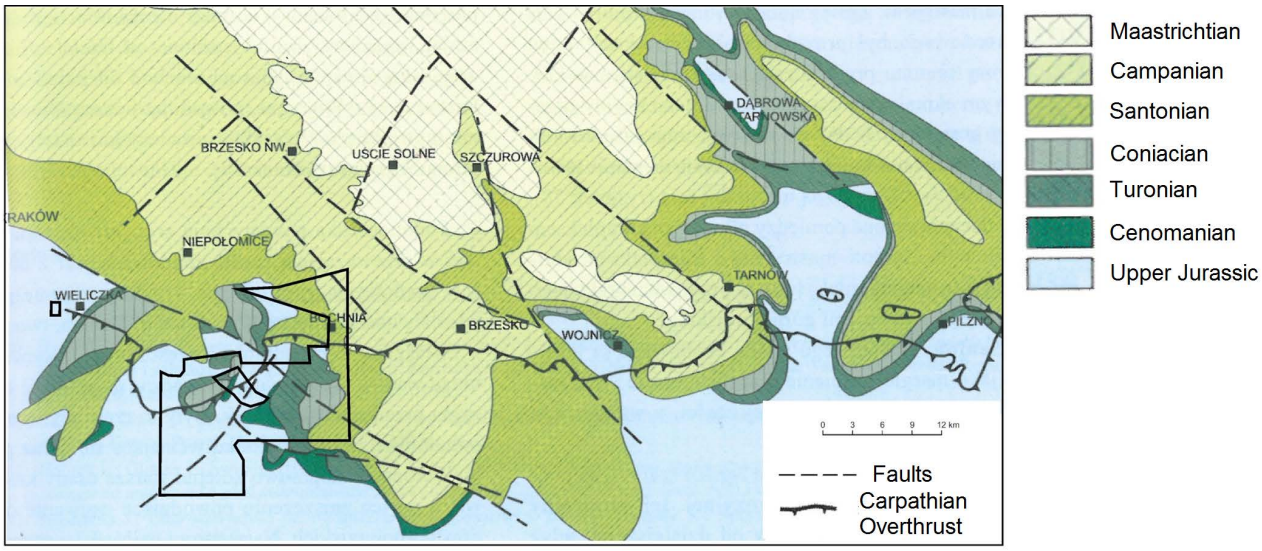


Fig. 11. Location of the Królówka tender area on the geological map of the top surface of the Paleozoic-Mesozoic basement of the Carpathian units (Moryc, 2006b; modified).

Autochthonous Miocene of the Carpathian Foredeep (Figs 3–4)

Lithostratigraphy: Upper Badenian and Lower Sarmatian Supra-Evaporitic Beds (Chodenice and Grabowiec Beds), Upper Badenian Evaporitic Beds (Wieliczka Formation), Lower Badenian Sub-Evaporitic Beds (Skawina Beds).
Lithology: sandstones, siltstones, mudstones and claystones of the Sub-Evaporitic and Supra-Evaporitic Beds; salts, gypsum and anhydrites with intercalations of mudstones and claystones of the Evaporitic Beds.
Wells and depth: Bochnia E (20.0–885.0 m),
Krzeczów 2 (20.0–795.0 m (775.0 m),
Puszcza 10 (20.0–739.0 m (719.0 m),
Stanisławice 2 (access to data is not allowed),
Dołuszyce 1 (808.0–1040.0 m),
Jaroszówka 1 (880.0–1530.0 m),
Kamyk 2 (767.0–1665.0 m),
Królówka 1 (access to data is not allowed),
Wiśnicz Nowy 2 (900.0–1353.0 m).
Thickness (according to wells): 232.0–898.0 m.
References: Myśliwiec, 2004a, b; Oszczypko, 2006; Peryt, 2013; Głuszyński and Aleksandrowski, 2016.

Para-Autochthonous Miocene of the Gdów Embayment (Figs 3–4)

Lithostratigraphy: Lower Badenian Sub-Evaporitic Beds (Skawina Beds).
Lithology: sandstones, siltstones, mudstones and claystones.
Wells and depth: Cichawa 1 (0,0,–503,0 m),
Cichawa 2 (0.0–504.7 m),
Cichawa 8 (access to data is not allowed),
Jawczyce 1 (5.0–89.0 m),
Kawki 1 (0.0–146.0 m),
Kawki 2 (0.0–537.0 m),
Przebieczany XXI (0.0–767.0 m),
Sułków XVII (18.0–510.0 m),
Szczytniki 2 (8.0–749.0 m),
Świątniki 2 (25.0–765.0 m),
Trąbki 1 (20.0–831.0 m),
Wiatowice 2 (0.0–508.0 m),
Zabłocie 1 (20.0–966.0 m),
Zabłocie 2 (7.8–103.0 m),
Zagórze 2 (20.0–680.0 m),
Thickness (according to wells): >84.0–946.0 m.
References: Bukowski et al., 2010, Krzywiec et al., 2012.

Sub-Silesian and Silesian Unist of the Carpathians (Figs 2–4)

Sub-Silesian Unit lithostratigraphy: Krosno Beds, Menilite Beds, Variegated Shales, Węglówka Marls, Godula Beds, Gaize Beds, Lgota Beds, Werowice Beds, Grodziszcze Beds, Cieszyn Beds.
Silesian Unit lithostratigraphy: Krosno Beds, Ostre Sandstones, Gorlice Beds, Jasło Limestone, Zatwarnica Beds, Menilite Beds, Globigerina Marls, Green Shales, Hieroglyphic Beds, Variegated Shales, Ciężkowice Sandstones, Istebna Beds, Godula Beds, Variegated Shales, Lgota Beds, Wierowice Beds, Grodziszcze Sandstones, Cieszyn Beds.
Lithology: flysch sediments.
Wells and depth: Gdów 2 (0.0–510.9 m),
Grabina 10 (10.0–477.0 m),
Jaroszówka 2 (10.0–1008.0 m),
Książnice 1 (0.0–735.0 m),
Książnice 2 (901.0–1283.5 m),
Liplas 1 (0.0–402.5 m),
Liplas 2 (39.0–722.0 m),
Niewiarów 1 (0.0–500.0 m),
Nieznanowice 1 (13.5–413.8 m),
Nieznanowice 2 (20.0–1199.0 m),
Pierzchów 2 (0.0–555.5 m),
Puszcza 10 (20.0–739.0 m),
Puszcza 12 (20.0–874.0 m).
Thickness (according to wells): 400.3–1179.0 m.
References: Jankowski et al. 2012.

Quaternary

Lithology: clays, muds, sands, gyttjas, bog limes, tills.
Thickness: 0–225.0 m.

3. PETROLEUM SYSTEMS

Three conventional petroleum systems are developed in the Królówka tender area (Fig. 12) in the:

- Carpathian Sub-Silesian and Silesian Units,
- autochthonous Miocene of the Carp. Foredeep,
- Paleozoic-Mesozoic basemen of the Carpathians.

They are separated by two unconformities – Carpathian Overthrust (tectonic unconformity) and sub-Miocene discordance. Both unconformities do not separate the petroleum systems each other: a migration/ remigration of hydrocarbons generated in one system to the other cannot be excluded.

Petroleum system in the Carpathian Sub-Silesian and Silesian

Source rocks: Lgota Beds, Grodziszcze Beds, Werowice Beds, Cieszyn Beds, Menilite Beds.
Reservoir rocks: sandstones of the Istebna and Ciężkowice Beds.
Seal rocks: fine-grained flysch sediments of the Carpathian Sub-Silesian and Silesian units: Verovice Beds, Inoceramian Beds, Hieroglyphic Beds, Variegated Shales, Menilite and Krosno Beds.
Thickness of the overburden: 0–100 m b.g.l.
Traps: structural (imbricated folds), stratigraphic (related to narrowing of sandstone layers). The traps have multi-horizontal character.
References: Wdowiarz, 1960; Poprawa and Machowski, 2010; Matyasik et al., 2015; Wróbel et al., 2016.

Petroleum system in the autochthonous Miocene of the Carpathian Foredeep

Source rocks: claystones and mudstones in the autochthonous Miocene of the Carpathian Foredeep (Sub-Evaporitic Beds and Supra-Evaporitic Beds).
TOC = 0.02–3.22% (average 0.69%).
T_{max} = 395°C
Reservoir rocks I: sandstones, sands and mudstones of the Sub-Evaporitic Beds (Skawina Beds).
Reservoir rocks II: sandstones, sands and mudstones of the Supra-Evaporitic Beds.
Seal rocks: claystones intercalations in the autochthonous Miocene of the Carpathian Foredeep, fine-grained flysch sediments of the Carpathian Sub-Silesian and Silesian units.
Thickness of the overburden: 0–880 m b.g.l.
Traps: structural (compaction anticlines developed over the elevations of the Paleozoic basement, compression anticlines developed below the Carpathian Overthrust), stratigraphic (related to narrowing of sandstone layers and to intra-Miocene unconformities). The traps developed in the Carpathian Foredeep have multi-horizontal character.
Hydrocarbon fields: Dąbrówka, Grabina-Nieznanowice, Grabina-Nieznanowice S, Łapanów, Łąkta, Raciborsko, Grądy Bocheńskie, Jadowniki.
References: Kotarba and Peryt, 2011; Kotarba et al. 2011.

Petroleum system in the Paleozoic–Mesozoic basement of the Carpathian units

Source rocks I: Silurian.
Source rocks II: Middle and Upper Devonian carbonates (with average values for the Upper Silesian Block and Małopolska Block, respectively).
TOC = 0.00–4.99% (average 0.06–0.01%).
T_{max} = 416–468°C (average 429–451°C).
S2 = 0.11–13.66 mg HC/g rock (average 0.88–0.14 mg HC/g rock).
PI = 0.01–0.82 (average 0.45–0.5).
HI = 4–361 mg HC/g TOC (average 240–42 mg HC/g TOC).
Kerogen type: III/II.
Source rocks III: Mississippian clastics – Culm facies (with average values for the Upper Silesian Block and Małopolska Block, respectively).
TOC = 0.11–2.55% (average 1.12–0.73%).
T_{max} = 429–468°C (average 439–451°C).
S2 = 0.33–2.96 mg HC/g rock (average 1.17–0.8 mg HC/g rock).
PI = 0.03–0.32 (average 0.08–0.22).
HI = 49–116 mg HC/g TOC (average 108–61 mg HC/g TOC).
Kerogen type: III/II.
Source rocks IV: Middle Jurassic clastics (with average values for the Upper Silesian Block and Małopolska Block, respectively).
TOC = 0.00–17.04% (average 2.06–0.19%).
T_{max} = 408–450°C (average 423–442°C).
S2 = 0.22–54.82 mg HC/g rock (average 17.76–0.22 mg HC/g rock).
PI = 0.02–0.27 (average 0.04–0.27).
HI = 32–507 mg HC/g TOC (average 263–62 mg HC/g TOC).
Kerogen type: III/II.
Source rocks V: Upper Jurassic carbonates (Małopolska Block).
TOC = 0.01–0.32% (average 0.12%).
T_{max} = 420–432°C (average 426°C).
S2 = 0.10–0.53 mg HC/g rock (average 0.25 mg HC/g rock).
PI = 0.14–0.31 (average 0.19).
HI = 63–179 mg HC/g TOC (average 108 mg HC/g TOC).
Kerogen type: III/II.
Reservoir rocks I: Precambrian sandstones (hypothetical).
Reservoir rocks II: Devonian–Carboniferous carbonates.
Reservoir rocks III: Upper Jurassic carbonates.
Reservoir rocks IV: Upper Cretaceous sandstones and carbonates.
Seal rocks: Silurian, Carboniferous, Permian-Triassic, Jurassic and Miocene of the Carpathian Foredeep fine-grained clastics for particular reservoir horizons.
Thickness of the overburden: 722–1938 m b.g.l.
Traps: structural, stratigraphic.
Hydrocarbon fields: Marklowice CBM.
References: Zając, 1984; Więcław et al., 2011; Kotarba et al., 2014; Sowiżdżał et al., 2015; Wróbel et al., 2016.

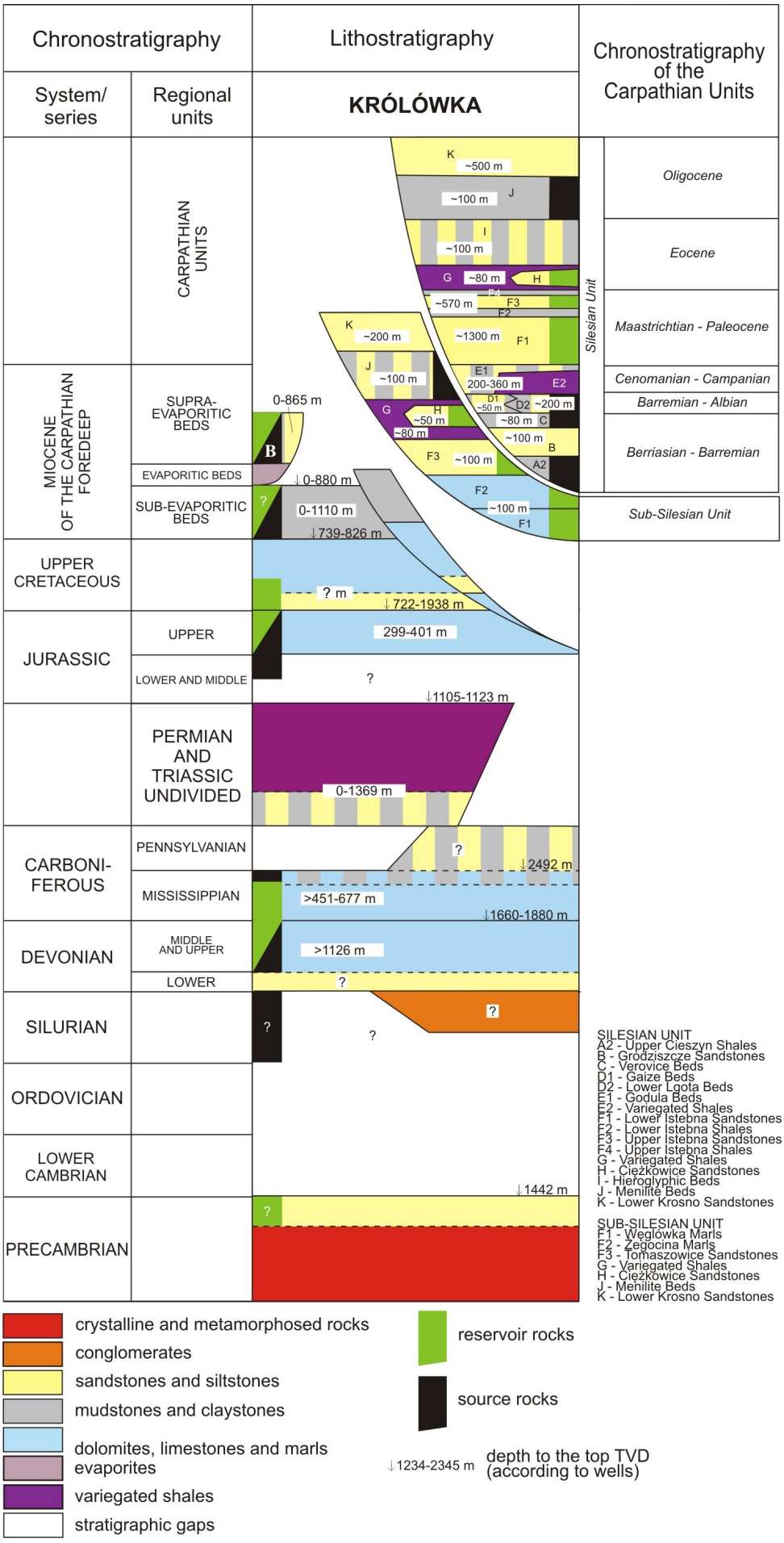


Fig. 12. Stratigraphy, lithology and major elements of petroleum systems (main horizons of source and reservoir rocks) in the Królówka tender area. (Jagielski et al., 2019; modified).

4. HYDROCARBON FIELDS

Numerous hydrocarbon fields have been discovered in the neighborhood of the Królówka tender area. These are (Fig. 13):

- Dąbrówka gas field (GZ 4620),
- Grabina-Nieznanowice gas field (GZ 4600),
- Grabina-Nieznanowice S gas field (GZ 4747),
- Grobla oil field (NR 4765),
- Łapanów gas field (GZ 12078),
- Łąkta gas field (GZ 4597),
- Raciborsko gas field (GZ 4840),
- Grądy Bocheńskie gas field (GZ 4640),
- Jadowniki gas field (GZ 5380).

In the further neighborhood of the tender area there are also (Fig. 13):

- Brzezowiec L, II gas field (GZ 4621),
- Łazy gas field (GZ 7113),
- Mniszów oil field (NR 4768),
- Pławowice oil field (NR 4764),
- Rajsko gas field (GZ 7788),
- Rylowa gas field (GZ 4932),
- Rysie gas field (GZ 4639),
- Szczepanów gas field (GZ 5318),
- Słopnice gas field (GZ 4596),
- Łętowice-Bogumiłowice gas field (GZ 6007).

Most of them (excluding Jadowniki gas field and Mniszów oil field) are still exploited.

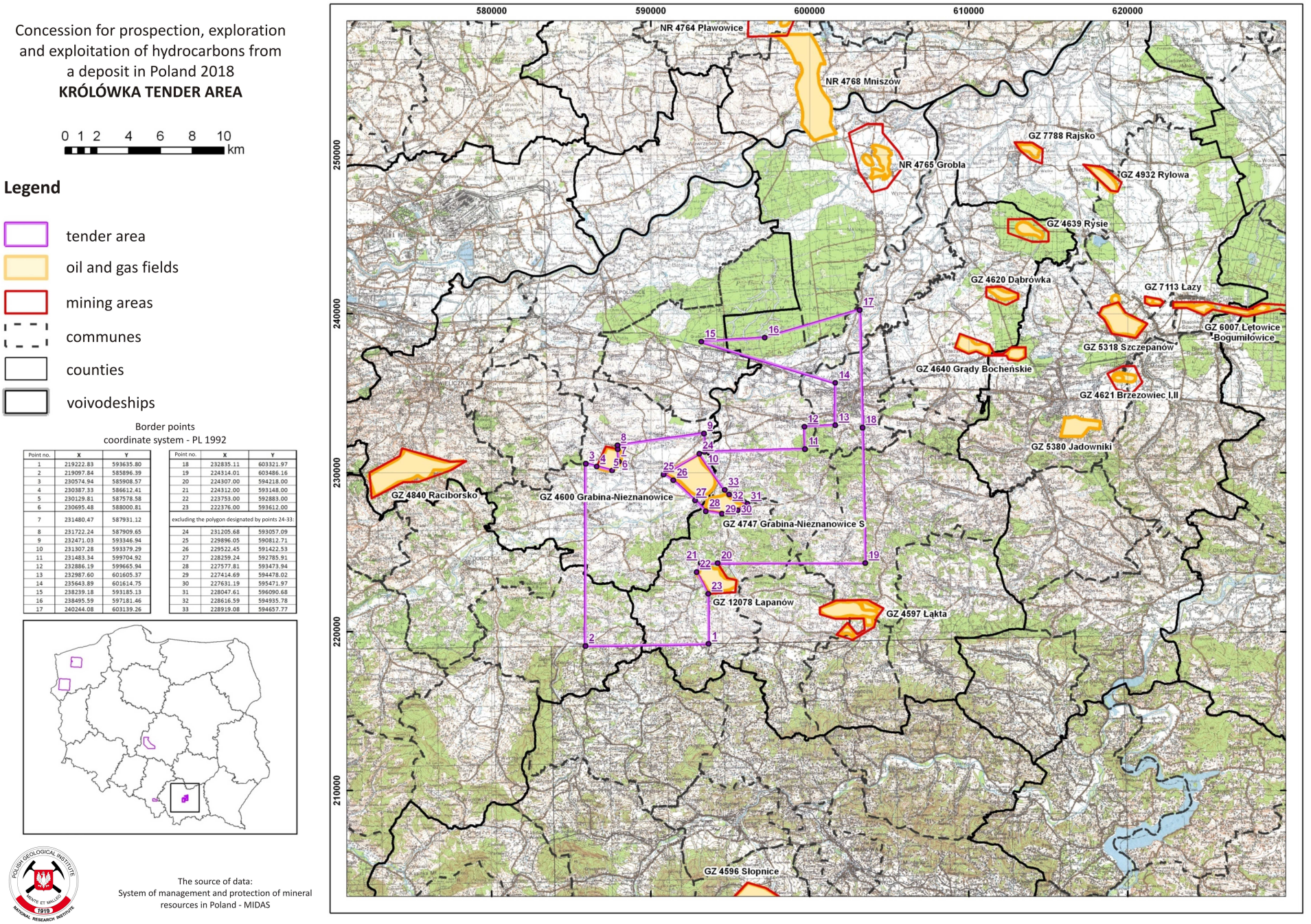


Fig. 13. Oil and gas fields in the neighborhood of the Królówka tender area.

