Appendix F

Water Resources

Calculations

Clay County Percent Population Below Poverty Level
Income in the past 12 months below poverty level: 3,599
Total Population: 25,759

3,599/25,759 = **13.97%**

Census Tract 406 Percent Population Below Poverty Level
Income in the past 12 months below poverty level: 341
Total Population: 3,676

341/3,676 = **9.28%**

125% of COC: 13.97% x 125% = **17.46%**

9.28% < 17.46%

Clay County Percent Minority Population
Total Population White Alone: 25,283
Total Population: 26,268

26,268 – 25,283 = **985**
985 / 26,268 = **3.75%**

Census Tract 406 Percent Minority Population
Total Population White Alone: 3,627
Total Population: 3,676

3,676 – 3,627 = **49**
49 / 3,676 = **1.33%**

125% of COC: 3.75% x 125% = **4.69%**

1.33% < 3.69%

WATERS REPORT
INDIANA DEPARTMENT OF TRANSPORTATION (INDOT)
STATE ROUTE 157
IN CLAY COUNTY, INDIANA
CULVERT REPLACEMENT
DES. NO.: 1800147
ASSET ID #: CV 157-011-21.14

Prepared by:
Mathew Aldridge
Mathew.Aldridge@burgessniple.com
614-459-7272 ext. 1022
Burgess & Niple Inc.

Completed Date: 11/19/2019

Date of Field Reconnaissance: 10/17/2019

Location:
Section 10, Township 9N, Range 6W
Coal City, Indiana Quadrangle
Clay County, Indiana
HUC 12: 0512 0203 0805 (Lafferty Ditch-Eel River)
39.234154, -87.070235

1.0 PROJECT DESCRIPTION

The proposed project is located 5.19 miles South of State Route 246 in Clay County, Indiana. The small structure carries State Road 157 over an Unnamed Tributary to White Oak Creek. The build date of the structure is unknown. The existing structure is a 5.1′(span) x 3.9′(rise) corrugated metal pipe and has a condition appraisal rating of 4. The proposed project will replace the small structure to improve hydraulic efficiency and extend the life of the crossing. The preferred replacement structure consists of a 5′ (span) x 4′ (rise) reinforced concrete box. The skew of the structure may increase to allow the construction of wingwalls. Minimal to no profile change is anticipated. Minimal roadway work is anticipated.

2.0 DESKTOP RECONNAISSANCE

The literature review for this report included review of proposed project plans, U.S. Geological Survey (USGS) topographic maps, current aerial photography, National Hydrography Database (NHD), National Wetlands Inventory (NWI) maps, soils maps and soil survey information, Federal Emergency Management Agency (FEMA) flood hazard mapping, and Indiana Department of Environmental Management (IDEM) water quality and use designation information, as applicable. Findings of the literature review are summarized below.

2.1 USGS Topographic Mapping and Aerial Photography

The project location is depicted on the Coal City, Indiana 7.5-Minute Series USGS topographic quadrangle. Aerial photography was evaluated from imagery obtained from Indiana Map (*https://maps.indiana.edu*).

The study area is located in a rural setting along SR 157 and approximately 1.33 miles west of Coal City, IN. The unnamed tributary (UNT) to White Oak Creek is depicted as an intermittent stream on the USGS topographic map that begins to the southwest of the study area. The elevation of the surrounding area is approximately 600 ft. above mean sea level (AMSL) with elevations decreasing to the west. Aerial photography shows the entirety of the area to the north and south of the study area as active farmland. A narrow, wooded corridor surrounds the stream to the southwest of the study area. The NHD map shows one stream flowing from north to south through the study area.

2.2 Soils

According to the Soil Survey Geographic (SSURGO) Database for Clay County, Indiana, the study area does not contain soil areas with nationally listed hydric soils.

The primary mapped soil type within the study area is Cincinnati silt loam, Wabash Lowland, 6 to 12 percent slopes, severely eroded (CcC3). Two other soil types also occur within the study area. All of the soil types are rated as non-hydric.

Review results for soil mapping and unit descriptions obtained from the NRCS Web Soil Survey *(http://websoilsurvey.nrcs.usda.gov)* are summarized in **Table 1** below.

Table 1
Soil Survey

Soil Name	Map Abbreviation	Hydric Range
Ava silt loam, 2 to 6 percent slopes, eroded	AvB2	0%
Cincinnati silt loam, Wabash Lowland, 6 to 12 percent slopes, severely eroded	CcC3	0%
Hickory silt loam, Wabash Lowland, 12 to 18 percent slopes, severely eroded	HcD3	0%

2.3 National Wetland Inventory (NWI) Information

No wetlands, ponds or other mapped NWI features are depicted within the study area.

Within the neighboring area, there is one mapped riverine NWI feature (Map ID 1). It is depicted as an intermittent stream (R4SBC). Three NWI mapped freshwater ponds are also located within the neighboring area. These ponds are listed on the mapping as PUBGh (ID 2), PUBGx (ID 3), and PUBGh (ID 4).

NWI map review results obtained from the U.S. Fish & Wildlife Service's Wetlands Mapper application (*https://www.fws.gov/wetlands/Data/Mapper.html*), are summarized in **Table 2** below.

Table 2
NWI Mapped Features

Map ID	Abbreviation	Classification	Description	Location
1	R4SBC	Riverine/Intermittent/ Streambed/Seasonally Flooded	Stream	0.04 mi. SW
2	PUBGh	Palustrine/Unconsolidated Bottom/ Intermittently Exposed/Diked/Impounded	Freshwater Pond	0.01 mi. SE
3	PUBGx	Palustrine/Unconsolidated Bottom/ Intermittently Exposed/Excavated	Freshwater Pond	0.03 mi. S
4	PUBGh	Palustrine/Unconsolidated Bottom/ Intermittently Exposed/Diked/Impounded	Freshwater Pond	0.10 mi. S

2.4 Flood Hazard Mapping

The project location appears on Flood Insurance Rate Map (FIRM) panel 18021C0250C (effective 9/2/2011). It is shown located entirely within Zone X, indicating that it is in an area of minimal flood hazard.

3.0 FIELD RECONNAISSANCE

The study area was visited by Mathew Aldridge & Matthew Kestner, Environmental Scientists of B&N on October 17, 2019 to observe and document existing conditions, and to identify and evaluate potentially jurisdictional "waters of the U.S." (WOTUS) and other aquatic resources. Weather conditions were a high of 58°F and the last recorded precipitation was 0.85 inches on October 11, 2019. Findings of the field investigation are summarized below.

3.1 Streams

One stream was identified within the study area. It displayed a bed, bank, and ordinary high-water mark (OHWM), therefore meeting each of the criteria which define a potentially jurisdictional tributary. Stream characteristics are summarized below:

UNT to White Oak Creek: Unnamed tributary (UNT) to White Oak Creek is an intermittent stream that runs approximately 55 ft. from northeast to southwest through the study area before reaching its confluence with White Oak Creek off-site. This stream forms at the outlet of the project culvert (020-76-03494-A) to the south of SR 157. It has an estimated OHWM width of approximately 5.0 ft. and OHWM depth of approximately 0.8 ft. Estimated upstream drainage area is 0.062 $mi.^2$ according to USGS StreamStats. It is dominated by cobble and sand substrates, which were moderately embedded. Instream cover was nearly absent. This stream has been historically channelized in the study area but is recovering. There is no channel sinuosity and there was no pool/riffle development within the study area. The riparian corridor is a thin strip of grassland surrounded by agricultural fields. Bank erosion was moderate. Overall, it was rated "poor" in quality. Due to its hydrological connection to White Oak Creek, it is likely a jurisdictional "Water of the U.S".

Stream characteristics are summarized in **Table 3** below:

Table 3
Stream Summary Table

Water Feature Name	Photos	Lat / Long	OHWM Width (ft.)	OHWM Depth (ft.)	USGS Blue-line? Type?	Riffles? Pools?	Quality	Substrate	Likely Water of the U.S.?
UNT to White Oak Creek	9-11	39.234041, -87.070383	5.0	0.8	No Intermittent	No	Poor	Cobble/ Sand	Yes

3.2 Wetlands

A total of two data collection points were established in the study area to characterize and delineate potential wetland resources, and adjacent upland communities. Vegetation, hydrology, and soil data were collected at each sample point in accordance with applicable U.S. Army Corps of Engineers (USACE) Regional Supplement delineation protocols (*Midwest Regional Supplement*). Data collection results for each sample plot are discussed below:

Wetland 1: This is a palustrine emergent wetland that occurs to the east of the UNT to White Oak Creek and south of SR 157. It is approximately 0.009 acres in size. The wetland is dominated by *Carex frankii, Leersia oryzoides,* and *Typha angustifolia*. It appears to be seasonally flooded/saturated as evidenced by the depleted matrix and redox depressions. This wetland also contained drainage patterns, geomorphic position, and passed the FAC-Neutral test, all of which are wetland hydrology indicators. Due to its hydrological connection to the UNT of White Oak Creek, it is likely a Jurisdictional Water of the U.S.

Soil Point (SP) 2 was taken in the field to the south of Wetland 1. This soil exhibited a friable matrix of 10YR 4/2. This point had a dominance of *Schedonorus arundinaceus, Poa pratensis,* and *Trifolium pratense*. Hydrophytic vegetation was neither dominant nor prevalent. Wetland hydrology criteria were not met.

Wetland and Data Point characteristics are summarized in **Tables 4 & 5**.

Table 4
Data Point Summary Table

Data Point	Vegetation	Soils	Hydrology	Wetland
SP 1	Yes	Yes	Yes	Yes
SP 2	No	No	No	No

Table 5
Wetland Summary Table

Wetland Name	Photos	Lat/Long	Type	Total Area (acres)	Quality	Likely Water of the U.S.?
Wetland 1	9; 12-14	39.234068, -87.070234	PEM1E	0.009	Poor	Yes

3.3 Open Waters

No ponds, lakes, or other open water features were observed in the study area.

