# SCOPING DOCUMENT

Charles Road Bridge over Slough Creek
Phase I/II Engineering

**Location and Description.** Charles Road is a rural two-lane major collector under the jurisdiction and maintenance of MCDOT with a projected ADT of 10,700 vpd in 2050. The Charles Road bridge over Slough Creek is located in Greenwood Township approximately three miles north of the City of Woodstock. The bridge is located on a horizontal curve and is 400 feet from the Nelson Road intersection. Charles Road becomes Alden Road north of the intersection. The surrounding land use is agricultural.


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**Need.** The bridge has a sufficiency rating of 61.7 (2022) and is comprised of PPC deck beams rated as 4 (poor) and substructure rated as 5 (fair). The superstructure is only 38 years old, but PPC deck beams are known to have shortened life spans. The substructure is 75 years old. Temporary concrete barriers were placed along the north side of the bridge in 2018 due to a guardrail hit that damaged the outside beam.

**Data.** Obtained from I-Roads, MCDOT Classification Table and MCDOT GIS

| Design Element | Charles Road | Alden Road | Nelson Road |
|---|---|---|---|
| Jurisdiction | County | County | County |
| Key Route | FAS 0026 | FAS 0026 | CH 0041 |
| County Route | A28 | V12 | A28 |
| Functional Classification (IDOT) | Major Collector | Major Collector | Minor Collector |
| Functional Classification (County)* | Principal Arterial | Principal Arterial | Arterial |
| Truck Route | No | No | No |
| Strategic Regional Arterial | No | No | No |
| National Highway System | No | No | No |
| Current ADT (2021) | 6,300 | 4,900 | 2,500 |
| Projected ADT (2050) | 10,700 | 8,000 | 3,300 |
| % Trucks | 8% | - | - |
| Posted Speed | 55 mph | 55 mph | 55 mph/45 mph ** |
| Design Speed | 60 mph | 60 mph | 60 mph |
| Condition Rating Survey | 56.66 (2021) | 91.10 (2021) | 84.44 (2021) |

* IDOT classification governs
** Warning sign on curve approaching intersection

**Roadway** Charles Road is 25 feet wide with narrow aggregate shoulders. The pavement is full-depth HMA that was constructed in 1982 and most recently overlaid in 2012. The 2021 Condition Rating Survey was 56.66 (average). BLR Classification is Class II. Treatment is recommended in 2025. Alden Road and Nelson Road have excellent condition ratings with treatments recommended in 2042 and 2040, respectively.

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Phase I/II Engineering

**Bridge.** The bridge (SN 056-3006) was originally constructed in 1947 as a 31-foot single span concrete slab bridge on closed concrete abutments. The superstructure was reconstructed in 1984 with PPC deck beams. The sufficiency rating is 61.7 (2022), and the superstructure is rated 4 (poor) and substructure rated 5 (fair). The sufficiency rating was 81.8 and 63.1 in 2018 and 2020, respectively. Guardrail is mounted to the outside beams. The bridge roadway width is 40 feet. The approach roadway width is 32 feet. The bridge is open with no restrictions. Temporary concrete barriers were placed along the north side of the bridge in 2018 due to a guardrail hit that damaged the outside beam.

**Waters.** Slough Creek is a perennial stream that flows south to north in Zone AE floodplain within the Nippersink Creek (Fox River) watershed. A Flood Insurance Study is available and a FEMA hydraulic model was requested. There does not appear to be any buildings or structures, or LOMA/LOMR's in the floodplain 1,000 feet upstream of the bridge. The stream is not biologically significant. It is "blue-lined" on the USGS map so it, and associated wetlands, are likely under the jurisdiction of USACE. The drainage area is 9.78 square mile (StreamStats).

**Nelson Road Intersection.** Charles Road is a three-legged intersection with Alden Road and Nelson Road. The Nelson Road approach is stop controlled. All approaches are on horizontal curves. Nelson Road has a 45 mph warning sign on the approach to Charles/Alden Road. There is a mast arm street light mounted on a wood pole in the south quadrant. Enough survey should be provided to ensure the profile meets sight distance requirements.

**Crash Data.** Five year crash data from 2016 through 2020 was compiled through the MS2 portal for 1,500 feet on each leg of the intersection. There were a total of 27 crashes of which 13 included injuries (1-K, 3-A, 6-B and 3-C). The fatality was on the outer range and will likely be outside the project limits. Fixed object (37.0%) and animal (11.1%) crashes were the predominant types. Crash reports still need to be obtained. The Charles/Alden/Nelson Road intersection is identified as a high-tier intersection 2017 Local Jurisdiction Safety Tier map. Within the influence of the bridge (limits of guardrail), there were 6 crashes of which three resulted in injuries from fixed objects. Within the influence of the intersection (200 feet each leg), there were 15 crashes of which two resulted in injuries.

**Design Criteria.** Reconstruction. BLRS Figures 32-2B and36-5A (Rural Two-Lane Collectors). Minimum low beam bridge clearance is one-foot above natural 30-year HWE. Minimum freeboard is three-foot above proposed 30-year headwater HWE.

**Geometrics.** The horizontal curve along Charles Road is approximately 1,300' which is greater than the 1,200' minimum radius for 8% superelevation for 60 mph (BLRS Figure 29-3b). The horizontal curve along Nelson Road is approximately 700' which is greater than the 587' radius for 8% superelevation for 45 mph (BLRS Figure 29-3b). Topographic survey limits should be set to ensure superelevation transitions are adequate.

The recommended clear zone is 30 feet for 1:4 front slopes (BLRS Figure 35-2A). The recommended K-value for crest and sag curves is 151 and 136 (BLRS Figures 30-2A and 30-2D). BLRS design criteria indicates the roadway cross section should consist of two 12-foot lanes with 8-foot shoulders (40 feet) and a 40-foot bridge face-to-face width.

# SCOPING DOCUMENT

Charles Road Bridge over Slough Creek
Phase I/II Engineering

**Bicyclist/Pedestrian/Complete Streets.** There are no existing pedestrian or bicyclist accommodations along Charles Road, Alden Road or Nelson Road. Charles Road is identified for On-Road/Sharrows/Bike Lanes/Wide Paved Shoulders in the 2022 McHenry County Council of Mayors' McHenry County Connection Bike/Ped Plan. The IDOT Bicycle Selection Table (BDE Figure 17-2.A) recommends six-foot paved shoulders as the on-road accommodation.

**Right-of-Way.** The existing right-of-way width along Charles Road and Alden Road is 70 feet, and 66 feet along Nelson Road according to McHenry GIS. The MCDOT classification table indicates Charles Road and Alden Road should have 70-feet ROW each side, and Nelson Road 55-feet.

**Environmental.** There are no INAI sites, Section 4(f), Section 6(f), Section 106 or historic properties identified in the project area. Wetland and stream impacts are anticipated. The ESR and WIE will be submitted once preliminary structure type and project limits are identified.

**Permits.** A joint Section 404 permit, MCP&D permit, IDNR-OWR Part 3708 permit, and NPDES permit are anticipated.

**Traffic Management.** A detour for the bridge is preferred to reduce construction duration and cost, and to improve worker safety. If the intersection can remain open, IL 47 (IDOT), O'Brien Road (County), Durkee Road (County) and Alden Road (County) could be used. The selected detour should be driven and load posted structures investigated.

**Public Involvement.** A project/survey notification letter should be considered for property owners within the project limits. Certified letters will be mailed to property owners with ROW impacts. A public informational meeting and public hearing should be scoped if new intersection types are being considered.

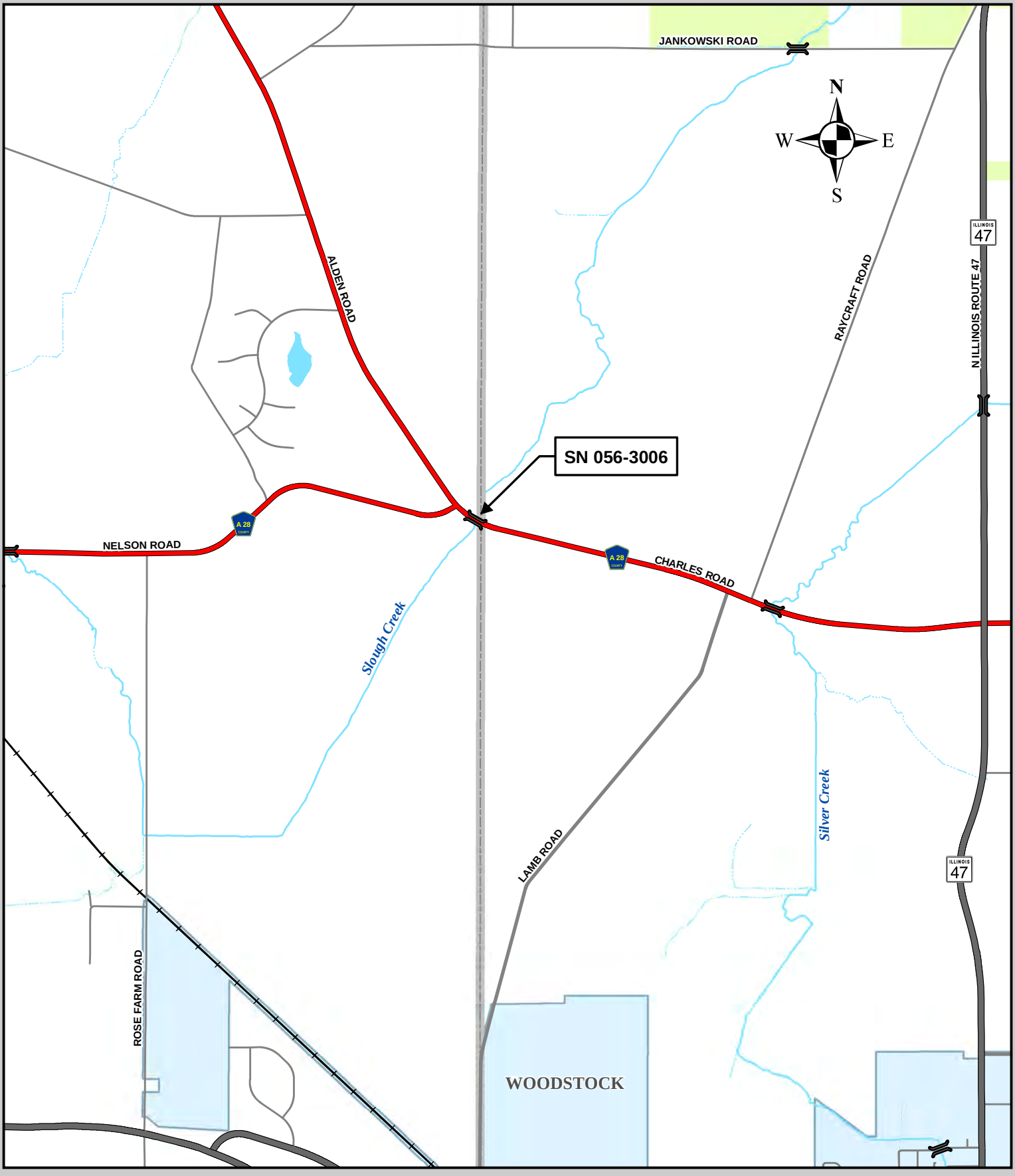
**Adjacent Projects and Studies.** None known.

**Local Agencies.** The bridge and intersection are located in Hartland Township, but project limits will also include Greenwood Township. Fire/EMS is served by Woodstock Fire Rescue. The school district is Woodstock Community Unit School District 200. Law enforcement is by McHenry County Sheriff.