Dąbrówka gas field

Acreage: no data for the entire field
I horizon level 2 – 41.87 ha,
Ia horizon – 40.62 ha,
II horizon – 81.25 ha,
IIa horizon, level 1 – 61.25 ha,
IIa horizon level 2 – 59.37 ha,
III horizon, level 1 – 91.87 ha,
III horizon, level 2 – 71.25 ha,
IIIa horizon – 98.75 ha,
IV horizon – 53.12 ha.
Depth: no data for the entire field
I horizon, level 2 – 799.0–846.0 m b.g.l.,
Ia horizon – 763.5–814.0 m b.g.l.,
II horizon – 741.0–792.0 m b.g.l.,
IIa horizon, level 1 – 715.0–766.5 m b.g.l.,
IIa horizon, level 2 – 682.5–742.0 m b.g.l.,
III horizon, level 1 – 665.0–710.0 m b.g.l.,
Stratigraphy: Miocene.
Resources:

- Extractable balance resources as of 2017: 26.58 million m^3 of natural gas in cat. C,
- Economic resources in place as of 2017: 3.45 million m^3 of natural gas,
- Production in 2017: 1.38 million m^3 of natural gas.

Parameter	Average value	Unit	Comment
minimal actual pressure	5.480	MPa	IIa horizon (as of 01.01.1993)
maximal actual pressure	6.970	MPa	II horizon (as of 01.01.1993)
primary minimal reservoir pressure	6.290	MPa	IV horizon
primary maximal reservoir pressure	8.845	MPa	I horizon, level 2
minimal net pay	1.60	m	I horizon level 2
maximal net pay	8.35	m	IV horizon
minimal porosity	17.00	%	IIa horizon level 1
maximal porosity	26.20	%	IV horizon
minimal permeability	8.70	mD	Ia horizon
maximal permeability	998.40	mD	I horizon level 2
minimal total efficiency V_{tot}	3.53	m^3/min	IIIa horizon, Dąbrówka 21well (according to measurement from 06.1992)
maximal total efficiency V_{tot}	113.00	m^3/min	II horizon, Dąbrówka 20 well (according to measurement from 06.1992)

Tab. 2. Quality parameters of the Dąbrówka gas field (MIDAS, 2019; according to Dudka et. al., 1992).

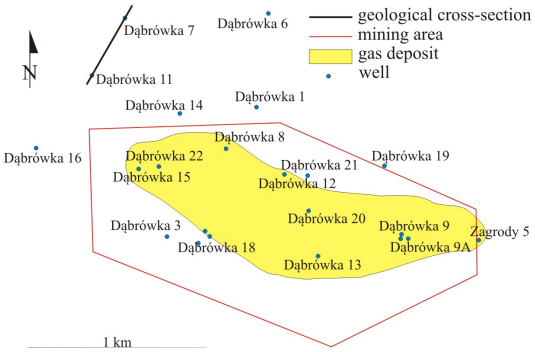
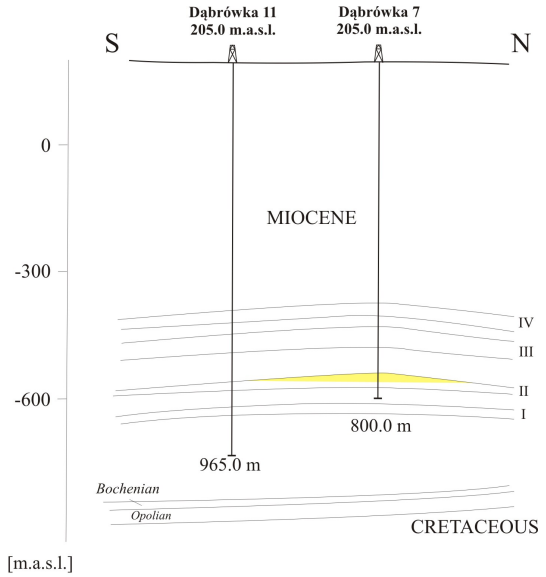
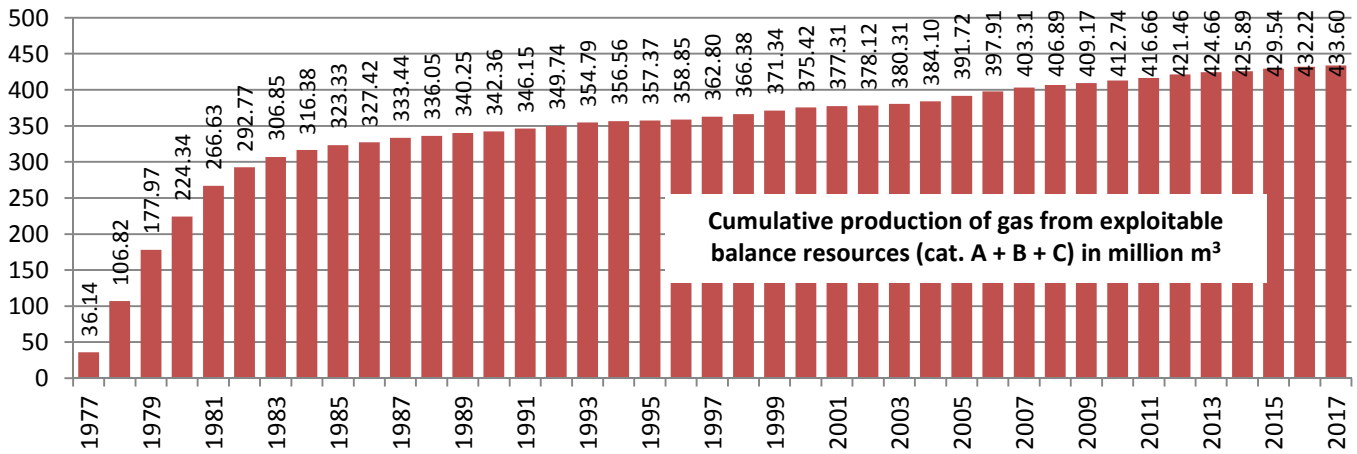


Fig. 14. Map and geological cross section through the Dąbrówka gas field (CBDG, 2019; Jawor E. et. al., 1976).





Grabina-Nieznanowice gas field

Acreage: no data for the entire field
I horizon – 300.00 ha (cat. B), 150.00 ha (cat. C1),
II horizon – 312.00 ha (cat. B),
IIIa horizon – 153.00 ha (cat. C1),
IIIb horizon – 210.00 ha (cat. C1),
IV horizon – 120.00 ha (cat. B),
V horizon – 84.00 ha (cat. C1),
Liplas area – 150.00 ha.
Depth: no data for the entire field
I horizon – 282.0 m b.g.l.,
II horizon – 378.5 m b.g.l.,
IIIa horizon – 593.0 m b.g.l.,
IIIb horizon – 517.0 m b.g.l.,
IV horizon – 650.0 m b.g.l.,
V horizon – 745.0 m b.g.l.,
Liplas area – 634.0 m b.g.l.
Stratigraphy: Miocene.
Resources:

- Extractable balance resources as of 2017: 324.20 million m^3 of natural gas,
- Economic resources in place as of 2017: 12.42 million m^3 of natural gas,
- Production in 2017: 1.89 million m^3 of natural gas.

Parameter	Average value	Unit	Comment
initial minimal reservoir pressure	30.86	ata	I horizon
initial maximal reservoir pressure	79.82	ata	V horizon
minimal net pay	1.80	m	IV horizon
maximal net pay	18.10	m	I horizon
minimal effective porosity	11.00	%	V horizon
maximal effective porosity	16.70	%	I horizon
minimal permeability	7.30	mD	V horizon
maximal permeability	549.30	mD	II horizon

Tab. 3. Quality parameters of the Grabina-Nieznanowice gas field (MIDAS, 2019, according to Baran et. al., 1973).

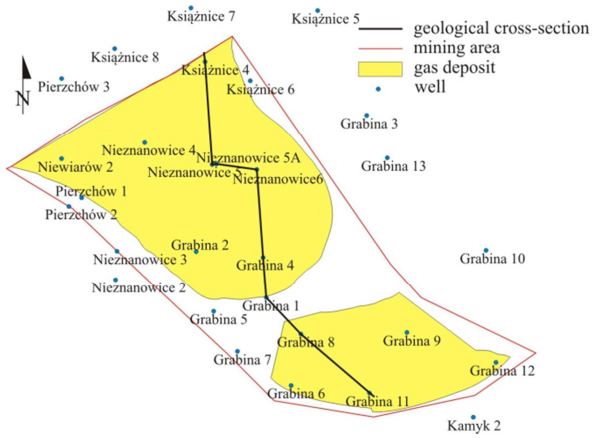
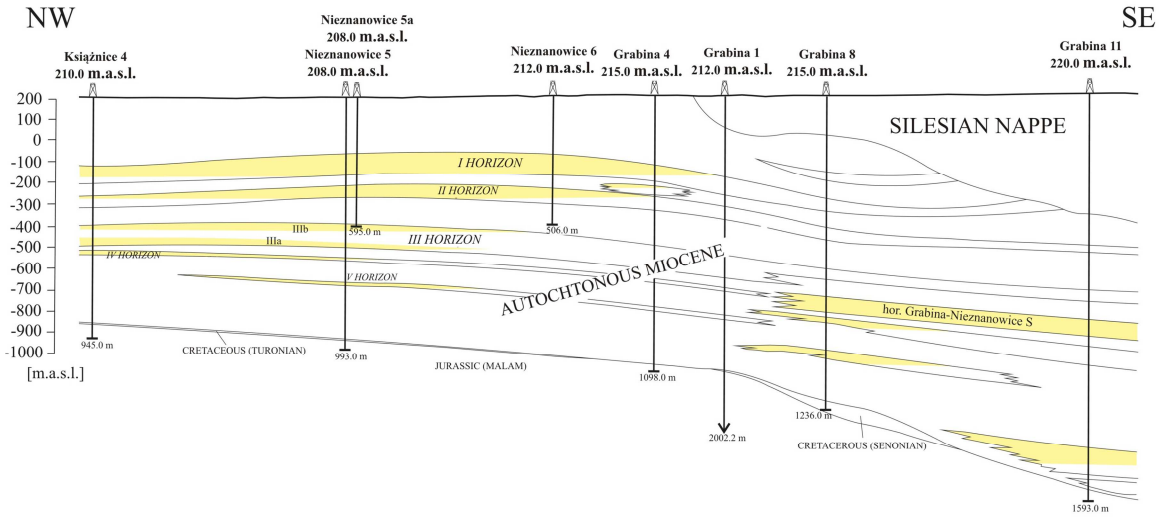
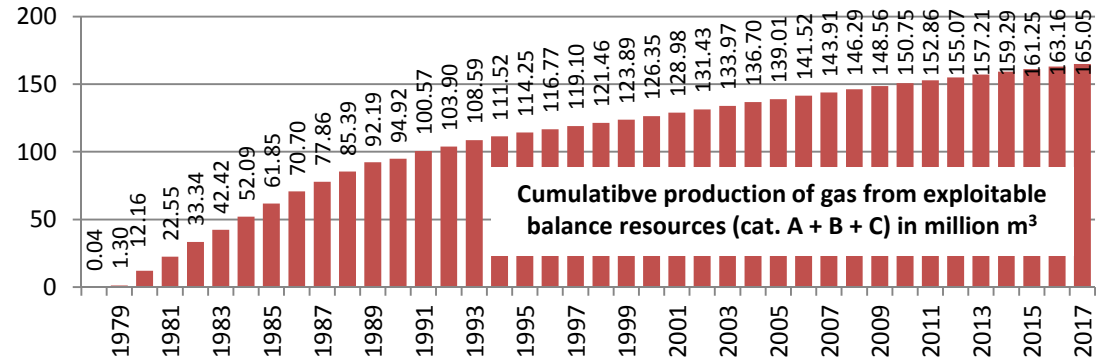


Fig. 15. Map and geological cross section through the Grabina-Nieznanowice and Grabina-Nieznanowice S gas fields (without Liplas element; CBDG, 2019; Jawor E. et. al. 1987).





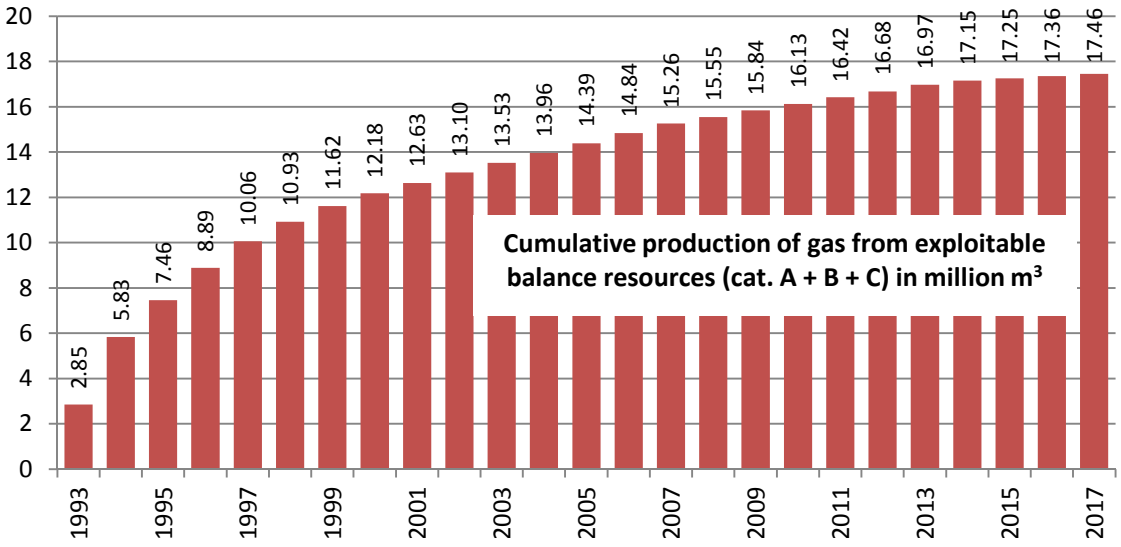
Grabina-Nieznanowice S gas field

Acreage: no data for the entire field
Grabina 6 horizon – 170.00 ha,
Grabina 8 horizon – 30.00 ha,
Grabina 12 horizon – 70.00 ha.
Depth: from -823.0 m a.s.l. to -971.0 m a.s.l.
Stratigraphy: Miocene.
Resources:

- Extractable balance resources as of 2017: 205.53 million m^3 of natural gas,
- Economic resources in place as of 2017: 110.33 million m^3 of natural gas,
- Production in 2017: 0.10 million m^3 of natural.

Parameter	Average value	Unit	Comment
formation pressure	8.53	MPa	Grabina 6 horizon
formation pressure	10.22	MPa	Grabina 8 horizon
formation pressure	9.23	MPa	Grabina 12 horizon
net pay	17.70	m	Grabina 6 horizon
net pay	4.60	m	Grabina 8 horizon
net pay	12.00	m	Grabina 12 horizon
effective porosity	13.60	%	Grabina 6 horizon
effective porosity	18.00	%	Grabina 8 horizon
effective porosity	12.60	%	Grabina 12 horizon
production index	0.70	–	Grabina 6, 8 horizon
production index	0.60	–	Grabina 12 horizon
well efficiency	8.00	m^3/min	Grabina 8 horizon
well efficiency	7.30	m^3/min	Grabina 12 horizon

Tab. 4. Quality parameters of the Grabina-Nieznanowice S gas field (MIDAS, 2019, according to Jawor E. et. al., 1987).



Grobla oil field

Acreage: Jurassic limestones – 169.0 ha, Cenomanian sandstones – 38.0 ha.

Depth: no data for the entire field (top of the field in the Jurassic limestones: 598.5–873.0 m b.g.l., av. 745.0 m b.g.l., top of the field in the Cenomanian sandstones: 596.0–855.0 m b.g.l., av. 740.0 m b.g.l.).

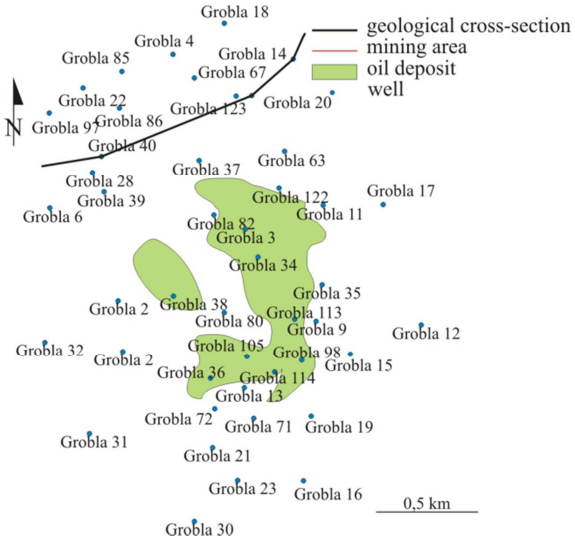
Stratigraphy: Upper Cretaceous – Cenomanian; Upper Jurassic – Oxfordian.

Resources:

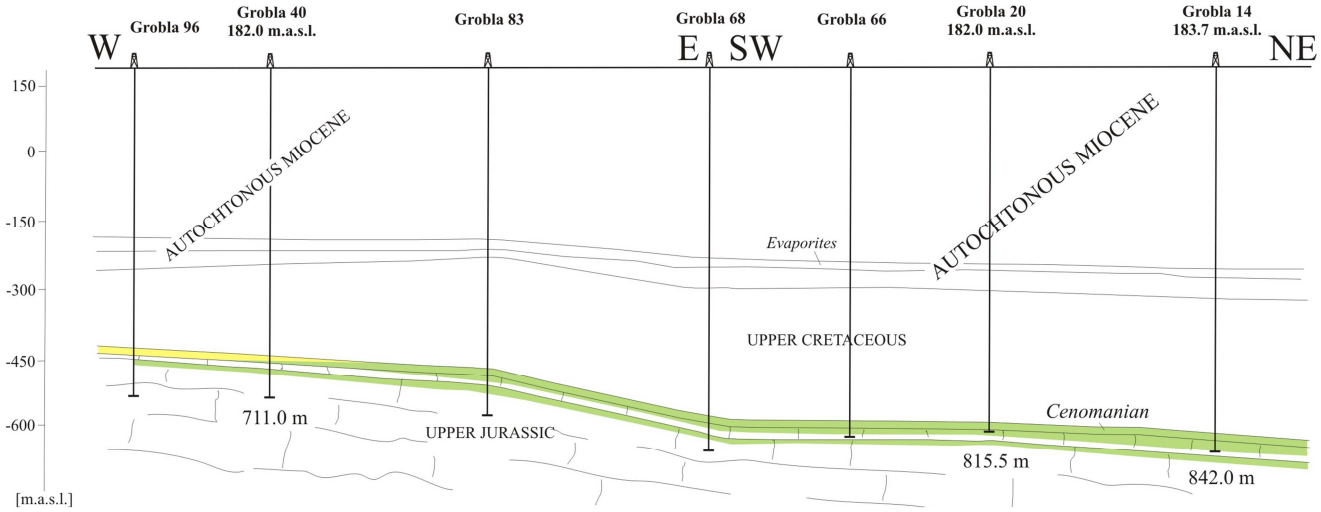
- Extractable balance resources as of 2017:
  35.89 ktonnes of oil in cat. A+B,
  53.70 million m^3 of natural gas in cat. A+B,
- Economic resources in place as of 2017:
  12.54 ktonnes of oil,
  0.80 million m^3 of natural gas,
- Production in 2017:
  3.71 ktonnes of oil,
  0.26 million m^3 of natural gas.