3.4 Other Features

A roadside ditch was observed to the north of SR 157. This ditch did not exhibit an OHWM or a defined bed and bank. It flows from the northeast and into the project culvert. At the culvert outlet, this ditch becomes the UNT to White Oak Creek.

4.0 CONCLUSION

Based on the findings of this investigation, B&N concludes that there is one potentially jurisdictional stream and one potentially jurisdictional wetland located within the study area. One non-jurisdictional ditch was also observed. No ponds, lakes, or other water features were observed in the study area.

These waterways are likely Waters of the U.S. Every effort should be taken to avoid and minimize impacts to the waterway and wetlands. If impacts are necessary, then mitigation may be required. The INDOT Environmental Services Division should be contacted immediately if impacts will occur. The final determination of jurisdictional waters is ultimately made by the U.S. Army Corps of Engineers. This report is our best judgement based on the guidelines set forth by the Corps.

5.0 ACKNOWLEDGEMENT

The waters determination has been prepared based on the best available information interpreted in the light of the investigator's training, experience, and professional judgement in conformance with the 1987 Corps of Engineers Wetlands Delineation Manual, the appropriate regional supplement, the USACE Jurisdictional Determination Form Instructional Guidebook, and other appropriate agency guidelines

Respectfully,

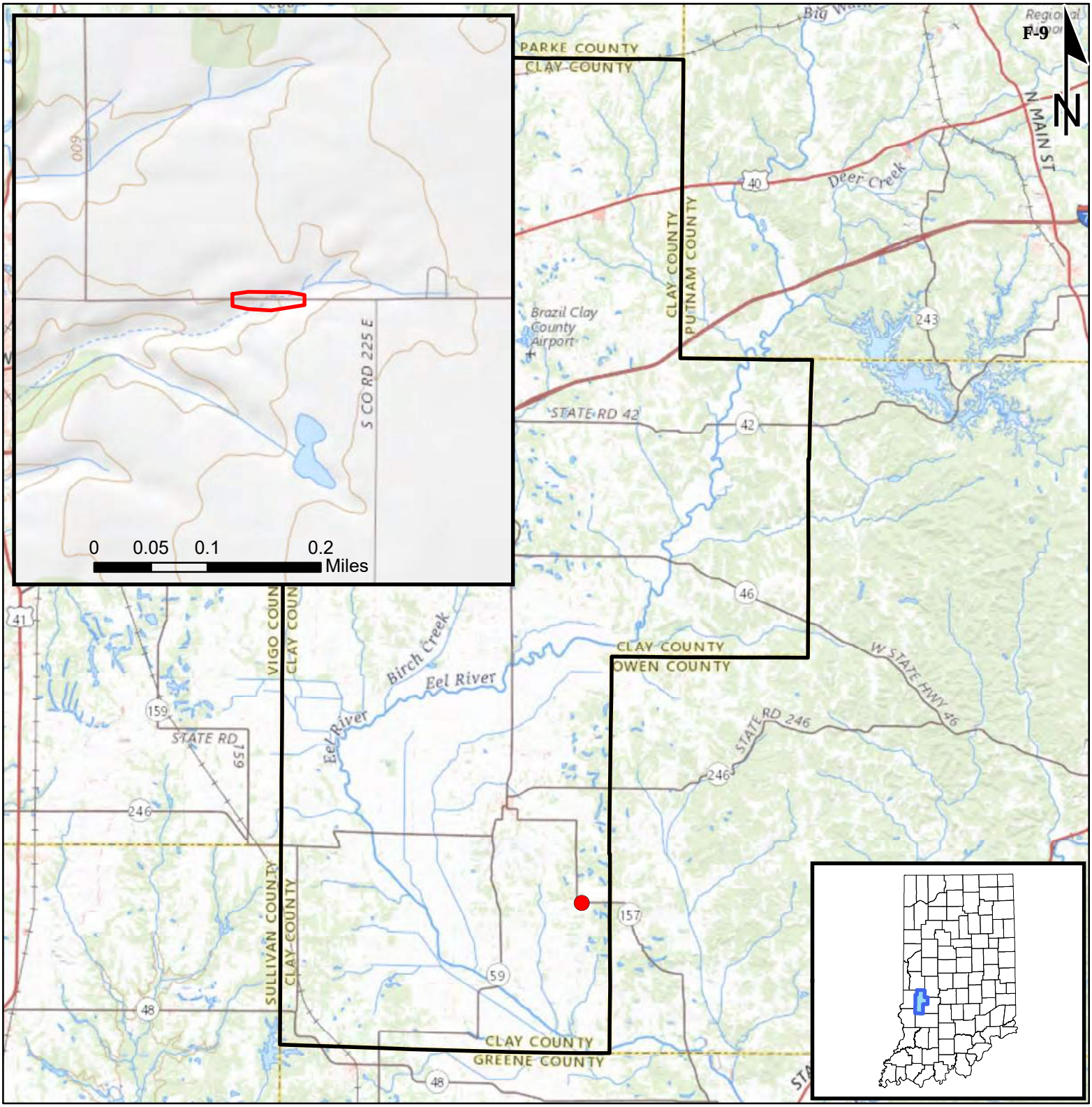
Mathew Aldridge

11/19/2019

Environmental Scientist
Burgess & Niple, Inc. / Crawfordsville District

ATTACHMENTS

Attachment 1	Project Location Map
Attachment 2	USGS Topographic Map
Attachment 3	Aerial Map
Attachment 4	National Hydrography Dataset (NHD) Map
Attachment 5	NRCS Soil Survey Map
Attachment 6	NWI Features Map
Attachment 7	FEMA Flood Hazard Map
Attachment 8	Site Photographs
Attachment 9	Water Resources Documentation
Attachment 10	Preliminary Jurisdictional Determination Form



0 2 4 8 Miles

Attachment 1

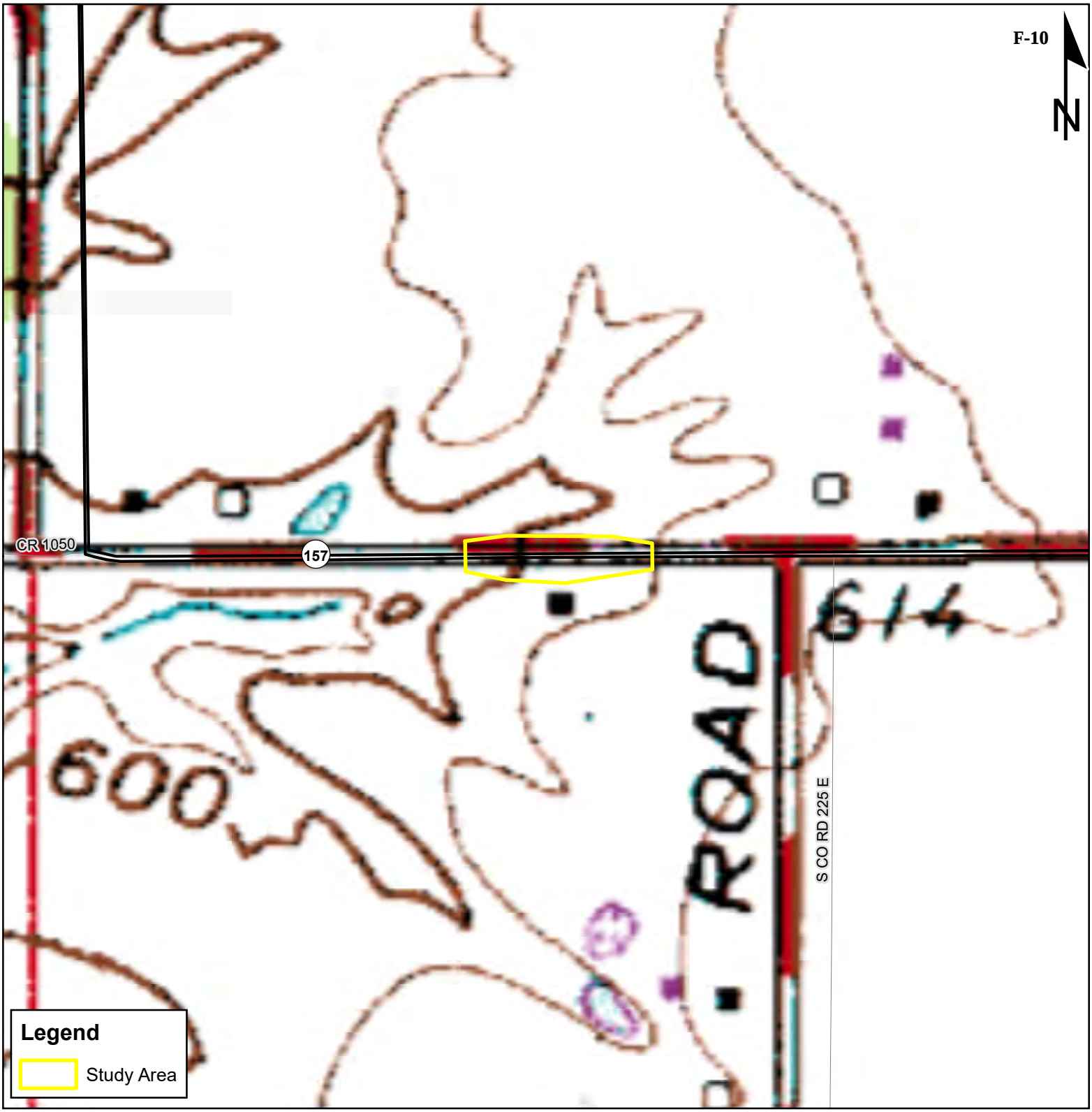
Indiana Dept. of Transportation (INDOT)
SR 157 - Culvert Replacement
Des. No.: 1800147
Coal City, IN 47427; Clay County

Sources:
Non Orthophotography
Data - Obtained from ESRI Online Services
Map Projection: UTM Zone 16 N **Map Datum:** NAD83