**Local Agency Agreements.** None identified.

**Early Input from Local Agencies and Public:**

- **Greenwood Township**. TBD
- **Hartland Township**. TBD
- **Public**. TBD




**DISCLAIMER**

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**DATE**

Friday, February 25, 2022

**FILE**

SN 056□3006

**PROJECTION**

Transverse Mercator
NAD 1983 State Plane
Illinois East

**LEGEND**

- County Route
- State/US Route
- Interstate Route
- Municipal/Township Route
- Rail Road
- Hydrography

0 500 1,000 2,000 Feet

**SCALE**

1 inch = 2,000 feet

# LOCATION MAP

## CHARLES ROAD OVER SLOUGH CREEK

DIVISION OF TRANSPORTATION

# Illinois Department of Transportation
# Structures Information Management System
# Structure Summary Report



**Structure Number:** 056-3006 **District:** 1

## Inventory Data

**Facility Carried:** CHARLES RD
**Feature Crossed:** Slough Creek
**Bridge Remarks:**
**Bridge Status:** 1 OPEN - NO RESTRICT
**Status Remarks:**
**Maint County:** 056 MCHENRY
**Maint Responsibility:** 30 COUNTY
**Service On/Under:** 1 HIGHWAY / 5 WATERWAY
**Reporting Agency:** 3 COUNTY
**Main Span Matl/Type:** 5 PRESTRESS CONCRETE / 05 BOX BEAM OR GIRDER-MULTIPLE
**Nbr Of Main Spans:** 1 **Nbr Of Approach Spans:** 0
*****Approaches*****
**Near #1 Matl/Type:** /
**Near #2 Matl/Type:** /
**Far #1 Matl/Type:** /
**Far #2 Matl/Type:** /
**Median Width/Type:** 0 Ft. / 0 None
**Guardrail Type L/R:** 0None / 0 None
**Toll Facility Indicator:** 0 No Toll
**Latitude:** 42.36493030 **S** **Longitude:** 88.47286019 **S**
**Deck Structure Type:** E PCAST PRES CN DK BM
**Sidewalks Under Structure:** 0 None

**Bridge Name:**
**Location:** AT NELSON RD
**Status Date:** 4/1/1988 12:00:00 AM
**Maint Township:** 09 GREENWOOD
UNKNOWN

**Sufficiency Rating:** 61.7
**HBP Eligible:** Yes
**Replaced By:** -
**Replaces:** -
**Last Update Date:** 03/30/2021
**Parallel Structure:** None
**Multi-Level Structure Nbr:**
**Skew Direction:** R Right
**Skew Angle:** 14 **D**
**Structure Flared:** No
**Historical Significance:** No
**Border Bridge State:**
**Bdr State SN:**
**Bdr State % Responsibility:** 0
**Structural Steel Wt** 0
**Substructure Material:** 5N

**Structure Length:** 31.0
**AASHTO Bridge Length:** 28.5
**Length of Long Span:** 31.0
**Bridge Roadway Width:** 40.0
**Appr Roadway Width:** 32.0
**Deck Width:** 40.0
**Sidewalk Width Right:** 0.0
**Sidewalk Width Left:** 0.0
**Navigation Control:** 0 No
**Navigation Horiz Clear:** 0
**Navigation Vert Clear:** 0
**Culvert Fill Depth:** 0.0
**Number Culvert Cells:** 0
**Culvert Opening Area:** 0.0
**Culvert Cell Height:** 0.00
**Culvert Cell Width:** 0.00

**Rated By:** 3 Consultant
**Rate Method:** 6 LOAD FACTOR (LF) REPORTED BY RATING FACTOR (RF)
**Inventory Rating:** 0.920(33)
**Operating Rating:** 1.540(55)
**Design Load:** 02 HS20
**Deck Structure Thickness:** 17 **SD:** Y **FO:** N
**Load Rating Date:** 10/13/2021
**Railroad Crossing Info**
**Crossing 1 Nbr:**
**Crossing 1 Nbr:**
**RR Lateral Underclear:** 0.0
**RR Vertical Underclear:** 0 **Ft** 0 **In**

## Key Route On Data

**Key Route Nbr:** FEDERAL-AID SECONDARY 0026
**Appurtenances** Main Route 00000
**Inventory County:** 056 MCHENRY
**Township/Road Dist** 09 GREENWOOD
**Municipality** 0000
**Urban Area:** None 0000
**Functional Class:** 5 MAJOR COLLECTOR
**** CLEARANCES **** **South/East** **North/West**
**Max Rdwy Width:** 40.0
**Horizontal:** 40.0 0.0
**Lateral:**

**Station:** 10.0900
**Segment:**
**Linked:** Y
**Natl. Hwy System:** Not on NHS
**Inventory Direction:**
**Curr AADT Yr/Count:** 2021 / 6300
**Est Truck Percentage:** 8
**Number Of Lanes:** 2
**One Or Two Way:** 2 Two-Way
**Bypass Length:** 4
**Future AADT Yr/Cnt:** 2046 / 7560
**Designated Truck Rte:** NONE
**Special Systems:** No

## Key Route Under Data

**Station:**
**Segment:**
**Linked:**
**Natl. Hwy System:**
**Inventory Direction:**
**Curr AADT Yr/Count:** /
**Est Truck Percentage:**
**South/East** **North/West**
**Number Of Lanes:**
**One Or Two Way:**
**Bypass Length:**
**Future AADT Yr/Cnt:** /
**Designated Truck Rte:**
**Special Systems:**

## *** Marked Route Under Data ***

**Designation** **Kind** **Number**

**Structure Number: 056-3006** **District: 1**

## Data Related to Inspection Information

| *** Inspection Intervals *** | | | | *** Maximum Allowable Posting Limits *** | | | | Bridge Posting Level: | |
|---|---|---|---|---|---|---|---|---|---|
| **Routine NBIS:** | 24 MOS | **Underwater:** | 0 MOS | **One Truck At A Time:** | 0 | **Combination Type 3S-1:** | Tons | 5 | No Posting Required |
| | | **Special:** | N | **Single Unit Vehicles:** | Tons | **Combination Type 3S-2** | Tons | | |

## Inspection/Appraisal Information

**Inspection Date:** 10/11/2022 **Inspection Temperature:** 56Deg. F

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Deck:** | 4 | POOR CONDITION - ADVANCED DETERIORATION | | | | | **Single Unit Vehicles:** | Tons |
| **Superstructure:** | 4 | POOR CONDITION - ADVANCED DETERIORATION | | | | | **Combination Type 3S-1:** | Tons |
| **Substructure:** | 5 | FAIR CONDITION - MINOR SECTION LOSS, CRACKS | | | | | **Combination Type 3S-2:** | Tons |
| **Culvert:** | N | NOT APPLICABLE | | | | | **One Truck At A Time:** | 0 |
| **Channel and Protection:** | 8 | VERY GOOD CONDITION - NO PROBLEMS NOTED | **Deck Wearing Surf:** | G | BITUMINOUS OVERLAY | | **Last Paint Type:** | |
| **Structural Evaluation:** | 4 | MINIMUM ADEQUACY TO BE LEFT IN PLACE | **Deck Membrane:** | A | WATERPROOF MEM SYST | | | |
| **Deck Geometry:** | 5 | BETTER THAN ADEQUATE TO BE LEFT IN PLACE | **Deck Protection:** | J | NONE | | | |
| **Underclearance-Vert/Lat.:** | N | NOT APPLICABLE | **Total Deck Thick:** | 24.0 | | | | |
| **Waterway Adequacy:** | 9 | SUPERIOR TO PRESENT DESIRABLE CRITERIA | **Last Paint Date:** | | | | | |
| **Approach Roadway Align:** | 8 | EQUAL TO PRESENT DESIRABLE CRITERIA | | | | | | |
| **Bridge Railing Appraisal:** | 2 | Doesn't Meet Standards | | | | | | |
| **Approach Guardrail:** | 222 | Not Acceptable Not Acceptable Not Acceptable | | | | | | |
| **Pier Navig Protection:** | N | N/A | | | | | | |

## Underwater Inspection/Appraisal Information

**Inspection Date:**
**Temperature:** **Inspection Method:**
**Appraisal Rating:**

## Scour Critical Information

**Rating:** 8 CALCULATED SCOUR ABOVE FOOTING **Evaluation Method:** A Computer Calculation
**Analysis Date:** 06/07/1994

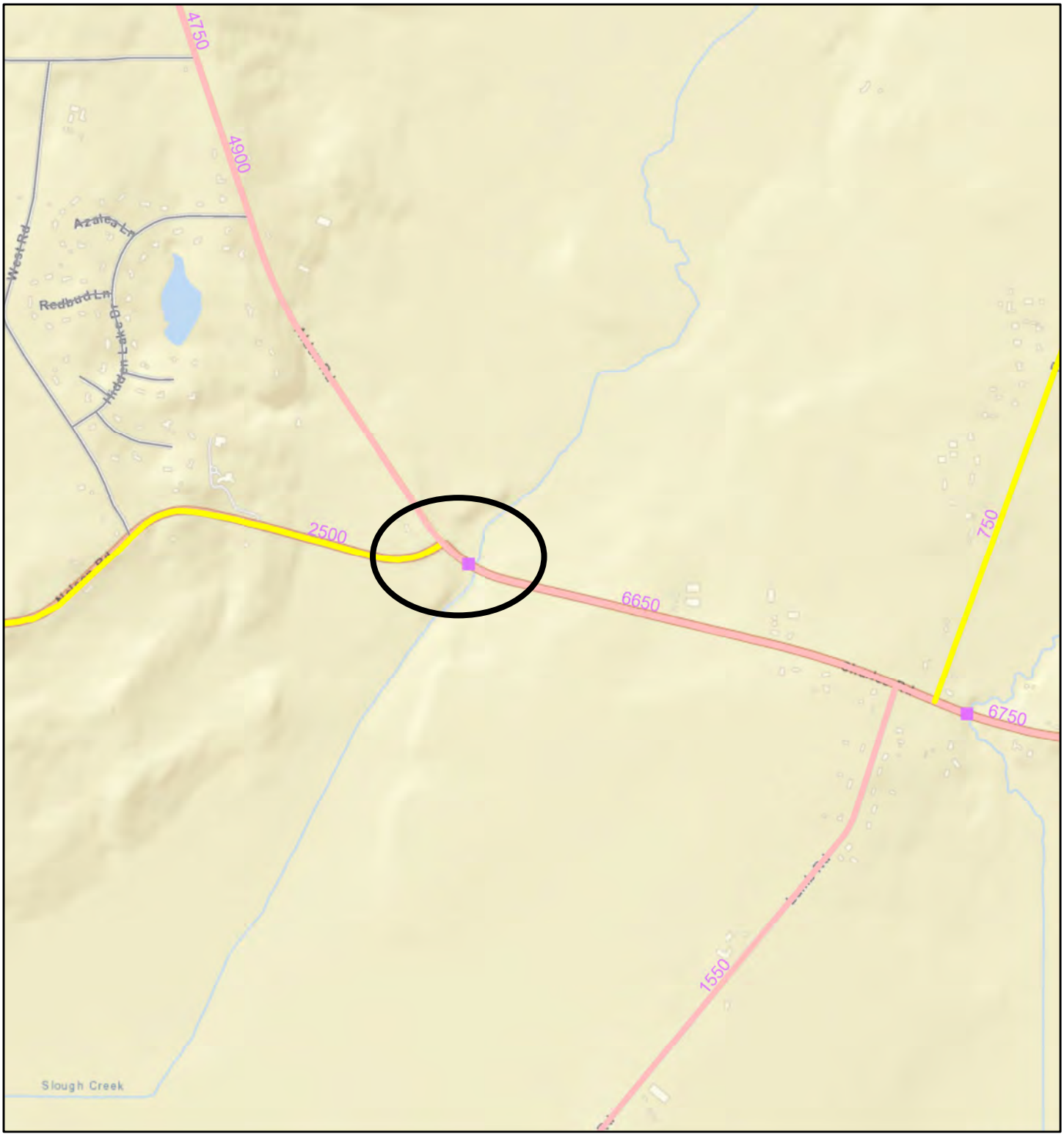
## Miscellaneous

**Microfilm Data Recorded:** No

## Construction Information

| | | | | | | |
|---|---|---|---|---|---|---|
| **Year:** | 1947 | Original | | 1984 | Reconstructed | |
| **Route:** | FAS 26 | **Sta:** 415+58.1 | | FAS 26 | **Sta:** 415+58.1 | |
| **Section Nbr:** | 82-00106-00-BR | | | 82-00106-00-BR | | |
| **Contract Nbr:** | | | | | | |
| **Fed Aid Pr#:** | BR-S26 0102000 | | | BR-S26 0102000 | | |
| **Built By:** | 3 | COUNTY AGENCY | | 0 | UNKNOWN | |

