MAP 508 • 2021

Bedrock geology of Dodge County, Wisconsin

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EXPLANATION OF MAP UNITS

Quaternary

Undifferentiated sediment

Qu — Unconsolidated sediments deposited by modern and glacial processes. Generally 20–60 feet (ft) thick; ranges from absent where bedrock crops out to more than 200 ft thick in preglacial bedrock valleys. Shown in cross sections only.

Silurian

Dolostone, undivided *(Llandovery, Aeronian; 0–250 ft)*

Su — Light-gray dolostone and shaly dolostone; locally fossiliferous with brachiopods, corals, and gastropods; chert nodules common near base. Exposed in isolated ledge-forming outcrops along edge of Niagara Escarpment; locally deeply incised by east-west-trending bedrock channels infilled with several hundred feet of unconsolidated sediments. Overlies the Maquoketa Formation across a sharp contact.

Ordovician

Maquoketa Group, undivided *(Upper Ordovician, upper Katian; 0–270 ft)*

Om — Slope-forming unit along edge of Niagara Escarpment. Includes Neda, Brainard, Fort Atkinson, and Scales Formations. Unreoded thickness between 180 and 270 ft. Overlies Galena Formation of Sinnipee Group across a sharp contact.

Neda Formation (0–30 ft). Red, hematitic, dolomitic, and goethite-bearing mudstone to oolite. Lenticular, laterally discontinuous beds.

Brainard Formation (80–100 ft). Light-gray to green, dolomitic shale and lesser shaly dolomite and grainstone.

Fort Atkinson Formation (10–15 ft). Light-gray to green, shaly dolostone. Locally fossiliferous with thin (centimeter-scale) beds of fossil hash, especially towards base.

Scales Formation (110–150 ft). Dark-gray to green shale. Locally fossiliferous with thin (centimeter-scale) beds of fossil hash.

Sinnipee Group, undivided *(Upper Ordovician, upper Sandbian to upper Katian; 0–230 ft)*

Os — Includes Galena, Decorah, and Platteville Formations. Platteville Formation crops out in western Dodge County; Galena and Decorah Formations are present but poorly constrained by well cuttings. Unreoded thickness between 200 and 230 ft.

Galena Formation (maximum 160 ft). Gray to beige, fossiliferous dolostone.

Decorah Formation (absent to less than 10 ft). Silty dolostone.

Platteville Formation (40–60 ft). Gray, yellow, and beige; fine-grained dolostone. Internally structureless to planar-laminated dolostone includes molds and casts of brachiopods and lesser trilobites, gastropods, crinoids, and cephalopods. Displays common millimeter-scale, dark-gray, wavy, discontinuous silt laminations and scour surfaces; common to rare, millimeter- to centimeter-scale, ovoid burrows in thicker silt laminations; ovoid, mud-lined burrows in fine-grained, mottled to relatively structureless dolostone matrix; and centimeter-scale beds of fossil hash. Crops out as thin (decimeter- to meter-scale), laterally continuous, tabular beds that locally cap isolated bedrock plateaus. Overlies St. Peter Formation across a sharp contact.

Ancell Group, undivided *(Middle to Upper Ordovician, upper Darriwilian to lower Sandbian; 0–170 ft)*

Oa — Includes Glenwood and St. Peter Formations. St. Peter Formation crops out in western Dodge County. Glenwood Formation is present but known only from well cuttings.

Glenwood Formation (less than 10 ft; locally may reach 20–30 ft). Carbonate-cemented sandstone to sandy dolostone.

St. Peter Formation, undivided (0–165 ft). Consists of Tonti and Readstown Members. Members are present as laterally discontinuous interbedded lithofacies. Overlies Prairie du Chien Group or Trempealeau Group across a sharp, erosional, and unconformable contact. Locally may exceed 250 ft in northeastern Dodge County.

—Tonti Member (0–150 ft). Gray, white, beige, yellow, orange, and red; medium- to coarse-grained; well-rounded; well- to moderately well-sorted sandstone. Exhibits high- to low-angle crossbedding, fine (pinstripe) laminations, or is internally structureless. Other features include common soft-sediment deformation; common decimeter-scale, brittle slumping of crossbedded and internally structureless strata; and localized millimeter- to centimeter-scale sulfide mineralization disseminated throughout the matrix and concentrated along bedding planes, fractures, and brittle slump planes. Locally intercalated with centimeter-scale beds of poorly sorted clay to silty sandstone. Prevalent at top of St. Peter Formation, locally absent. Gradational contact or interbedded with Readstown Member.

