

Bedrock Geology of the Mason City (Iowa) 7.5' Quadrangle

BEDROCK GEOLOGY OF THE MASON CITY 7.5' QUADRANGLE, CERRO GORDO COUNTY, IOWA

Iowa Geological Survey
Open File Map OFM-14-1
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Introduction to the Bedrock Geology of Mason City 7.5' Quadrangle, Cerro Gordo County, Iowa

The Mason City quad lies along the border area of the Des Moines Lobe landform region, which was the last area covered by a Quaternary glacial advance in Iowa, and the Iowa Surface landform region, which was modified by various episodes of erosion before Wisconsin glacial events (Prior, 1991). Due to extensive glacial and erosional activities, the land surface in this area has relatively low topographic relief, except the area along the Winnebago River in the southern part of the quad.

The land surface of the Mason City quad is mostly covered by Quaternary deposits. The undifferentiated Quaternary deposit in the quad varies between 0 and 24 m (0 to 80 ft). It is usually thicker in the north and thin in the south. The thickest Quaternary deposits occur along a local valley trending NW-SE through the quad. Bedrock outcrops exist mostly in the western and southern portions of the quad, and along the Winnebago River and Willow Creek. Several rock quarries are also located along these two water bodies. More than 40 bedrock outcrops and quarries within the quad were investigated in the field, which provided significant information concerning regional bedrock stratigraphy. Subsurface geologic information was mostly derived from the analysis of water well cutting samples repositated at the Iowa Geological Survey (IGS). Lithologic and stratigraphic information from these samples are stored in the online GEOSAM database of the IGS. Geologic information from about 140 private and public wells within the mapping area was used for bedrock geologic mapping purposes. Shallow bedrock information from the soil survey in Cerro Gordo County (DeWitt, 1981) was used for identifying potential bedrock outcrops in the field. Stratigraphic information from the surrounding area, including bedrock outcrops, quarries, and well samples, was also utilized for this mapping project.

Paleogeographically, the mapping area is within the northern portion of the Devonian Iowa Basin, a region of thickened shelf carbonates and shale deposits. Middle and lower Upper Devonian rocks form the major bedrock surface and upper bedrock aquifer in this area. Due to its stratigraphic completeness, the stratigraphic and depositional environments of the Devonian Iowa Basin have been intensively studied (e.g., Beland, 1927, 1928; Koch, 1970). Recent geologic and stratigraphic studies of this basin include Witke and Bunker (1984), Anderson (1984), Bunker and others (1986), Witke and others (1988), Bunker (1995), Anderson and Bunker (1998), Groves and others (2008), and McKay and Liu (2012). Bedrock geology of the surrounding area was recently mapped by Witke and others (2010) and Liu and others (2010a & b; 2011a & b; 2012, 2013). Results from these studies and bedrock mapping projects provide an important stratigraphic framework for this bedrock geologic map. The bedrock stratigraphic nomenclature and correlation for this map follows the stratigraphic framework proposed by Witke and others (1988).

The bedrock surface of the Mason City quad comprises Devonian rocks varying between carbonates and shale. Based on lithologic features and fossils, these bedrocks are stratigraphically subdivided into, in descending order, the Lime Creek, Shell Rock, and Lithograph City formations. The Lime Creek Formation comprises the bedrock surface mostly in the southwestern part and bedrock highs of the mapping area. This formation is usually characterized by calcareous shale in the lower part and carbonates in the upper part. Only the lower part of the formation occurs in the quad, represented in bluish gray and greenish yellow shale. The maximum thickness of the Lime Creek Formation is about 25 m (83 ft), but is usually less than 15 m (50 ft) in the mapping area. The Shell Rock Formation forms most of the bedrock surface of the Mason City quad, and is comprised of fossiliferous limestone, dolomitic limestone and dolomite, with minor shale. Commonly, a 2-meter-thick stromatoporoid-rich biostrome facies occurs near the base of the formation in this area. Shaly and/or argillaceous carbonates usually occur in the middle and upper portions of the Shell Rock Formation. Thickness of the Shell Rock Formation is usually about 12-21 m (40-70 ft), but can be less than 9 m (30 ft) at places within the quad. The Lithograph City Formation is characterized by laminated lithographic and sublithographic limestone and dolomite. "Bilobes," vugs, and calcite vugs/fossils are common in this formation. Some layers of this formation are fossiliferous with brachiopods, corals and stromatoporoids. The Lithograph City Formation occurs at the bedrock surface mostly within the bedrock valley, and along the Winnebago River and Willow Creek, or at quarries where the overlying bedrock units have been removed by mining. The maximum thickness of the Lithograph City Formation is about 34 m (110 ft) in this area. Underlying Coralville and Little Cedar formations of the Middle Devonian are found in wells only and do not occur at the bedrock surface in the Mason City quad.