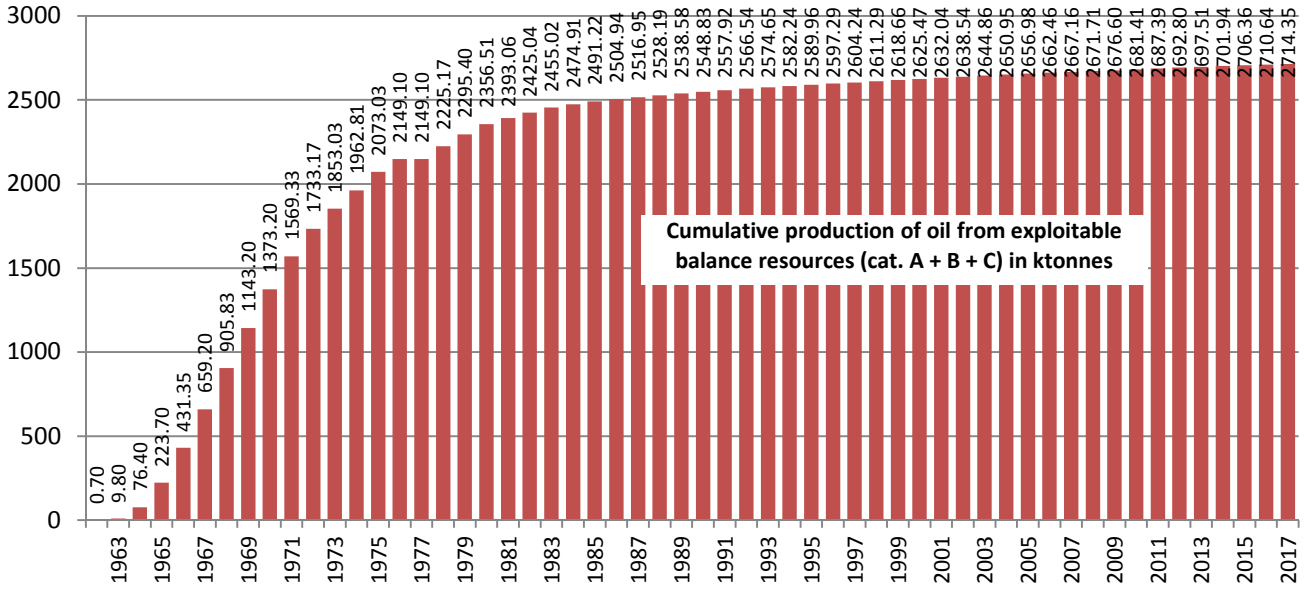
Parameter	Average value	Unit	Comment
initial reservoir pressure	5.98	MPa	Jurassic limestones, depth: 750 m, 1962
initial reservoir pressure	8.84	MPa	Cenomanian sandstones, depth: 775 m, 1962
net pay	20.00	m	Jurassic limestones
net pay	2.00	m	Cenomanian conglomerates
net pay	7.00	m	Cenomanian sandstones
porosity	3.00	%	Jurassic limestones; for calculations average value 3.5%
porosity	5.50	%	Cenomanian conglomerates
porosity	16.00	%	Cenomanian sandstones
permeability	–	mD	Jurassic limestones
permeability	20.00	mD	Cenomanian conglomerates and Jurassic limestones
permeability	500.00	mD	Cenomanian sandstones
production index	0.20	–	Jurassic limestones
production index	0.55	–	Cenomanian sandstones

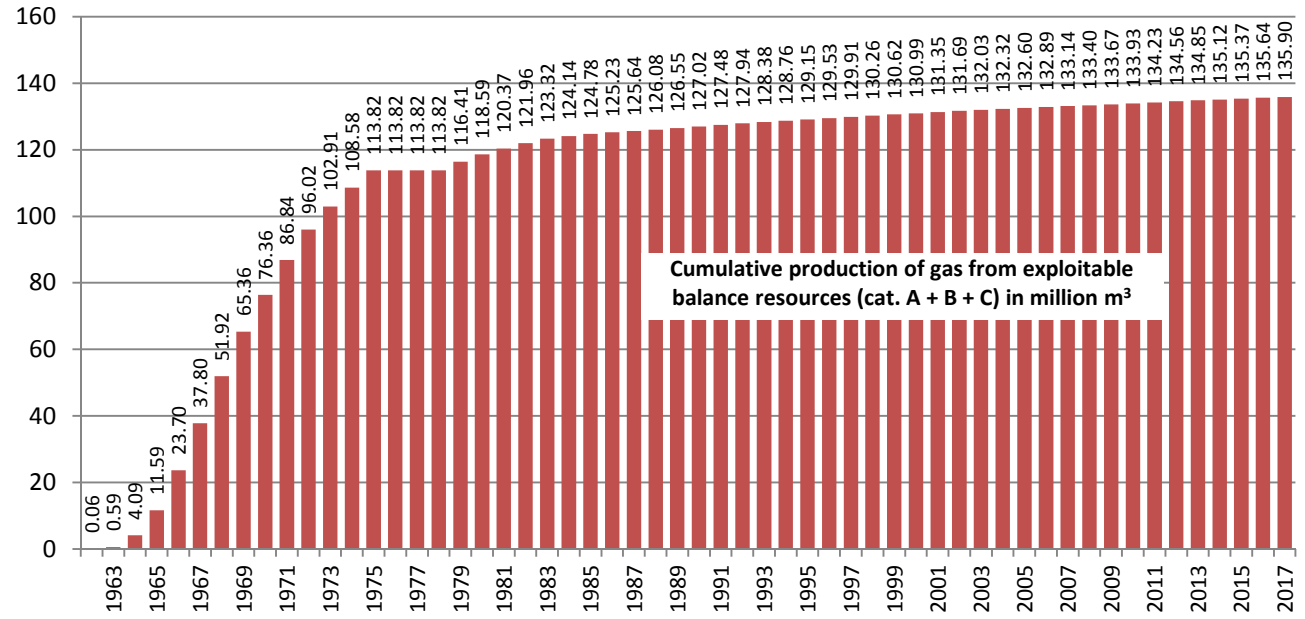
Tab. 5. Quality parameters of the Grobla oil field (MIDAS, 2019; according to Gawlik, 2003).



←**Fig. 16.** Map and geological cross section through the Grobla oil field (CBDG, 2019; Gawlik, 2003).



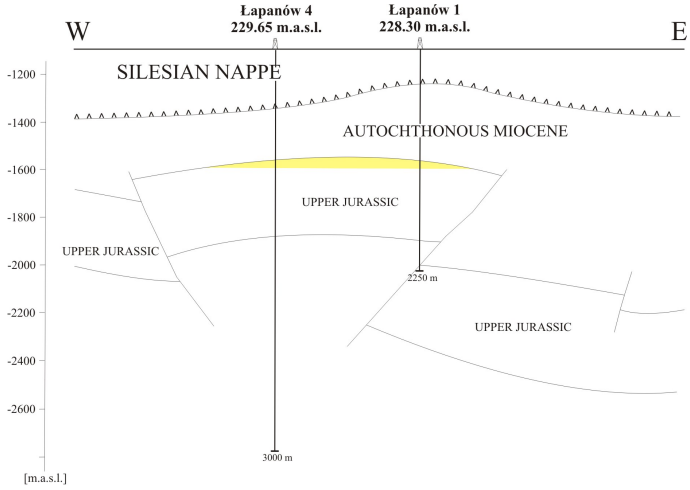

Cumulative production of oil from exploitable balance resources (cat. A + B + C) in ktonnes
0.70
9.80
76.40
223.70
431.35
659.20
905.83
1143.20
1373.20
1569.33
1733.17
1853.03
1962.81
2073.03
2149.10
2149.10
2225.17
2295.40
2356.51
2393.06
2425.04
2455.02
2474.91
2491.22
2504.94
2516.95
2528.19
2538.58
2548.83
2557.92
2566.54
2574.65
2582.24
2589.96
2597.29
2604.24
2611.29
2618.66
2625.47
2632.04
2638.54
2644.86
2650.95
2656.98
2662.46
2667.16
2671.71
2676.60
2681.41
2687.39
2692.80
2697.51
2701.94
2706.36
2710.64
2714.35
0
500
1000
1500
2000
2500
3000
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017


Cumulative production of gas from exploitable balance resources (cat. A + B + C) in million m³
0.06
0.59
4.09
11.59
23.70
37.80
51.92
65.36
76.36
86.84
96.02
102.91
108.58
113.82
113.82
113.82
113.82
116.41
118.59
120.37
121.96
123.32
124.14
124.78
125.23
125.64
126.08
126.55
127.02
127.48
127.94
128.38
128.76
129.15
129.53
129.91
130.26
130.62
130.99
131.35
131.69
132.03
132.32
132.60
132.89
133.14
133.40
133.67
133.93
134.23
134.56
134.85
135.12
135.37
135.64
135.90
0
20
40
60
80
100
120
140
160
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017

Łapanów gas field

Acreage: 245.00 ha.
Stratigraphy: Upper Jurassic.
Resources:

- Extractable balance resources as of 2017: 286.12 million m^3 of natural gas in cat. C,
- Economic resources in place as of 2017: 286.10 million m^3 of natural gas,
- Production in 2017: 8.14 million m^3 of natural gas.



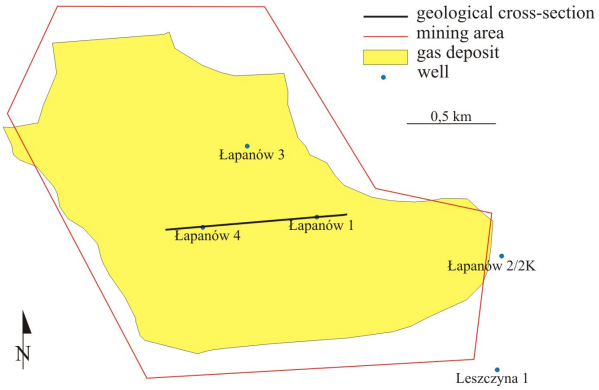


Fig. 17. Map and geological cross section through the Łapanów gas field (CBDG, 2019; Polakowski 2011).

Parameter	Min. value	Max. value	Average value	Unit
initial reservoir pressure	–	–	18.28	MPa
aquifer depth	–	–	–	m
net pay	–	–	11.30	m
porosity	–	–	11.20	%
permeability	21.72	46.91	–	mD
production index	–	–	0.80	–
maximum efficiency V_{max}	15.00	33.00	–	Nm^3/min

Tab. 6. Quality parameters of the Łapanów gas field (MIDAS, 2019; according to Polakowski, 2011).

In 2011, 446 thousands m^3 of natural gas from Łapanów 1 well was produced during hydrodynamic tests. During efficiency measurements 260 thousands m^3 of natural gas was produced from Łapanów 3 well and 72 thousands m^3 of natural gas from Łapanów 4 well. The production of gas from the Łapanów field (from exploitable balance resources in cat. C) was as follows:

– 0.12 million m^3 in 2014,
– 17.92 million m^3 in 2015,
– 11.92 million m^3 in 2016,
– 8.14 million m^3 in 2017.

Łąkta gas field

Acreage: no data for the entire field
Miocene I horizon – 35.00 ha,
Miocene II horizon, Łąkta 5 well – 30.50 ha,
Miocene II horizon, Łąkta 10 well – 21.00 ha,
Miocene III horizon – 65.50 ha,
Cenomanian – 216.30 ha,
Malm – 219.10 ha.

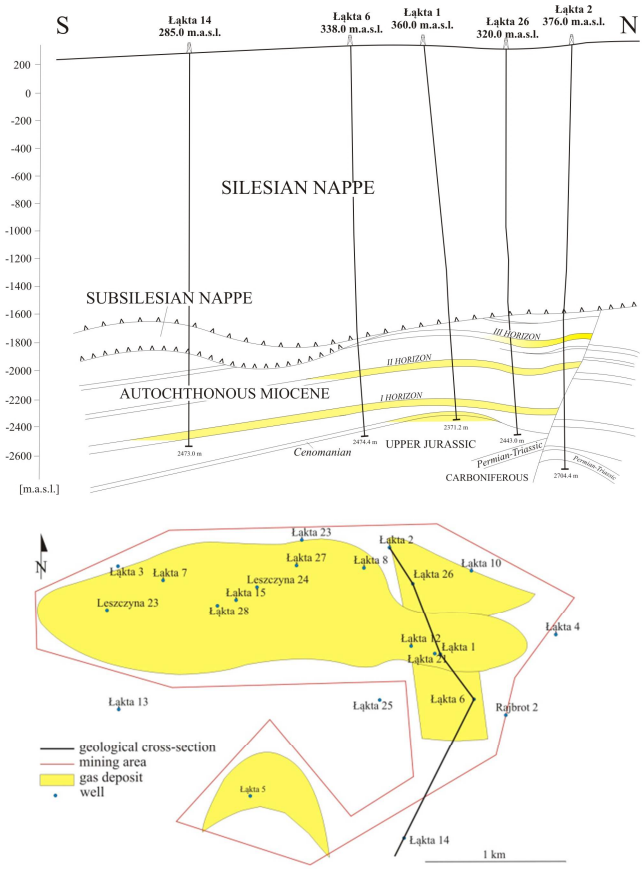
Depth: no data for the entire deposit
Miocene I horizon – 1900.0 m b.g.l.,
Miocene II horizon, Łąkta 5 well – 2220.0 m b.g.l.,
Miocene II horizon, Łąkta 10 well – 2030.0 m b.g.l.,
Miocene III horizon – 2260.0 m b.g.l.,
Cenomanian, Malm – 2290.0 m b.g.l.

Stratigraphy: Upper Jurassic, Upper Cretaceous – Cenomanian, Miocene.

Resources:

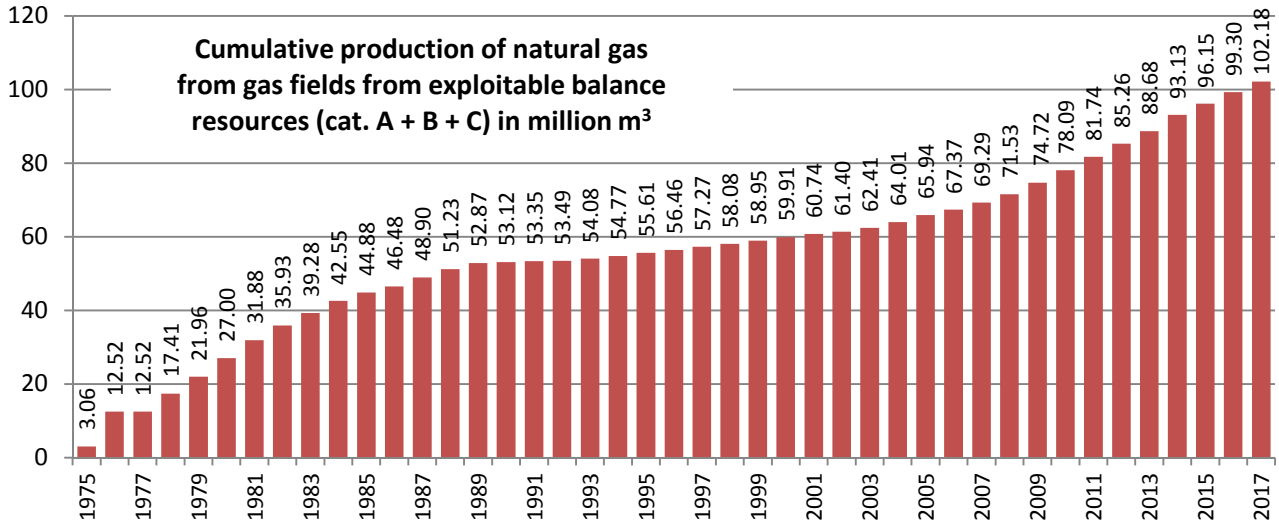
- Extractable balance resources as of 2017:
  205.70 million m^3 of natural gas,
  4.58 ktonnes of condensate in cat. A+B,
- Economic resources in place as of 2017:
  11.78 million m^3 of natural gas,
  lack of gas resources from condensate field,
  lack of economic resources in place of condensate,
- Production in 2017:
  2.88 million m^3 of natural gas,
  no condensate was extracted.

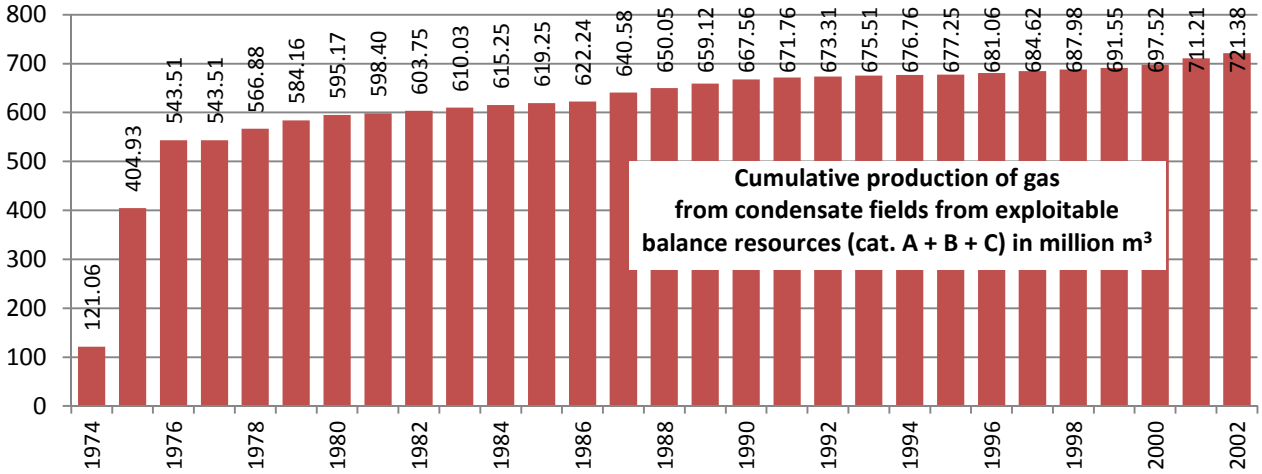
Fig. 18. Map and geological cross section through the Łąkta gas field (CBDG, 2019; Dusza and Dudek, 1986).

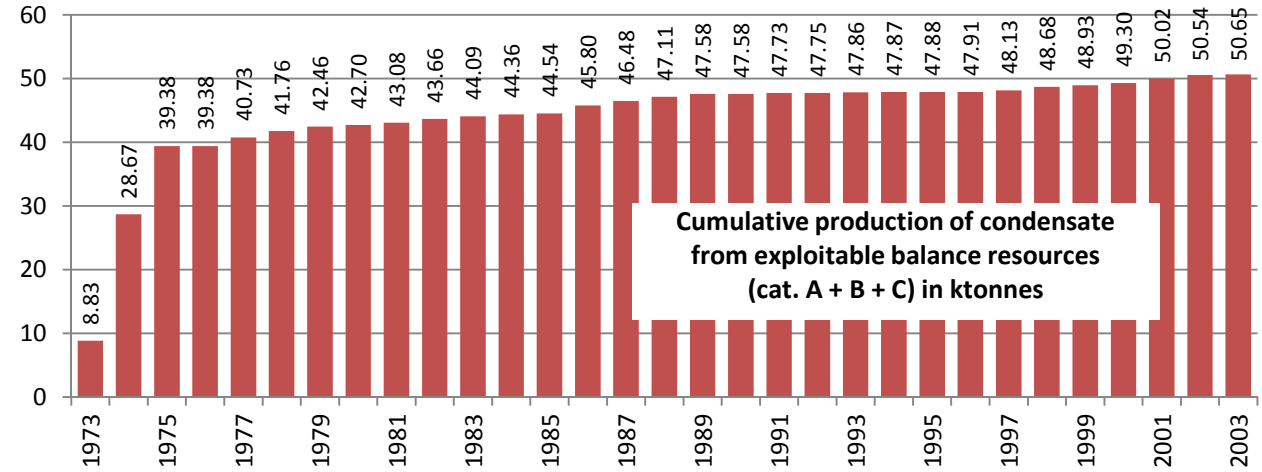


Parameter	Average value	Unit	Comment
actual pressure	6.85	MPa	Miocene (I horizon)
actual pressure	11.87-12.85	MPa	Miocene (II horizon)
actual pressure	4.60	MPa	Miocene (III horizon)
actual pressure	20.91	MPa	Cenomanian, Malm
initial reservoir pressure	14.62	MPa	Miocene (I horizon)
initial reservoir pressure	15.77–16.66	MPa	Miocene (II horizon)
initial reservoir pressure	19.70	MPa	Miocene (III horizon)
initial reservoir pressure	23.58	MPa	Cenomanian, Malm
net pay	13.63	m	Miocene (I horizon)
net pay	10.50–13.76	m	Miocene (II horizon)
net pay	13.65	m	Miocene (III horizon)
net pay	11.80	m	Cenomanian
net pay	31.10	m	Malm
effective porosity	11.53	%	Miocene (I horizon)
effective porosity	9.90–12.50	%	Miocene (II horizon)
effective porosity	11.23	%	Miocene (III horizon)
effective porosity	13.28	%	Cenomanian
effective porosity	4.87	%	Malm
permeability	40.00	mD	Miocene (I horizon, II horizon, III horizon)
permeability	364.90	mD	Cenomanian
permeability	48.90	mD	Malm
production index	0.75	–	Miocene (I horizon, II horizon, III horizon)
production index	0.80	–	Cenomanian
production index	0.65	–	Malm
total efficiency V_{tot}	99.50	m^3/min	Miocene (I horizon)
total efficiency V_{tot}	4.25–9.20	m^3/min	Miocene (II horizon)
total efficiency V_{tot}	20.00–30.00	m^3/min	Miocene (III horizon)

Tab. 7. Quality parameters of the Łąkta gas field (MIDAS, 2019, according to Dusza and Dudek, 1986).