—Readstown Member (0–86 ft). Gray, red, and green clay; siltstone; and poorly sorted clay to silty sandstone. Includes meter-scale interbeds of green or red, silty clay and lesser moderately well-sorted sandstone with interlaminated clay; common scour surfaces overlain by decimeter-scale, massive to convolute-bedded silt or clay with white chert or angular chert clasts; lesser centimeter-scale pebble-lag beds composed of quartzite and chert pebbles (millimeter scale) in a very coarse-grained sandstone matrix; and lesser planar- to wavy-laminated silt and clay. Commonly intercalated with centimeter- to decimeter-scale beds of medium- to coarse-grained, well- to moderately well-sorted, crossbedded sandstone. Prevalent toward middle to base of St. Peter Formation, locally absent.

Prairie du Chien Group, undivided *(Lower Ordovician, Tremadocian to lower Floian; 0–140 ft)*

Opc — Includes Shakopee and Oneota Formations. Unreoded thickness of about 150 ft. Overlies Trempealeau Group across a sharp contact.

Shakopee Formation (0–119 ft). Gray and beige dolostone grading into lesser sandy dolostone. Interbedded (commonly across scour surfaces) with centimeter- to decimeter-scale beds of very coarse-grained, well-rounded sandstone; green to gray siltstone; or clay. Dolostone is massive, parallel laminated, oolitic, or vuggy. Vugs are millimeter to centimeter scale and locally filled with quartz; some are clustered and appear to be microbially derived (thrombolytic). Sandy dolostone is predominantly red with low-angle to planar-parallel crossbedding and scour surfaces; angular dolostone clasts commonly overlie scour surfaces. Locally underlain by interbedded dolostone, sandstone, and clay of the Oneota Formation.

Oneota Formation (0–36 ft). Gray to beige dolostone is massive to planar to wavy-laminated, vuggy, and locally oolitic. Vugs are round, ovoid, or vertical; clustered in centimeter- to decimeter-thick intervals; and are likely microbially derived (thrombolytic). Includes lesser sandy dolostone and interbedded sandstone.

Cambrian

Trempealeau Group, undivided *(Furongian; 0–100 ft)*

Ct — Includes Jordan and St. Lawrence Formations.

Jordan Formation (0–60 ft). White, beige, and yellow; medium- to coarse-grained; well-rounded; well-sorted sandstone; local green to gray, thin (centimeter scale) interbeds of clay or interlaminated fine-grained sandstone, silt, and clay. Poorly to moderately cemented. Includes common, localized high- and low-angle crossbeds and lesser gray, wavy siltstone laminae; localized metallic-gray sulfide mineralization (millimeter scale) disseminated in sandstone matrix. Thickness varies greatly across unit's extent, but may reach 100 ft in northeastern Dodge County.

St. Lawrence Formation (0–66 ft). Consists of Lodi and Black Earth Members. Members are present as laterally discontinuous interbedded lithofacies. Overlies Tunnel City Group across a gradational contact.

—Lodi Member (0–63 ft). Red, green, and beige; fine- to medium-grained; poorly sorted; glauconitic; mottled; dolomitic sandstone and silty sandstone. Sandstone beds are very poorly sorted with a predominant mottled texture of probable microbial origin; local coarse-grained, glauconitic (15–20 percent), centimeter-scale crossbed sets overlie scour surfaces. Includes common centimeter-scale interbeds of planar-laminated, fine-grained sandstone and siltstone to mudstone with Skolithos burrow or soft-sediment deformation including flame structures and millimeter-scale, lithified dolomite clasts. Gradational contact and locally interbedded with underlying Black Earth Member.

—Black Earth Member (0–13 ft). Tan, pink, or gray; mottled; fine-grained; silty dolostone. Exhibits wispy, discontinuous, gray, fine-grained laminations; and millimeter-scale, calcite-filled vugs of probable microbial (stromatolitic) origin.