# Functional Classification Map




Printed On: 2/17/2022

1:21,491

0 0.175 0.35 0.7 mi

0 0.275 0.55 1.1 km

IDOT Roads

Local Structures

**Functional Class**

1 Interstate

2 Freeway or Expressway

3 Other Principal Arterial

4 Minor Arterial

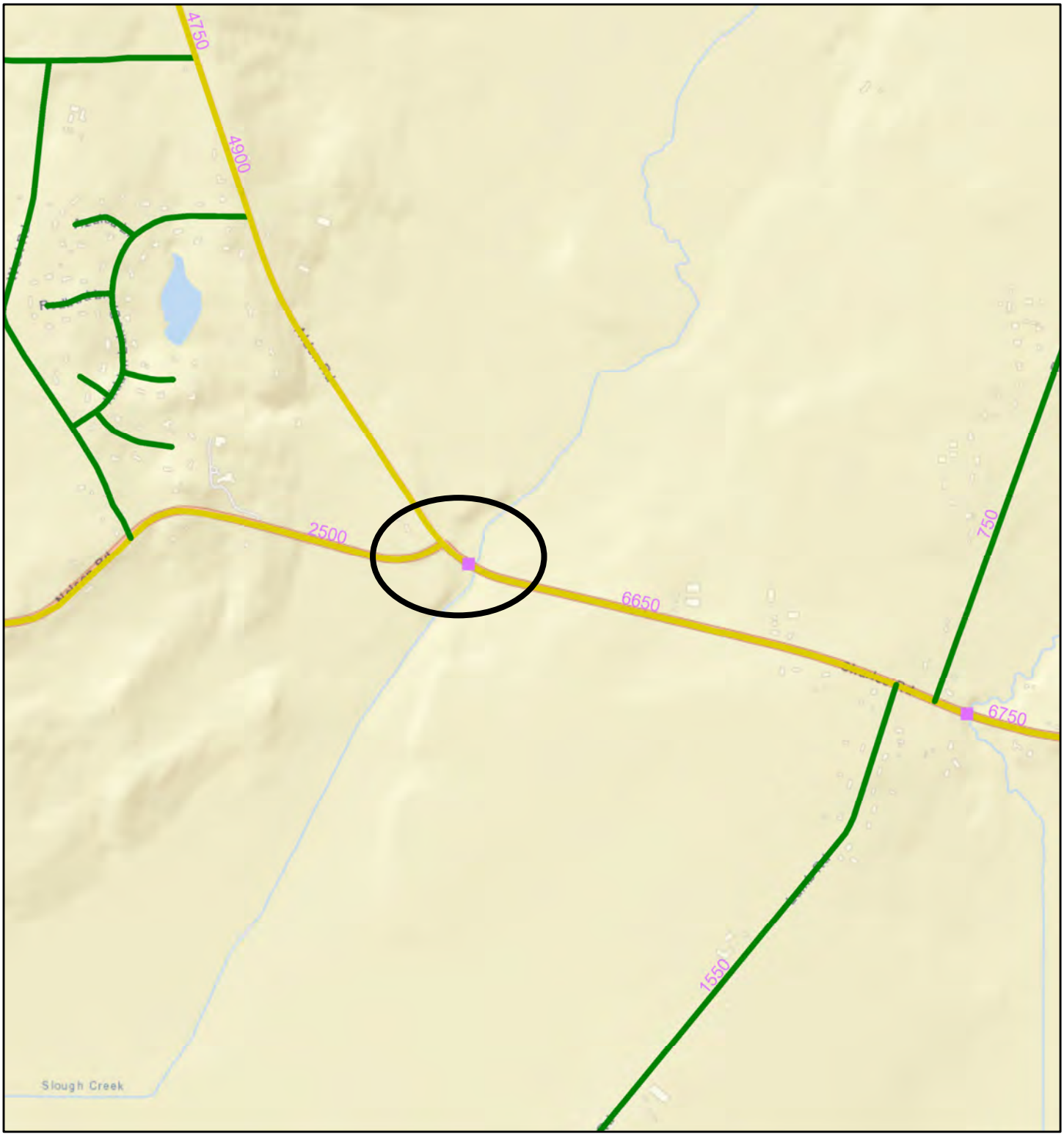
5 Major Collector

6 Minor Collector

7 Local Road or Street

DTR SM Posted Structures

# Jurisdiction Map




Printed On: 2/17/2022

1:21,491

0 0.175 0.35 0.7 mi

0 0.275 0.55 1.1 km

IDOT Roads
Local Structures

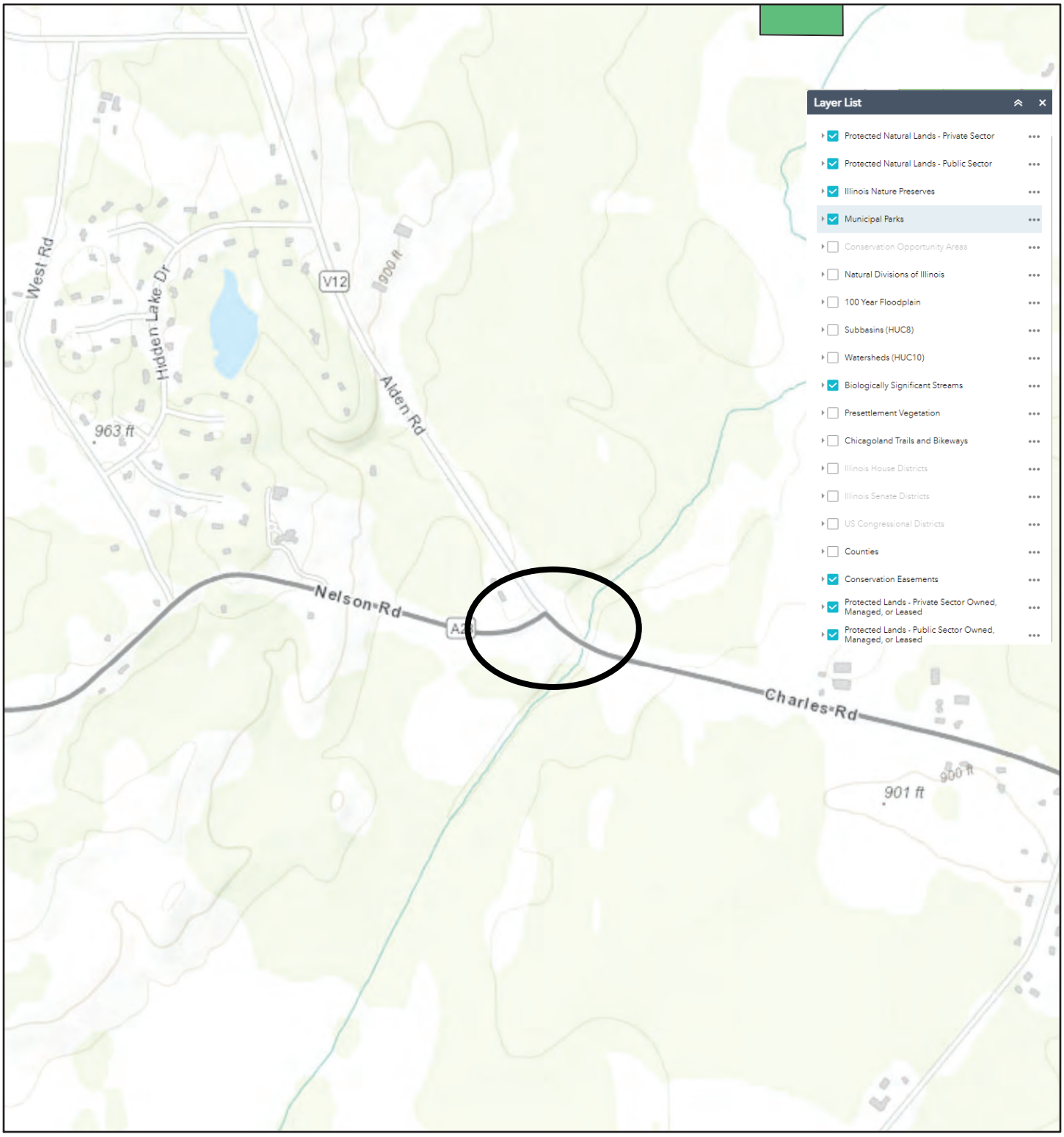
**Jurisdiction**

State
Other State
County
Adjacent County

Municipality
Federal
Private
Township
Adjacent Township
DTR SM Posted Structures

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

# I-View




6/30/2022, 4:25:50 PM

Protected Natural Lands - Public Sector

1:18,056

0 612.5 1,225 2,450 ft

0 187.5 375 750 m

County of McHenry, Esri Canada, Esri, HERE, Garmin, GeoTechnologies, Inc., USGS, METI/NASA, EPA, USDA

Charles Road over Slough Creek and Nelson Road Intersection
Crash Data
Years 2016 through 2020

**Injury Crashes**

| | | |
|---|---|---|
| Fatalities: | 1 | 4.0% |
| Type A: | 3 | 11.0% |
| Type B: | 6 | 22.0% |
| Type C: | 3 | 11.0% |
| Total injury crashes: | 13 | 48.0% |
| **Total crashes:** | **27** | **100.0%** |