Cumulative production of natural gas from gas fields from exploitable balance resources (cat. A + B + C) in million m³
3.06
12.52
12.52
17.41
21.96
27.00
31.88
35.93
39.28
42.55
44.88
46.48
48.90
51.23
52.87
53.12
53.35
53.49
54.08
54.77
55.61
56.46
57.27
58.08
58.95
59.91
60.74
61.40
62.41
64.01
65.94
67.37
69.29
71.53
74.72
78.09
81.74
85.26
88.68
93.13
96.15
99.30
102.18


Cumulative production of gas from condensate fields from exploitable balance resources (cat. A + B + C) in million m³
121.06
404.93
543.51
543.51
566.88
584.16
595.17
598.40
603.75
610.03
615.25
619.25
622.24
640.58
650.05
659.12
667.56
671.76
673.31
675.51
676.76
677.25
681.06
684.62
687.98
691.55
697.52
711.21
721.38


Cumulative production of condensate from exploitable balance resources (cat. A + B + C) in ktonnes
8.83
28.67
39.38
39.38
40.73
41.76
42.46
42.70
43.08
43.66
44.09
44.36
44.54
45.80
46.48
47.11
47.58
47.58
47.73
47.75
47.86
47.87
47.88
47.91
48.13
48.68
48.93
49.30
50.02
50.54
50.65

Raciborsko gas field

Acreage: no data for the entire field
I horizon – 90.0 ha,
II horizon – 500.0 ha,
IV horizon – 470.0 ha.
Depth: no data for the entire field
I horizon – 531.5 m b.g.l.,
II horizon – 546.0 m b.g.l.,
IV horizon – 698.5 m b.g.l.
Stratigraphy: Miocene.
Resources:

- Extractable balance resources as of 2017: 431.23 million m^3 of natural gas in cat. C,
- Economic resources in place as of 2017: 15.89 million m^3 of natural gas in cat. C,
- Production in 2017: 0.21 million m^3 of natural gas.

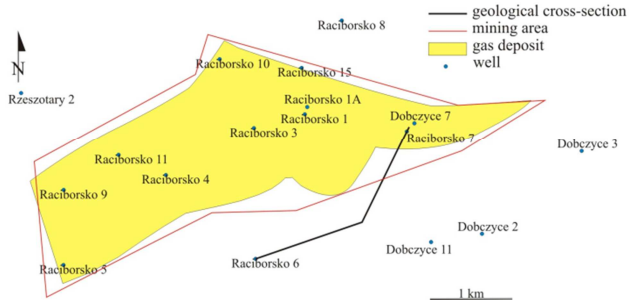
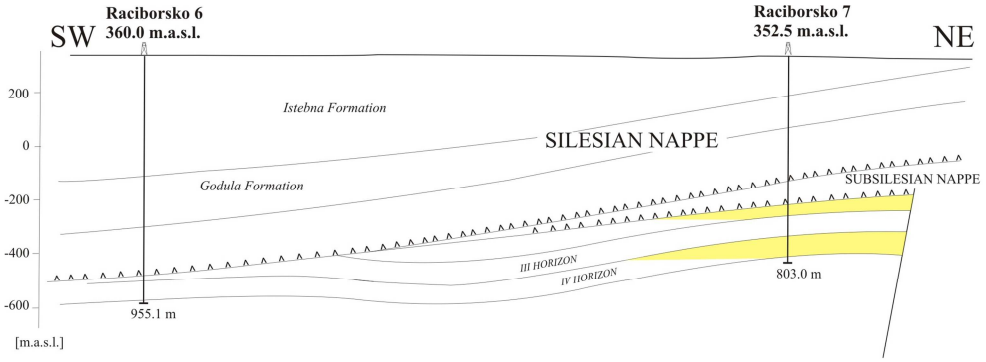
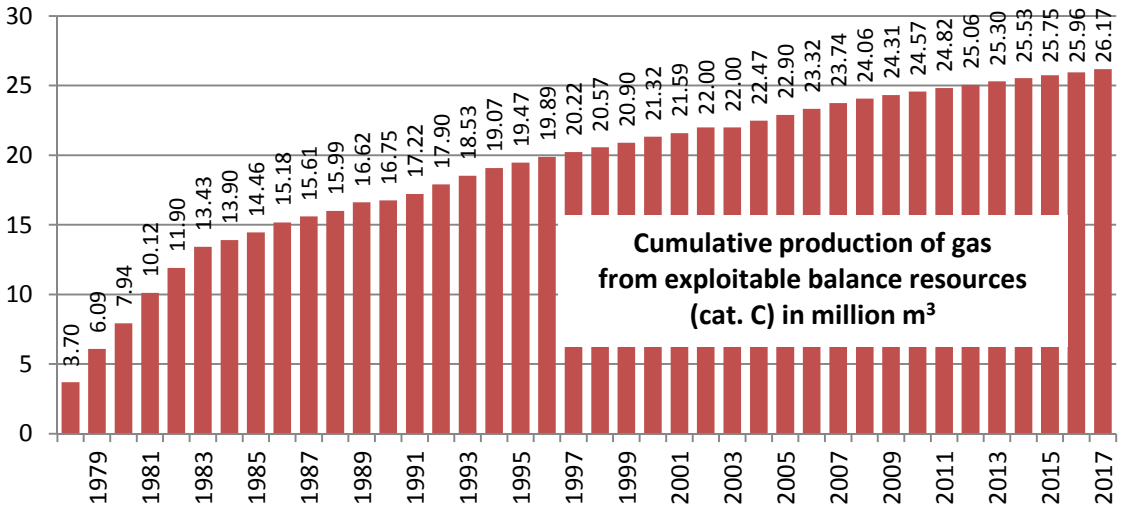


Fig. 19. Map and geological cross section through the Raciborsko gas field (CBDG, 2019; Jawor E. and Jawor W., 1971b).

Parameter	Average value	Unit	Comment
initial reservoir pressure	44.70	ata	I horizon (Raciborsko 1 well)
initial reservoir pressure	51.44	ata	II horizon (Raciborsko 4 well)
initial reservoir pressure	58.90	ata	IV horizon (Raciborsko 4 well)
net pay	11.00	m	I horizon
net pay	7.30	m	II horizon
net pay	14.00	m	IV horizon
porosity	7.31	%	I horizon
porosity	8.54	%	II horizon
porosity	9.22	%	IV horizon
effective porosity	13.00	%	all horizons
permeability	120.00	mD	all horizons
total efficiency V_{tot}	72.00	m^3/min	I horizon (Raciborsko 1 well)
total efficiency V_{tot}	5.20	m^3/min	II horizon (Raciborsko 4 well)
total efficiency V_{tot}	30.00	m^3/min	IV horizon (Raciborsko 4 well, I perforation)
total efficiency V_{tot}	6.00	m^3/min	IV horizon (Raciborsko 4 well, II perforation)

Tab. 8. Quality parameters of the Raciborsko gas field (MIDAS, 2019, according to Jawor E. and Jawor W., 1971b).





Grądy Bocheńskie gas field

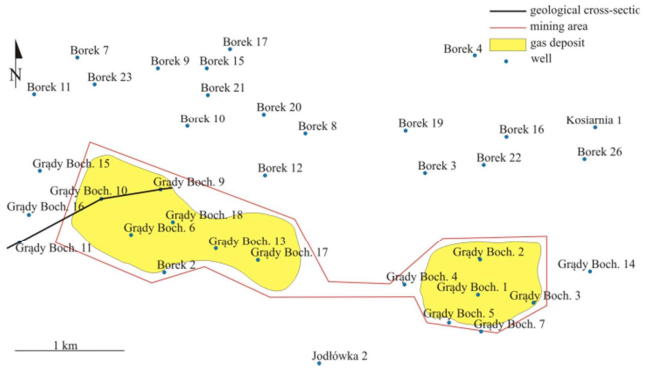
Acreage: 211.00 ha.
Depth: from 455.0 m b.g.l. to 675.0 m b.g.l.
Stratigraphy: Miocene.
Resources:

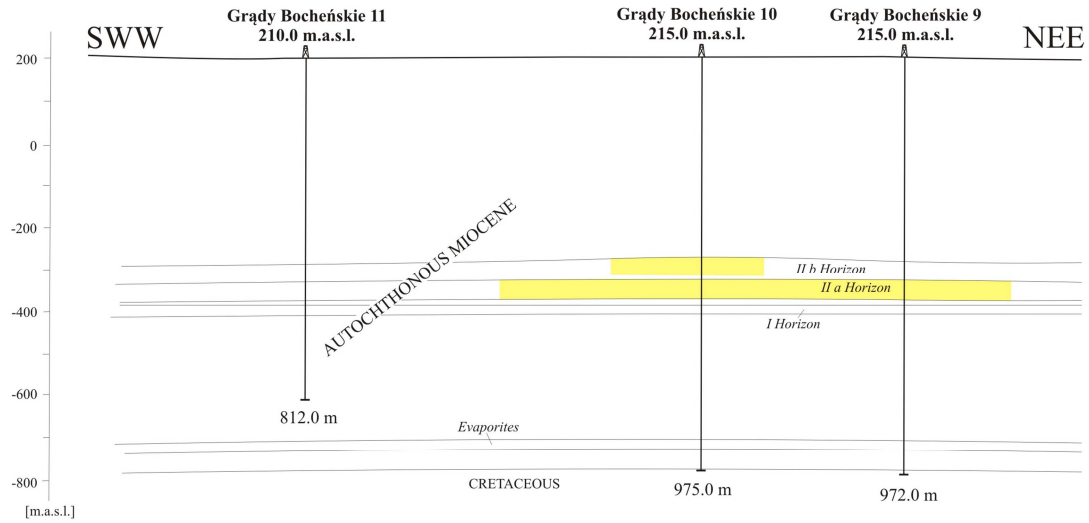
- Primary exploitable balance resources (as of 2013): 166.88 million m^3 of natural gas,
- Extractable balance resources in 2017: none, Economic resources in place in 2017: none,
- Production in 2017: none.

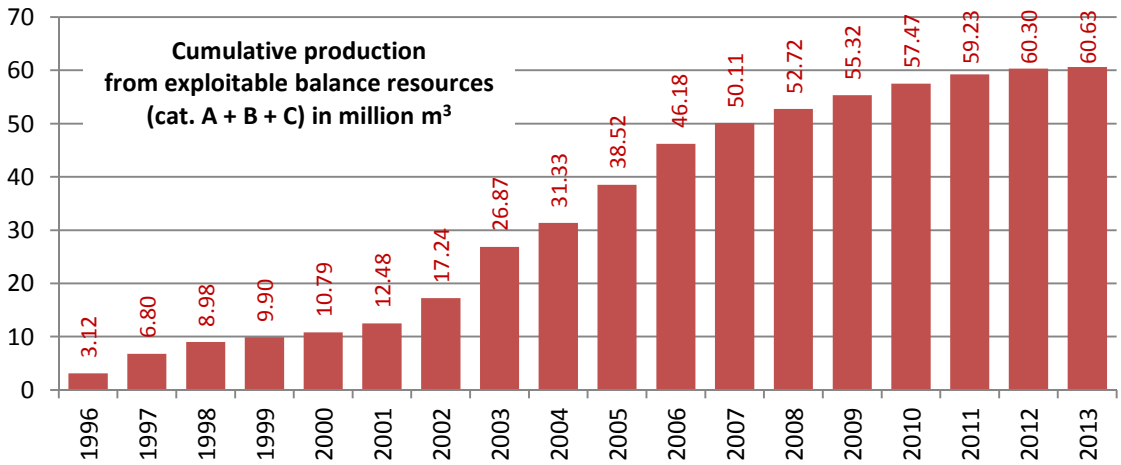
Parameter	Average value	Unit	Comment
actual pressure	5.25	MPa	I E horizon (1997)
actual pressure	4.87	MPa	I W horizon (2009)
actual pressure	5.93	MPa	II E horizon (2006)
actual pressure	4.31	MPa	II W horizon (2004)
initial reservoir pressure	7.12	MPa	I E horizon
initial reservoir pressure	5.88	MPa	I W horizon
initial reservoir pressure	6.85	MPa	II E horizon
initial reservoir pressure	5.21	MPa	II W horizon
net pay	4.50	m	I E horizon
net pay	33.50	m	I W horizon
net pay	12.50	m	II E horizon
net pay	23.00	m	II W horizon
porosity	22.10	%	I E horizon
porosity	13.80	%	I W horizon
porosity	14.60	%	II E horizon
porosity	11.10	%	II W horizon
permeability	159.00	mD	I E horizon
permeability	59.00	mD	I W horizon
permeability	40.00	mD	II E horizon
permeability	26.00	mD	II W horizon

Tab. 9. Quality parameters of the Grądy Bocheńskie gas field (MIDAS, 2019, according to Rzeźnik, 2015).

Fig. 20. Map and geological cross section through the Grądy Bocheńskie gas field (CBDG, 2019; Jawor E. et. al. 1985).







Jadowniki gas field

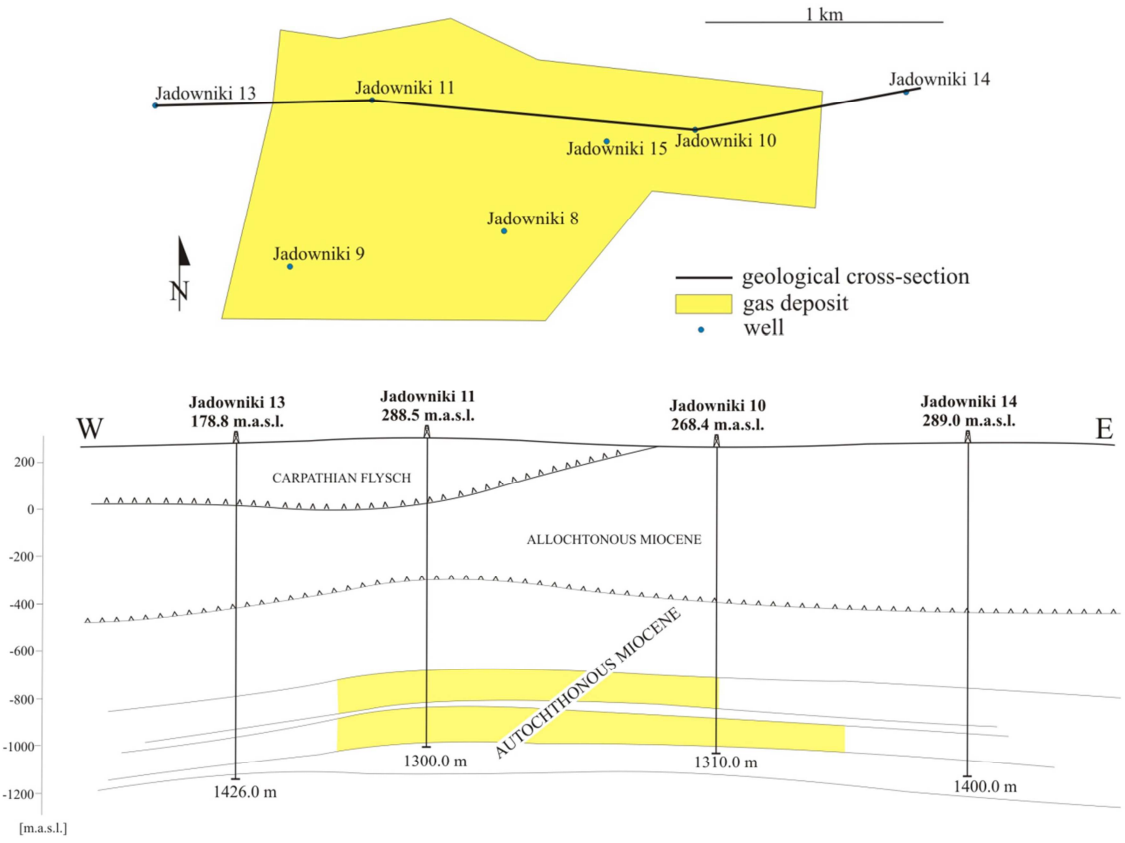
Acreage: no data for the entire field
I series – 100.00 ha,
II series – 180.00 ha.
Depth: from 984.0 m b.g.l. to 1586.0 m b.g.l.
Stratigraphy: Miocene.
Resources:

- Extractable balance resources as of 2017: 330 million m^3 of natural gas in cat. C,
- Economic resources in place as of 2017: none,
- Production in 2017: none.

Parameter	Average value	Unit	Comment
formation pressure	9.50	MPa	I series
formation pressure	11.71	MPa	II series
net pay	20.40	m	I series
net pay	20.60	m	II series
effective porosity	10.70	%	I series
effective porosity	0.11	%	II series
production index	0.70	–	I, II series

Tab. 10. Quality parameters of the Jadowniki gas field (MIDAS, 2019, according to Jawor E. et. al. 1985).

Fig. 21. Map and geological cross section through the Jadowniki gas field (CBDG, 2019; Jawor E. et. al. 1985).



5. WELLS

Seventy-two deep wells (> 500 m TVD) reached the prospective intervals within the Królówka tender area and in its close neighborhood (Fig. 22). These are selected: Bochnia E, Cichawa 1, 2, 8, Dołuszyce 1, 5, Dziewin 2, Gdów 2, 4, Grabina 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, Grobla 28, Jaroszówka 1, 2, Jawczyce 1, Kamyk 1, 2, Kawki 1, 2, Królówka 1, Krzeczów 2, 5, Książnice 1, 2, 3, 4, 6, 7, 8, Liplas 1, 2, 3, Niewiarów 1, 2, Nieznanowice 1, 2, 3, 4, 5, 5A, 6, Pierzchów 1, 2, 3, Przebieczany XXI, Puszcza 1, 3, 10, 12, Stanisławice 2, Sułków XVII, Szczytniki 2, Świątniki 2, Tarnawa 1, Trąbki 1, Wiatowice 1, 3, Wiśnicz Nowy 2, 3, Zabłocie 1, Zabłocie 2 (wells located within the tender area are highlighted).