Tunnel City Group, undivided *(Furongian; 0–155 ft)*

Ctc — Includes Lone Rock and Mazomanie Formations. These formations are both interbedded and laterally discontinuous and therefore cannot be mapped individually at this scale in Dodge County. Overlies Elk Mound Group across a sharp contact.

Pink, gray, white, and green; coarse- to fine-grained; moderately to poorly sorted; glauconitic sandstone, siltstone, and mudstone with variable carbonate cement. Glauconite concentrations are generally less than 3 percent but locally 15–20 percent and are especially concentrated along scoured surfaces and immediately overlying centimeter- to decimeter-scale, medium- to coarse-grained sandstone beds. Exhibits predominant mottled texture of probable microbial origin; lesser high- and low-angle crossbedding with abundant coarse-grained glauconite concentrated along crossbed foresets within intervals of coarse-grained sandstone; meter-scale intervals of mottled beige and green sandstone through mudstone likely caused by bleaching (oxidation) from secondary fluid flow. A distinct red, tan, and gray; laminated; slightly burrowed mudstone to fine-grained sandstone bed (about 1 ft thick) was identified toward the base in multiple boreholes in Dodge and Columbia Counties.

Elk Mound Group *(Epoch 3 to lower Furongian; uncertain maximum thickness)*

Includes Wonewoc, Eau Claire, and Mount Simon Formations. Paleoproterozoic to Mesoproterozoic Baraboo interval sediments across a nonconformity; grades laterally into Parfreys Glen Formation near elevated areas in underlying Precambrian surface. Variations in thickness are mostly accommodated by Mount Simon Formation and reflect variations in topography of underlying Precambrian surface. Shown in cross sections only.

Ce — **Undivided** (absent to more than 460 ft).

Cew — **Wonewoc Formation** (0–100 ft). White to pink, medium- to coarse-grained, well-rounded, well-sorted, texturally and compositionally mature quartz arenite. Characterized by high- and low-angle crossbeds, planar beds, and internally structureless beds. Centimeter-scale quartzite pebbles locally overlie scour surfaces; localized abundant sulfide mineralization and associated calcite cementation are concentrated along high-angle fractures and disseminated throughout the sedimentary matrix. The Sauk II–Sauk III unconformity, present in upper Wonewoc Formation (Runkel and others, 1998), is evident in drill core by an abrupt increase in grain size and higher concentration of heavy minerals. Overlies Eau Claire Formation across a gradational contact.

Cee — **Eau Claire Formation** (0–150 ft). White, fine- to medium-grained sandstone with common discontinuous, gray or green, millimeter- and centimeter-thick silt to clay laminations. Overlies the Mount Simon Formation across a gradational contact. Well construction reports indicate fine-grained fraction increases in eastern Dodge County.

Cem — **Mount Simon Formation** (absent to more than 250 ft). Similar to Wonewoc Formation. Locally includes discontinuous, gray silt laminations. Indistinguishable from Wonewoc Formation where Eau Claire Formation is absent.

Parfreys Glen Formation *(Epoch 3(?) through Lower Ordovician(?); 0–10 ft)*

COpg — Pebble to cobble conglomerate. Rounded to subrounded quartzite pebbles, cobbles, and boulders (4- to 6-ft diameter) in coarse- to medium-grained sandstone matrix. Beds are massive to lenticular, 3–5 ft thick. Exhibits high-angle crossbedding in sandier intervals. Locally present overlying high-elevation Precambrian quartzite bedrock. Lower contact is an angular unconformity with Precambrian Baraboo interval rocks; upper contact is gradational with overlying Cambrian units (through Jordan Formation) and possibly with Ordovician Oneota Formation based on observations of this contact about 50 miles to the west in Sauk County (Clayton and Attig, 1990). Shown in cross sections only.