**Weather**

| | | |
|---|---|---|
| Dry | 23 | 85.2% |
| Not Dry | 4 | 14.8% |

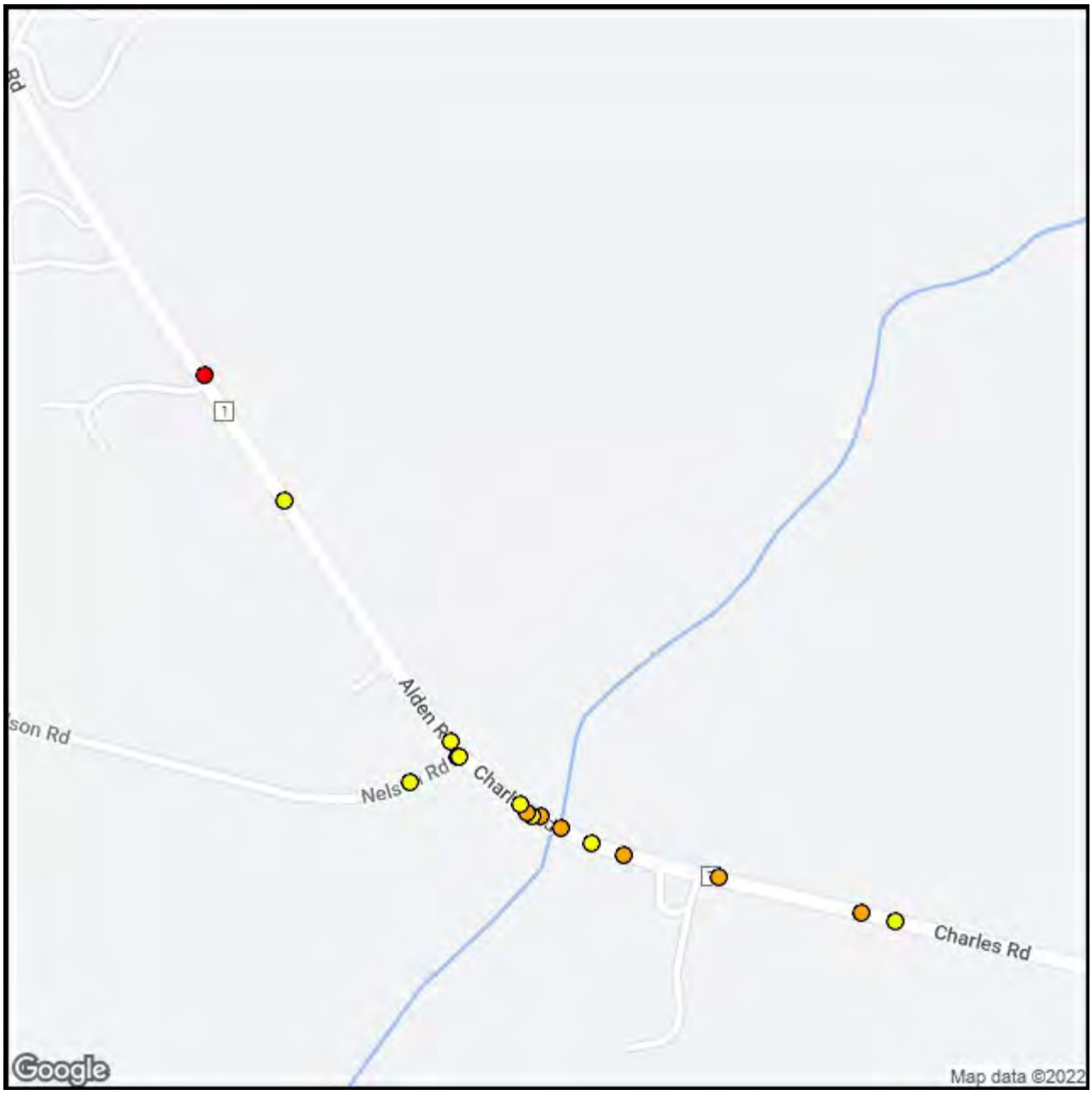
**Light**

| | | |
|---|---|---|
| Day | | |
| Not Day | | |

**Crash Type**

| | | |
|---|---|---|
| Angle | 1 | 3.7% |
| Animal | 3 | 11.1% |
| Fixed object | 10 | 37.0% |
| Head on | 1 | 3.7% |
| Other non collision | 2 | 7.4% |
| Other object | 2 | 7.4% |
| Overturned | 1 | 3.7% |
| Rear end | 2 | 7.4% |
| Sideswipe | 1 | 3.7% |
| Sideswipe opposite | 2 | 7.4% |
| Turning | 2 | 7.4% |
| **Total** | **27** | **100.0%** |

| A.CRSH_ID | A.DATE_VAL | CRSH_TYPE_CD | NUM_INJY_A | NUM_INJY_B | NUM_INJY_C | A.NUM_FATL | RD_COND_CD | MILT_TIME | WTHR_CD |
|---|---|---|---|---|---|---|---|---|---|
| 201601062302 | 3/10/2016 | Fixed object | 0 | 0 | 0 | 0 | Dry | 7 | Clear |
| 201601142294 | 6/21/2016 | Other non collision | 0 | 0 | 0 | 0 | Dry | 2313 | Clear |
| 201601170711 | 7/25/2016 | Fixed object | 0 | 0 | 0 | 0 | Dry | 1440 | Clear |
| 201601247667 | 10/12/2016 | Sideswipe | 0 | 2 | 0 | 1 | Dry | 952 | Clear |
| 201601266460 | 11/8/2016 | Animal | 0 | 0 | 0 | 0 | Dry | 1740 | Clear |
| 201701026051 | 1/21/2017 | Other object | 0 | 0 | 0 | 0 | Wet | 207 | Fog/smoke/haze |
| 201701116667 | 5/15/2017 | Animal | 0 | 0 | 0 | 0 | Dry | 1905 | Clear |
| 201701139889 | 5/25/2017 | Fixed object | 0 | 0 | 0 | 0 | Dry | 548 | Clear |
| 201701260339 | 10/6/2017 | Angle | 0 | 0 | 0 | 0 | Dry | 904 | Clear |
| 201801011283 | 1/3/2018 | Fixed object | 0 | 0 | 0 | 0 | Wet | 1016 | Clear |
| 201801116567 | 4/17/2018 | Overturned | 0 | 0 | 0 | 0 | Dry | 754 | Clear |
| 201801203324 | 7/5/2018 | Other object | 0 | 0 | 0 | 0 | Dry | 1004 | Clear |
| 201901016453 | 1/6/2019 | Fixed object | 0 | 0 | 0 | 0 | Ice | 114 | Clear |
| 201901027184 | 1/19/2019 | Fixed object | 0 | 1 | 0 | 0 | Snow and slush | 1015 | Snow |
| 201901132164 | 5/1/2019 | Animal | 0 | 0 | 0 | 0 | Dry | 1630 | 8 |
| 201901133284 | 4/26/2019 | Fixed object | 1 | 1 | 0 | 0 | Dry | 1553 | Clear |
| 201901161381 | 5/27/2019 | Rear end | 0 | 0 | 0 | 0 | Dry | 948 | Clear |
| 201901243109 | 7/19/2019 | Turning | 0 | 0 | 1 | 0 | Dry | 629 | 8 |
| 201901246696 | 7/24/2019 | Turning | 0 | 0 | 0 | 0 | Dry | 1655 | Clear |
| 201901260369 | 8/2/2019 | Sideswipe | 0 | 0 | 0 | 0 | Dry | 1000 | Clear |
| 201901265576 | 8/3/2019 | Other non collision | 0 | 1 | 0 | 0 | Dry | 1634 | Clear |
| 201901430634 | 12/2/2019 | Rear end | 0 | 0 | 0 | 0 | Dry | 807 | Clear |
| 202001090919 | 3/26/2020 | Fixed object | 0 | 0 | 0 | 0 | Dry | 805 | 8 |
| 202001160982 | 6/22/2020 | Fixed object | 1 | 0 | 0 | 0 | Dry | 1621 | 8 |
| 202001184008 | 7/22/2020 | Head on | 0 | 0 | 1 | 0 | Dry | 1107 | Clear |
| 202001249913 | 9/23/2020 | Fixed object | 1 | 0 | 0 | 0 | Dry | 1735 | Clear |
| 202001300443 | 11/11/2020 | Sideswipe | 0 | 1 | 1 | 0 | Dry | 1515 | Clear |




0 750 1500

Feet

N

**Crash Level**

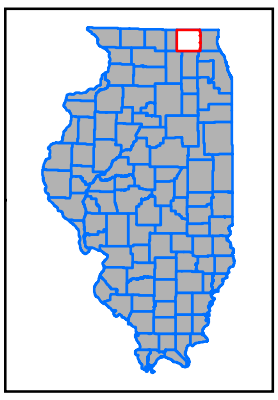
- Fatal
- Injury
- PDO
- Located Fatal
- Located Injury
- Located PDO

6/29/2022

Disclaimer: Results of these analyses are based on data that was received from the Illinois Department of Transportation. Crash data used represents years 2011 to 2015 and was obtained from the state police and other enforcement agencies. Crash data for year 2011 and 2012 was received from IDOT on November 26, 2013, crash data for 2013 was received from IDOT on December 4, 2014, crash data for 2014 was received from IDOT on December 16, 2015, and crash data for 2015 was received from IDOT on April 4, 2017. The roadway data was developed by IDOT and represents the end of the 2013 year conditions while the intersection data represents end of the year 2014 conditions. The segments layer was received from IDOT on March 28, 2012 and the intersection layer was received from IDOT on May 31, 2012. The data was used "as is" for analysis purposes and should be interpreted accordingly. Date: 11/22/2017

Note:
Local jurisdiction consists of county, municipality, and township roads based on the Illinois Roadway Inventory System (IRIS).

*Intersections listed in the Critical Safety Tier are identified using red text and the following identification format, WW_X_Y_ZZZZ:
- WW: Represents the year of analysis
- X: Represents the IDOT District
- Y: Represents the Peer Group
- ZZZZ: Represents the Unique ID number



# McHenry County Intersections 2017 Local Jurisdiction Safety Tier Analysis Period: 2011-2015

State System Segments
Local System Segments

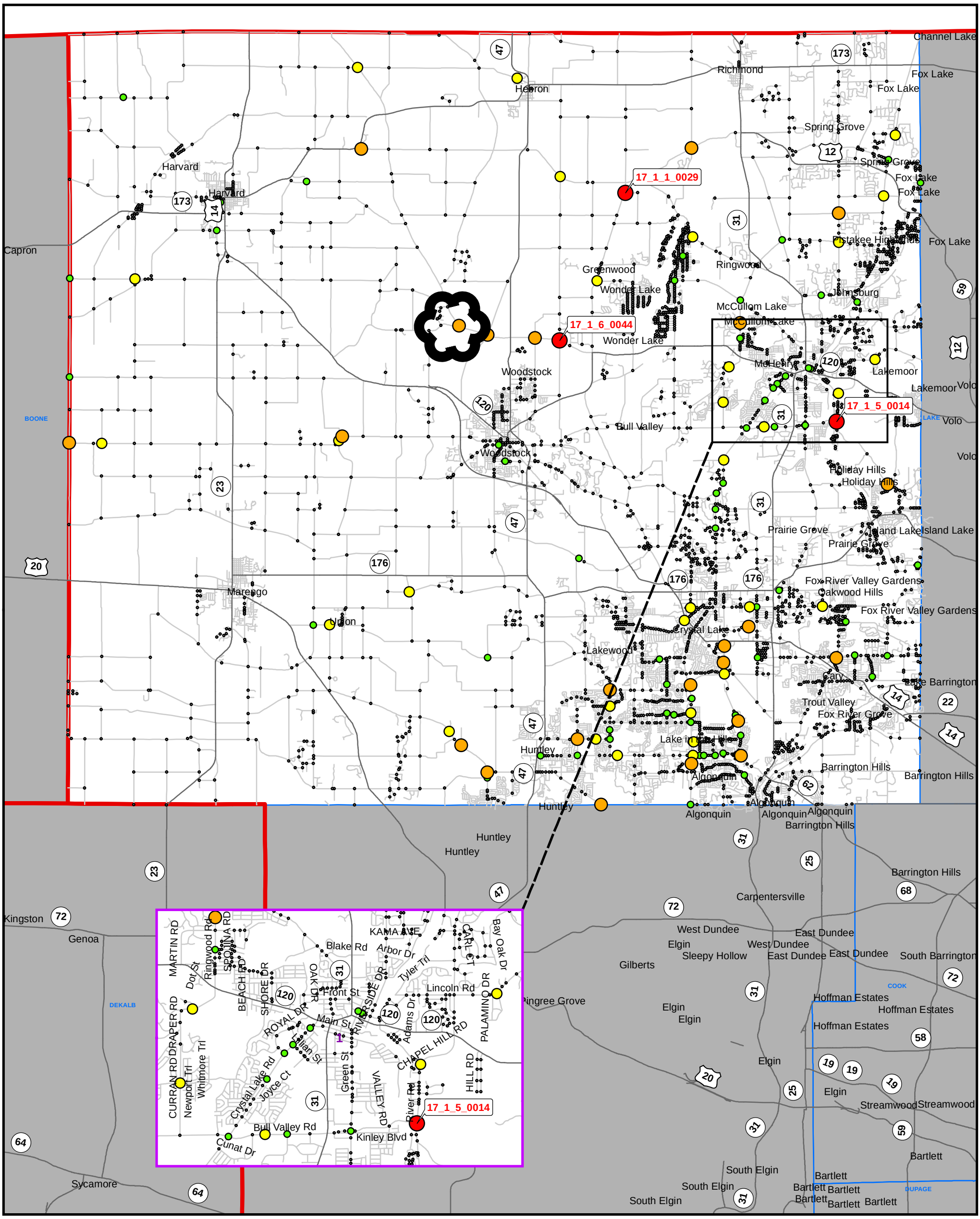
**Local System Safety Tier**
- Critical*
- High
- Medium
- Low
- Minimal