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LEGEND

CENOZOIC

QUATERNARY SYSTEM

Qu Unconsolidated Pleistocene-Holocene sediments. This map uses the term Quaternary to describe all of the Quaternary deposits, including the Pleistocene and Holocene. The term Quaternary is used in this map to describe all of the Quaternary deposits, including the Pleistocene and Holocene. The term Quaternary is used in this map to describe all of the Quaternary deposits, including the Pleistocene and Holocene.

DEVONIAN SYSTEM

DI Middle Devonian and Bedrock (Lime Creek Formation) Devonian. This map uses the term Devonian to describe all of the Devonian rocks, including the Middle Devonian and Upper Devonian. The term Devonian is used in this map to describe all of the Devonian rocks, including the Middle Devonian and Upper Devonian.

Dsr Lower Devonian, Bedrock (Shell Rock Formation) Devonian. This map uses the term Devonian to describe all of the Devonian rocks, including the Middle Devonian and Upper Devonian. The term Devonian is used in this map to describe all of the Devonian rocks, including the Middle Devonian and Upper Devonian.

Digc Upper Devonian, Bedrock (Lithograph City Formation) Devonian. This map uses the term Devonian to describe all of the Devonian rocks, including the Middle Devonian and Upper Devonian. The term Devonian is used in this map to describe all of the Devonian rocks, including the Middle Devonian and Upper Devonian.