Mesoproterozoic

Pegmatites and mafic intrusions *(uncertain age)*

Ypm — Pegmatites likely related to the Wolf River batholith (about 1.46 million years old, or Ma), part of the Eastern Granite-Rhyolite province (1,50–1.44 Ma; see Bucholz and others, 2005; Bickford and others, 2015; Holm and others, 2020). Mafic intrusions of uncertain affinity; may be related to the Wolf River batholith or the Midcontinent Rift (about 1.1 billion years old, or Ga). Mafic dikes and pagmatites are reported from Waterloo quarry in southeastern Dodge County. These units are mostly inferred from regional aeromagnetic data and geochronologic and geochemical data that indicates alteration of Baraboo interval metasediments during emplacement of Wolf River batholith (Bucholz and others, 2005; Medaris and others, 2019; Holm and others, 2020). Shown in cross sections only.

Mesoproterozoic to Paleoproterozoic

Baraboo interval metasediments, undivided *(younger than 1,710 Ma; uncertain maximum thickness)*

XYb — Includes at least two units in Dodge County: Waterloo Quartzite and an unnamed iron-formation. The nature of the contact between the Waterloo Quartzite and underlying units is unconstrained in Dodge County and unconformable in the Baraboo Hills, 50 miles to the west (Stewart and others, 2018; Stewart and Stewart, 2020).

Waterloo Quartzite *(uncertain thickness—likely more than 800 ft)*

Yw — Pink, white, and gray pebble conglomerate to medium-grained quartzite and green to gray schist. Observed minerals include quartz, muscovite, chlorite, kaolinite, plagioclase, andalusite, hematite, rutile, apatite, and zircon (Geiger and others, 1982). Normally graded beds 5–15 ft thick commonly fine upward from granule conglomerate to fine-grained sandstone and siltstone. Pebbles (2–23 mm, long axis) of rounded quartzite and subrounded to subangular jasper and dark lithic fragments (probably slate) are concentrated near the base of beds. Sedimentary structures include trough crossbeds, low- and high-angle crossbeds, planar beds, and internally structureless beds. Fine-grained (pelitic and quartzose schist) intervals are typically 5–100 mm thick with common euhedral andalusite porphyroblasts in a foliated, muscovite-chlorite groundmass. Lower contact with underlying iron-formation is not directly observed in the map area. Detrital zircons indicate a maximum depositional age of 1,643 Ga±11 Ma (Schwartz and others, 2018). Crops out or is shallowly buried near Waterloo. Shown in cross sections only.

Iron formation *(uncertain thickness)*

XYi — Blue-green, red, and white iron formation with varied clastic fraction. Includes interbedded and interlaminated carbonate, chert, and hematite-rich siltstone to mudstone; and thin beds (15–30 cm) of predominantly hematite-rich clay and silt or interlaminated, hematite-rich clay, silt, and recrystallized carbonate. Primary mineral assemblage is iron- and magnesium-rich silicates and lesser kaolinite, iron oxides, and chert; prevalent carbonate veins and detrital minerals present. Known from one drill core (WGNHS Slinger; WID: 14001388), several well construction reports, and inferred from aeromagnetic anomalies. Lower contact is not directly observed in the map area. Shown in cross section only.

Interpretation

For more information about the bedrock geology of Dodge County, Wisconsin, please refer to the supplemental report that accompanies this map.

