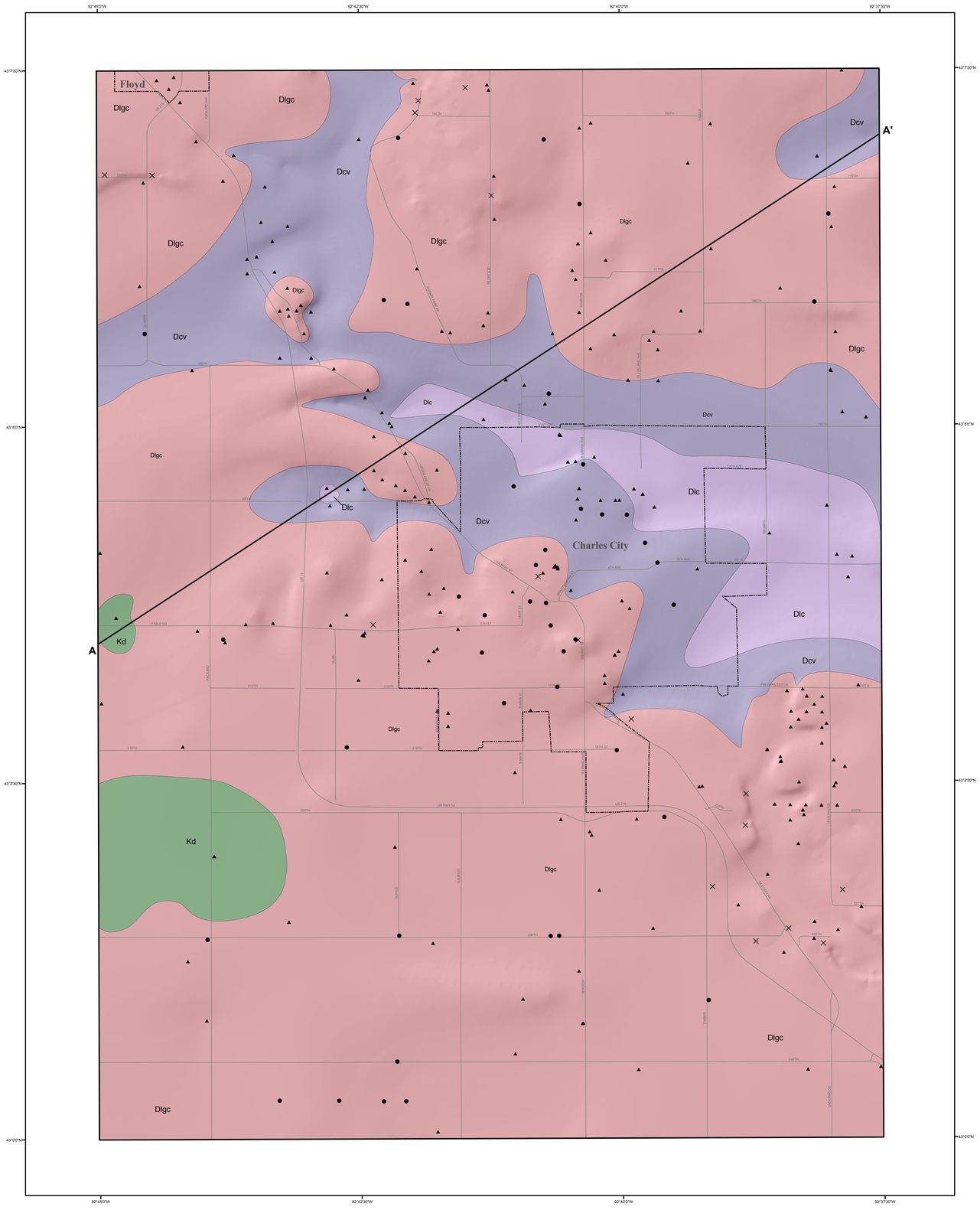
Bedrock Geologic Map of the Charles City (Iowa) 7.5' Quadrangle