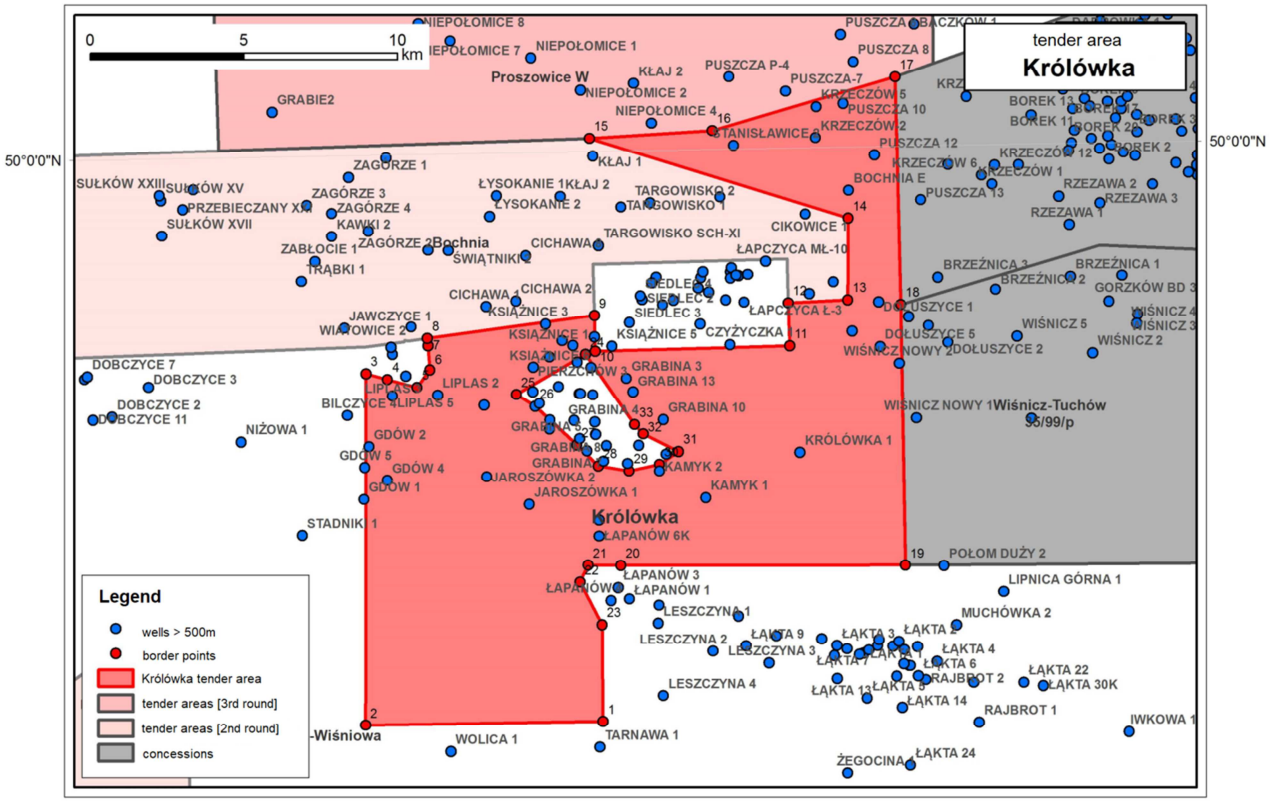


Fig. 22. Deep wells (> 500 m TVD) reaching the prospective intervals within the Królówka tender area and in its close neighborhood.

Stratigraphy		Bochnia E		Dołuszyce 1				Dołuszyce 5		Grabina 1				Grabina 2				Grabina 3				Grabina 4				Grabina 5			
		top	bottom	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]
Quaternary		0.0	24.0	0.0	5.0			data are not aviable		0.0	20.0			0.0	20.0			0.0	55.0			0.0	10.0			0.0	20.0		
Carpathian units	Outer Carpathians			5.0	1040.0	4.36–21.03	1.5–302.9			20.0	150.0																		
	Miocene of the Carpathian Foredeep	24.0	885.0							150.0	1100.0	3.17 – 19.34	0.0 – 310.8	20.0	1007.0			55.0	1014.0	0.41 – 18.30	0.96 – 222.64	10.0	1059.0	3.01 – 14.43	0.0 – 127.7	20.0	1142.5	2.31 – 14.01	0.0 – 1.1
Cretacerous		885.0	885.5	1040.0	1075.0									1007.0	1012.0	3.69 – 20.75	0.0 – 131.9					1059.0	1069.0	1.57 – 1.97	0.0 – 2.4				
Jurrasic	Upper Jurassic								1346.0													1069.0	1098.0	1.00 – 3.19	0.00 – 4.6	1142.5	1166.0	2.52 – 2.63	0.0
	Middle Jurassic			1075.0	1442.0	1.39 – 9.53	0.0			1100.0	1555.0	0.23 – 7.56	0.0 – 1.6	1012.0	1034.0			1014.0	1053.0.0	2.78 – 4.69	0.0								
	Lower Jurassic																												
Triassic										1555.0	2002.0	1.49 – 11.31	0.0 – 0.8																
Permian										2002.0	2002.2																		
Carboniferous																													
Precambrian				1442.0	1485.3	0.67	0.0																						

Tab. 11. Stratigraphy and petrophysical characteristics in the Bochnia E (Garlicki, 1963), Dołuszyce 1 (Górka, 1971a), Dołuszyce 5 (Jawor and Pieniążek, 1989), Grabina 1 (Jawor E. And Jawor W. 1971a), Grabina 2 (Baran, 1972b), Grabina 3 (Baran and Dulniawka, 1971), Grabina 4 (Zworowski, 1985), Grabina 5 (Pieniążek, 1984).

Stratigraphy		Grabina 6				Grabina 7				Grabina 8				Grabina 9				Grabina 10				Grabina 11			
		top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]
Quaternary		0.0	20.0			0.0	20.0			0.0	20.0			0.0	20.0			0.0	10.0			0.0	10.0		
Carpathian units	Outer Carpathians	20.0	186.0			20.0	220.0			20.0	150.0			20.0	360.0			10.0	477.0			10.0	475.0		
	Miocene of the Carpathian Foredeep	186.0	1353.0			220.0	1262.0	11.45 – 26.80	10.2	150.0	1204.0	1.75 – 16.69			1287.0	2.06 – 15.04	0.0 – 1.4	477.0	1320.0	6.82 – 15.79	0.00 – 0.71	475.0	1560.0		
	Sarmatian									*150.0*	*1204.0*	*1.75 – 16.69*						477.0	1320.0	*6.82 – 15.79*	*0.00 – 0.71*	*475.0*	*1560.0*	*1.79 – 12.47*	*0.0 – 2.4*
	Badenian													*360.0*	*1287.0*	*2.06 – 15.04*	*0.0 – 1.4*								
Cretacerous										1204.0	1236.0	0.16 – 13.08	0.0 – 3.4									1560.0	1593.0	2.22 – 10.27	0.0 – 0.71
Jurrasic	Upper Jurassic	1353.0	1382.0	0.88 – 2.24	0.0																				

Tab. 12. Stratigraphy and petrophysical characteristics in the Grabina 6 (well chart), Grabina 7 (Pieniążek and Jawor W., 1985), Grabina 8 (Pieniążek, 1986), Grabina 9 (Jawor W. and Pieniążek, 1986), Grabina 10 (Jawor W. and Pieniążek, 1987a), Grabina 11 (Jawor W. and Pieniążek, 1987b).

.

Stratigraphy		Grabina 12		Grabina 13				Jaroszówka 1				Jaroszówka 2				Kamyk1				Kamyk 2				Królówka 1	
		top	bottom	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom
Quaternary		0.0	20.0	0.0	10.0							0.0	10.0			0.0	0.5			0.0	20.0			data are not aviable	
Carpathian units	Outer Carpathians	20.0	640.0					0.0	880.0	3.33 – 13.90	0.0 – 39.9	10.0	1008.0	5.94 – 17.17	1.3 – 89.3	0.5	1938.0	3.79 – 13.98	0.0 – 712.0	20.0	1665.0	0.93 – 15.35	0.0 – 16.7		
	Miocene of the Carpathian Foredeep	640.0	1629.0	10.0	1125.0	0.0 – 11.94		880.0	1530.0	6.11 – 15.33	0.0 – 22.5														
	Sarmatian			*10.0*	*1125.0*	*0.0 – 11.94*																			
	Badenian	*640.0*	*1629.0*																						
Cretacerous		1629.0	1654.0																						
Jurrasic	Upper Jurassic			1125.0	1188.0	0.0 – 4.08	0.0													1665.0	1714.0	1.17 – 14.45	0.0 – 6.4		1802.0
	Middle Jurassic							1530.0	1745.4	1.26 – 2.95	0.0	1008.0	1037.0	0.60 – 2.91	0.0	1938.0	2400.0	3.20 – 8.06	0 0 – 2.2						
	Lower Jurassic																								

Tab. 13. Stratigraphy and petrophysical characteristics in the Grabina 12 (Jawor W. and Pieniążek, 1988), Grabina 13 (Jawor W. and Pieniążek, 1987c), Jaroszówka 1 (Pieniążek, 1970), Jaroszówka 2 (Pieniążek, 1973a), Kamyk 1 (Pieniążek, 1974b), Kamyk 2 (Złonkiewicz, 1977), Królówka 1 (Brzostowska and Jawor W. 1991).

Stratigraphy		Krzeczów 2				Krzeczów 5		Książnice 1		Książnice 3				Książnice 4				Książnice 6				Ksiażnice 7				Książnice 8			
		top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	top	bottom	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]
Quaternary		0.0	20.0			data are not aviable				0.0	10.0			0.0	5.0			0.0	10.0			0.0	10.0			0.0	10.0		
Miocene of the Carpathian Foredeep		20.0	795.0	19.07				0.0	735.0	10.0	818.0	2.87 – 16.74	1402.7	5.0	890.0	9.41 – 15.63	0.0 – 18.9	10.0	751.0	7.28 – 20.49	0.0 – 508.2	10.0	726.0	12.89 – 19.29	9.3	10.0	764.0	4.05 – 22.30	0 – 624.2
Cretacerous		795.0	829.5											890.0	898.0	1.18 – 2.17	0.0												
Jurrasic	Upper Jurassic	829.5	961.0	2.05	0.0		792.0							898.0	945.0														
	Middle Jurassic							735.0	814.1	818.0	890.0	0.78 – 7.14	0.0 – 4.4																
	Lower Jurassic																												

Tab. 14. Stratigraphy and petrophysical characteristics in the Krzeczów 2 (Pieniążek, 1982), Krzeczów 5 (Jawor and Brzostowska, 1992b), Książnice 1 (well chart), Książnice 3 (Pieniążek, 1972a), Książnice 4 (Baran, 1972a), Książnice 6 (Baran, 1973b), Książnice 7 (Pieniążek, 1973b), Książnice 8 (Pieniążek, 1973c).

Stratigraphy		Liplas 2		Liplas 3		Niewiarów 1		Niewiarów 2		Nieznanowice 2				Nieznanowice 3				Nieznanowice 4				Nieznanowice 5				Nieznanowice 5A				Nieznanowice 6		
		top	bottom	top	bottom	top	bottom	top	bottom	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	botto m	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]
Quaternary		0.0	39.0	0.0	20.0			data are not aviable		0.0	20.0			0.0	20.0			0.0	25.0			0.0	20.0			0.0	20.0			0.0	10.0	
Miocene of the Carpathian Foredeep		39.0	722.0	20.0	652.0	0.0	500.0		870.0	20.0	1199.0	9.42 – 12.39		20.0	1083.0	0.42 – 19.91	0.0 – 13.29	25.0	935.0	8.47 – 23.03	0.0 – 279.3	20.0	951.0	0.84 – 13.04	0.0 – 7.3	20.0	503.0	2.16 – 15.01	2.1 – 243.0	10.0	506.0	7.33 – 22.30
Cretacerous																						951.0	955.0	0.72 – 0.95	0.0							
Jurrasic	Upper Jurassic	722.0	1123.0	652.0	1026.0					1199.0	1240.6	0.40 – 1.06	0.0	1083.0	1133.0	0.71 – 1.84	0.0	935.0	973.0	1.07 – 1.29	0.0	955.0	993.0									
	Middle Jurassic																															
	Lower Jurassic																															
Carboniferous		2491.9	2942.8																													

Tab. 15. Stratigraphy and petrophysical characteristics in the Liplas 2 (well chart), Liplas 3 (well chart), Niewiarów 1 (well chart), Niewiarów 2 (Urbaniec, 2008), Nieznanowice 2 (Pieniążek, 1969), Nieznanowice 3 (Dulniawka, 1971), Nieznanowice 4 (Baran, 1972c), Nieznanowice 5 (Baran, 1973a), Nieznanowice 5A (Baran, 1973c), Nieznanowice 6 (Baran, 1973d).

Stratigraphy	Pierzchów 1		Pierzchów 2		Pierzchów 3				Puszcza 10		Puszcza 12		Stanisławice 2		Wiatowice 1		Wiatowice 3				Wiśnicz Nowy 2				Wiśnicz Nowy 3			
	top	bottom	top	bottom	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	top	bottom	top	bottom	top	bottom	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]	top	bottom	Porosity min–max [%]	Permeability min–max [mD]
Quaternary					0.0	30.0			0.0	20.0	0.0	20.0	data are not aviable				0.0	20.0			0.0	10.0			0.0	5.0		
Outer Carpathians																					10.0	900.0	1.04 – 2.35	0.0	5.0	680.0		
Miocene of the Carpathian Foredeep	0.0	506.4	0.0	555.5	30.0	926.0	11.00 – 12.38		20.0	739.0	20.0	797.5			0.0	514.5	20.0	824.0	3.59 – 14.85	0.0 – 1.0	900.0	1353.0	7.84 – 12.24	0.5 –21.4	680.0	1177.0	7.02 – 16.99	4.3 –4.6
Cretacerous					926.0	934.0	0.70 – 1.85	0.0	739.0	810.0	797.5	874.0									1353.0	1396.9						
Jurassic					934.0	968.0	0.87		810.0	901.5	874.0	909.2		1002.0			824.0	860.0	1.53 – 2.30	0.0	1396.9	1607.0	2.64 – 23.30	0.0 – 4743.8	1177.0	1221.0	0.43 – 3.35	0.0 –4.7

Tab. 16. Stratigraphy and petrophysical characteristics in the Pierzchów 1 (well chart), Pierzchów 2 (well chart), Pierzchów 3 (Baran, 1972d), Puszcza 10 (well chart), Puszcza 12 (well chart), Stanisławice 2 (Jawor W. and Brzostowska, 1992a), Wiatowice 1 (well chart), Wiatowice 3 (Górka, 1971b), Wiśnicz Nowy 2 (Kucała, 1972), Wiśnicz Nowy 3 (Pieniążek, 1974a).

Well:	BOCHNIA E	DOŁUSZYCE 1	DOŁUSZYCE 5	GRABINA 1	GRABINA 2	GRABINA 3	GRABINA 4	GRABINA 5	GRABINA 6	GRABINA 7	GRABINA 8	GRABINA 9	GRABINA 10	GRABINA 11	GRABINA 12
Depth:	885.5	1485.3	1346.0	2002.2	1034.0	1053.0	1098.0	1166.0	1382.0	1262.0	1236.0	1287.0	1320.0	1593.0	1654.0
Drill core – storage	NO core	NAG: Chmielnik	NAG: Chmielnik	NO core	NO core	NO core	NO core	NO core	NO core	NO core	NAG: Chmielnik	NAG: Chmielnik	NAG: Chmielnik	NAG: Chmielnik	NAG: Chmielnik
PK		25.0 – 1440.0		25.0 – 1950.0	25.0 – 1030.0	25.0 – 1050.0	0.0 – 1095.0	0.0 – 1156.0	0.0 – 1360.0	0.0 – 1275.0	0.0 – 1200.0	25.0 – 1285.0	0.0 – 1318.0	0.0 – 1589.0	0.0 – 1630.0
PŚr		811.5 – 1098.0		150.0 – 1955.0					875.0 – 1025.0		1104.0 – 1216.0			24.0 – 1585.0	
PŚr KS-3									188.0 – 1363.0	151.5 – 1259.0					
PŚr SKS-4		100.0 – 1445.0			145.0 – 1028.0	69.0 – 1052.0	191.0 – 1095.0	145.0 – 1156.0		151.5 – 859.0	178.0 – 1179.0	195.5 – 1239.0	229.0 – 1315.0		50.0 – 1645.0
mPŚr		811.5 – 1098.0							1238.0 – 1363.0						
PA				20.0 – 1475.0								133.0 – 1287.0	170.0 – 1318.0	0.0 – 1588.0	0.0 – 1630.0
PAdt							145.0 – 1095.0	93.0 – 1156.0	132.0 – 1362.0	100.0 – 1259.0	115.0 – 1218.0				
PAt1							145.0 – 1095.0	93.0 – 1156.0	132.0 – 1362.0	100.0 – 1259.0	115.0 – 1218.0				
PAt2							145.0 – 1095.0	93.0 – 1156.0	132.0 – 1362.0	100.0 – 1259.0	115.0 – 1218.0				
PAc(Ar)					10.0 – 1015.0	8.0 – 952.0	0.0 – 392.0	188.0 – 1039.0	10.0 – 968.0	160.0 – 1036.0	25.0 – 1041.0	0.0 – 1125.0	0.0 – 229.0	0.0 – 399.0	0.0 – 1590.0
PAc(As)											25.0 – 1041.0				
PAc(Ts)											25.0 – 1041.0				
PAP (logA1/A2)								93.0 – 1156.0			1104.0 – 1218.0				
PG		5.0 – 1478.0		350.0 – 1104.0		920.0 – 1006.0						0.0 – 743.0	0.0 – 839.0	0.0 – 1593.0	0.0 – 1630.0
PG SP–62				2.0 – 1734.0	10.0 – 1000.0	10.0 – 1052.0					0.0 – 1218.0	650.0 – 1287.0	350.0 – 1630.0	350.0 – 987.0	
PG SP–62M										0.0 – 862.0					
PG SP–62R							0.0 – 1095.0	550.0 – 1156.0	0.0 – 815.0	750.0 – 1259.0					
PG SP–62T				1650.0 – 1961.0				0.0 – 653.0	750.0 – 1290.0						
PGG		786.0 – 1483.0			140.0 – 1028.0	527.0 – 1052.0	995.0 – 1095.0								
PNG		5.0 – 1478.0		350.0 – 1104.0								0.0 – 743.0		0.0 – 402.0	
PNG SP–62				2.0 – 1734.0	10.0 – 1028.0	10.0 – 1052.0				0.0 – 862.0	0.0 – 1218.0	650.0 – 1287.0	750.0 – 1320.0	350.0 – 987.0	
PNG SP–62R							0.0 – 1095.0	550.0 – 1156.0	0.0 – 815.0	750.0 – 1259.0					
PNG SP–62T				1650.0 – 1961.0				0.0 – 653.0	750.0 – 1290.0						
PNNnt													0.0 – 839.0	890.0 – 1593.0	0.0 – 1630.0
PI							191.0 – 1095.0		188.0 – 1362.0	151.5 – 1259.0	178.0 – 1205.0	195.5 – 1053.0	229.0 – 1318.0	24.0 – 1589.0	50.0 – 1645.0
PS		100.0 – 1482.0		160.0 – 1960.0	147.0 – 1028.0	69.0 – 1052.0	191.0 – 1095.0	145.0 – 1156.0	188.0 – 1362.0	151.5 – 1259.0	178.0 – 1218.0	195.5 – 1285.0	229.0 – 1318.0	24.0 – 1589.0	50.0 – 1645.0
PO		B4.48A1.62M 100.0 – 1482.0		B4.48A1.62M 155.0 – 1100.0	B4.48A1.62M 147.0 – 1028.0	B4.48A1.62M 69.0 – 1052.0	M5.28A0.82B 191.0 – 1095.0	A5.28M0.82N 550.0 – 1156.0	A5.28M0.82N 188.0 – 1362.0	A5.28M0.82N 151.5 – 1259.0	A5.28M0.82N 178.0 – 1218.0	M5.28A0.82N 195.5 – 1285.0	A5.28M0.82N 229.0 – 1318.0	399.0 – 985.0	A5.28M0.82N 50.0 – 1645.0
		B5.7A0.4M 100.0 – 815.0		B5.7A0.4M 155.0 – 1100.0	B5.7A0.4M 147.0 – 1028.0	B5.7A0.4M 69.0 – 1052.0	N4.48M1.62A 191.0 – 1095.0	B4.48A1.62M 145.0 – 653.0	N4.48M1.62A 188.0 – 1362.0	N4.48M1.62A 151.5 – 1259.0	N4.48M1.62A 178.0 – 1218.0	N4.48M1.62A 195.5 – 1285.0	N4.48M1.62A 229.0 – 1318.0	A5.28M0.82N 24.0 – 1589.0	N4.48M1.62A 50.0 – 1645.0
		M0.5A0.1B 811.5 – 1482.0		M0.5A0.1B 1100.0 – 1960.0	M5.28A0.82B 147.0 – 1028.0	M5.28A0.82B 69.0 – 1052.0	N5.7M0.4A 191.0 – 1095.0	M5.28A0.82B 145.0 – 653.0	N5.7M0.4A 188.0 – 1362.0	N5.7M0.4A 151.5 – 1259.0	N5.7M0.4A 178.0 – 1205.0	N5.7M0.4A 195.5 – 1285.0	N5.7M0.4A 229.0 – 1318.0	N4.48M1.62A 24.0 – 1589.0	N5.7M0.4A 50.0 – 1645.0
		M0.1A0.1B 811.5 – 1482.0		M1.0A0.1B 1100.0 – 1960.0				N4.48M1.62A 550.0 – 1156.0						N5.7M0.4A 24.0 – 1589.0	
		M2.5A0.25B 811.5 – 1482.0		M2.5A0.25B 1100.0 – 1960.0				N5.7M0.4A 550.0 – 1156.0							
		M4.0A0.5B 811.5 – 1482.0		M4.0A0.5B 1100.0 – 1960.0											
		M5.28A0.82B 100.0 – 1098.0		M5.28A0.82B 155.0 – 1100.0											
		M8.0A0.5B 811.5 – 1482.0		M8.0A0.5B 1100.0 – 1960.0											
mPO		A1”M1”N 812.0 – 1445.0		160.0 – 1100.0	A1.0M1.0N 950.0 – 1028.0	A1.0M1.0N 1015.0 – 1052.0									
		A2”M 812.0 – 1445.0		A1.0M1.0N 150.0 – 1960.0	A2.0N 950.0 – 1028.0	A2.0N 1015.0 – 1052.0									
				A2”M 150.0 – 1960.0											
POpł							200.0 – 1100.0	150.0 – 1150.0	200.0 – 1350.0	150.0 – 1250.0	200.0 – 1200.0	200.0 – 1275.0	250.0 – 1300.0	50.0 – 1575.0	50.0 – 1645.0
POst		811.5 – 1482.0			950.0 – 1028.0										
POst LL3															
PT				20.0 – 1900.0											
PTn							200.0 – 1100.0	150.0 – 1150.0	200.0 – 1350.0	150.0 – 1250.0	200.0 – 1200.0	200.0 – 1275.0	250.0 – 1300.0	400.0 – 1575.0	50.0 – 1645.0
Velocity survey				20 – 1844			5.0 – 1065.0	20.0 – 1160.0	10.0 – 940.0		10.0 – 990.0			10.0 – 1540.0	20.0 – 1400.0