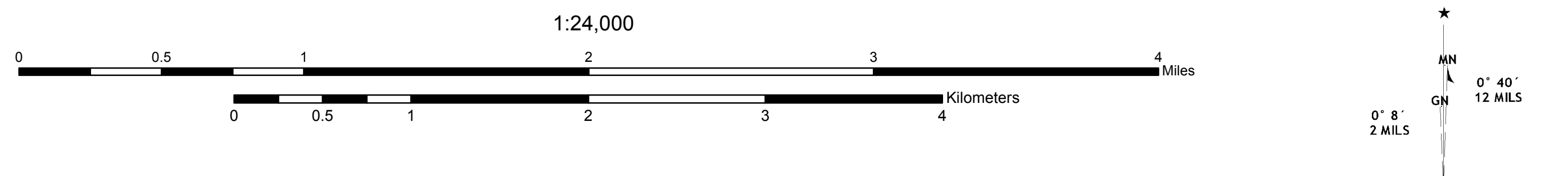
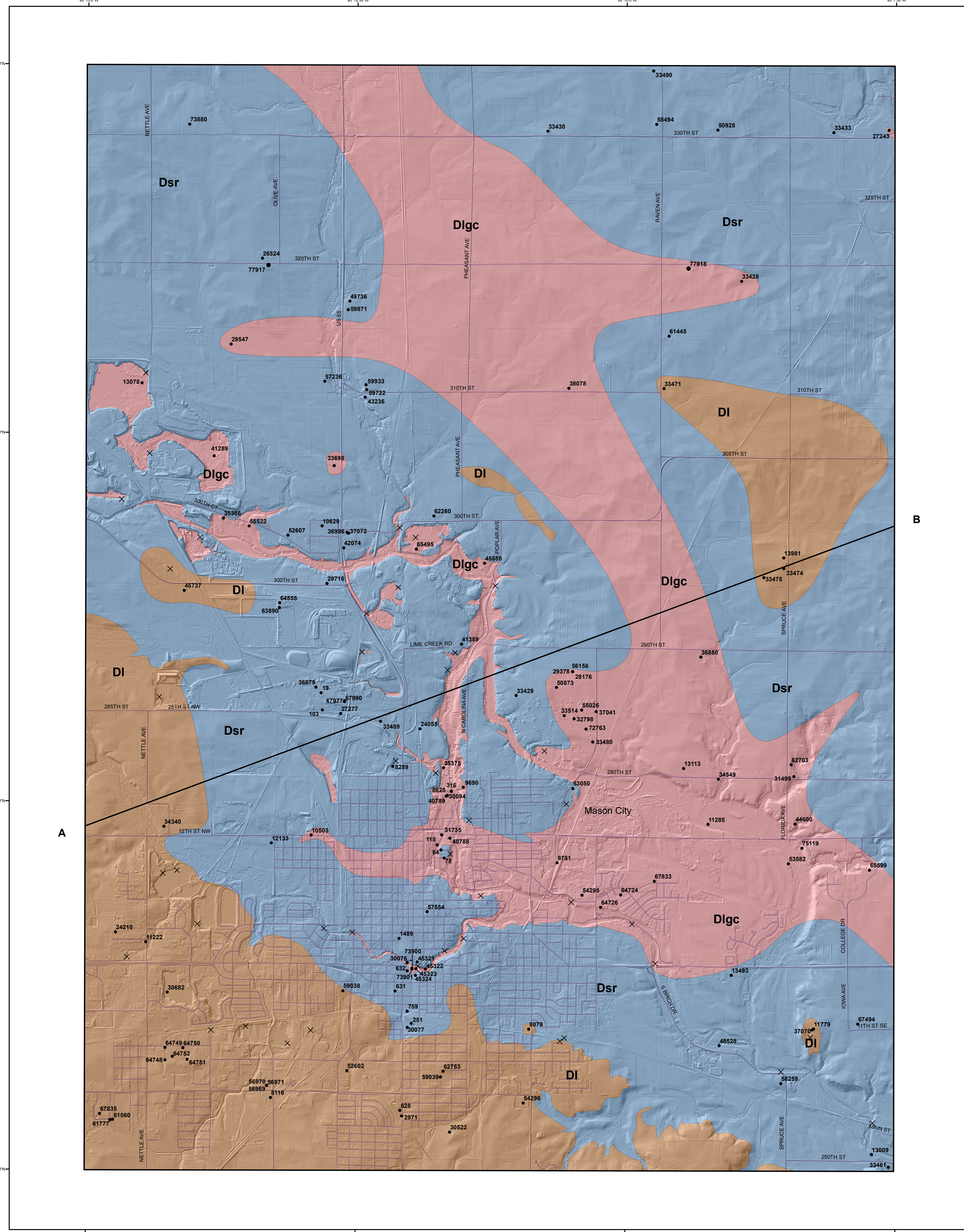
Dcv Middle Devonian, Bedrock (Coralville Formation) Devonian. This map uses the term Devonian to describe all of the Devonian rocks, including the Middle Devonian and Upper Devonian. The term Devonian is used in this map to describe all of the Devonian rocks, including the Middle Devonian and Upper Devonian.

Dic Middle Devonian, Bedrock (Little Cedar Formation) Devonian. This map uses the term Devonian to describe all of the Devonian rocks, including the Middle Devonian and Upper Devonian. The term Devonian is used in this map to describe all of the Devonian rocks, including the Middle Devonian and Upper Devonian.