Prepared By: Burgess & Niple

Project Location Map

October 2019



0 125 250 500 Feet

Attachment 2

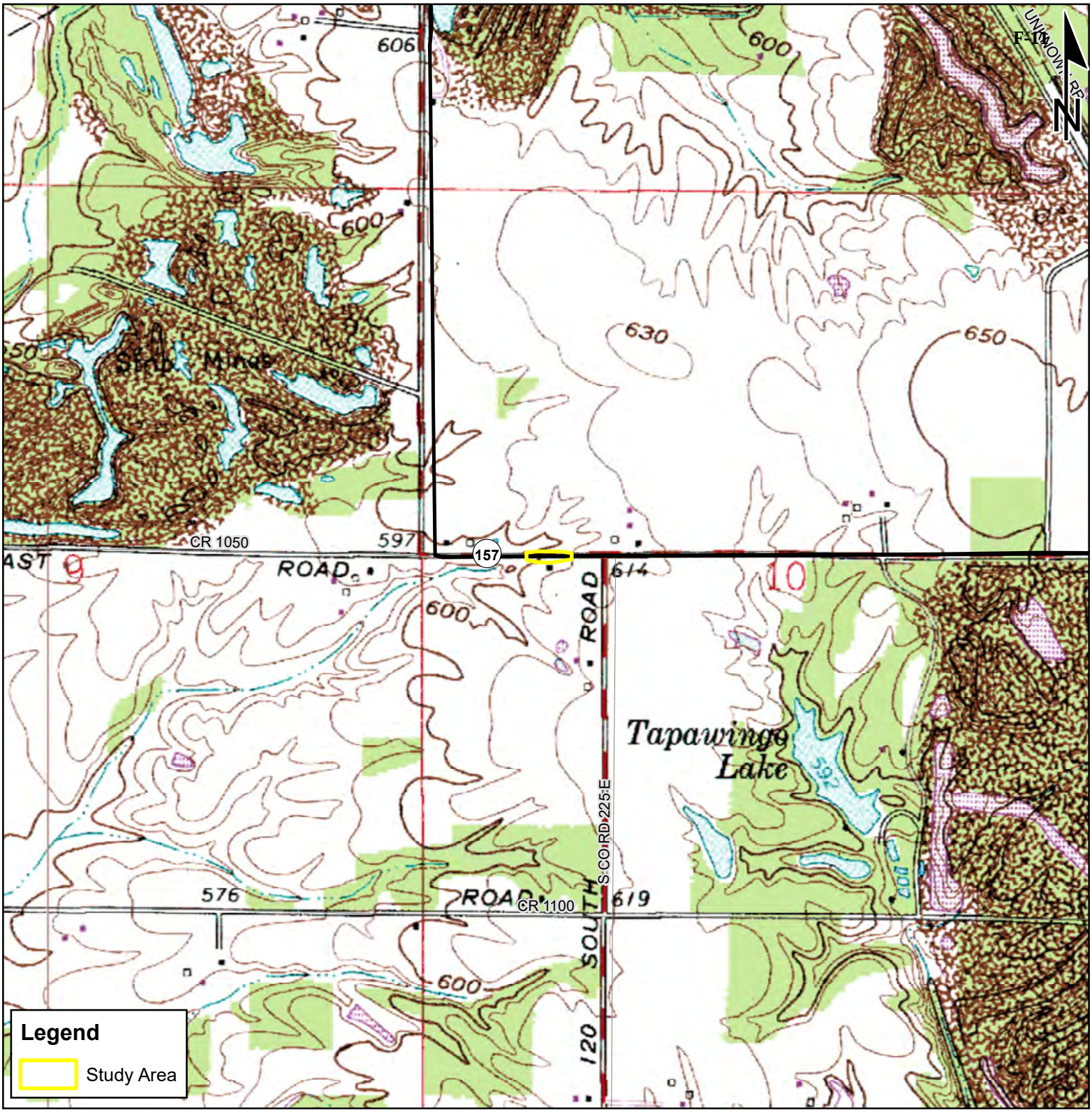
Indiana Dept. of Transportation (INDOT)
SR 157 - Culvert Replacement
Des. No.: 1800147
Coal City, IN 47427; Clay County

USGS Topographic Map

Sources:
Non Orthophotography
Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83

Prepared By: Burgess & Niple

October 2019



0 500 1,000 2,000 Feet

Attachment 2

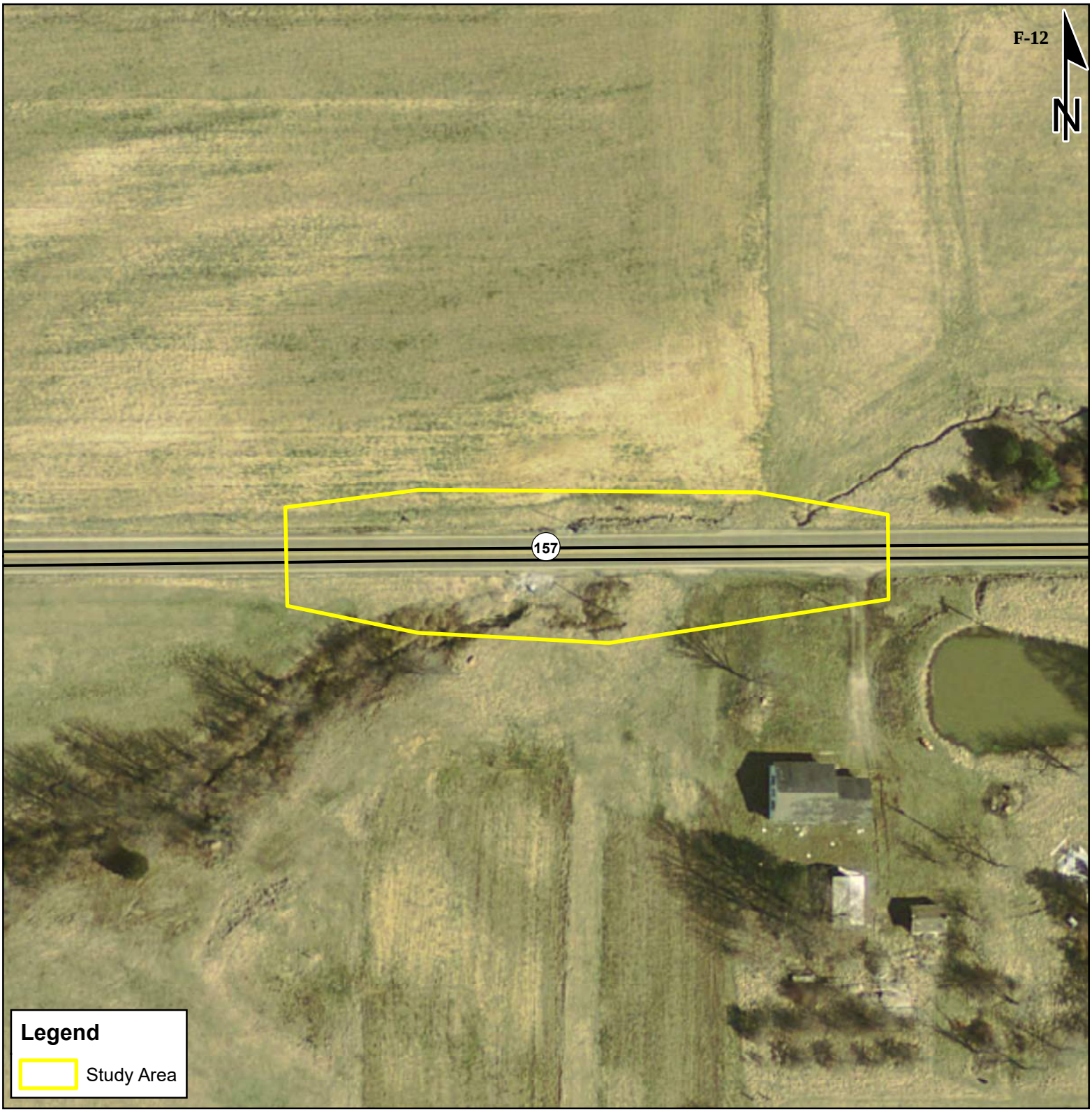
Indiana Dept. of Transportation (INDOT)
SR 157 - Culvert Replacement
Des. No.: 1800147
Coal City, IN 47427; Clay County

USGS Topographic Map

October 2019

Sources:
Non Orthophotography
Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83