N

Illinois Department of Transportation

ch2m

0 1.5 3 4.5 Miles



# National Flood Hazard Layer FIRMette

FEMA

88°28'44"W 42°22'8"N


88°28'7"W 42°21'42"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

*Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020*

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

**SPECIAL FLOOD HAZARD AREAS**
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

**OTHER AREAS OF FLOOD HAZARD**
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

**OTHER AREAS**
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

**GENERAL STRUCTURES**
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

**OTHER FEATURES**
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

**MAP PANELS**
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

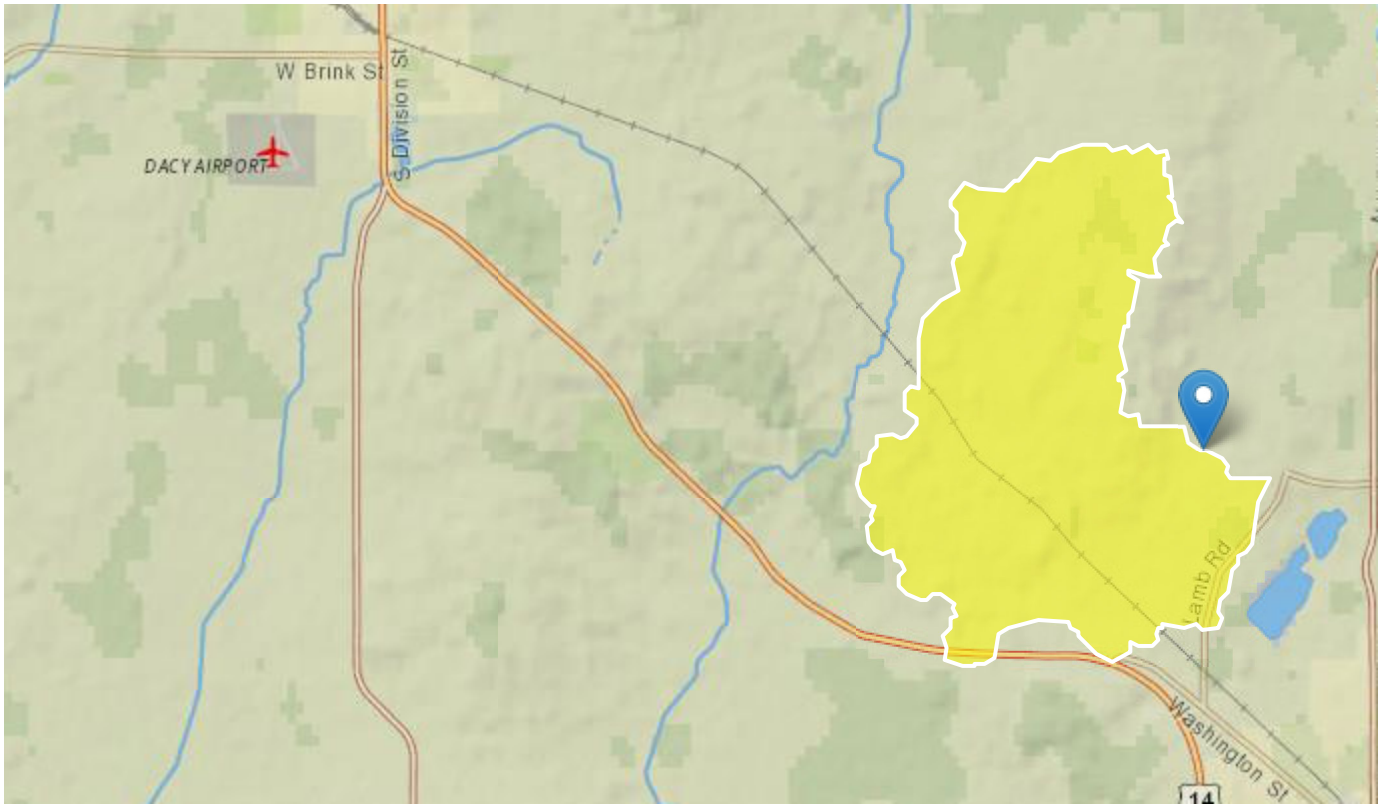
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/1/2022 at 3:03 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# StreamStats Report - Charles Road Bridge (3006)

**Region ID:** IL
**Workspace ID:** IL20220704193925142000
**Clicked Point (Latitude, Longitude):** 42.36463, -88.47264
**Time:** 2022-07-04 14:39:46 -0500




Collapse All

## Basin Characteristics

| Parameter Code | Parameter Description | Value | Unit |
|---|---|---|---|
| DRNAREA | Area that drains to a point on a stream | 9.78 | square miles |
| FLC11DVLMH | Fraction of drainage area that is in low to high developed land-use classes 22-24 from NLCD 2011 | 0.036 | decimal fraction |
| FSSURGDC78 | Fraction of land area that is in very poorly drained and unknown likely water drainage classes 7 and 8 from SSURGO | 0.045 | decimal fraction |

| Parameter Code | Parameter Description | Value | Unit |
|---|---|---|---|
| RELRELF | Basin relief divided by basin perimeter | 7.02 | feet per mi |

## Peak-Flow Statistics

### Peak-Flow Statistics Parameters [Region 2 Peak SIR 2016 5050 V3]

| Parameter Code | Parameter Name | Value | Units | Min Limit | Max Lim |
|---|---|---|---|---|---|
| DRNAREA | Drainage Area | 9.78 | square miles | 0.0878 | 135 |
| FLC11DVLMH | Frac_Lo_Med_Hi_Developed_from_NLCD2011 | 0.036 | decimal fraction | 0.0022 | 0.9 |
| FSSURGDC78 | Fraction_SSURGO_Drainage_Classes_7_and_8 | 0.045 | decimal fraction | 0 | 0.2 |
| RELRELF | Relative Relief | 7.02 | feet per mi | 0.821 | 37. |

### Peak-Flow Statistics Flow Report [Region 2 Peak SIR 2016 5050 V3]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

| Statistic | Value | Unit | PIl | PIu | ASEp |
|---|---|---|---|---|---|
| Urban 20-Percent AEP flood | 425 | ft^3/s | 203 | 892 | 47.5 |
| Urban 50-percent AEP flood | 258 | ft^3/s | 125 | 531 | 46 |
| Urban 10-percent AEP flood | 545 | ft^3/s | 253 | 1180 | 49.6 |
| Urban 4-percent AEP flood | 703 | ft^3/s | 310 | 1600 | 53.4 |
| Urban 1-percent AEP flood | 936 | ft^3/s | 381 | 2300 | 59.5 |
| Urban 2-percent AEP flood | 820 | ft^3/s | 346 | 1940 | 56.6 |
| Urban 0.2-percent AEP flood | 1210 | ft^3/s | 455 | 3220 | 66 |

*Peak-Flow Statistics Citations*

**Over, T.M. , Saito, R.J., Veilleux, A.G., Sharpe, J.B., Soong, D.T., and Ishii, A.L.2021, Estimation of peak discharge quantiles for selected annual exceedance probabilities in**

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE NORTHEASTERN ILLINOIS METROPOLITAN
AREA PLANNING COMMISSION

HYDROLOGIC INVESTIGATIONS
ATLAS HA-256


# FLOODS IN WOODSTOCK QUADRANGLE NORTHEASTERN ILLINOIS

This report presents hydrologic data that can be used to evaluate the economic development of flood plains in the Woodstock quadrangle, northeastern Illinois. It will aid individuals, government agencies, and others responsible for solving existing flood problems and for formulating effective flood-plain regulations that will minimize the creation of new flood problems. The report will also be useful for preparing building and zoning regulations, locating waste disposal facilities, developing recreational areas, and managing surface water in relation to groundwater resources.

The areas inundated by floods along streams in the Woodstock 7½-minute quadrangle are delineated on a topographic map. The stream names and the dates of the floods shown on the map are tabulated below:

| Date of flood | Stream name |
|---|---|
| March 1943 | Slough Creek |
| April 1962 | Boone Creek |
| February 1966 | Apple Creek, Franklinville Creek, and Silver Creek |
| March and April 1967 | Kishwaukee River, Kishwaukee River tributary, and several unnamed streams |

The Woodstock quadrangle location is shown in figure 1.

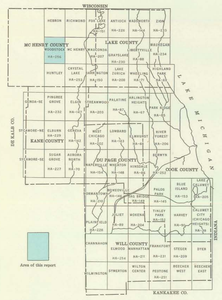



FIGURE 1.—*Index map of northeastern Illinois showing location of quadrangles included in flood-hazard mapping program.*

Local residents reported that the flood of March 1943 was the highest observed in the last 25 years on Slough Creek. Residents along the Kishwaukee River report that only minor overbank flooding has occurred during the last 15 years.

Greater floods than the floods whose boundaries are shown on the map are possible. The flood boundaries shown provide a record of historic fact that reflect channel conditions existing when the floods occurred. Changes in channel conditions, in waterway openings at highways and railroads, or changes in runoff characteristics of the streams caused by increased urbanization that may have taken place subsequent to the floods represented on the map could affect the flood height reached by a future flood of comparable discharge. Protective works built after the floods shown may reduce the frequency of flooding in the area but will not necessarily eliminate all future flooding. The inundation pattern of future floods may be affected by new highways and bridges, relocation and improvement of stream channels, and other cultural changes.

The general procedure used in defining the flood boundaries was to construct flood profiles from elevations of floodmarks identified in the field and from data available from other agencies. The extent of flooding delineated on the topographic map was derived from the profiles by interpolation between contours (lines of equal ground elevations) and by plotting overflow limits identified during field investigations and surveys. The portrayal of flood boundaries is consistent with the scale of the map (1 inch = 2,000 feet; contour interval, 5 feet and 10 feet).

There are several depressions or lowland areas in the Woodstock quadrangle where surface water accumulates because of inadequate drainage into the streams. Frequency and depth of flooding in these areas are unrelated to the water-surface elevation along the streams. Some areas are flooded only briefly after periods of heavy rainfall or snowmelt, whereas others remain inundated continously, depending largely upon the rates of evaporation and seepage into the ground. Flood boundaries are shown for all such areas that were detected in this investigation.

*Cooperation and acknowledgment.*— The preparation of this report is a part of an extensive flood-mapping program financed through cooperative agreements between the Northeastern Illinois Metropolitan Area Planning Commission and the U.S. Geological Survey. Under previous agreements, flood maps were prepared for forty-three 7½-minute quadrangles. Under the present agreement, the flood-mapping program was expanded to include all the 7½-minute quadrangles shown in figure 1. The program includes parts of Cook and McHenry Counties, nearly all of Kane and Will Counties, and all of Du Page and Lake Counties. The six counties cooperate in the program financially through separate agreements with the Planning Commission. Financial support for the preparation of this report was provided by McHenry County through the Northeastern Illinois Metropolitan Area Planning Commission.

The cooperative program is administered on behalf of the Planning Commission by Matthew L. Rockwell, Executive Director, and is directly coordinated by Arthur J. Zeizel, Acting Planning Officer.

The report was prepared by the U.S. Geological Survey under the administrative direction of William D. Mitchell, district chief, and under the immediate supervision of Allen W. Noehre, engineer-in-charge of the project.

Acknowledgment is made to the McHenry County Highway Department for furnishing information of flood heights at bridges and culverts in the area.