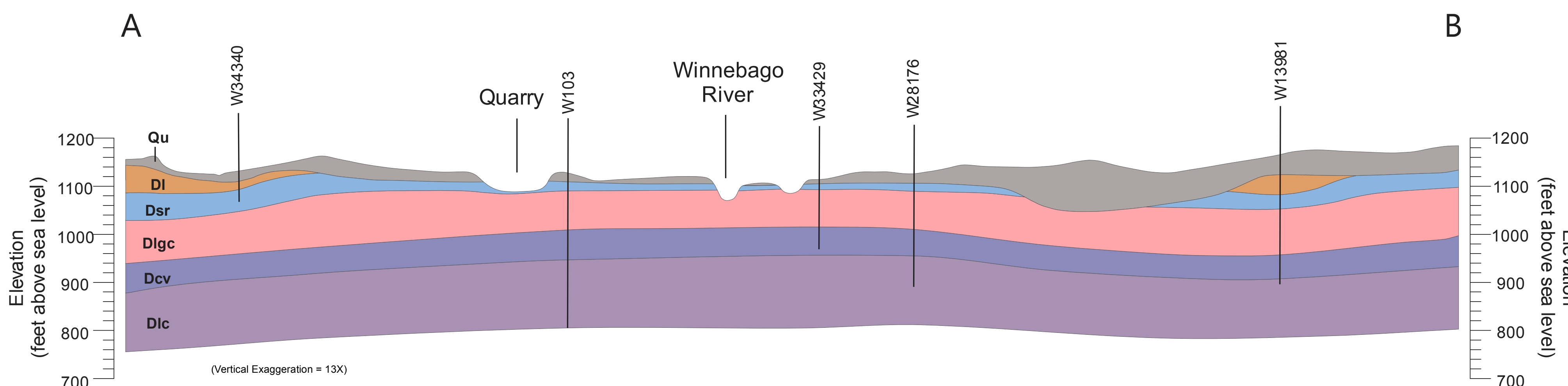
77202 Well location for data point

103 Well location for data point

Rock

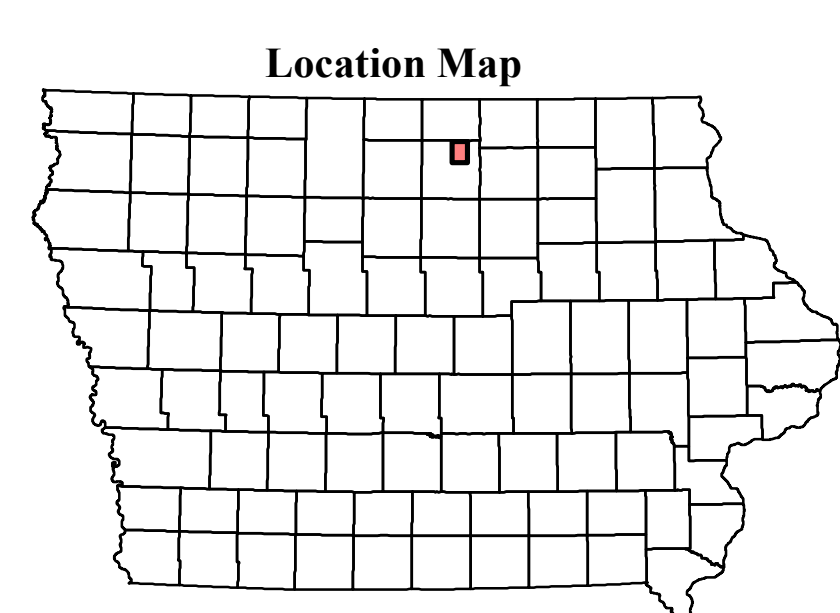
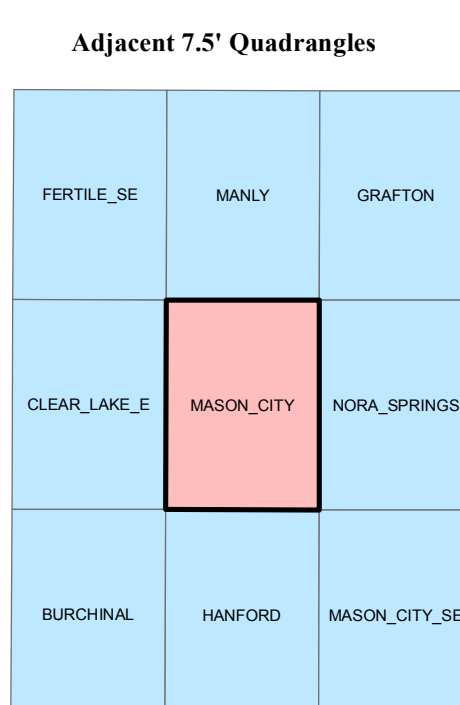


GEOLOGIC CROSS-SECTION A-B



Correlation of Map Units

AGE (Ma)	SYSTEM	SERIES	STAGE	MAP UNIT	
2.588	QUATERNARY			Qu	
382.7	DEVONIAN	Upper	Frasnian	DI	
					Dsr
					Digc
					Dcv
387.7	Middle		Givetian		
393.3	Lower		Eifelian		



Base map from Iowa DOT Road map Layer 2006. Shaded relief from Iowa LIDAR Project 2007-2011.
Iowa Geological Survey digital cartographic file MasonCity_BedrockGeology.mxd, version 9/16/14. (sdc018 10)
Map projection and coordinate system based on Universal Transverse Mercator (UTM) Zone 16, datum NAD83.
The map and cross section are based on interpretations of the best available information of the form of mapping. Map interpretations are not a substitute for detailed site specific studies.
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