Prepared By: Burgess & Niple



0 37.5 75 150 Feet

Attachment 3

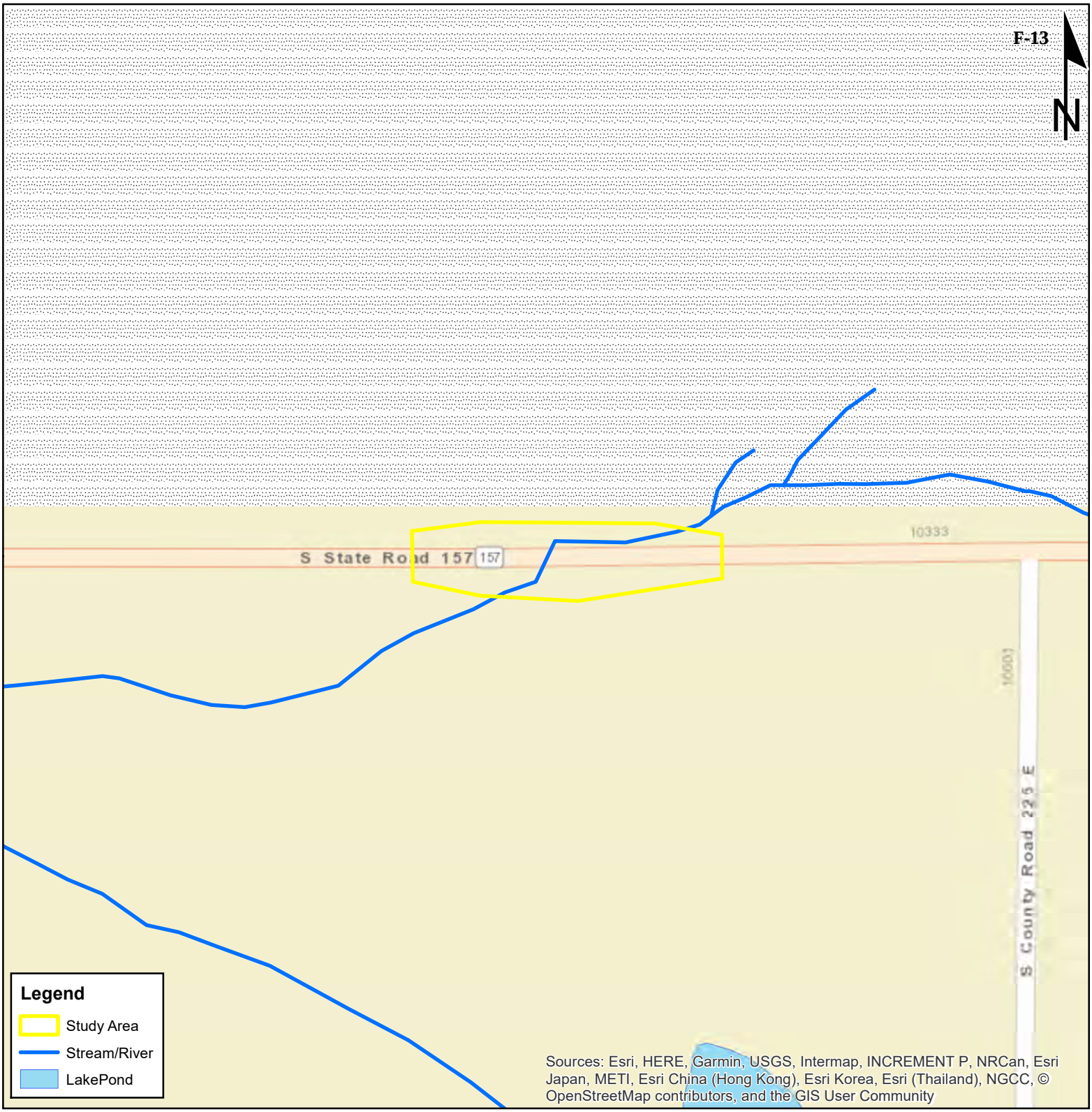
Indiana Dept. of Transportation (INDOT)
SR 157 - Culvert Replacement
Des. No.: 1800147
Coal City, IN 47427; Clay County

Aerial Map

October 2019

Sources:
Non Orthophotography
Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83

Prepared By: Burgess & Niple



0 75 150 300 Feet

Sources:
Non Orthophotography
Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83

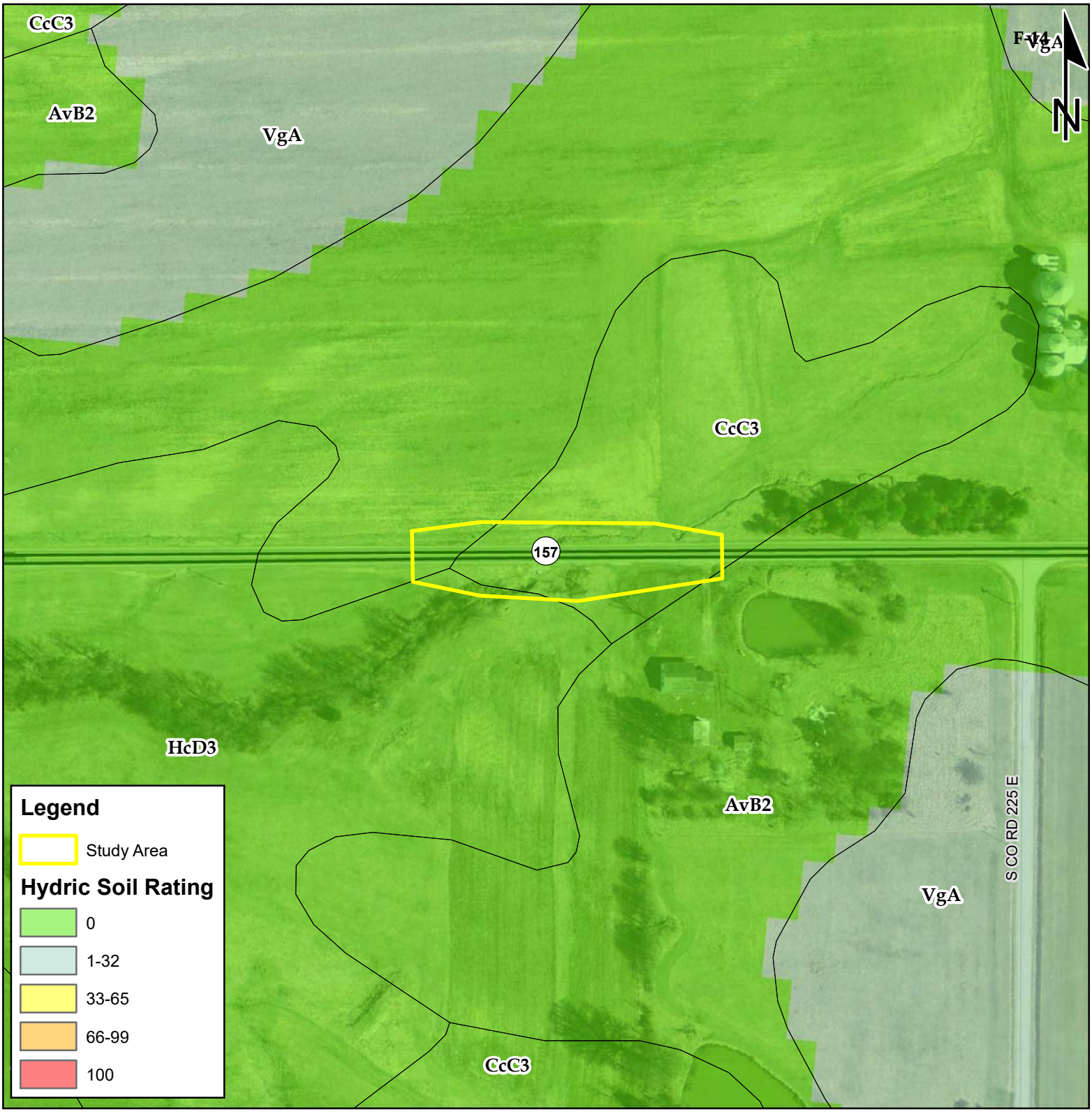
Prepared By: Burgess & Niple

Attachment 4

Indiana Dept. of Transportation (INDOT)
SR 157 - Culvert Replacement
Des. No.: 1800147
Coal City, IN 47427; Clay County

NHD Map

October 2019



0 75 150 300 Feet

Attachment 5

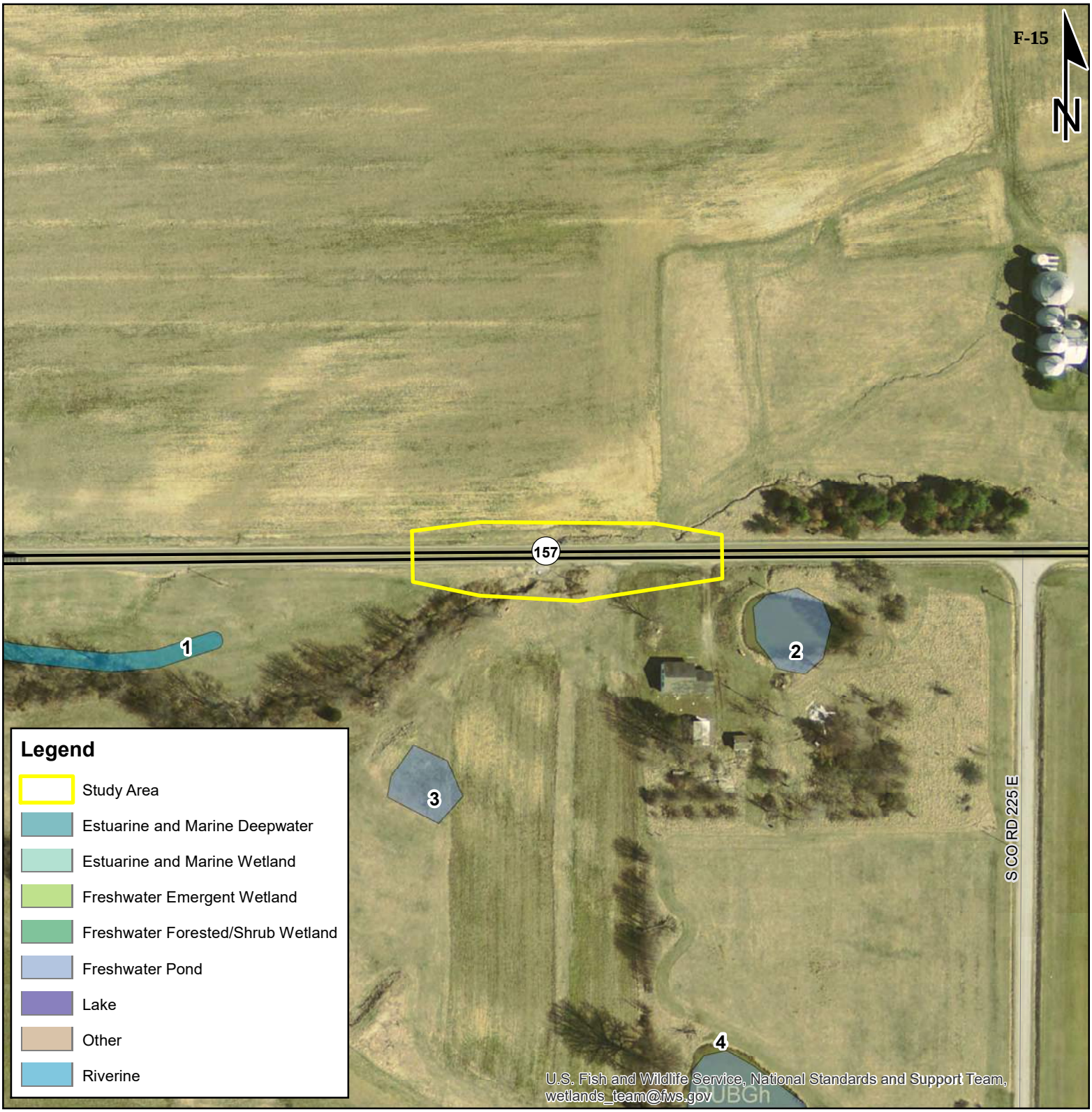
Indiana Dept. of Transportation (INDOT)
SR 157 - Culvert Replacement
Des. No.: 1800147
Coal City, IN 47427; Clay County