Tab. 17. Geophysical survey – well logs (underlined intervals are available in LAS format). NAG – National Geological Archive, PK – deviation log, PŚr – caliper, PŚr KS-3 – caliper using KS–3 probe, PŚr SKS-4 – caliper using SKS–4 probe, PŚr SA-80 – caliper using SA–80 probe, mPŚr – caliper – microlog, PA – acoustic log , PAa1 – amplitude, acoustic log using dipole transmitter probe, PAdt – interval transit time – acoustic log, PAt1 – travel time, T1 – acoustic log, PAt2 – travel time T2 – acoustic log, PAc(Ar) – cement bond log – amplitude,e acoustic log (casing), PAc(As) – cement bond log – amplitude, acoustic log (rock), PAc(Ts) – cement bond log – time Acoustic log (rock), PAP (logA1/A2) – SKANG-2, PG – gamma ray log, PG SP-62 – gamma ray log using SP–62 probe, PG SP-62M – gamma ray log using SP–62M probe, PG SP-62R – gamma ray log using SP–62R probe, PG SP-62T – gamma ray log using SP–62T probe, PGG – density log, PNG – neutron-gamma ray log, PNG SP-62 – neutron-gamma ray log using SP–62 probe, PNG SP-62M – neutron-gamma ray log using SP–62M probe, PNG SP-62R – neutron-gamma ray log using SP–62R probe, PNG SP-62T – neutron-gamma ray log using SP–62T probe, PNNnt – epithermal neutron log, PI – induction log, PS – spontaneous potential log, PO – conventional electrical log (EL – lateral, EN – normal), mPO – electrical microlog, POg – electric log using gradient probe, POp – electric log using N1.0M0.1A potential probe, POpł – salinity log, POst – focussed electric log, POst LL3 – focussed electric log using LL3 probe, mPOst –focussed electric microlog, PP – induced potential log, PT – temperature log, PTn – temperature log in thermal disequilibrium, PTnc – temperature log after cementation in thermal disequilibrium, PGaz – gas log, velocity survey.

Well:	GRABINA 13	JAROSZÓWKA 1	JAROSZÓWKA 2	KAMYK 1	KAMYK 2	KRÓLÓWKA 1	KRZECZÓW 2	KRZECZÓW 5	KSIĄŻNICE 1	KSIĄŻNICE 2	KSIĄŻNICE 3	KSIĄŻNICE 4	KSIĄŻNICE 6	KSIĄŻNICE 7	KSIĄŻNICE 8	LIPLAS 2
Depth:	1188.0	1745.4	1037.0	2400.0	1714.0	1802.0	961.0	792.0	814.1	1302.8	890.0	945.0	751.0	726.0	764.0	2942.8
Drill core – storage	NAG: Chmielnik	NO core	NO core	NO core	NO core	NAG: Chmielnik	NO core	NAG: Chmielnik	NO core	NO core	NO core	NO core	NO core	NO core	NO core	NO core
PK	0.0 – 1185.0	125.0 – 1700.0	25.0 – 1030.0	25.0 – 1980.0	575.0 – 1715.0		0.0 – 955.0			1125.0 – 1295.0	25.0 – 865.0	25.0 – 935.0	25.0 – 745.0	25.0 – 710.0	25.0 – 760.0	25.0 – 2925.0
PŚr		27.0 – 1309.0	145.0 – 1030.0	87.0 – 1920.0	68.5 – 1663.0						144.0 – 870.0			100.5 – 709.5	15.0 – 763.0	
PŚr SA-80				730.5 – 1712.0												
PŚr SKS-4	198.5 – 1179.0	825.0 – 1698.0		87.0 – 1973.0			196.0 – 958.0					139.5 – 933.0				
mPŚr				1680.0 – 1976.0								140.0 – 933.0				
PA	138.0 – 1188.0				16.0 – 1715.0							139.0 – 941.0				
PAa1			150.0 – 1030.0	950.0 – 1980.0									98.0 – 746			
PAdt			150.0 – 1030.0	1680.0 – 1976.0			196.0 – 955.0									
PAt1			150.0 – 1030.0	1778.0 – 1980.0			196.0 – 955.0						98.0 – 746			
PAt2			150.0 – 1030.0	1778.0 – 1980.0			196.0 – 955.0						98.0 – 746			
PAc(Ar)				7.0 – 1948.0	592.0 – 1689.0					17.0 – 574.0					15.0 – 590.0	
PG	0.0 – 1188.0									740.0 – 1302.8			1.0 – 746.0		25.0 – 763.0	150.0 – 2935.0
PG SP–62		135.0 – 1702.0	0.0 – 1030.0	5.0 – 1977.0	0.0 – 1721.0		20.0 – 955.0				19.0 – 879.0	7.0 – 940.0		43.0 – 709.5		
PGG		800.0 – 1312.0	145.0 – 1030.0	1680.0 – 1976.0	722.0 – 1717.0								90.5 – 746.0			
PNG													1.0 – 746.0		25.0 – 763.0	
PNG SP–62		135.0 – 1702.0	0.0 – 1030.0	5.0 – 1977.0	0.0 – 1721.0		20.0 – 955.0				19.0 – 879.0	7.0 – 940.0		25.0 – 763.0		
PNNnt	0.0 – 1188.0															
PI	198.5 – 1188.0			950.0 – 1980.0			196.0 – 955.0									
PS	198.5 – 1188.0	27.0 – 1700.0	149.0 – 1030.0	87.5 – 1977.0	68.5 – 1710.0		196.0 – 955.0				144.0 – 870.0	139.5 – 939.0	98.0 – 746.0	100.5 – 709.5	97.5 – 761.0	
PO	A5.28M0.82N 198.5 – 1188.0	B4.48A1.62M 27.0 – 1309.0	B4.48A1.62M 149.0 – 1030.0	B4.48A1.62M 87.5 – 1977.0	M8.0A1.0B 68.5 – 1710.0		 805.0 – 955.0			 100.0 – 1300.0	B4.48A1.62M 144.0 – 870.0	B4.48A1.62M 139.5 – 939.0	B4.48A1.62M 98.0 – 746.0	B4.48A1.62M 100.5 – 709.5	B4.48A1.62M 97.5 – 761.0	 40.0 – 2935.0
	N5.7M0.4A 198.5 – 1188.0	B5.7A0.4M 27.0 – 1309.0	B5.7A0.4M 149.0 – 1030.0	B5.7A0.4M 87.5 – 1977.0			A5.28M0.8N 196.0 – 888.0				B5.7A0.4M 144.0 – 870.0	B5.7A0.4M 139.5 – 939.0	B5.7A0.4M 98.0 – 746.0	B5.7A0.4M 100.5 – 709.5	B4.48A1.62M 97.5 – 761.0	
	B4.48A1.62M 198.5 – 1188.0	M0.5A0.1B 1250.0 – 1700.0	M5.28A0.82B 149.0 – 1030.0	M5.28A0.82B 87.5 – 1977.0			N4.48M1.62A 196.0 – 888.0				M5.28A0.82B 144.0 – 870.0	M5.28A0.82B 139.5 – 939.0	M5.28A0.82B 98.0 – 746.0	M5.28A0.82B 100.5 – 709.5	B5.7A0.4M 97.5 – 761.0	
		M1.0A0.1B 250.0 – 1700.0					N5.7M0.4A 196.0 – 888.0								M5.28A0.82B 97.5 – 761.0	
		M2.5A0.25B 250.0 – 1700.0														
		M4.0A0.5B 250.0 – 1700.0														
		M5.28A0.82B 27.0 – 1309.0														
		M8.0A0.5B 1250.0 – 1700.0														
mPO		A1.0M1.0N 1528.0 – 1700.0	A1”M1”N 995.0 – 1032.5								A1.0M1.0N 750.0 – 870.0	A1.0M1.0N 850.0 – 939.0				
		A2”M 1528.0 – 1700.0	A2”M 995.0 – 1032.5								A2”M 750.0 – 870.0	A2.0M 850.0 – 939.0				
POg	1080.0 – 1188.0				M2.5A0.25B 68.5 – 1710.0											
					M4.0A0.5B 68.5 – 1710.0											
POpł	200.0 – 1175.0						200.0 – 950.0									
POst			1680.0 – 1977.0		729.5 – 1235.0						725.0 – 870.0	850.0 – 939.0			97.5 – 763.0	
mPOst															97.5 – 763.0	
PP					68.5 – 1710.0											
PT																590.0 – 1640.0
PTn	200.0 – 1175.0				0.0 – 1663.0		200.0 – 950.0									
PTnc			2.0 – 1682.0													
PGaz		802.0 – 1667.5														839.0 – 2253.0
Velocity survey		40.0 – 837.0		20.0 – 1918.0	20.0 – 1640.0											

Tab. 17. Cont.

Well:	LIPLAS 3	ŁAPANÓW 6K	ŁAPANÓW 7K	NIEWIARÓW 1	NIEWIARÓW 2	NIEZNANOWICE 2	NIEZNANOWICE 3	NIEZNANOWICE 4	NIEZNANOWICE 5	NIEZNANOWICE 5A	NIEZNANOWICE 6	PIERZCHÓW 1	PIERZCHÓW 2	PIERZCHÓW 3	PUSZCZA 10	PUSZCZA 12
Depth:	1202.0	2175.0	1980.0	500.0	870.0	1240.6	1133.0	973.0	993.0	503.0	506.0	506.4	555.5	968.0	901.5	909.2
Drill core – storage	NO core	NAG: Chmielnik	NAG: Chmielnik	NO core	NO core	NO core	NO core	NO core	NO core	NO core	NO core	NO core	NO core	NO core	NO core	NO core
PK	25.0 – 1195.0					5.0 – 1230.0	25.0 – 1150.0	25.0 – 968.0	25.0 – 990.0	25.0 – 500.0	25.0 – 500.0			25.0 – 960.0		
PŚr	190.0 – 840.0					80.0 – 1234.0	515.0 – 1132.0	71.0 – 967.0	107.0 – 990.0	100.0 – 498.0	82.0 – 498.0			150.0 – 683.0		
PŚr SKS-4	250.0 – 1191.0						75.0 – 515.0							150.0 – 950.0		
mPŚr	190.0 – 856.0															
PA	195.0 – 757.0						510.0 – 1133.0	47.0 – 762.0								
PAc(Ar)						33.0 – 1216.0			3.0 – 708.0							
PG									594.0 – 647.0	5.0 – 498.0	0.0 – 498.0					
PG SP–62	3.0 – 1194.0					5.0 – 1230.0	7.0 – 1132.0	0.0 – 968.0	1.0 – 991.0					3.0 – 963.0		
PGG							500.0 – 1132.0	68.0 – 967.0						139.0 – 962.0		
PNG									128.0 – 990.0	5.0 – 498.0	0.0 – 498.0			3.0 – 963.0		
PNG SP–62	3.0 – 1194.0					5.0 – 1230.0	7.0 – 1132.0	0.0 – 968.0	1.0 – 991.0							
PI							75.0 – 515.0									
PS	191.0 – 1198.0					80.0 – 1234.0	75.0 – 1132.0	71.0 – 967.0	128.0 – 990.0					150.0 – 963.0		
PO	B4.48A1.62M 191.0 – 755.0					B4.48A1.62M 80.0 – 1234.0	B4.48A1.62M 75.0 – 1132.0	B4.48A1.62M 71.0 – 967.0	B4.48A1.62M 128.0 – 990.0	100.0 – 498.0	82.0 – 498.0			B4.48A1.62M 150.0 – 963.0		
	B5.7A0.4M 191.0 – 755.0					B5.7A0.4M 80.0 – 1234.0	B5.7A0.4M 75.0 – 1132.0	B5.7A0.4M 71.0 – 967.0	B5.7A0.4M 128.0 – 990.0					B5.7A0.4M 150.0 – 963.0		
	M0.5A0.1B 650.0 – 1198.0					M5.28A0.82B 80.0 – 1234.0	M5.28A0.82B 75.0 – 1132.0	M5.28A0.82B 71.0 – 967.0	M5.28A0.82B 128.0 – 990.0					M5.28A0.82B 150.0 – 963.0		
	M1.0A0.1B 650.0 – 1198.0															
	M2.5A0.25B 650.0 – 1198.0															
	M4.0A0.5B 196.0 – 1198.0															
	M5.28A0.82B 191.0 – 755.0															
	M8.0A0.5B 650.0 – 1198.0															
mPO	A1.0M0.1N 620.0 – 765.0					A1”M1”N 1176.0 – 1234.0	A1”M1”N 1083.0 – 1132.0							A1”M1”N 925.0 – 963.0		
	A2”M 620.0 – 765.0					A2”M 1176.0 – 1234.0	A2”M 1083.0 – 1132.0							A2”M 925.0 – 963.0		
POst							1083.0 – 1132.0		900.0 – 990.0					925.0 – 963.0		
PT								41.0 – 836.5								

Tab. 17. Cont.

Well:	STANISŁAWICE 2	WIATOWICE 1	WIATOWICE 3	WIŚNICZ NOWY 2	WIŚNICZ NOWY 3
Depth:	1002.0	514.5	860.0	1607.0	1221.0
Drill core – storage	NAG: Chmielnik	NO core	NO core	NO core	NO core
PK			25.0 – 850.0	25.0 – 1600.0	10.0 – 1195.0
PŚr SKS-4			150.0 – 853.0	93.0 – 1395.0	2.0 – 1195.0
mPŚr				346.0 – 1395.0	
PA					700.0 – 1193.0
PG SP–62			5.0 – 853.0	3.0 – 1599.0	0.0 – 1195.0
PGG			150.0 – 853.0	339.0 – 1599.0	
PNG SP–62			5.0 – 853.0	3.0 – 1599.0	0.0 – 1195.0
PS			150.0 – 849.0	93.0 – 1600.0	2.0 – 1195.0
PO			B4.48A1.62M 150.0 – 853.0		B4.48A1.62M 2.0 – 1195.0
				B4.48A1.62M 1093.0 – 1600.0	
			B5.7A0.4M 150.0 – 853.0	B4.48A1.62M 93.0 – 1157.0	B5.7A0.4M 2.0 – 1195.0
			M5.28A0.82B 150.0 – 853.0	B5.7A0.4M 93.0 – 1157.0	M5.28A0.82B 2.0 – 1195.0
				M5.28A0.82B 93.0 – 1396.0	
mPO				A1”M1”N 1344.0 – 1596.0	A1”M1”N 1100.0 – 1195.0
				A2”M 1344.0 – 1596.0	A2”M 1100.0 – 1195.0
POst				1353.0 – 1600.0	1175.0 – 1195.0

Tab. 17. Cont.

Well	Top [m]	Bottom [m]	Stratigraphy	Shows
Bochnia E		186.0	Carpathian Foredeep	formation water flow
Dołuszyce 1	1178.5	1182.5	Jurassic	bituminous odour of the core
Grabina 1		20.0	Outer Carpathians	drilling fluid outflow
	1101.0	1124.0	Jurassic	inflow of 350 dm^3 brine with gasificated drilling fluid
Grabina 2		270.0	Miocene	gasificated drilling fluid blow out
		796.4		gasificated drilling fluid blow out
Grabina 4		904.0	Miocene	gasificated drilling fluid outflow
Grabina 11		1440.0	Miocene	gasificated drilling fluid after 10 hrs waiting
Jaroszówka 1	802.0	837.4	Outer Carpathians	0.24–0.75% of CH_4 in drilling fluid
	1627.0	1629.5	Jurassic	<0.20% of CH_4 in drilling fluid
	1629.75	1633.9		0.50–1.15% of CH_4 in drilling fluid
	1633.9	1639.4		0.17–0.57% of CH_4 in drilling fluid
Jaroszówka 2		18.0	Outer Carpathians	10 m^3 drilling fluid loss
Kamyk 2		1599.0	Miocene	gasificated drilling fluid
Książnice 1		415.5	Miocene	drilling fluid outflow
		430.0		gasificated drilling fluid
Książnice 2		534.0	Miocene	gasificated drilling fluid
	981.0	ca. 1002.0	Jurassic	brine
		1059.0		gasificated drilling fluid
Książnice 6	10.0	38.0	Miocene	circulation loss
Książnice 8		762.0	Miocene	1.8 m^3/3h drilling fluid loss
Liplas 2	230.0	235.0	Miocene	gasificated drilling fluid
	724.2	729.4	Jurassic	traces of oil in the core
	738.7	747.7		circulation loss
		776.0		gasificated drilling fluid
	942.4	946.9		circulation loss
		978.0		circulation loss
		992.8		circulation loss
		998.2		circulation loss
	2668.9	2672.4	Carboniferous	weak bituminous odour
	2714.8	2717.1	Carboniferous	bituminous odour
Nieznanowice 4		390.5	Miocene	gasificated drilling fluid blow out
	from 471.8			signs of drilling fluid gasification
Nieznanowice 5		232.0	Miocene	gasificated drilling fluid blow out
		993.0	Jurassic	circulation loss
Nieznanowice 5A		225.0	Miocene	gasificated drilling fluid
		251.6		drilling fluid outflow
		260.2		gasificated drilling fluid
		263.0		drilling fluid outflow
Nieznanowice 6	from 300.0		Miocene	gasificated drilling fluid
Pierzchów 2		467.5	Miocene	gasificated drilling fluid
		475.0		
Puszcza 10	830.0	863.2	Jurassic	bituminous odour
Wiatowice 3	785.0	791.0	Miocene	weak bituminous odour
Wiśnicz Nowy 2	1420.2	1421.7	Jurassic	weak hydrogen sulphide odour in the core
		ca. 1590		ca. 7 m^3 drilling fluid loss

Tab. 18. Hydrocarbon shows during drilling.