*Flood height.*— The height of a flood at a gaging station usually is stated in terms of gage height, or stage, which is the elevation of the water surface above a selected datum plane. Elevations shown in this report are in feet above mean sea level. Gage heights at crest-stage gages in the Woodstock quadrangle can be converted to elevations above mean sea level by adding the gage height to the appropriate datum of gage listed in the following table.

| Crest-stage gage | Station number | Datum of gage above mean sea level (feet) | Drainage area (square miles) |
|---|---|---|---|
| Kishwaukee River: | | | |
| Near Woodstock (Castle Road) | 5-4379 | 916.56 | 1.10 |
| Near Eldgefield (Doty Road) | 5-4379.1 | 914.66 | 5.46 |
| Kishwaukee River tributary near Woodstock (Pleasant Valley Road) | 5-4379.8 | 880.72 | 2.68 |
| Franklinville Creek near Franklinville (Davis Road) | 5-4380.1 | 843.95 | 4.87 |
| Apple Creek near Franklinville (Reig Road) | 5-4380.2 | 872.54 | 3.02 |
| Silver Creek: | | | |
| At Woodstock (State Highway 47) | 5-5480.4 | 875.60 | 4.19 |
| Near Woodstock (Charles Road) | 5-5480.5 | 852.46 | 15.5 |
| Slough Creek near Hartland (Rose Farm Road) | 5-5480.6 | 869.50 | 7.22 |

Size of the drainage basin for each station also is shown in the table. The subbasin divides from which the areas were determined are shown on the flood map. The divides were defined in the usual manner of following the ridge line or highest ground elevation between adjacent streams. Relief in parts of the quadrangle is slight and at times some of the divides may become submerged during floods. When this occurs water may flow in either direction across the divide depending upon the relative elevation of the streams and conveyance of their channels.

Gage height and year of occurrence of each annual flood (highest peak stage in a calendar year) above 748-foot elevation at the gaging station, Kishwaukee River at Belvidere, Ill., during the period 1938, 1940-66 are shown in figure 2. The gaging station is at the sewage disposal plant in Belvidere, and is about 19 miles west of the Woodstock quadrangle. The graph shows the history of floods at the gage and illustrates the irregular occurrence of floods on the Kishwaukee River.

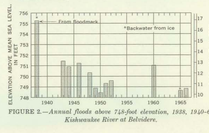



FIGURE 2.—*Annual floods above 748-foot elevation, 1938, 1940-66, Kishwaukee River at Belvidere.*

*Flood discharge.*— The rate of discharge of a stream is the volume of flow that passes a particular location in a given period of time. Discharge rates usually are expressed in units of cubic feet per second (cfs). Peak discharge, the maximum discharge attained by a flood, generally occurs at the time of the maximum height (stage) of the flood, but if a stream is affected by variable backwater, the time of the peak discharge may not coincide with that of the maximum stage. For example, backwater from an ice or debris jam may cause a high stage during a period of relatively low discharge.

*Flood frequency.*— Frequency of floods at the Geological Survey gaging stations on Boone Creek near McHenry, and on Kishwaukee River at Belvidere, were derived from streamflow records at these stations combined with records of other nearby stations and with the regional flood-frequency relation for streams in northern Illinois (Mitchell 1954). The Boone Creek gage is located on Bull Valley Road, 3.2 miles east of the Woodstock quadrangle and is 4.8 miles upstream from mouth of Boone Creek. The Kishwaukee River gage is at the sewage disposal plant in Belvidere, about 19 miles west of the Woodstock quadrangle and 20.8 miles upstream from mouth of Kishwaukee River.

The general relation between discharge and frequency is shown in figures 3 and 4 and the general relation between stage and frequency is shown in figures 5 and 6. The frequency curves in figures 5 and 6 are based on channel conditions existing in 1966. Longer records and future changes in channel conditions may define somewhat different flood-frequency curves. Extrapolation of the curves beyond the limits shown is not recommended.

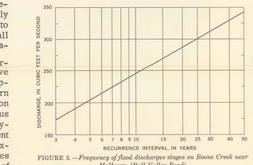



FIGURE 3.—*Frequency of flood discharges stages on Boone Creek near McHenry (Bull Valley Road).*

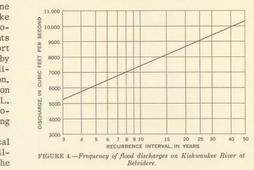



FIGURE 4.—*Frequency of flood discharges on Kishwaukee River at Belvidere.*

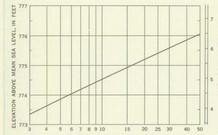



FIGURE 5.—*Frequency of flood stages on Boone Creek near McHenry (Bull Valley Road).*

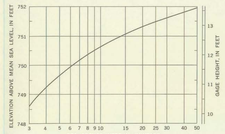



FIGURE 6.—*Frequency of flood stages on Kishwaukee River at Belvidere.*

*Recurrence intervals.*— As applied to flood events, recurrence interval is the average interval of time within which a given flood will be equaled or exceeded once. Frequencies of floods can be stated in terms of their probabilities of occurrence (virtually, reciprocals of their recurrence intervals for floods with recurrence intervals greater than 10 years). For example, a flood with a 25-year recurrence interval would have a 4-percent chance of being equaled or exceeded in any given year, or a flood with a 50-year recurrence interval would have a 2-percent chance of being equaled or exceeded in any given year.

The general relation between recurrence interval and flood height at the gaging stations on Boone Creek near McHenry (fig. 5) and Kishwaukee River at Belvidere (fig. 6) is tabulated below:

| Recurrence interval (years) | Elevation above mean sea level (feet) | |
|---|---|---|
| | Boone Creek near McHenry | Kishwaukee River at at Belvidere |
| 50 | 776.0 | 751.9 |
| 30 | 775.6 | 751.6 |
| 20 | 775.2 | 751.3 |
| 10 | 774.5 | 750.6 |
| 5 | 773.9 | 749.6 |
| 3 | 773.4 | 748.6 |

It is emphasized that recurrence intervals are average figures—the average number of years between occurrences of floods that equal or exceed a given magnitude. The fact that a major flood is experienced in one year does not reduce the probability of that flood being exceeded in the next year or even in the next week.

*Flood profiles.*— Profiles of the water surface, based primarily on elevations of marks left by floods of March 1943, February 1966, March 1967, and April 1967 are shown in figures 7-12. Where floodmarks could not be identified, the profiles were constructed on the basis of flood crests determined from reports by local residents, and on elevations of streambeds and lower flood stages. River miles used for the profiles correspond to those marked along the streams on the flood map.

*Flood depths.*— Depth of flooding at any point can be estimated by subtracting the ground elevation from the water-surface elevation at the same point, indicated by the profiles in figures 7-12. The approximate ground elevation can be determined from contours on the map, although more accurate elevations can be obtained by leveling from nearby bench marks.

*Additional data.*— Other information pertaining to floods in the Woodstock quadrangle can be obtained at the office of the U.S. Geological Survey, Oak Park, Ill., and from the following published reports:

Daniels, W. S., and Hale, M. D., 1958, Floods of October 1954 in the Chicago area, Illinois and Indiana: U.S. Geol. Survey Water-Supply Paper 1370-B, 107-200.

Mitchell, W. D., 1954, Floods in Illinois, magnitude and frequency: Illinois Dept. Public Works and Bldgs., Div. of Waterways, 386 p.