NRCS Hydric Soil Map

Sources:
Non Orthophotography Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83

Prepared By: Burgess & Niple

October 2019



0 75 150 300 Feet

Attachment 6

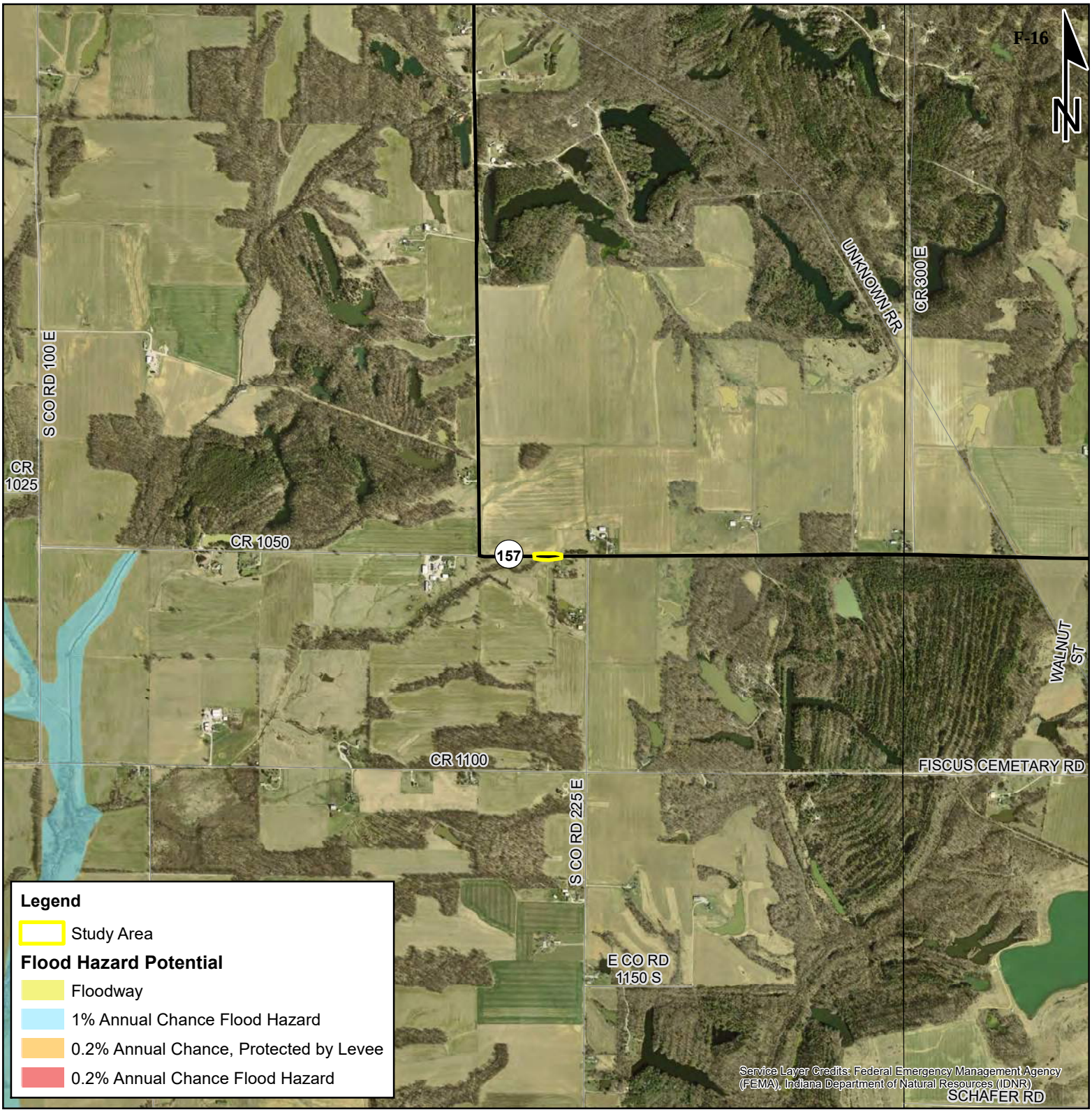
Indiana Dept. of Transportation (INDOT)
SR 157 - Culvert Replacement
Des. No.: 1800147
Coal City, IN 47427; Clay County

NWI Map

Sources:
Non Orthophotography
Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83

Prepared By: Burgess & Niple

October 2019



0 875 1,750 3,500 Feet

Attachment 7

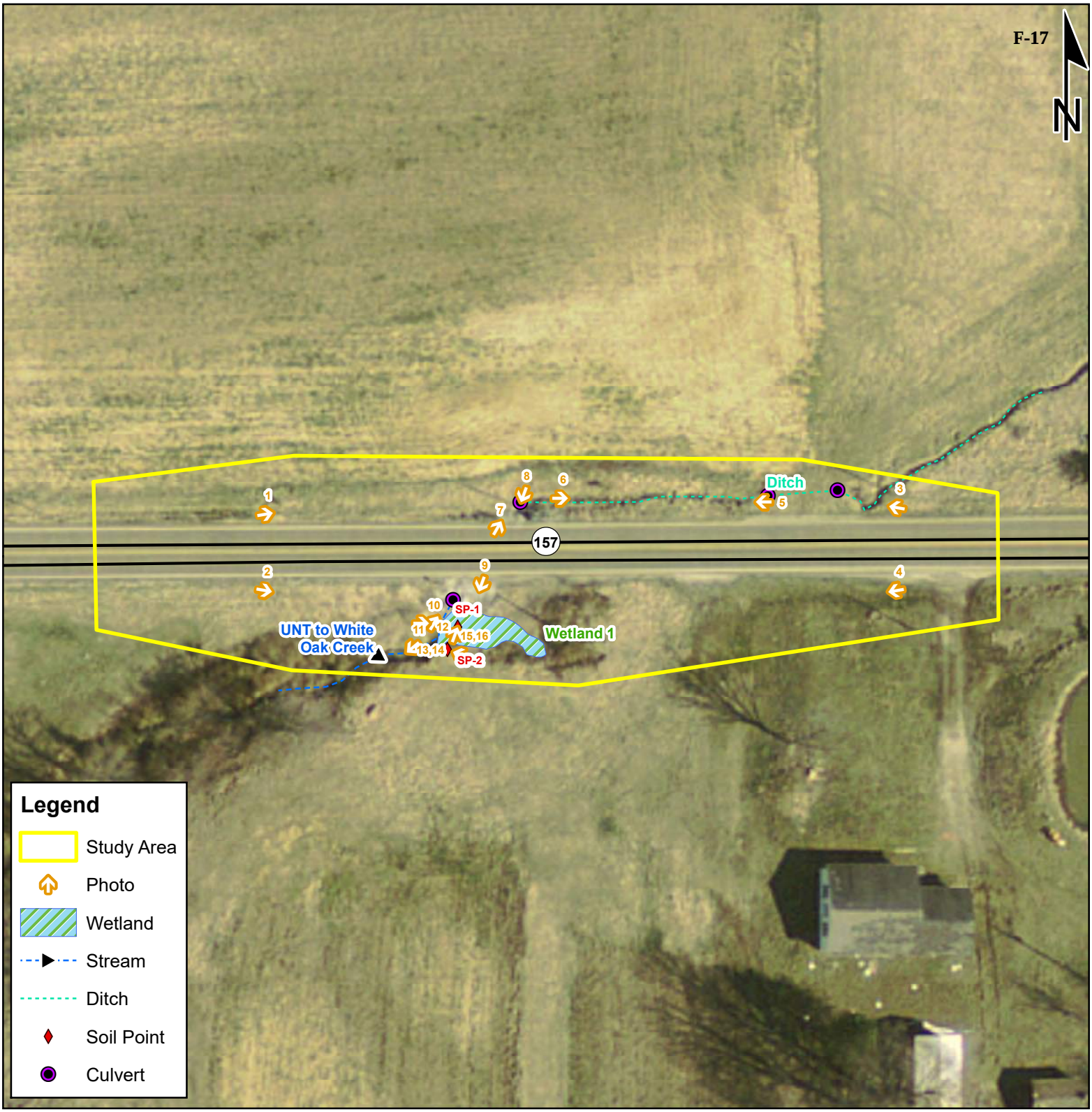
Indiana Dept. of Transportation (INDOT)
SR 157 - Culvert Replacement
Des. No.: 1800147
Coal City, IN 47427; Clay County

FEMA Flood Hazard Map

Sources:
Non Orthophotography
Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83

Prepared By: Burgess & Niple

October 2019



0 25 50 100 Feet

Sources:
Non Orthophotography
Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83
Prepared By: Burgess & Niple

Attachment 8

Indiana Dept. of Transportation (INDOT)
SR 157 - Culvert Replacement
Des. No.: 1800147
Coal City, IN 47427; Clay County

Photo Orientation Map

October 2019

INDIANA DEPARTMENT OF TRANSPORTATION (INDOT)
S.R. 157 IN CLAY COUNTY, INDIANA
CULVERT REPLACEMENT
DES. NO.: 1800147
STRUCTURE ID #: CV 157-011-21.14
SITE PHOTOGRAPHS
OCTOBER 17, 2019

Photo 1: North of SR 157 and west of the culvert, facing east.

Photo 2: South of SR 157 and west of the culvert, facing east.

Photo 3: North of SR 157 and east of the culvert, facing west.

Photo 4: South of SR 157 and east of the culvert, facing west.

Photo 5: Ditch to the north of SR 157 and east of the culvert, facing west.

Photo 6: Ditch to the north of SR 157 and east of the culvert, facing east.