6. SEISMIC SURVEYS

The Królówka tender area is explored by 2D seismic surveys done in 1974-2014 (101 lines of total length of 1437.18 km; Tab. 19, Fig. 23). One 3D seismic survey – Łapanów – has been carried out, as well.

The seismic surveys in the Outer Carpathians and Carpathian Foredeep begun in 1960s. However, these old researches are of poor quality, having only historical value because of analogue recording/single-fold surveys (Zubrzycka, 2005). Better results were obtained in 1978, when 48-channels equipment and acquisition scheme by multi-fold coverage method were used in the "Żywiec-Wadowice-Gdów" seismic project (Tab. 19, Fig. 23). As a result, the seismic interpretations of the bottom surface of the Miocene (Msp), top surface of the Jurassic (Jstr) and bottom surface of the Jurassic (Jsp) were mapped.

In 1993 the "Liplas-Puszcza" seismic project was carried out (Łobaziewicz, 1995). The time and structural maps of the Miocene bottom surface, top and bottom surfaces of the Jurassic and the top surface of the Carboniferous, as well as the Cretaceous thickness and intra-Miocene surfaces were investigated. Nine structural objects outside of the Królówka tender area, and two objects within its NE part – Niepołomice and Krzeczów – were detected (Fig. 23). The Niepołomice object (within the Miocene succession) is seen as an anomaly on the seismic profiles 41-8-87K, 25-8-93K, 42-8-87K, 9-8-93K, and 43-8-87K. The object was drilled out by the Niepołomice 4 and Stanisławice 2 wells. In the first case, the results of the drilling tests are unknown. The second well – Stanisławice 2 – was drilled in 1992, and the gas shows were observed. The Krzeczów object (within the Miocene succession, as well) is seen on the seismic profiles 10-8-93K, 30-7-78K, 11-8-93K, and 31-7-78K. It was checked by the Puszcza 7 and Puszcza 10 wells, drilled in 1967, but their documentations are very poor. According to the current interpretation, the Niepołomice and Krzeczów objects have acreages of 3.6 and 4.5 km^2, respectively. However, further investigations (especially more recent seismic interpretations) are required.

In 2004, the "Kamyk-Niepołomice" 2D seismic project finished. Some new objects were mapped, while the older ones – previously detected structures – were reinterpreted. One of the new – the Liplas object (Fig. 23) – is related to the top surface of the Jurassic. The area of the object is 5 km^2, with 120 m amplitude and -550 m a.s.l. isoline. Another Jurassic object – Jaroszówka – has 3 km^2, 20 m amplitude and -820 m a.s.l. isoline. The object was checked by the Jaroszówka 1 well, which turned out to be dry. The other perspective objects in the Królówka tender area require additional interpretation works.

In 2008, the Łapanów 3D seismic survey was executed. A part of this survey covered the SE part of the tender area (Zubrzycka, 2009; Fig. 23). The data were reprocessed and reinterpreted in 2014 (Łukaszewski et al., 2014).

Name	Year	Seismic project name	Owner	Length
9-3-74K	1974	Myślenice-Sucha-	State Treasury	31.48
2-3-75K	1975	Sucha-Rabka-Nowy Targ		10.04
1-3-75K	1975			8.84
3-3-75K	1975			15.10
19-7-76K	1976	Brzesko-Pilzno-Olszyny		10.92
18-7-76K	1976			6.23
31-7-78K	1978	Bochnia-Czchów-Pilzno		15.77
63-7-78K	1978			13.21
30-7-78K	1978			10.60
11-1-78K	1978	Żywiec-Wadowice-Gdów		18.10
17-1-78K	1978			33.56
19-1-78K	1978			28.65
10-8-84K	1984	Wiśniowa-Łąkta		14.19
11-8-84K	1984			16.58
19-8-84K	1984			16.33
38-8-86K	1986			9.06
41A-8-86K	1986			11.71
42-8-86K	1986			9.94
43-8-86K	1986			10.80
37-1-87K	1987	Niepołomice-Gdów-Myślenice		19.15
42-8-87K	1987			11.89
41-8-87K	1987			18.41
31-1-87K	1987			20.57
40-1-87K	1987			8.92
43-8-87K	1987			13.92
38-1-87K	1987			13.98
36-1-87K	1987			11.86
42-1-88K	1988			16.17
48-1-88K	1988			24.14
5-1-89K	1989	Dobczyce-Gdów-Wolica	PGNiG S.A.	13.39
6-1-89K	1989			14.20
10-1-89K	1989			12.47
10A-1-89K	1989			13.81
33-1-88/89K	1989	Niepołomice-Gdów-Myślenice		20.23
32-1-89K	1989			24.04
45-1-89K	1989			13.75
11-8-91K	1991	Dobczyce-Gdów-Wolica		13.47
14-8-91K	1991			11.92
12-8-91K	1991			14.65
21-8-92K	1992			8.76
13-8-92K	1992			8.88
22-8-92K	1992			10.66
11A-8-92K	1992			11.88
20-8-92K	1992			15.23
7-8-92K	1992			12.42
23-8-92K	1992			9.54
8-8-92K	1992	Myślenice-Limanowa-Czchów		10.39
38B-7-92K	1992			9.80
5-8-93K	1993	Liplas-Grobla-Żukowice		14.62
3-8-93K	1993			14.84
19-8-93K	1993			12.49
27-8-93K	1993			13.59
28-8-93K	1993			13.55
24-8-93K	1993			10.85
11-8-93K	1993	Liplas-Puszcza		12.48
9-8-93K	1993			12.64
25-8-93K	1993			12.80
26-8-93K	1993			8.65
10-8-93K	1993			13.74
7-11-01K	2001	Raciechowice-Stadniki		13.99
3-11-01K	2001			12.79
24-11-01K	2001			10.04
9-11-01K	2001			14.69
5-11-01K	2001			8.69
1-11-01K	2002		State	12.64
16-1-03K	2003	Puszcza-Krzeczów-Borek	Treasury	9.15
17-1-03K	2003			13.89
19-1-03K	2003			9.37
20-1-03K	2003			8.42
2-1-03K	2003			8.60
3-1-03K	2003			9.72
6-1-03K	2003			6.15
21-1-03K	2003			12.85
1-1-03K	2003			8.30
15-1-03K	2003			10.57
4-1-03K	2003			8.56
18-1-03K	2003			8.33
5-1-03K	2003			9.30
15-1-04K	2004	Kamyk-Niepołomice		21.69
17-1-04K	2004			19.12
2-1-04K	2004			15.69
11-1-04K	2004			21.58
12-1-04K	2004			22.06
8-1-04K	2004			14.39
16-1-04K	2004			18.91
14-1-04K	2004			21.70
6-1-04K	2004			18.29
5-1-04K	2004			18.89
3-1-04K	2004			18.07
7-1-04K	2004			17.41
1-1-04K	2004			15.68
4-1-04K	2004			18.87
13-1-04K	2004			22.44
T0061904	2004	Krzeczów-Rajsko-3C		7.38
20-2-05K	2005	Wiśnicz		9.88
15-2-05K	2005			19.83
19-2-07K	2007	Tarnawa-Czchów		21.58
21-2-07K	2007			11.81
18-2-07K	2007			19.24
4-2-07K	2007			15.07
22-2-07K	2007			11.69

SUMMARY:	
PGNIG S.A.	**449.94**
State Treasury	**987.24**
Total	**1437.18**

Tab. 19. Seismic surveys conducted on the Królówka tender area (CBDG, 2019).

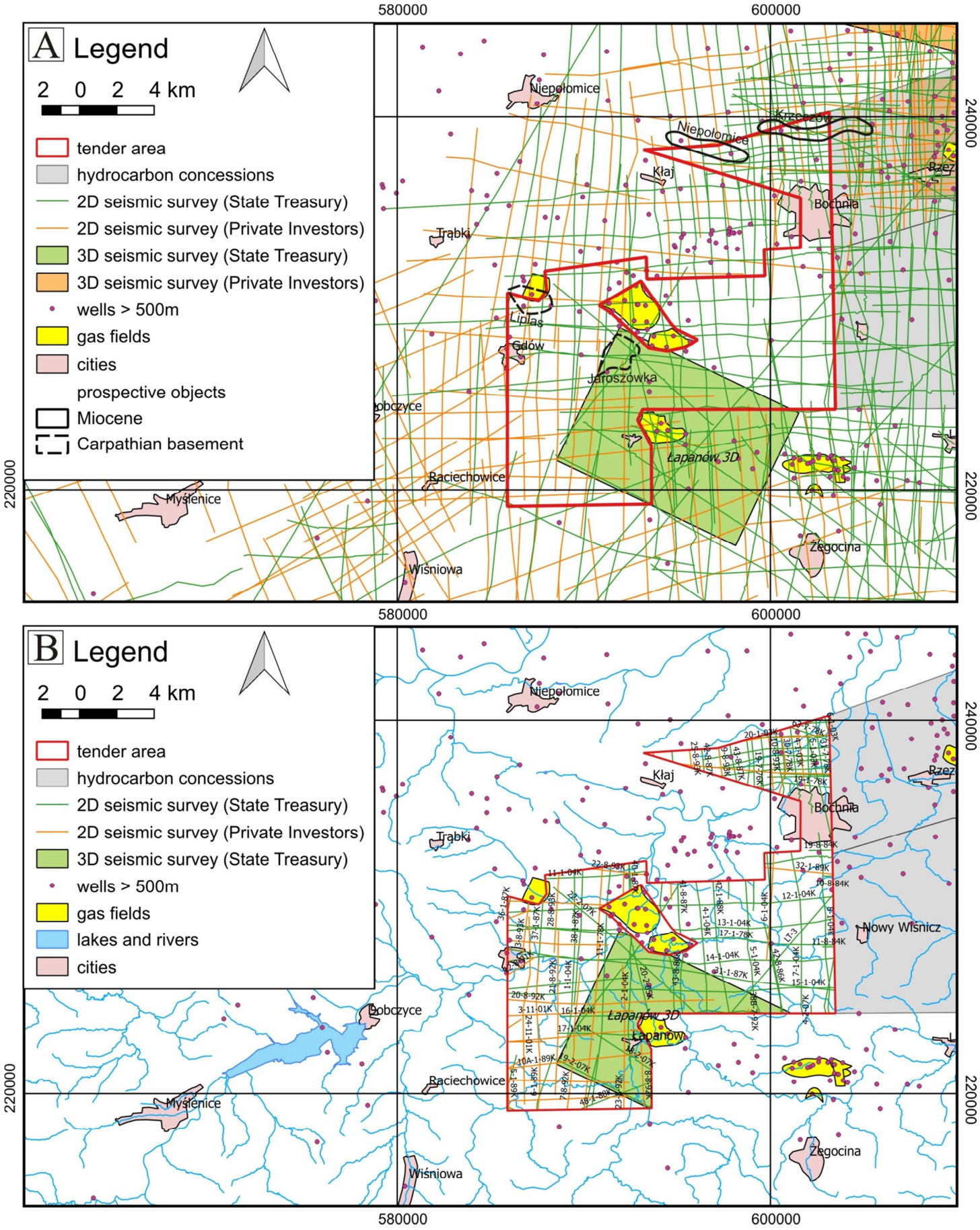


Fig. 23. A. Seismic surveys conducted in the Królówka tender area and in its neighborhood with location of the prospective objects in the Miocene of the Carpathian Foredeep (Niepołomice and Krzeczów structures) and in the basement of the Carpathian units (Liplas and Jaroszówka structures). **B.** 2D and 3D seismic surveys within the Królówka tender area.

7. GRAVIMETRY, MAGNETOMETRY AND MAGNETOTELLURICS

7.1 GRAVIMETRY

The major part of the Królówka tender area is covered by the "Western Carpathians" semidetailed gravimetric survey (Fig. 24 – no. 1; Reczek, 1978), with average density of 4 stations/km^2. The northern part of the area was covered by a subsequent survey in the Carpathian Foredeep (Fig. 24 – no. 2; Łąka and Ostrowski, 1987), with a bit lower point density of 2.5 stations/km^2.

There are also four detailed surveys within the Królówka tender area or in its close surroundings. The first one was conducted along regional magnetotelluric profile (Fig. 24 – no. 6; Ostrowski et al., 2001). The second one – Puszcza-Krzeczów-Borek (Fig. 24 – no. 3; Ostrowski, 2003) and the third one (Fig. 24 – no. 4; Ostrowski et al., 2002) run along seismic profiles, with a 50 m and 100 m steps, respectively. There are also some additional measurements with irregular point distribution (9–10 stations/km^2) at the third survey. The last survey (Fig. 24 – no. 5; Ostrowska et al., 2006) has an irregular point distribution with average distance ca. 400 m. There are three profiles as well, with a 100 m step.

Królikowski and Petecki (1995) proposed a division of Poland into several gravity regions. The Królówka tender area is placed at the southern part of the Szczecin-Mogilno-Miechów Low – at a part called the Nida Depression (Fig. 25).

Hydrocarbon reservoir zones can be analysed by gravity method using transformed maps such as residual anomalies resulting from BTWR filter (Fig. 26; Szczypa and Oniszk, 2002). A zone of low-amplitude, positive anomalies in the northern part of the map is caused by reservoirs, which has been confirmed by production wells. There is a distinct belt of negative anomalies, with a characteristic shape of the Gdów Embayment. Residual anomalies become stronger to the south of the aforementioned negative belt and their pattern correlates with the Carpathians. The negative anomalies reflects relatively light rocks of the Subsilesian Unit, while its south border coincides with a northern border of Magura unit, characterized by high densities (Szczypa and Oniszk, 2002).

7.2. MAGNETOMETRY

There are two separate magnetic surveys on the Królówka tender area and its close neighborhood. The first one is an aeromagnetic survey of the Carpathians and their foreland (Fig. 27 – black dots; Wasiak, 1982). The resulting data had to be filtered to remove the noise coming from electrified railways. As an effect, only regional anomaly image was obtained. The second survey is a ground, semidetailed one (Fig. 27 – blue dots; Kosobudzka and Wrzeszcz, 2005).

The magnetic anomaly map (Fig. 28) was drawn on the basis of a Magnetic Map of Poland (Petecki et al., 2003; Petecki and Rosowiecka, 2017), which is divided into several regions with different magnetic characteristics. The Królówka tender area is located within the Upper Silesia and Malopolska domain (USMd) in which several magnetic regional highs occur. The southern part of the USMd is dominated by three positive anomalies: Tychy, Jordanów and Nowy Sącz. The last one appears at the south-eastern corner of the Fig. 28. The Nowy Sącz anomaly should be related to the Precambrian basement of the Carpathians (Grabowska et al., 2007; 2011).

7.3. MAGNETOTELLURICS

Several MT profiles were conducted within the Królówka tender area and in its close neighborhood. The oldest two of them (Fig. 29 – no. 1 and 3; Święcicka-Pawliszyn, 1986; Molek and Oraczewski, 1988) helped to develop a depth map of the top surface of consolidated basement rocks. Correlation of MT with gravimetric pattern was prepared within later MT works (Fig. 29 – no. 2; Stefaniuk, 1999; Stefaniuk et al., 2001). Resistivity section along the Bukowina Tatrzańska-Niepołomice profile (Fig. 29 – grey dashed line), shows distinct differentiation into two zones (Fig. 30). There is a high resistivity (presumably crystalline) massif with ca. 2 km complex of the Mesozoic–Paleozoic deposits to the north. The southern zone seems to be a tectonic trench, filled with low resistivity, higher Paleozoic and Mesozoic deposits. A rock complex characterized by 200–300 Ωm resistivity at the bottom of the southern zone can be interpreted as the Devonian series. A strong resistivity contrast between the Sub-Miocene basement/Miocene sediments and flysch cover was detected at the Raciechowice-Stadniki MT survey (Fig. 29 – no. 4; Stefaniuk, 2002). Additionally, a pattern of flysch cover resistivity reflects lithological differentiation of flysch rocks (high resistivity sandstones and low resistivity calystones and mudstones).

The last one – Tarnawa-Łąkta-Czchów MT survey (Fig. 29 – no. 5; Ostrowska et al., 2006) – was conducted together with gravimetric survey. An integrated interpretation of both geophysical methods showed that there is a fault zone within the sub-Cenozoic basement.

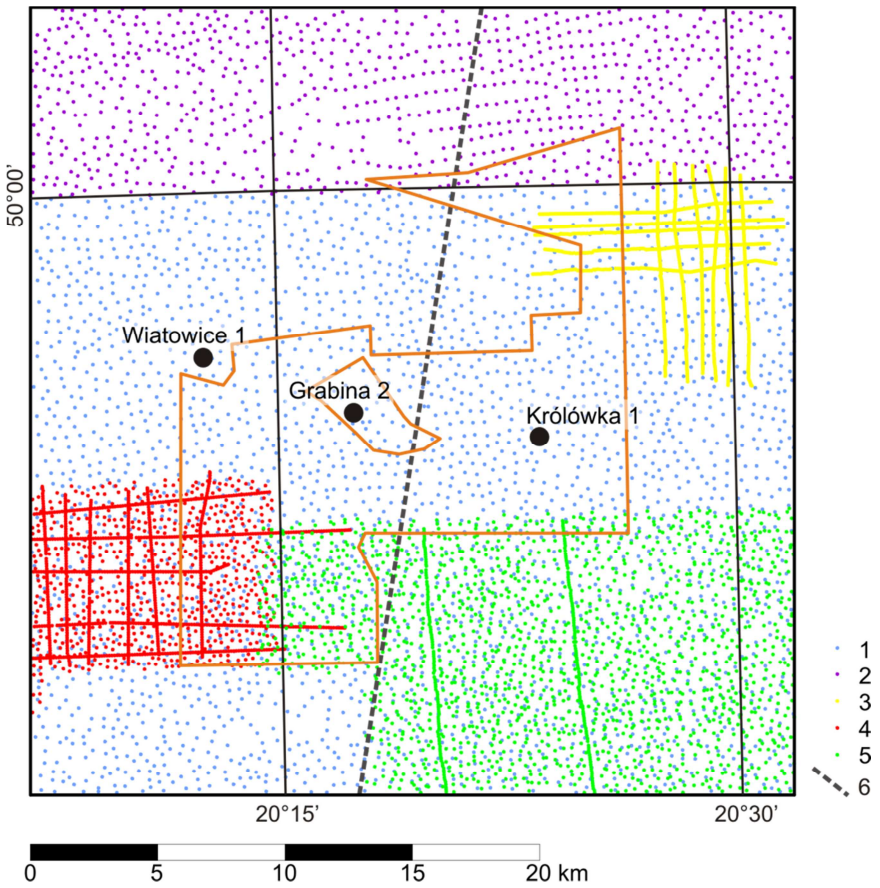


Fig. 24. Distribution of gravimetric measurements in the Królówka tender area and in its close neighbourhood. Orange line – boundaries of the tender area; 1 – Reczek, 1978; 2 – Łąka and Ostrowski, 1987; 3 – Ostrowski, 2003; 4 – Ostrowski et al., 2002; 5 – Ostrowska et al., 2006; 6 – Ostrowski et al., 2001., black dots – key wells.