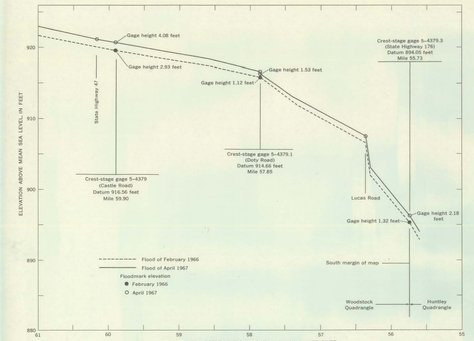



FIGURE 7.—*Profiles of floods on Kishwaukee River.*

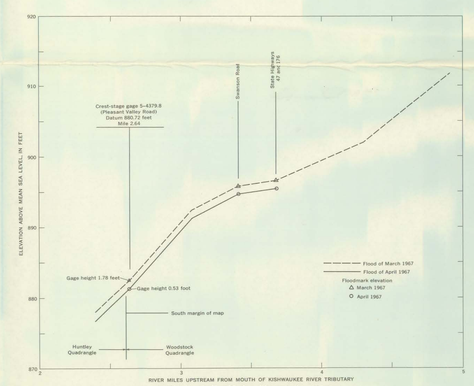



FIGURE 8.—*Profiles of floods on Kishwaukee River tributary.*

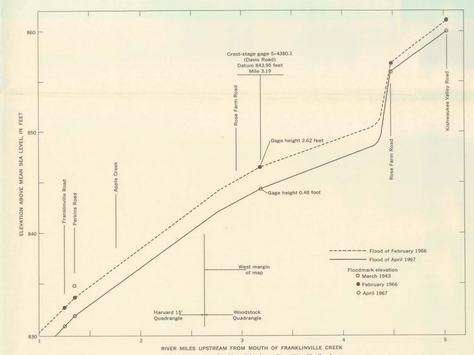



FIGURE 10. —*Profiles of floods on Franklinville Creek.*

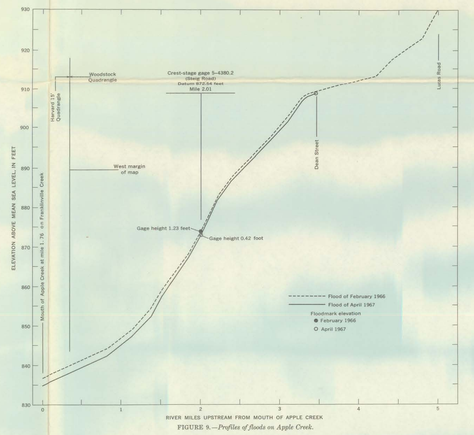



FIGURE 9.—*Profiles of floods on Apple Creek.*

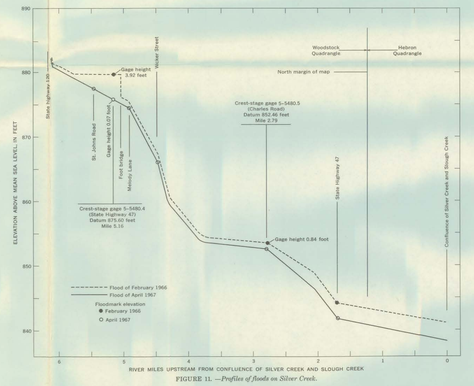



FIGURE 11. —*Profiles of floods on Silver Creek.*

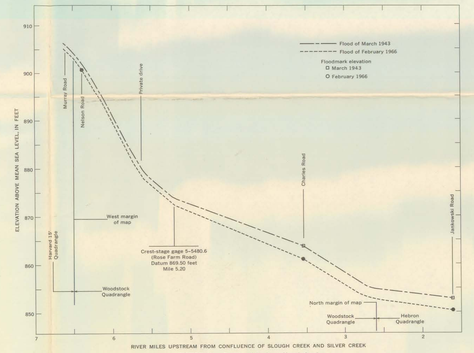



FIGURE 12. —*Profiles of floods on Slough Creek.*

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1968—W68156

# FLOODS IN WOODSTOCK QUADRANGLE, NORTHEASTERN ILLINOIS

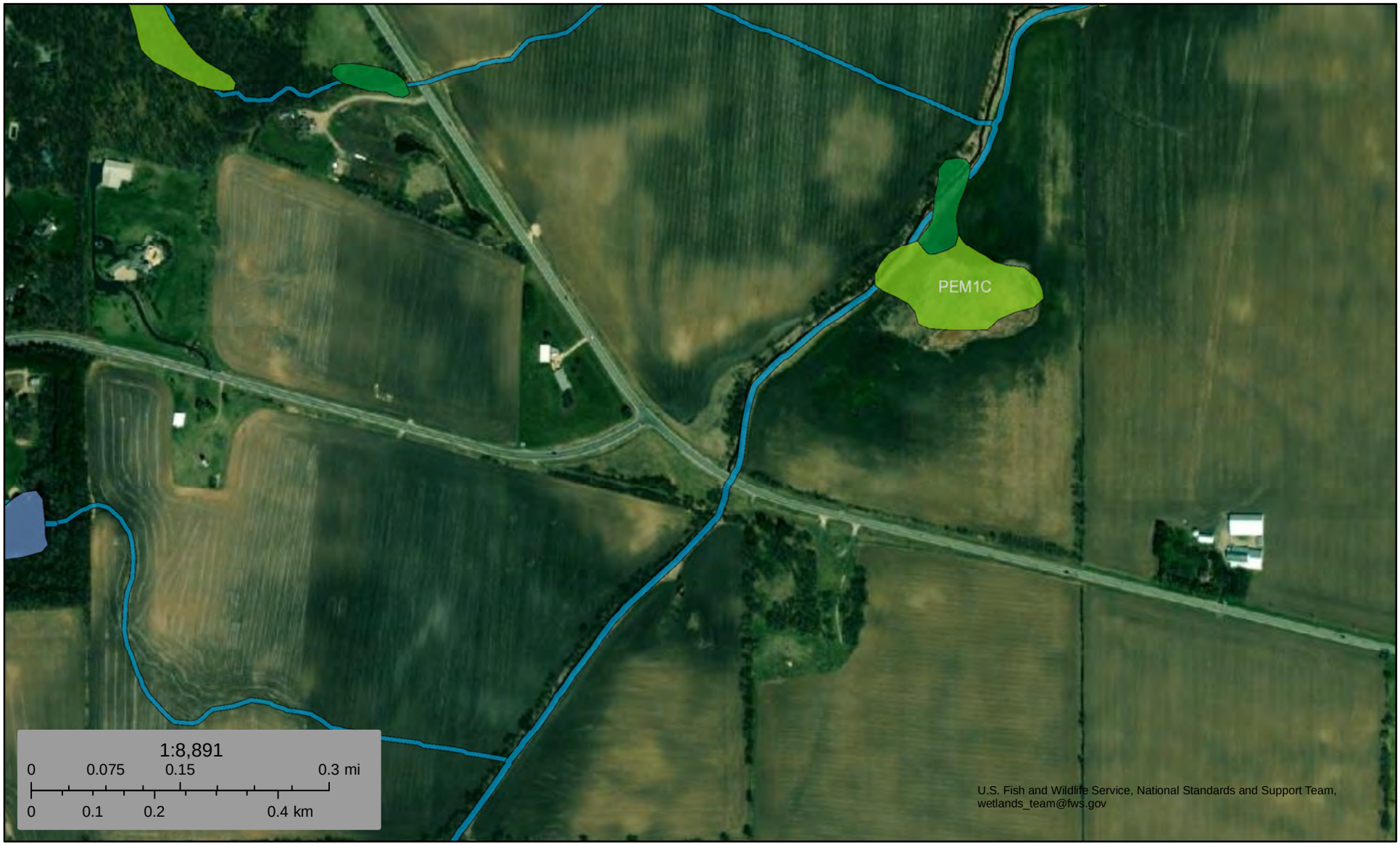
By
Howard E. Allen

1968

For sale by U.S. Geological Survey, price 75 cents

U.S. Fish and Wildlife Service
National Wetlands Inventory

# Wetlands

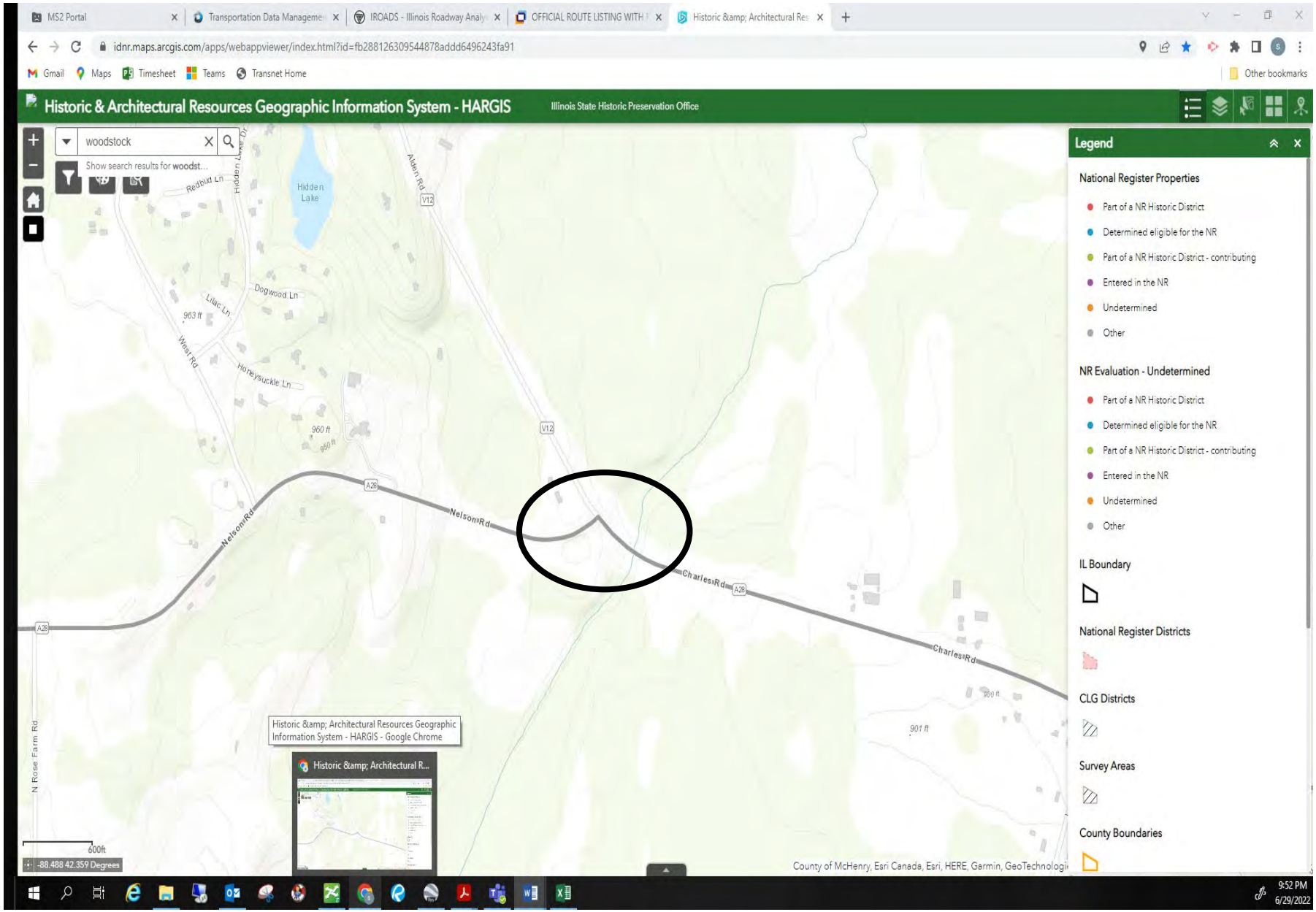



June 28, 2022

**Wetlands**

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.


MS2 Portal
Transportation Data Manageme
IROADS - Illinois Roadway Analy
OFFICIAL ROUTE LISTING WITH
Historic & Architectural Res
idnr.maps.arcgis.com/apps/webappviewer/index.html?id=fb28812630954487 8addd6496243fa91
Gmail
Maps
Timesheet
Teams
Transnet Home
Other bookmarks
Historic & Architectural Resources Geographic Information System - HARGIS
Illinois State Historic Preservation Office
woodstock
Show search results for woodst...
Redbud Ln
Hidden Lake Dr
Hidden Lake
Alden Rd
V12
Dogwood Ln
Lilac Ln
963 ft
West Rd
Honeysuckle Ln
960 ft
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County of McHenry, Esri Canada, Esri, HERE, Garmin, GeoTechnologi
Legend
National Register Properties
Part of a NR Historic District
Determined eligible for the NR
Part of a NR Historic District - contributing
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Undetermined
Other
NR Evaluation - Undetermined
Part of a NR Historic District
Determined eligible for the NR
Part of a NR Historic District - contributing
Entered in the NR
Undetermined
Other
IL Boundary
National Register Districts
CLG Districts
Survey Areas
County Boundaries
9:52 PM
6/29/2022

| e | V = 20 mph R (ft) | Trans. Length $L_1$ (ft) | Trans. Length TR (ft) | V = 25 mph R (ft) | Trans. Length $L_1$ (ft) | Trans. Length TR (ft) | V = 30 mph R (ft) | Trans. Length $L_1$ (ft) | Trans. Length TR (ft) |
|---|---|---|---|---|---|---|---|---|---|
| NC | ≥ 1640 | 0 | 0 | ≥ 2370 | 0 | 0 | ≥ 3240 | 0 | 0 |
| RC | 1190 | 22 | 22 | 1720 | 24 | 24 | 2370 | 25 | 25 |
| 2.5% | 915 | 37 | 22 | 1360 | 39 | 24 | 1845 | 42 | 25 |
| 3.0% | 730 | 45 | 22 | 1070 | 47 | 24 | 1480 | 50 | 25 |
| 3.5% | 596 | 52 | 22 | 878 | 55 | 24 | 1225 | 59 | 25 |
| 4.0% | 490 | 59 | 22 | 729 | 63 | 24 | 1030 | 67 | 25 |
| 4.5% | 401 | 67 | 22 | 608 | 71 | 24 | 864 | 75 | 25 |
| 5.0% | 314 | 74 | 22 | 499 | 79 | 24 | 727 | 84 | 25 |
| 5.5% | 247 | 82 | 22 | 404 | 87 | 24 | 605 | 92 | 25 |
| 6.0% | 199 | 89 | 22 | 332 | 94 | 24 | 506 | 100 | 25 |
| 6.5% | 163 | 97 | 22 | 277 | 102 | 24 | 428 | 109 | 25 |
| 7.0% | 135 | 104 | 22 | 231 | 110 | 24 | 360 | 117 | 25 |
| 7.5% | 110 | 111 | 22 | 190 | 118 | 24 | 300 | 125 | 25 |
| 8.0% | 76 | 119 | 22 | 134 | 126 | 24 | 214 | 134 | 25 |
| | $R_{min}$ = 76 ft | | | $R_{min}$ = 134 ft | | | $R_{min}$ = 214 ft | | |

| e | V = 35 mph R (ft) | Trans. Length $L_1$ (ft) | Trans. Length TR (ft) | V = 40 mph R (ft) | Trans. Length $L_1$ (ft) | Trans. Length TR (ft) | V = 45 mph R (ft) | Trans. Length $L_1$ (ft) | Trans. Length TR (ft) |
|---|---|---|---|---|---|---|---|---|---|
| NC | ≥ 4260 | 0 | 0 | ≥ 5410 | 0 | 0 | ≥ 6710 | 0 | 0 |
| RC | 3120 | 27 | 27 | 3970 | 28 | 28 | 4930 | 31 | 31 |
| 2.5% | 2430 | 44 | 27 | 3100 | 47 | 28 | 3860 | 51 | 31 |
| 3.0% | 1960 | 53 | 27 | 2510 | 57 | 28 | 3130 | 61 | 31 |
| 3.5% | 1630 | 62 | 27 | 2095 | 66 | 28 | 2610 | 71 | 31 |
| 4.0% | 1370 | 71 | 27 | 1770 | 76 | 28 | 2220 | 81 | 31 |
| 4.5% | 1165 | 80 | 27 | 1515 | 85 | 28 | 1905 | 92 | 31 |
| 5.0% | 991 | 89 | 27 | 1310 | 95 | 28 | 1650 | 102 | 31 |
| 5.5% | 842 | 97 | 27 | 1125 | 104 | 28 | 1435 | 112 | 31 |
| 6.0% | 713 | 106 | 27 | 965 | 114 | 28 | 1250 | 122 | 31 |
| 6.5% | 605 | 115 | 27 | 833 | 123 | 28 | 1080 | 132 | 31 |
| 7.0% | 518 | 124 | 27 | 716 | 132 | 28 | 933 | 142 | 31 |
| 7.5% | 434 | 133 | 27 | 604 | 142 | 28 | 794 | 153 | 31 |
| 8.0% | 314 | 142 | 27 | 444 | 151 | 28 | 587 | 163 | 31 |
| | $R_{min}$ = 314 ft | | | $R_{min}$ = 444 ft | | | $R_{min}$ = 587 ft | | |