Photo 7: Roadside ditch at the culvert inlet, facing northeast.

Photo 8: Roadside ditch at the culvert inlet, facing southwest.

Photo 9: UNT to White Oak Creek and Wetland 1 at the culvert outlet, facing southwest downstream.

Photo 10: UNT to White Oak Creek at the culvert outlet, facing northeast upstream.

Photo 11: UNT to White Oak Creek, facing southwest downstream.

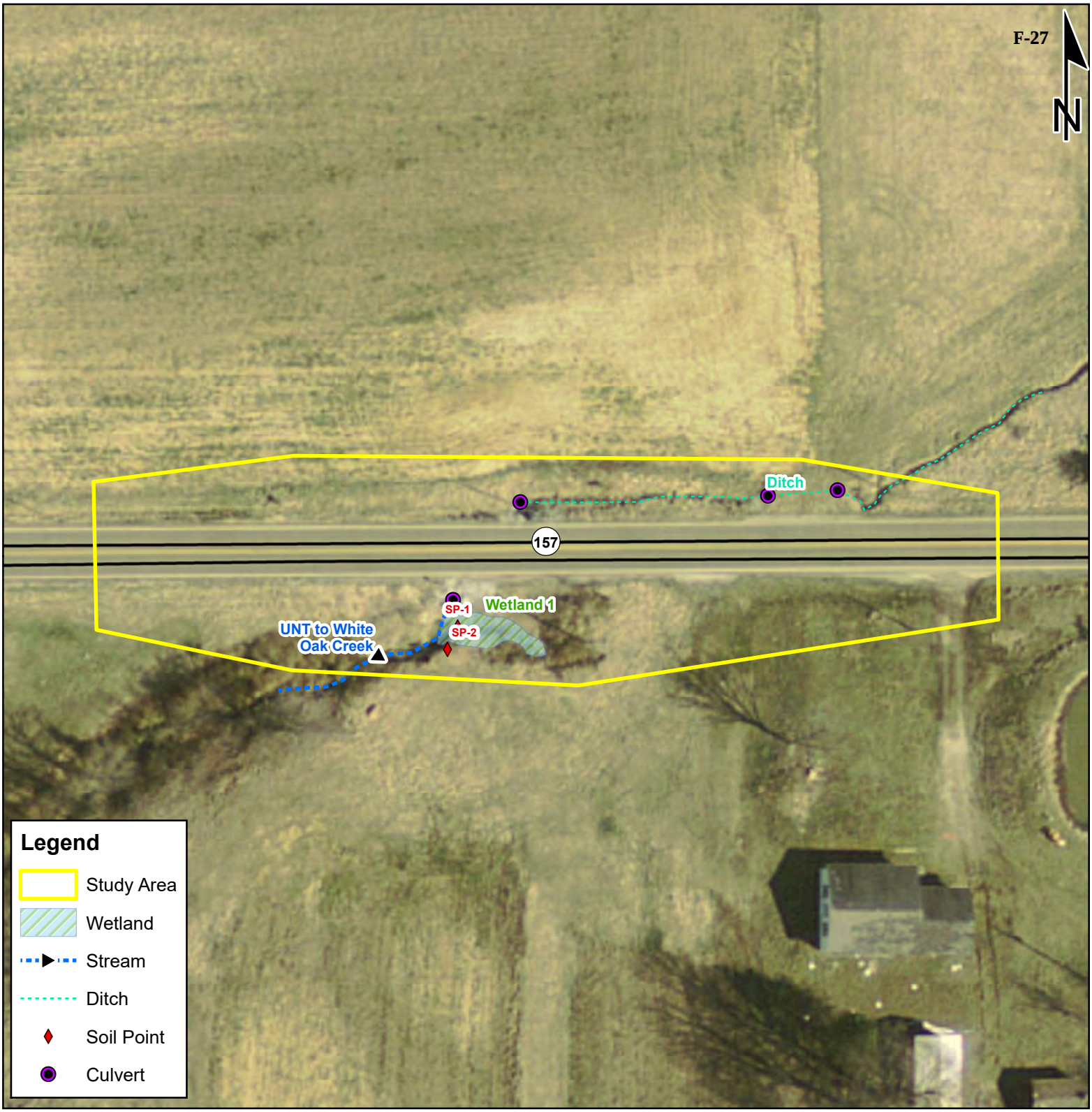
Photo 12: Wetland 1, facing east.

Photo 13: Location of Soil Point 1 within Wetland 1.

Photo 14: Hydric soils taken from Soil Point 1.

Photo 15: Location of Soil Point 2 taken outside of Wetland 1.

Photo 16: Upland soils taken from Soil Point 2.



0 25 50 100 Feet

Sources:
Non Orthophotography
Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83
Prepared By: Burgess & Niple

Attachment 9

Indiana Dept. of Transportation (INDOT)
SR 157 - Culvert Replacement
Des. No.: 1800147
Coal City, IN 47427; Clay County

Delineation Map

October 2019

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: SR 157 (Des. No.: 1800147) City/County: Clay County Sampling Date: 10/17/2019

Applicant/Owner: Indiana Department of Transportation State: IN Sampling Point: SP 1

Investigator(s): M. Aldridge & M. Kestner Section, Township, Range: S10/T9N/R6W

Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 6-12 Lat: 39.234074 Long: -87.070272 Datum: NAD 83

Soil Map Unit Name: Cincinnati silt loam, Wabash Lowland, severely eroded (CcC3) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Soil Point 1 was taken within Wetland 1.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5 ft.)			
1. *Carex frankii*	35	Yes	OBL
2. *Leersia oryzoides*	30	Yes	OBL
3. *Typha angustifolia*	20	Yes	OBL
4. *Carex cristatella*	15	No	FACW
5. *Iris pseudacorus*	15	No	OBL
6. *Agrimonia parviflora*	15	No	FACW
7. *Solidago gigantea*	10	No	FACW
8. *Bidens frondosa*	2	No	FACW
9.			
10.			
	142 =Total Cover		
Woody Vine Stratum (Plot size: 5 ft.)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species	42	x 2 =	84
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	142 (A)		184 (B)

Prevalence Index = B/A = 1.30

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: SP 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 5/2	75	7.5YR 4/6	25	C	M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? Yes ___ No X Depth (inches): ___

(includes capillary fringe)

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: SR 157 (Des. No.: 1800147) City/County: Clay County Sampling Date: 10/17/2019

Applicant/Owner: Indiana Department of Transportation State: IN Sampling Point: SP 2

Investigator(s): M. Aldridge & M. Kestner Section, Township, Range: S10/T9N/R6W

Landform (hillside, terrace, etc.): Plain Local relief (concave, convex, none): None

Slope (%): 6-12 Lat: 39.234051 Long: -87.070286 Datum: NAD 83

Soil Map Unit Name: Cincinnati silt loam, Wabash Lowland, severely eroded (CcC3) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation X , Soil ____ , or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Soil Point 2 was taken outside of Wetland 1.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1.			
2.			
3.			
4.			
5.			
	=Total Cover		
Herb Stratum (Plot size: 5 ft.)			
1. *Schedonorus arundinaceus*	35	Yes	FACU
2. *Poa pratensis*	30	Yes	FAC
3. *Trifolium pratense*	25	Yes	FACU
4. *Daucus carota*	15	No	UPL
5. *Taraxacum officinale*	5	No	FACU
6.			
7.			
8.			
9.			
10.			
	110 =Total Cover		
Woody Vine Stratum (Plot size: 5 ft.)			
1.			
2.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	30	x 3 =	90
FACU species	65	x 4 =	260
UPL species	15	x 5 =	75
Column Totals:	110 (A)		425 (B)

Prevalence Index = B/A = 3.86

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (Include photo numbers here or on a separate sheet.)
The vegetation at this location is regularly mowed/baled.

SOIL

Sampling Point: SP 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/2	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Iron-Manganese Masses (F12)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Attachment 10

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PJD: 11/19/2019

B. NAME AND ADDRESS OF PERSON REQUESTING PJD: Mathew Aldridge; Burgess & Niple, Inc.; 251 N. Illinois St.; Capital Center Suite 920; Indianapolis, IN 46204

C. DISTRICT OFFICE, FILE NAME, AND NUMBER:

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION: Des. No.: 1800147

(USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)

State: Indiana County/parish/borough: Clay County City: Coal City

Center coordinates of site (lat/long in degree decimal format):

Lat.: 39.234154 Long.: -87.070235

Universal Transverse Mercator: 16N

Name of nearest waterbody: White Oak Creek

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:

☐ Field Determination. Date(s):

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

Site number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resource in review area (acreage and linear feet, if applicable)	Type of aquatic resource (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
UNT to White Oak Creek	39.234041	-87.070383	55 l.f.	Non-Wetland Stream	Section 404
Wetland 1	39.234068	-87.070234	0.009 acre	Wetland	Section 404

1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.

2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there *"may be"* waters of the U.S. and/or that there *"may be"* navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for PJD (check all that apply)

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

- ■ Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
  Map: indianamap.org.
- ■ Data sheets prepared/submitted by or on behalf of the PJD requestor.
  - ☐ Office concurs with data sheets/delineation report.
  - ☐ Office does not concur with data sheets/delineation report. Rationale: _____.
- ☐ Data sheets prepared by the Corps: _____.
- ☐ Corps navigable waters' study: _____.
- ■ U.S. Geological Survey Hydrologic Atlas: indianamap.org.
  - ■ USGS NHD data.
    USGS 8 and 12 digit HUC maps.
- ■ U.S. Geological Survey map(s). Cite scale & quad name: Coal City, IN - 7.5 Minute.
- ■ Natural Resources Conservation Service Soil Survey. Citation: websoilsurvey.nrcs.usda.gov.
- ■ National wetlands inventory map(s). Cite name: fws.gov/wetlands/Data/Mapper.html.
- ☐ State/local wetland inventory map(s): _____.
- ■ FEMA/FIRM maps: indianamap.org.
- ☐ 100-year Floodplain Elevation is: _____.(National Geodetic Vertical Datum of 1929)
- ■ Photographs: ■ Aerial (Name & Date): www.indianamap.org.
  or ■ Other (Name & Date): Site Visit: October 17, 2019.
- ☐ Previous determination(s). File no. and date of response letter: _____.
- ■ Other information (please specify): See attached Waters Report - INDOT Des. No.: 1800147.