Acknowledgments

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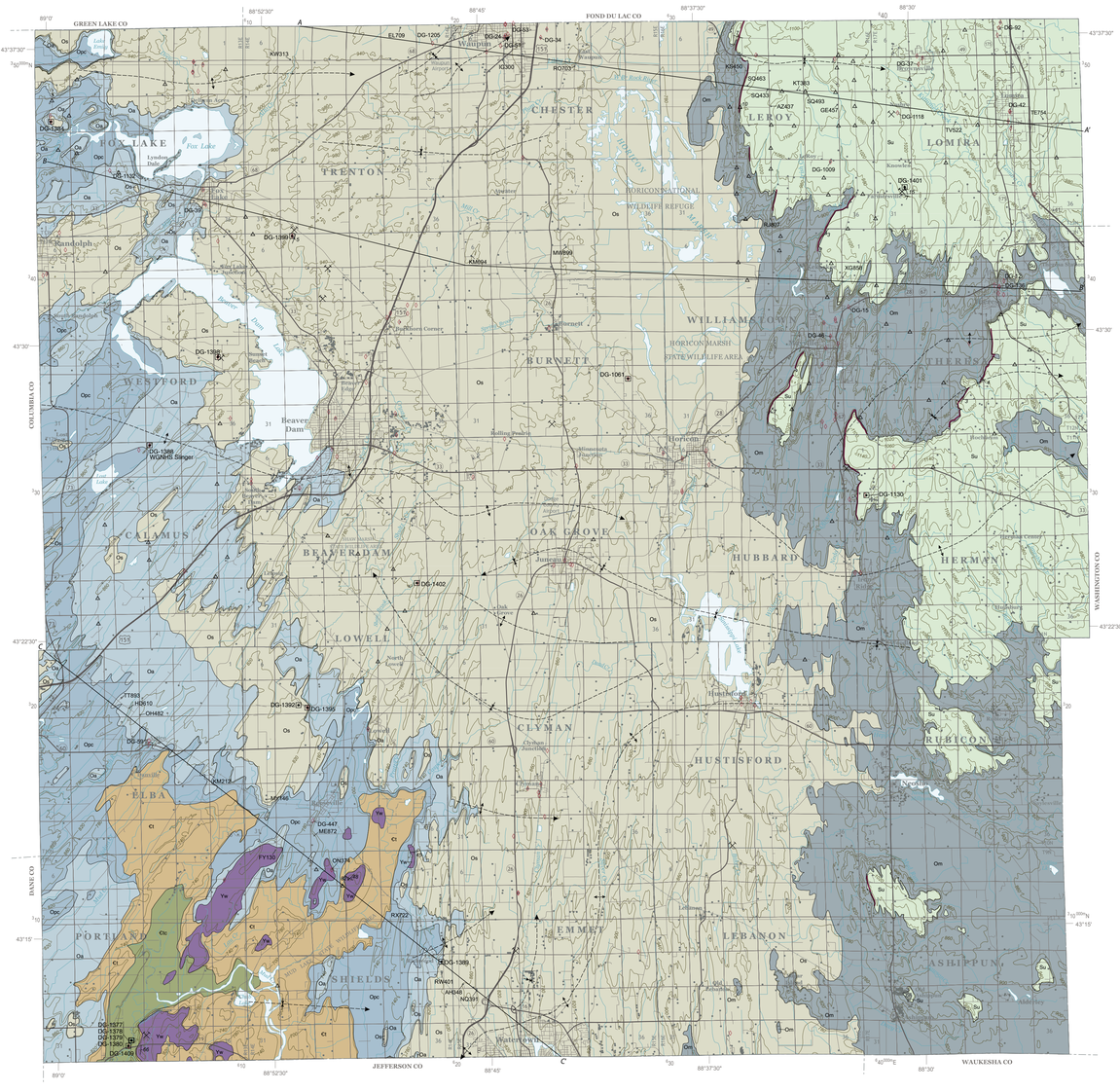
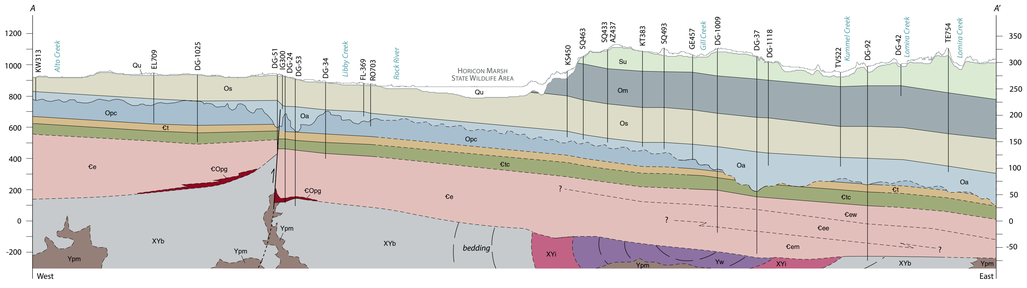
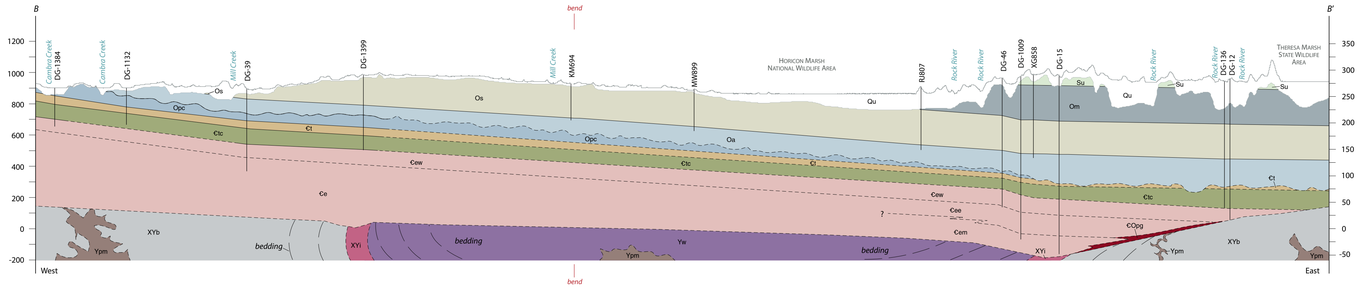
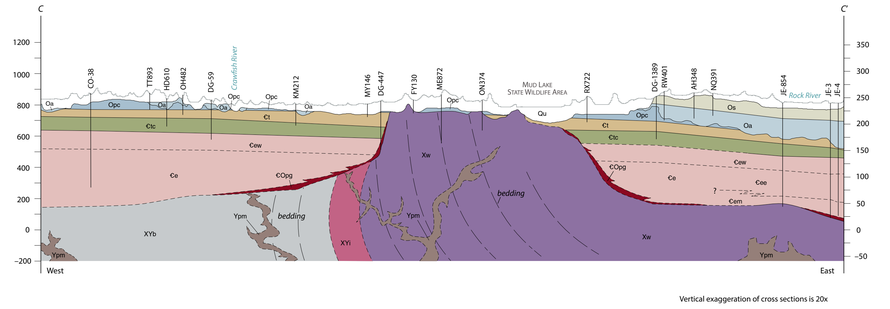