| e | V = 50 mph R (ft) | Trans. Length $L_1$ (ft) | Trans. Length TR (ft) | V = 55 mph R (ft) | Trans. Length $L_1$ (ft) | Trans. Length TR (ft) | V = 60 mph R (ft) | Trans. Length $L_1$ (ft) | Trans. Length TR (ft) |
|---|---|---|---|---|---|---|---|---|---|
| NC | ≥ 8150 | 0 | 0 | ≥ 9720 | 0 | 0 | ≥ 11,500 | 0 | 0 |
| RC | 5990 | 33 | 33 | 7150 | 35 | 35 | 8440 | 37 | 37 |
| 2.5% | 4700 | 55 | 33 | 5620 | 59 | 35 | 6640 | 61 | 37 |
| 3.0% | 3820 | 66 | 33 | 4580 | 70 | 35 | 5420 | 73 | 37 |
| 3.5% | 3195 | 77 | 33 | 3840 | 82 | 35 | 4550 | 85 | 37 |
| 4.0% | 2720 | 88 | 33 | 3270 | 94 | 35 | 3890 | 98 | 37 |
| 4.5% | 2345 | 99 | 33 | 2830 | 105 | 35 | 3380 | 110 | 37 |
| 5.0% | 2040 | 110 | 33 | 2470 | 117 | 35 | 2960 | 122 | 37 |
| 5.5% | 1785 | 121 | 33 | 2175 | 129 | 35 | 2615 | 134 | 37 |
| 6.0% | 1560 | 132 | 33 | 1920 | 141 | 35 | 2320 | 147 | 37 |
| 6.5% | 1365 | 143 | 33 | 1690 | 152 | 35 | 2060 | 159 | 37 |
| 7.0% | 1190 | 154 | 33 | 1480 | 164 | 35 | 1820 | 171 | 37 |
| 7.5% | 1020 | 165 | 33 | 1275 | 176 | 35 | 1580 | 183 | 37 |
| 8.0% | 758 | 176 | 33 | 960 | 187 | 35 | 1200 | 195 | 37 |
| | $R_{min}$ = 758 ft | | | $R_{min}$ = 960 ft | | | $R_{min}$ = 1200 ft | | |

**SUPERELEVATION RATES/TRANSITION LENGTHS (US Customary) ($e_{max}$ = 8.0%)**

**Figure 29-3B**

*(See Figures 29-3C or 29-3D for Key and Note)*

| Design Element | | | | Manual Section | Design Volume (ADT) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | ADT < 400 | 400 to 750 | 750 to 2000 | ADT > 2000 |
| Design Controls | Design Forecast Year | | | 27-6.02 | Current | 20 Years | | |
| | Minimum Design Speed * (1a) | Level | | 27-5.02 | 40 mph (1b) | 50 mph (1b) | 50 mph | 60 mph |
| | | Rolling | | | 30 mph (1b) | 40 mph (1b) | | 50 mph |
| | Level of Service (LOS) * | | | 27-6.04 | C | | | |
| Cross Section Elements | Traveled Way Width * | | | 31-1.01 | 20’ | 22’ | | 24’ (2) |
| | Surface Type | | | Chapter 44 | Aggregate Surface or Bituminous Treated (3) | High Type Pavement | | |
| | Shoulder Width * | | | 31-1.06 | 2’ (4a) | 4’ (4b) | 6’ (4b) | 8’ (4b) |
| | Shoulder Type | | | | Turf or Aggregate (5a) | | Aggregate or Paved (5b) | |
| | Auxiliary Lanes * | Lane Width | | 31-1.03 | 10’ | Desired 11’ Minimum 10’ | | Desired 12’ Minimum 11’ |
| | | Shoulder Width | | | 2’ | 4’ | Desired 6’ Minimum 4’ | Desired 8’ Minimum 4’ |
| | Cross Slope | Travel Lane * (6a) | | 31-1.08 | 2.0% - 4% (6b) | 1.5% - 2.0% | | |
| | | Shoulder | | | Turf 5% - 8% / Aggregate 4% - 6% | | Aggregate 4% - 6% / Paved 4% | |
| | | Rollover Factor | | | 10% | | 8% | |
| Roadway Slopes | Side Slope (Maximum) | Cut Section | Front Slope | 31-2.03 31-2.04 | 1V:3H | | | 1V:4H |
| | | | Ditch Width | | Minimum 2’ | | | |
| | | | Back Slope | | ≤10’ 1V:3H (7) >10’ 1V:2H (7) | ≤10’ 1V:3H >10’ 1V:2H | | <15’ 1V:4H 15’ - 25’ 1V:3H >25’ 1V:2H |
| | | Rock Cut | | | 1V:0.25H | | | |
| | | Fill Section | | | ≤6’ 1V:3H >6’ 1V:2H | ≤10’ 1V:3H >10’ 1V:2H | | ≤25’ 1V:4H >25’ 1V:2H |

* Controlling design criteria (see Section 27-7).

ADT = Average Daily Traffic

**GEOMETRIC DESIGN CRITERIA FOR RURAL TWO-LANE COLLECTORS**
**(New Construction/Reconstruction)**

**Figure 32-2B (US Customary)**

***Footnotes:***

(1) Design Speed.

a. A rural collector may pass through a relatively built-up area. In these sections, a lower design speed may be selected with justification. However, the selected design speed should not be less than 30 mph (50 km/h). Consider the following:

i. For low to moderate density areas, the design speed may be reduced 5 mph to 10 mph (10 km/h) below the listed design speed.

ii. For moderate to high density areas, the design speed may be reduced 10 mph to 15 mph (10 km/h to 20 km/h) below the listed design speed.

b. For rural bridge projects, the design speed may be increased to the posted or regulatory speed limit to avoid a deficient NBIS rating for approach roadway alignment appraisal. All elements of the project will be designed to the chosen design speed. The chosen design speed will be certified by the County Engineer.

(2) Traveled Way Width. On a reconstruction project, an existing 22 ft (6.6 m) traveled way width may be maintained where the alignment and safety records are satisfactory.

(3) Surface Type. A high-type pavement is desirable.

(4) Shoulder Width.

a. Where roadside barriers are included, provide a minimum offset of 4 ft (1.2 m) from the edge of the traveled way to the roadside barrier. When the 4 ft (1.2 m) width cannot be met because of a proposed or an existing bridge width (see Section 36-5), Section 35-4 shall be followed to flare the roadside barrier until the 4 ft (1.2 m) width is met or until the length of need is exceeded.

b. Where the rural collector passes through a moderate to high density area, the shoulder width may be 4 ft (1.2 m). This width may include the width of Type B gutter or the gutter flag with curb and gutter at the outside edge of the shoulder.

(5) Shoulder Type.

a. Aggregate shoulders may consist of a nominal 4 in (100 mm) thickness where the ADT is less than 750 vehicles/day.

b. For ADT's > 750 vehicles/day, an aggregate shoulder should be a minimum thickness of 6 in (150 mm) Type A shoulders.

(6) Cross Slopes.

a. Cross slopes for outside auxiliary lanes will be at least 2.0% and should be 0.5% greater than the adjacent travel lane. Inside auxiliary lane cross slopes are sloped at 1.5% to 2.0% with high-type pavements.

b. Use 1.5% to 2.0% with high-type pavement.

(7) Back Slopes. For isolated restricted right-of-way, the back slope may be 1V:2H for cut depths of 0 ft to 10 ft (0 m to 3 m) or 1V:1.5H for cut depths greater than 10 ft (3 m).

**GEOMETRIC DESIGN CRITERIA FOR RURAL TWO-LANE COLLECTORS**
**(New Construction/Reconstruction)**

**Footnotes to Figure 32-2B**

| Classification | | Collector | | | | Local | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Approach Roadway Criteria | | See Figure 32-2A | | | | See Figure 32-2B | | | | |
| Design Traffic Volumes (ADT) | | ≤ 400 | 401-2000 | 2001-4000 | > 4000 | ≤ 250 | 251-400 | 401-2000 | 2001-4000 | > 4000 |
| Clear Roadway Bridge Widths (Face-to-Face of Traffic Barriers)[2][3][4] | | 24′ (Traveled Way + 2′ each side) | 28′ (Traveled Way + 3′ each side) | 32′ (Traveled Way + 5′ each side) | 40′ (6) (Approach Roadway Width) | 22′ (7) (Traveled Way + 2′ each side) | 24′ (Traveled Way + 2′ each side) | 28′ (Traveled Way + 3′ each side) | 30′ (Traveled Way + 4′ each side) | 40′ (6) (Approach Roadway Width) |
| Minimum Width of Bridges (Face-to-Face of Traffic Barriers) Allowed to Remain in Place[5] | | 22′ | 22′ | 24′ | 28′ | 20′ | 20′ | 22′ | 24′ | 28′ |
| Minimum Design Flood Frequency | | 20 year[10] | 20 year | 30 year | | 15 year[7] | 20 year | | 30 year | |
| Minimum Clearance Above Design High-Water Elevation[8] | | 1′ | | | | | | | | |
| Design Live Load | New | HS-20 | | | | | | | | |
| | Remain in Place[11] | HS-15 | | | | H-15 (H-10 where ADT < 50) | | | | |
| Vertical Clearance for Structures Over Highways[9] | New | See Figure 36-4I | | | | | | | | |
| | Remain in Place | 14′ | | | | | | | | |
| Horizontal Clearance for Structures Over Highways | | See Figure 36-4I | | | | | | | | |
| Horizontal Clearance Over Railroads | | See Figures 36-4J and 36-4K | | | | | | | | |
| Vertical Clearance for Pedestrian or Bicycle Structures Over Highways | | 17’-3” | | | | | | | | |
| Vertical Clearance Over Railroads | | 23’-0” | | | | | | | | |

## DESIGN CRITERIA FOR NEW OR RECONSTRUCTED[1] RURAL BRIDGES

**Figure 36-5A (US Customary)**

## ***Footnotes for Figure 36-5A***

(1) *Implies reconstruction of a significant length of existing highway either on new location or within existing right-of-way. For reconstruction of relatively short intermittent highway segments within a project, the design criteria used, where cost-safety effective, should be consistent with the adjacent highway design but not less than that allowed to remain in place.*

(2) *The minimum bridge width shall not be less than the width of the approaching traveled way plus the paved portions of the shoulders.*

(3) *Bridge widths for bridge rehabilitation projects are discussed in Chapter 33.*

(4) *For reconstruction projects, where the minimum required shoulder widths on a structure can only be obtained with the addition of new beams and substructure, a cost-safety evaluation should be made to determine the appropriateness of providing the required width. Significant decreases of the required widths should not be considered.*

(5) *Bridges remaining in place without a design exception approval when a safety record is satisfactory if the bridge is being gapped within a roadway section. Clear width between curbs or rails, whichever is less, should be equal to or greater than the approach traveled way width.*

(6) *For bridges in excess of 100 ft (30 m) in length, a minimum bridge width of 30 ft (9.0 m) will be permitted.*

(7) *For road district projects only, the bridge width may be 20 ft (6.0 m), and the design flood frequency may be 10 years for ADTs less than or equal to 150.*

(8) *For reconstruction projects, the proposed low superstructure should not be below the existing superstructure unless 1 ft (300 mm) of clearance is achieved. Any proposed clearance less than 1 ft (300 mm) above design high-water elevation must be accompanied by a request for a design exception.*

(9) *The minimum required vertical clearance must be available over the traveled way and any paved shoulders.*

(10) *The design flood frequency may be 15 years for ADT under 250.*

(11) *The design live load for bridges to remain in place only applies to minor rehabilitation and in-kind replacements (e.g. rail or joint repair, partial deck repair, individual stringer replacement, etc.). Other work, including deck replacement shall be considered new.*

*Note: Traveled way width is the sum of the widths of all travel lanes. It is the larger of the value from Chapter 32 or, for existing bridges, the existing (or proposed) width of the approach traveled way.*