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

_____	_____ 11/19/2019
Signature and date of Regulatory staff member completing PJD	Signature and date of person requesting PJD (REQUIRED, unless obtaining the signature is impracticable)[1]

[1] Districts may establish timeframes for requestor to return signed PJD forms. If the requestor does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

Appendix G

Public Involvement

Notice of Survey

Date: 7/22/2019

SUBJECT: SR 157 Small Structure Replacement
DES No. 1800147, Clay County, Indiana

Dear Property Owner:

CECon, on behalf of Infrastructure Engineering, Inc., will perform a survey for the replacement of the SR 157 Small Structure over Unnamed Tributary to Sugar Creek, Clay County, Indiana. This work is associated with Indiana Department of Transportation (INDOT) Des No. 1800147. Our information indicates that you own or occupy property near the above referenced project. Our employees will be performing a survey of the project area in the near future. It may be necessary for them to come onto your property to complete this work. This is permitted by law per Indiana Code IC 8-23-7-26. They will show you their identification, if you are available, before coming onto your property. If you have sold this property, or it is occupied by someone else, please let us know the name and address of the new owner or current occupant so we can contact them about the survey.

At this stage, we generally do not know what effect, if any, our project may eventually have on your property. If we determine later that your property is involved, you will be contacted with additional information.

The survey work will include mapping the location of features such as trees, buildings, fences and drives, and obtaining ground elevations. The survey is needed for the proper planning and design of this project. Please be assured of our sincere desire to cause you as little inconvenience as possible during this survey. If any problems do occur, please contact our field crew or contact me at the telephone number or address shown above for our office. The Infrastructure Engineering, Inc. Project Manager is also available for questions concerning this project. His contact information is as follows:

Nick Bergman, PE
201 South Capitol Avenue, Suite 490
Indianapolis, IN 46225
(317) 243-9800

Sincerely,

Kurt M. Vonderheide

Kurt M. Vonderheide, PS
Senior Survey Project Manager

Envelope List

CECon Project No: 19-046 **County: Clay** **DES No: 1800147**

Owner Name	Owner Address	City, State and Zip Code
Stickles Farms Inc.	1941 US 40 West	Brazil, IN 47834
Credit Shelter Trust	1926 E. CR 1050 S.	Clay City, IN 47841
Eddie & Alexis Gilbert	PO Box 1	Coal City, IN 47427

Appendix H

Air Quality

SPONSOR	CONTRACT # / LEAD DES	STIP NAME	ROUTE	WORK TYPE	LOCATION	DISTRICT	MILES	FEDERAL CATEGORY	Estimated Cost left to Complete Project*	PROGRAM	PHASE	FEDERAL	MATCH	2020	2021	2022	2023	2024
Indiana Department of Transportation	2001639	A 22	I 70	Bridge Maintenance And Repair	4.51 mi W of SR 243 WB, Big Walnut Creek	Crawfordsville	0	NHPP	$71,967.00	District Other Construction	CN	$64,770.30	$7,196.70		$71,967.00			
Comments:New Project, CN phase for $71,967 FY21, No MPO.																		
Indiana Department of Transportation	37788 / 1400235	Init.	I 70	Small Structure Pipe Lining	5.11 mi W of SR 243	Crawfordsville	0	NHPP		Bridge Construction	CN	$5,578,569.00	$619,841.00	$6,198,410.00				
Putnam County	38267 / 1500251	Init.	VA VARI	Bridge Inspections	Countywide Bridge Inspection and Inventory Program for Cycle Years 2019-2022	Crawfordsville	0	Multiple		Local Funds	PE	$0.00	$37,247.19	$10,556.12	$23,549.64	$3,141.43		
										Local Bridge Program	PE	$148,988.75	$0.00	$42,224.46	$94,198.56	$12,565.73		
Indiana Department of Transportation	39259 / 1592687	Init.	US 40	HMA Overlay, Preventive Maintenance	From 0.07 mi W of US 231 to SR 75	Crawfordsville	8.593	STPBG		Road Construction	CN	$8,108,653.60	$2,027,163.40	$10,135,817.00				
Indiana Department of Transportation	39259 / 1592687	A 01	US 40	HMA Overlay, Preventive Maintenance	From 0.07 mi W of US 231 to SR 75	Crawfordsville	8.593	STPBG	$10,220,854.00	Bridge ROW	RW	$20,000.00	$5,000.00	$25,000.00				
Comments:ROW phase for $25,000 FY20, No MPO																		
Indiana Department of Transportation	39316 / 1701458	Init.	SR 243	Bridge Deck Overlay	Rocky Fork Creek, 00.41 N I-70	Crawfordsville	0	STPBG		Bridge Construction	CN	$301,648.80	$75,412.20	$377,061.00				
Indiana Department of Transportation	39964 / 1601108	Init.	SR 236	HMA Overlay Minor Structural	From US 231 E Jct to 0.39 mi W of SR 75	Crawfordsville	12.96	STPBG		Road Construction	CN	$7,686,888.80	$1,921,722.20		$9,608,611.00			
Indiana Department of Transportation	40571 / 1700119	Init.	US 36	HMA Overlay Minor Structural	From 0.07 mi E. of US 231 to 4. 31 mi E of US 231 (Bainbridge)	Crawfordsville	4.371	STPBG		Road Construction	CN	$1,650,574.40	$412,643.60			$2,063,218.00		
Indiana Department of Transportation	40573 / 1700121	Init.	US 231	Road Rehabilitation (3 R/4R Standards)	From 0.22 mi S of SR 240 to 1.7 4 mi N of SR 240 (Greencastle)	Crawfordsville	1.689	NHPP		Road Construction	CN	$4,593,269.60	$1,148,317.40			$5,741,587.00		
Indiana Department of Transportation	40573 / 1700121	A 01	US 231	Road Rehabilitation (3 R/4R Standards)	From 0.03 mi S of SR 240 to 1.6 1 mi N of SR 240 (Greencastle)	Crawfordsville	1.63	STPBG	$8,091,587.00	Road ROW	RW	$360,000.00	$90,000.00	$450,000.00				
Comments:ROW phase for $450,000 FY20, No MPO																		
Indiana Department of Transportation	40576 / 1701570	Init.	US 231	Small Structure Replacement	Over Unnamed Ditch/Creek on US 231, 0.10 S SR 236 W JCT	Crawfordsville	0	NHPP		Bridge Construction	CN	$1,412,190.40	$353,047.60			$1,765,238.00		
										Bridge ROW	RW	$60,000.00	$15,000.00	$75,000.00				
Indiana Department of Transportation	40742 / 1700091	Init.	US 231	Added Travel Lanes	From 0.27 mi N to 1.05 mi N of I-70	Crawfordsville	.756	NHPP		Mobility Construction	CN	$2,862,437.60	$715,609.40			$3,578,047.00		
Putnam County	40800 / 1600832	Init.	IR 1001	Bridge Deck Overlay	Bridge # 172carrying County Road 525 West over Mill Creek	Crawfordsville	.1	STPBG		Local Funds	RW	$0.00	$10,000.00	$10,000.00				
										Local Funds	CN	$0.00	$97,500.00	$3,900.00		$93,600.00		
										Local Bridge Program	RW	$40,000.00	$0.00	$40,000.00				

*Estimated Costs left to Complete Project column is for costs that may extend beyond the four years of a STIP. This column is not fiscally constrained and is for information purposes.

Appendix I

Additional Studies

Land and Water Conservation Fund (LWCF) County Property List for Indiana (Last Updated July 2020)

ProjectNumber	SubProjectCode	County	Property
1800336	1800336	Clay	Forest Park
1800369	1800369I	Clay	Harmony Community Park

*Park names may have changed. If acquisition of publically owned land or impacts to publically owned land is anticipated, coordination with IDNR, Division of Outdoor Recreation, should occur.

Abbreviated Engineer's Report

SR 157 over UNT to White Oak Creek
Small Structure Project

CV 157-011-21.14
Des. No. 1800147

March 2020

Prepared For

Indiana Department of Transportation

TABLE OF CONTENTS

PURPOSE OF REPORT

The purpose of this report is to document the engineering assessment phase of project development, including all coordination that has been completed in preparation for this small structure replacement project. This document outlines the proposal and is intended to serve as a guide for subsequent survey, design, environmental, right of way and other project activities leading to construction. The preferred alternative identified in this document is considered pre-decisional, pending the outcome of environmental studies.

PROJECT LOCATION

This project is located on SR 157, 5.19 miles south of SR 246 at reference post 21+14 in Clay County within the Indiana Department of Transportation's (INDOT) Crawfordsville District, Terre Haute Sub-District. The GPS coordinates at the project are 39° 14' 02.9" North and 87° 04' 12.8" West. The project is located within Section 10 of Township 9 North, Range 6 West in the Coal City Quadrangle Map. The project location map is in Appendix A.

PROJECT PURPOSE AND NEED

The existing small structure is exhibiting advanced signs of deterioration such as flow line section loss and a poor structural condition rating along with some minor stream and bank erosion. Additionally, the structure does not meet current design standards and is hydraulically undersized to handle the design flow. Therefore, the project need is to address the existing substandard and deteriorated small structure.

The project purpose is to improve the safety, condition, and performance of this crossing to current standards and hydraulic requirements.

EXISTING FACILITY

ROADWAY

The existing roadway facility is classified as a major collector. The roadway is not part of the US National Highway System (NHS) nor the National Truck Network. The posted speed limit at the project location is 55 mph. Table 1 shows the roadway information for SR 157.