1:24,000

0 0.5 1 2 3 4 Miles

0 0.5 1 2 3 4 Kilometers

MN

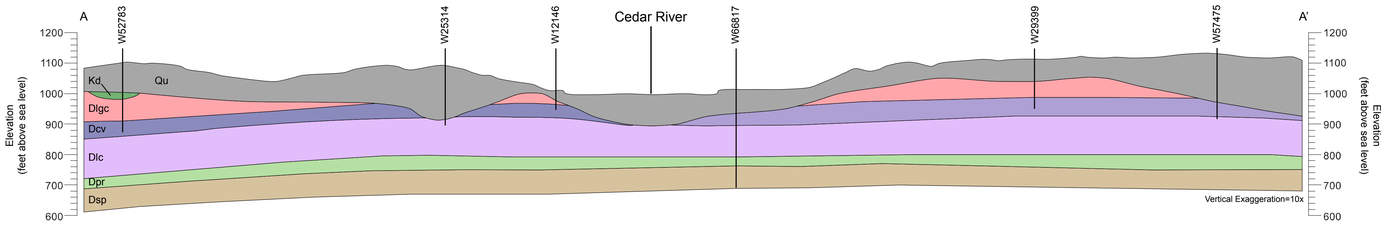
GN

0°0' 0 MILS

0°13' 4 MILS

UTM GRID AND 2016 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

GEOLOGICAL CROSS-SECTION A-A'



LEGEND

CENOZOIC

QUATERNARY SYSTEM

Qu - Undifferentiated Unconsolidated Sediments (Quaternary System). The Quaternary deposits consist of loamy soils developed in loess, glacial till, and colluvium of variable thickness, and alluvial clay, silt, sand, and gravel. The thickness of the Quaternary deposits varies from 0 to 71 m (0-235 ft) in the mapping area. This unit is shown only on the cross-section, not on the map.

MESOZOIC

CRETACEOUS SYSTEM

Kd - Sandstone, Mudstone, and Siderite Pellets (Dakota/Windrow Formation) "Mid"-Cretaceous. This map unit occurs as scattered erosional outliers and is only found occasionally in well cuttings and identified by the soil survey of Floyd County in the mapping area. This formation comprises a non-marine fluvial and pedogenic facies succession characterized by a variety of lithologies, commonly dominated by quartzose sandstones with secondary chert/quartz conglomerates, in part cemented by iron oxides. The thickness of this unit is variable, but is usually less than 6 m (20 ft) in the mapping area.

PALEOZOIC

DEVONIAN SYSTEM

Dlgc - Limestone, Dolomite, and Shale (Lithograph City Formation) Middle to Upper Devonian. This map unit dominates the bedrock surface except the large bedrock valley in the north and the areas with Cretaceous deposits in the southwest portion of the quadrangle, with a maximum thickness up to 30 m (100 ft). It consists of limestone, dolomitic limestone, dolomite, and minor shale. This unit is usually characterized by interbeds of laminated lithographic and sub-lithographic limestone and dolomitic limestone, in part argillaceous. "Birdseye" structures, vugs and calcite vug-fills are common. Some intervals are fossiliferous and stromatoporoid-rich.

Dcv - Limestone and Dolomite (Coralville Formation) Middle Devonian. This map unit occurs on the bedrock surface along the bedrock valleys in the northern portion of the quadrangle. The thickness of this map unit mostly varies between 12 and 21 m (40-70 ft) in the mapping area. It is dominated by limestone, dolomitic limestone, and dolomite, in part laminated, argillaceous, or shaly. Brachiopods, echinoderm debris and corals usually occur in the limestone facies.

Dlc - Dolomite, Limestone, and Shale (Little Cedar Formation) Middle Devonian. This map unit only occurs at the bedrock surface within the bedrock valley in the east-central part of the quadrangle. The thickness of this formation ranges from 26 to 40 m (85-130 ft) in the mapping area. This unit is dominated by slightly argillaceous to argillaceous dolomite and dolomitic limestone, usually vuggy and partially laminated and/or cherty. A shaly layer about 3 to 6 m (10-20 ft) commonly occurs in the upper part of the formation. This unit is commonly fossiliferous, and brachiopods are especially abundant in the lower portion.