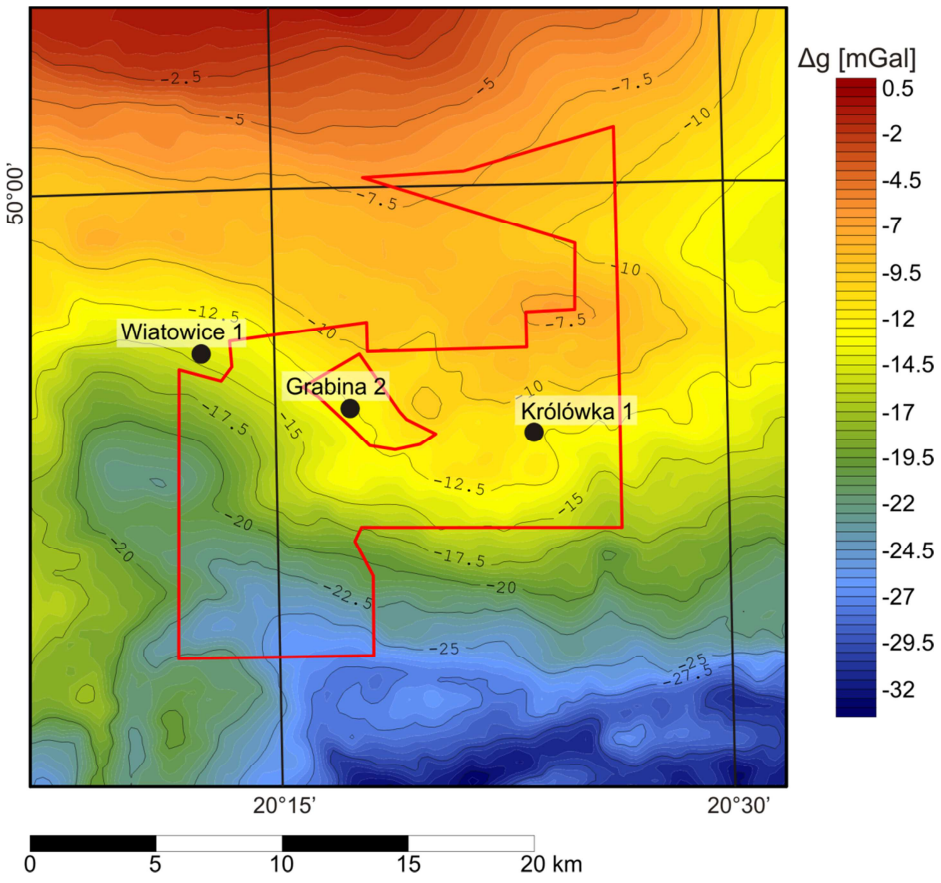


Fig. 25. Location of the Królówka tender area on the Bouguer gravity anomaly map of Poland, with a reduction density of 2.25 g/cm^3. Red line – boundaries of the tender area; black dots – key wells.

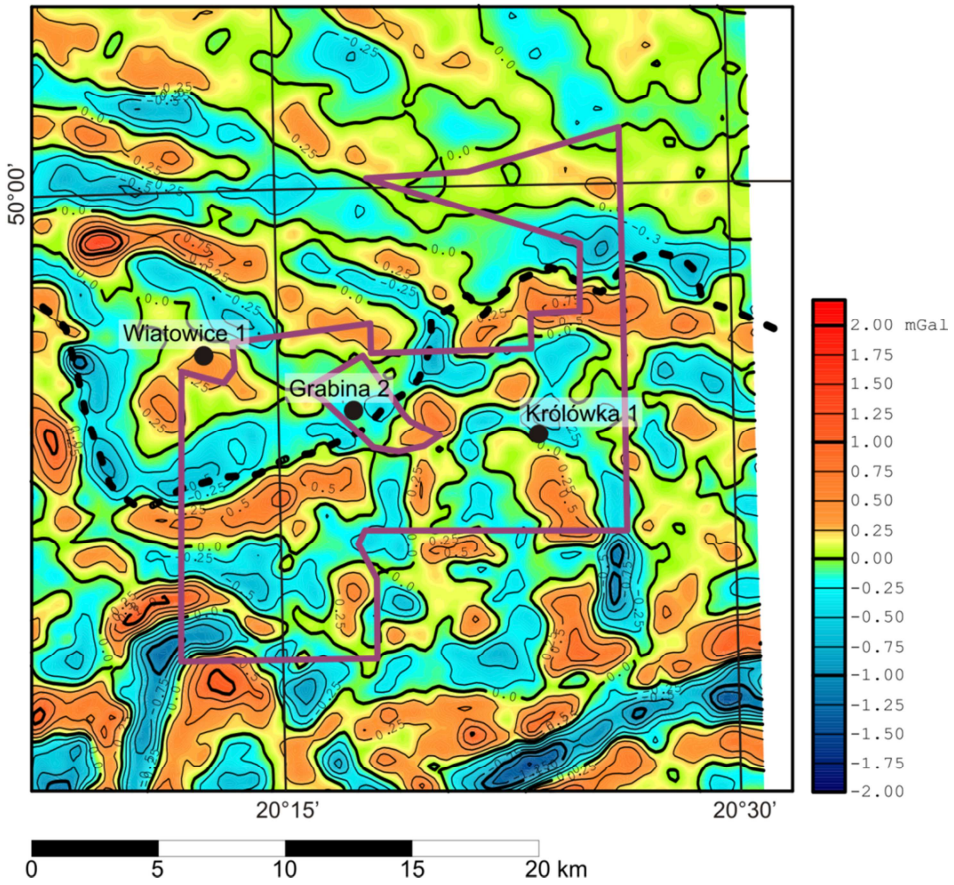


Fig. 26. Gravimetric map – residual anomalies in the Królówka tender area and its close neighborhood, BTWR filter with a conventional depth of 1.5 km (Szczypa and Oniszk, 2002). Purple line – boundaries of the tender area; black dashed line –Carpathians deformation front, black dots – key wells.

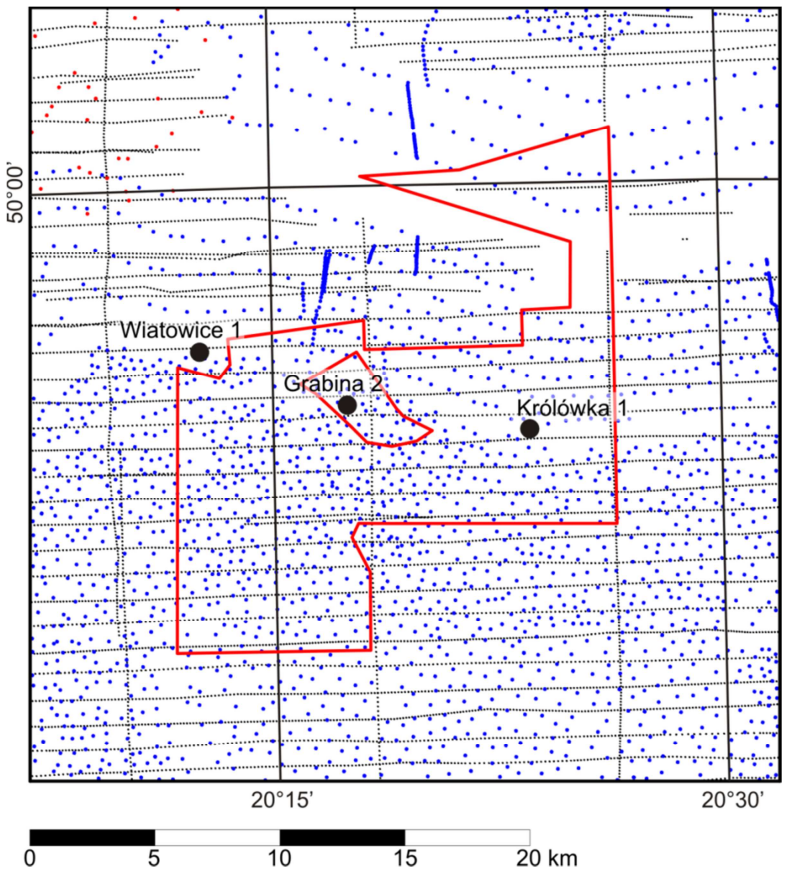


Fig. 27. Distribution of magnetic stations in the Królówka tender area and in its close neighbourhood: black points – Wasiak, 1982; blue dots – Kosobudzka and Wrzeszcz, 2005. Red line – boundaries of the tender area, bigger black dots – key wells.

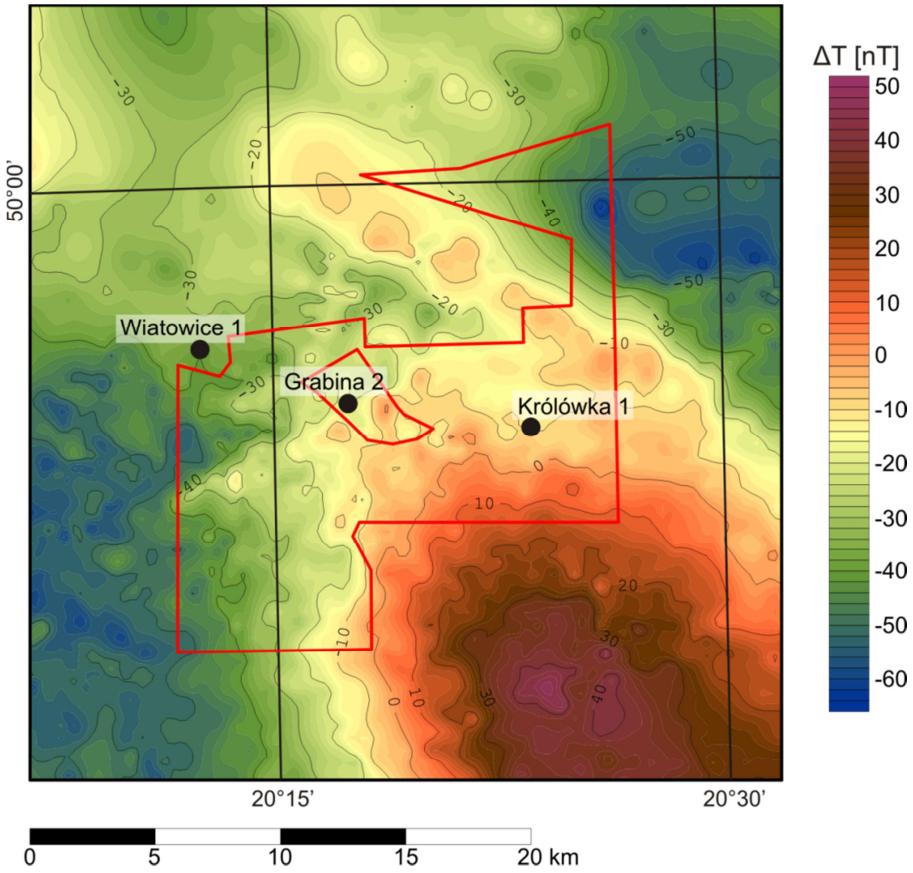


Fig. 28. Location of the Królówka tender area on the magnetic anomaly map of Poland (based on CBDG, 2019). Red line – boundaries of the tender area, black dots – key wells.

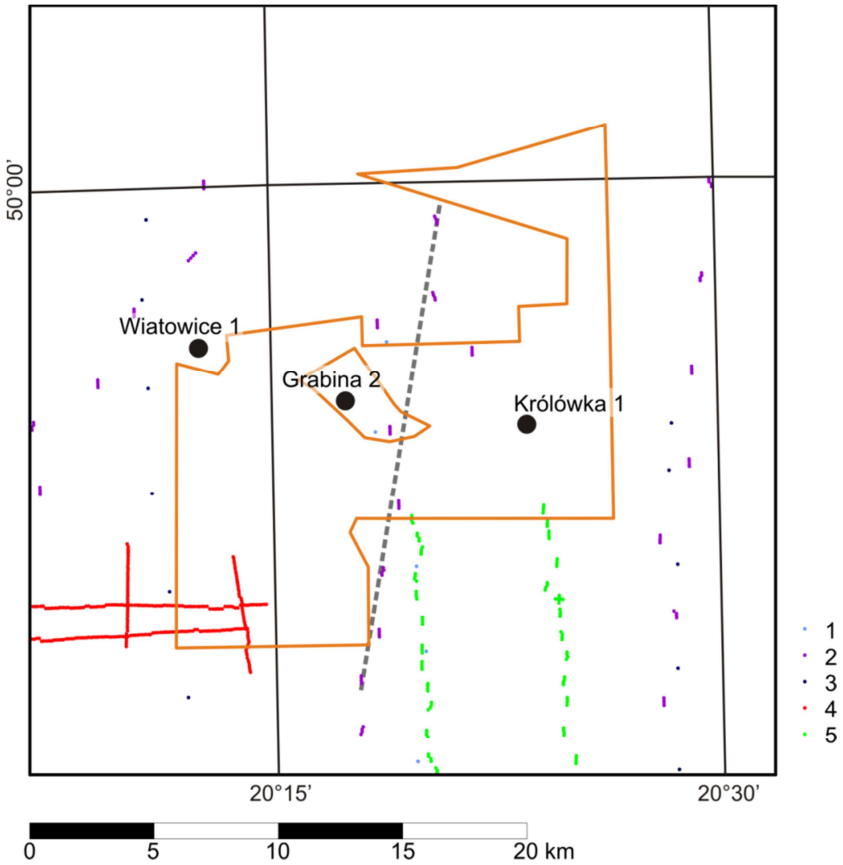


Fig. 29. Distribution of magnetotelluric surveys in the Królówka tender area and in its close neighbourhood: 1 – Święcicka-Pawliszyn, 1986; 2 – Stefaniuk, 1999, Stefaniuk et al., 2001, 3 – Molek and Oraczewski, 1988; 4 – Stefaniuk, 2002; 5 – Ostrowska et al., 2006; grey dashed line – part of Bukowina Tatrzańska-Niepołomice profile (Stefaniuk et al., 2001). Orange line – boundaries of the tender area, black dots – key wells.

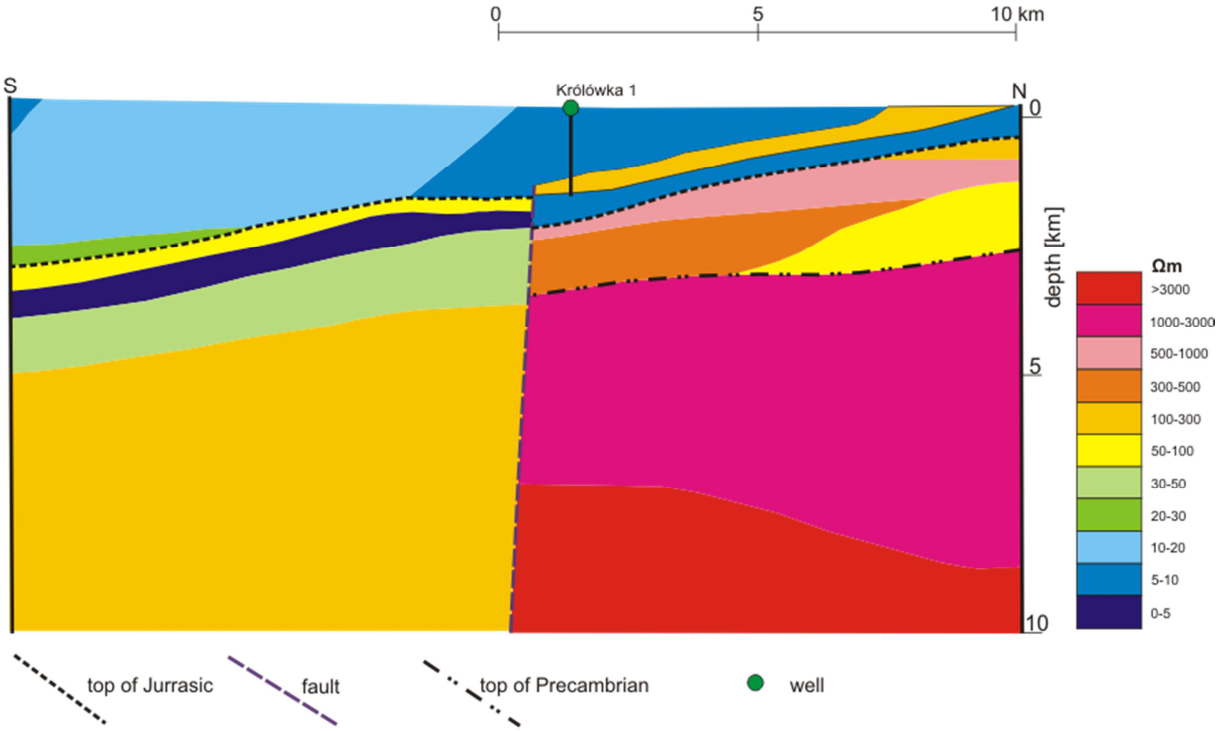


Fig. 30. Part of geoelectric section along Bukowina Tatrzańska-Niepołomice profile (Stefaniuk et al., 2001). Location of the section – see Fig. 29.

8. HYDROCARBON PROSPECTIVE

The Królówka tender area is located in the southern Poland, in the Southern Petroleum Province (Fig. 31). The area is located at the border of the Outer Carpathians and Carpathian Foredeep. Below the Carpathian units, the Upper Silesian Block and Małopolska Block with its Paleozoic-Mesozoic sedimentary cover occur.

Three independent petroleum systems work in the Królówka tender area. The first one occurs in the Outer Carpathians, being only partly developed. The second system occurs in the autochthonous Miocene of the Carpathian Foredeep, in which biogenic gas is generated from fine-grained sediments and accumulated in multi-layered traps. The third system is related to the Paleozoic-Mesozoic basement, in which gas and oil accumulations are expected in the Devonian, Jurassic and Cretaceous.

Numerous hydrocarbon fields have been discovered in the neighborhood of the Królówka tender area. The Liplas, Grabina-Nieznanowice, Grabina-Nieznanowice S, Łąkta, Łapanów, Raciborsko, Grobla, Dąbrówka, Grądy Bocheńskie and Jadowniki fields are the most important analogues for further exploration in the Miocene of the Carpathian Foredeep and its basement.

The exploration risks are related mostly to a proper definition of the trap geometry. The Królówka area is well recognized by seismic survey: the distance between 2D profiles is from 0.5–0.7 km in the eastern part to 1.5–2.0 km in the southern part of the area. 101 seismic profiles of total length about 1437 km have been conducted, so far. Moreover, the Łapanów 3D seismic survey covers the SE part of the tender area. As a result, the Niepołomice and Krzeczów structural objects have been mapped in the Miocene in the northern part of the area, and Liplas and Jaroszówka objects, related to the top of the Mesozoic basement, have been discovered in the central part. These prospects formed during thrusting of the Carpathians, when the Miocene deposits were deformed at the front and below of the Carpathian Overthrust, and block deformation of the Carpathian basement co-occurs. The objects could also developed together with formation of the Biadoliny-Łętowice-Szczepanów triangle zone within the Carpathian succession.

Also, 72 deep wells drilled out the prospective horizons in the Królówka tender area and in its neighborhood. The hydrocarbon shows occurred in the Miocene succession and in the Cretaceous and Jurassic basement.

Possible minimum work program for prospection and exploration phase:

- Stage I (12 months) – integration and reinterpretation of archival geological data;
- Stage II (48 months) – drilling of 2 wells to the maximal depth of 4500 m TVD with obligatory coring of prospective intervals.

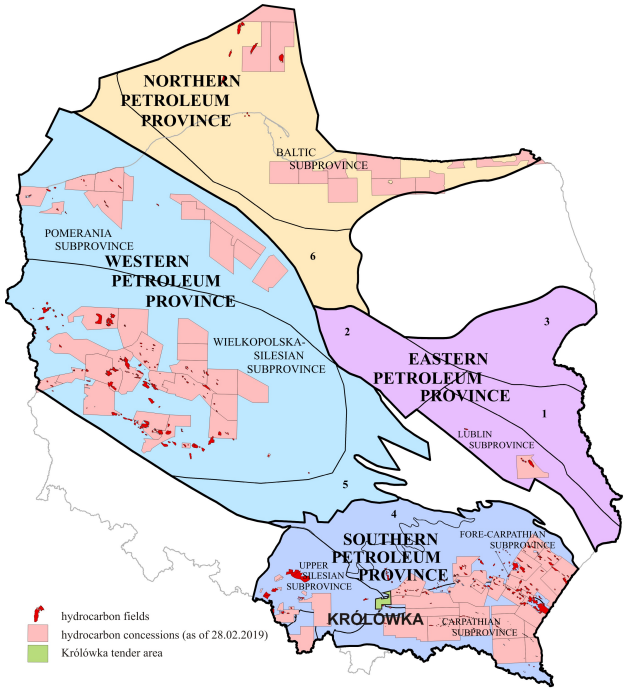


Fig. 31. Hydrocarbon subdivision of Poland (PIG-PIB, 2019) with location of the Królówka tender area. 1–6 – petroleum regions (of unconfirmed/hypothetical prospectivity): 1 – Chełm Region, 2 – Płock-Warszawa Region, 3 – Podlasie Region, 4 – Małopolska Region, 5 – Łódź-Wieluń Region, 6 – Słupsk-Grudziądz Region.

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