Vertical exaggeration of cross sections is 20x

Map base from U.S. Geological Survey, The National Map digital data, US TOPO map series, 2016; and the Wisconsin Department of Natural Resources, 2016.

Contours represent the bedrock elevation surface, most of which is covered by up to 200 ft of unconsolidated material. The contour interval is 40 ft. Roads and hydrography are shown for reference.

APPROXIMATE MEAN DECLINATION, 2019

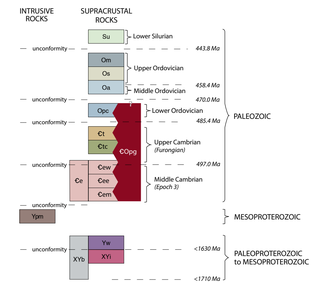
Scale 1:100,000

Wisconsin Transverse Mercator projection, 1991 Adjustment to the North American Datum of 1983 (NAD 83/91).

Mapping by E.K. Stewart, 2015–2019
Geodatabase and cartography by K.C. Roushar

The map and cross sections are interpretations of the data available at the time of preparation. Every reasonable effort has been made to ensure that this interpretation conforms to sound scientific and cartographic principles; however, the map should not be used to guide site-specific decisions without verification. Proper use of the map is the sole responsibility of the user.

CORRELATION OF MAP UNITS



SYMBOLS

- Contact—Concealed beneath unconsolidated Quaternary sediments throughout map area. In cross sections, solid where well control exists, dashed where inferred; internal bedding indicated by long dashed lines.
- Anticline—Concealed. Solid arrow, where present, indicates direction of plunge.
- Syncline—Concealed. Solid arrow, where present, indicates direction of plunge.
- 820 — Bedrock surface elevation contour—Drawn on surface of concealed bedrock units. Contour interval 40 ft.
- Niagara Escarpment—Approximately located
- 75 — Strike and dip of bedding
- 82 — Strike and dip of foliation
- Passive seismic sampling point
- DG-1401 — Drill core hole and identifier
- Quarry
- KW313 — Well where construction report is available; identifier provided if used on cross section
- Well with geophysical logs or geologic log of drill cuttings; identifier provided if used on cross section
- Well or drill hole in cross section
- Fault—Arrow shows sense of relative movement. Shown only in cross section.

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