Dpr - Dolomite and Dolomitic Limestone (Pinicon Ridge Formation) Middle Devonian. This formation consists of dolomite and dolomitic limestone with varying textures (shaly, laminated, brecciated, sandy, and/or cherty). The thickness of this unit usually ranges from 5 to 14 m (15-45 ft). Compared to other Devonian strata in the mapping area, this formation is usually unfossiliferous. This unit does not occur at the bedrock surface of the map, and is only shown on the cross-section.

Dsp - Dolomite (Spillville Formation) Middle Devonian. This unit is dominated by medium to thick bedded dolomite with scattered to abundant fossil molds. The thickness of this unit usually ranges from 21 to 26 m (70-85 ft) in the mapping area. Its basal part, where present, is variably sandy, shaly, and/or conglomeratic with reworked Ordovician chert clasts. This formation is only shown on the cross-section, and does not occur at the bedrock surface in the mapping area.

OTHER FEATURES

- **New drill holes for this map project**
- **Bedrock outcrops**
- **IGS GEOSAM data points** – records available at www.iowageologicalsurvey.com
- **Incorporated city boundary**
- **Roads**
- W52783 **Wells used for geologic cross-section**

STRATIGRAPHIC COLUMN

System	Series	Stage	Lithostratigraphic Unit	Map Symbol	Lithology	Thickness (in feet)
Cretaceous	"Middle"		Dakota/Windrow Formation	Kd		5-20
Devonian	Middle	Givetian	Cedar Valley Group: Lithograph City Formation	Dlgc		70-100
			Cedar Valley Group: Coralville Formation	Dcv		40-70
			Cedar Valley Group: Little Cedar Formation	Dlc		85-130
		Eifelian	Wapsipinicon Group: Pinicon Ridge Formation	Dpr		15-45
			Wapsipinicon Group: Spillville Formation	Dsp		70-85

Lithology Key

- Conglomerate
- Dolomitic limestone/ calcitic dolomite
- Dolomite
- Limestone
- Fine grained sandstone
- Shale
- Lithographic limestone
- Breccia

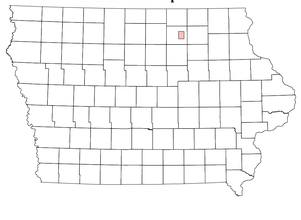
Symbol Key

- Dolomitic
- Chert
- Sandy
- Shaly
- Stromatoporoids
- Unconformity
- Vugs

Adjacent 7.5' Quadrangles

ORCHARD	FLOYD	COLWELL
ROSEVILLE	CHARLES CITY	BASSETT
GREENE	NASHUA NW	NASHUA

Location Map



BEDROCK GEOLOGIC MAP OF THE CHARLES CITY 7.5' QUADRANGLE, FLOYD COUNTY, IOWA

Iowa Geological Survey
Open File Map OFM-16-5
June 2016

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IOWA GEOLOGICAL SURVEY

Iowa Geological Survey, Robert D. Libra, State Geologist

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THE UNIVERSITY OF IOWA IIHR DNR Iowa DNR

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Introduction to the Bedrock Geologic Map of the Charles City 7.5' Quadrangle, Floyd County, Iowa

The Charles City 7.5' Quadrangle is located in Floyd County, north-central Iowa. In terms of landforms, this quadrangle lies in the Iowan Surface landform region where the land surface had been modified by various episodes of erosion before and during Wisconsin-age glacial events (Prior, 1991). Due to extensive glacial and erosional activities, the landscape of this area is characterized by relatively low topographic relief and commonly features large fieldstones of glacial origin known as glacial erratics.

The land surface of this mapping area is mostly covered by Quaternary deposits with a thickness commonly varying between 9 and 27 m (30-90 ft), and it can reach a maximum thickness of 71 m (235 ft) in bedrock valleys occurring in the east-central and northeast parts of the mapping area. These unconsolidated Quaternary sediments are undifferentiated in this map. For the detailed Quaternary stratigraphy, see the surficial geologic map of this quadrangle (Streeter et al., 2016).

Although Quaternary deposits are commonly thick, some bedrock outcrops and rock quarries occur in this map area, mostly along the Cedar River and its tributaries. During the field investigations, shallow bedrock information from the digital soil survey in Floyd County (Voy, 1995) was used for delineating potential bedrock outcrops. In the map area, 17 bedrock outcrops including a few quarries were accessed and studied, which provided important regional stratigraphic information for the bedrock geologic map. Subsurface geologic information was mainly derived from the analysis of water well data stored in the Iowa Geological Survey (IGS) GEOSAM database. Within the mapping area, a total of 328 private and public wells were studied, including 44 shallow drill holes which were completed for this mapping project. Among these wells, 59 have descriptive striplogs with cutting samples reposited at the IGS Oakdale Rock Library, 15 of which were newly logged for this bedrock geologic mapping task. Bedrock stratigraphic information from the surrounding area, including bedrock outcrops, quarries, and well information, was also studied and utilized for this mapping project.

The bedrock surface of the Charles City 7.5' Quadrangle is dominated by Devonian strata, with scattered Cretaceous deposits. Paleogeographically, the mapping area is within the northern portion of the Devonian Iowa Basin, a region of thickened shelf carbonate, shale and minor others deposited from the Eifelian through part of the Famennian age (Witzke et al., 1988; Witzke and Bunker, 2006; Day, 2006; Day et al., 2008). The Middle and lower Upper Devonian carbonate rocks form the important upper bedrock aquifer in the mapping area (Libra et al., 1984, 1994). This Devonian aquifer becomes vulnerable when it is shallow, and carbonate rocks, especially relatively pure limestones, are easily karstified (Moore, 1995). Due to its complex sedimentary lithology, many richly fossiliferous units, and groundwater and environmental issues, the geology, paleoenvironments, paleontology and stratigraphy of the Devonian Iowa Basin have been intensively studied (e.g., Belanski, 1927, 1928; Koch, 1970). Recent important studies of the Iowa Basin include Witzke and Bunker (1984), Anderson (1984), Bunker and others (1986), Bunker (1995), Anderson and Bunker (1998), Groves and others (2008), McKay and Liu (2012), and Day and others (2006, 2008, 2013). Geologic mapping projects at 1:24,000 and 1:100,000 scales in north-central Iowa have been undertaken by the IGS since 2009. In addition to 7.5' quadrangle maps, 1:100,000 scale bedrock geologic maps have been recently completed for Bremer County (McKay et al., 2010), Worth County (Liu et al., 2012), Black Hawk County (Rowden et al., 2013), Cerro Gordo County (Liu et al., 2015), and Mitchell County (Clark et al., 2016) in the Iowa Basin. The Bedrock Geologic Map of Iowa (1:500,000) was completed by Witzke and others (2010). Results from these geologic studies and bedrock mapping projects provide significant regional geologic information and new data for the present bedrock map.

Four bedrock formations, in descending order, the Cretaceous Dakota/Windrow Formation, the Devonian Lithograph City, Coralville, and Little Cedar formations comprise the bedrock surface of the map area. Two other formations, the Devonian Pinicon Ridge and Spillville formations, are found in wells only and do not occur at the bedrock surface. The bedrock stratigraphic nomenclature and correlation of the Devonian strata for this map follow the stratigraphic framework proposed by Witzke and others (1988). The general lithologic features and thickness of each map unit are shown in the Stratigraphic Column and described in the Legend section of this map.

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Base map from Iowa DOT Road map Layers 2006. Bedrock topography raster created internally for this map project.

Iowa Geological Survey digital cartographic file Charles_City_BedrockGeology.mxd, version 6/30/16 (ArcGIS 10.3)
Map projection and coordinate system based on Universal Transverse Mercator (UTM) Zone 15, datum NAD83.

The map and cross-section are based on interpretations of the best available information at the time of mapping. Map interpretations are not a substitute for detailed site specific studies.

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