The existing roadway typical section has two 9-foot lanes and no paved or usable shoulders. The side slope on the north side of SR 157 from the edge of pavement varies on either side of the culvert. West of the culvert, the side slope consists of an approximate 4% downgrade for about 6 feet then a 3(H):1(V) slope up to natural ground. East of the structure, the north side slope consists of an approximate 2.5(H):1(V) foreslope to the roadside ditch with an approximate 2(H):1(V) backslope to natural ground. The side slope conditions on the south side of SR 157, within the project area, vary from approximately 3(H):1(V) to 4(H):1(V) slopes down to natural ground allowing runoff to flow towards the tributary.

ROAD HISTORY

Records for road history were requested and none were found for this project.

Table 1: Roadway Information for SR 157

Geometric Criteria			
Design Speed	55 MPH	***Functional Class***	Major Collector
Design Criteria	3R, Non-Freeway	***Rural/Urban***	Rural
Terrain	Level	***Access Control***	None
Approach Cross Section			
IDM Figure Reference	IDM 55-3B		
Travel Lane Count	2	***Travel Lane Width***	9′ (Existing) 11′ (Minimum Req'd.)
Shoulder Width (Usable)	0′ (Existing) 2′ (Minimum Req'd.)	***Shoulder Width (paved)***	0′ (Existing) 0′ (Minimum Req'd.)
Mainline Pavement	HMA	***Shoulder Pavement***	N/A (Existing) Aggregate (Proposed)
Alignment			
Horizontal	Tangent	***Vertical***	Sag Curve
Roadside Safety			
Clear Zone ***IDM Fig. 49-2A***	14′	***Min. Guardrail Offset*** ***IDM Fig. 55-3B***	4′ *

* IDM Fig. 55-3B footnote (5), the minimum guardrail offset is 4′.

SMALL STRUCTURE

The existing culvert, CV 157-011-21.14, carries SR 157 over an Unnamed Tributary (UNT) to White Oak Creek, which flows generally from north/east to south/west. The existing structure is a 60 inch (span) by 46 inch (rise) corrugated metal pipe arch with a length of 42 feet skewed 35° to the roadway. The year built is unknown and there are no known rehabilitations to the structure. See Appendix B for site photographs of the small structure.

The small structure was last inspected on July 8, 2019. According to the 2019 Culvert Inspection Report, the culvert has a condition rating of 4 (poor) and recommended for replacement. Approximately a 5-foot by 1-foot hole has rusted through the structure's invert starting about 10 feet in from the southwest end. The rusted through openings in the invert are allowing the flow to "pipe" around the structure, which is causing settlement in the roadway. The remainder of the pipe invert has had the bituminous coating worn away. Both ends of the structure are projecting from fill without end sections. The culvert has a channel protection rating of 6 (fair); there is moderate bank erosion at the northeast end and minor channel scour at the southwest end of the structure.

The culvert inspection frequency is 12 months. See Appendix C for the 2019 Culvert Inspection Report.

TRAFFIC DATA

Per the Traffic Count Database System (TCDS), INDOT conducted traffic counts approximately 100 feet east of the project in September of 2018. INDOT provided traffic forecast information for build year. A growth rate of 0.7% was used to forecast the traffic. Table 2 shows the annual daily traffic (ADT) for the count year (2018), current year (2019), build year (2022), and the design year (2042).

Table 2: Traffic Data

Year	ADT
2018 – Count Year	556
2019 – Current Year	560
2022 – Build Year	572
2042 – Design Year	657

From the INDOT traffic counts, the peak hour factor (K Factor) is 11.87%, the directional distribution factor (D Factor) is 51.44%, and the percentage of trucks is 6.3%. The traffic data from TCDS can be found in Appendix D.

CRASH DATA

Crash data from 2015 to 2018 was analyzed within a half mile of the project location. One crash was identified in the area. Table 3 shows the location, manner of collision, severity level: fatality, injury, or property damage only (PDO), and any other contributing factors.

Table 3: Crash History

Year	Approximate Location	Manner of Collision	Severity Level	Other Contributing Factors
2016	At CR 225 E	Collision with deer	PDO	Nighttime

The only crash within the area was with a deer at nighttime with clear weather and dry pavement.

Based on the above information, the reported crash does not appear to be due to the culvert, lack of sight distance provided by the roadway, nor narrow shoulders.

However, during the field visit, evidence of slide-offs in the form of gouges in the existing pavement, were observed. The roadway cross section is narrow with no shoulders, both through the project area and in each direction beyond the project. The open ends of the existing structure would most likely contribute to increased severity if an accident were to occur at the crossing location.

ALTERNATIVES

Per the INDOT Hydraulics Approval Letter dated February 17, 2020, there are two approved options for replacement. One option is to replace the structure with a 71-inch span by 47-inch rise corrugated metal pipe arch sumped 12 inches with a flared-end section at the inlet. The other option is to replace the structure with a 5-foot span by 4-foot rise reinforced concrete box sumped 12 inches with wingwalls. Class 1 riprap will be required at the outlet to protect the structure from scour for both options.

It was expressed during the initial field check meeting that the reinforced concrete box option is preferred, but its selection is contingent on if the construction costs are within the current budget and if the life-cycle analysis shows it to be the most cost-effective solution. The proposed option might warrant a realignment in order to fit the wingwall or flared end section within the channel. See Appendix E for the INDOT Hydraulics Approval Letter.

Moving the roadway alignment to minimize impacts to the stream/roadside ditch running along the north edge of pavement was discussed during the initial field check meeting. The preference is to maintain the existing roadway alignment and narrow 9-foot lane widths, if feasible.

The roadside ditch on the north side, east of the small structure, is a roadside hazard due to its depth, grade of the side slopes and proximity to the existing edge of travelway. Evidence of slide-offs near the culvert in the form of gouges in the pavement were observed during a site visit. The hazard area is approximately 85′ in length along the northern edge of the roadway. Due to the safety concerns and the short length of the hazard, providing increased safety through the project area was evaluated as part of this assessment.

The following alternates were considered for correcting the roadside ditch safety hazard.

1. Add guardrail with 2(H):1(V) foreslope and backslope. This alternate requires relocating the ditch for approximately 85 feet along the north side of SR 157.
2. Add guardrail and a retaining wall. This alternate allows the ditch to remain in its current location, however, the hydraulic capacity of the channel will be reduced.
3. Relocate the ditch and add recoverable side slopes.
4. Enclose the ditch using a broken back culvert (horizontal and vertical alignment changes). However, a Grated Box End Section will be required and only the CMPA can work with the grated box end section.

ALTERNATE NO. 1A – 71″ (SPAN) X 47″ (RISE) CMPA (GUARDRAIL WITH 2:1)

This alternate uses the approved 71″ X 47″ Corrugated Metal Pipe Arch structure, sumped 12 inches. The roadway typical section through the project limits will have 2 – 11′ lanes and 2′ usable shoulder. The shoulder will be 4′ wide and paved up to the face of guardrail where guardrail is present. Guardrail is required along the north edge protecting the end of the structure and non-recoverable side slopes. The location of the roadside ditch on the north side of the road is impacted by this alternative and needs to be relocated approximately 8 feet to the north. The side slopes adjacent to the eastbound lanes are proposed to be graded at 6(H):1(V) to the clear zone (14 feet) then break at 3(H):1(V) to tie back into existing ground. The south end of the culvert will be located outside of the clear zone, therefore guardrail is not required along the south side. Refer to the Typical Sections in Appendix F.

ALTERNATE NO. 1B – 5′ (SPAN) X 4′ (RISE) RCB (GUARDRAIL WITH 2:1)

This alternate is identical to Alternate No. 1A except the proposed structure is a 5′ x 4′ Reinforced Concrete Box sumped 12 inches.

ALTERNATE NO. 2A – 71″ (SPAN) X 47″ (RISE) CMPA (GUARDRAIL WITH WALL)

This alternate uses the approved 71″ X 47″ Corrugated Metal Pipe Arch structure, sumped 12 inches. The roadway typical section through the project limits will have 2 – 11′ lanes and 2′ usable shoulder. The shoulder will be 4′ wide and paved up to the face of guardrail where guardrail is present. Guardrail is required along the north edge protecting the end of the structure and retaining wall. The location of the roadside ditch on the north side of the road is not impacted by this alternative. The side slopes adjacent to the eastbound lanes are proposed to be graded at 6(H):1(V) to the clear zone (14 feet) then break at 3(H):1(V) to tie back into existing ground. The south end of the culvert will be located outside of the clear zone, therefor guardrail is not required along the south side. Refer to the Typical Sections in Appendix F.

ALTERNATE NO. 2B – 5′ (SPAN) X 4′ (RISE) RCB (GUARDRAIL WITH WALL)

This alternate is identical to Alternate No. 2A except the proposed structure is a 5′ x 4′ Reinforced Concrete Box sumped 12 inches.

ALTERNATE NO. 3A – 71" (SPAN) X 47" (RISE) CMPA (NO GUARDRAIL)

This alternate uses the approved 71" X 47" Corrugated Metal Pipe Arch structure, sumped 12 inches. The roadway typical section through the project limits will have 2 – 11' lanes and 2' usable shoulder. The side slopes will be in accordance with IDM Fig. 55-5A(1). The sideslopes adjacent to the westbound lanes are proposed to be graded at 6(H):1(V) to the clear zone (14 feet) then break to 2(H):1(V) down to the relocated ditch. The location of the roadside ditch on the north side of the road is impacted by this alternative and needs to be relocated approximately 12 feet to the north and requires a backslope of 2(H):1(V). The side slopes adjacent to the eastbound lanes are proposed to be graded at 6(H):1(V) to the clear zone (14 feet) then break at 3(H):1(V) to tie back into existing ground. The ends of the culvert will be located outside of the clear zone, therefore guardrail is not required on either side. Refer to the Typical Sections in Appendix F.

ALTERNATE NO. 3B – 5' (SPAN) X 4' (RISE) RCB (NO GUARDRAIL)

This alternate is identical to Alternate No. 3A except the proposed structure is a 5' x 4' Reinforced Concrete Box sumped 12 inches.

ALTERNATE NO. 4A – 71" (SPAN) X 47" (RISE) CMPA (ENCLOSURE)

This alternate uses the approved 71" X 47" Corrugated Metal Pipe Arch structure, sumped 12 inches. The roadway typical section through the project limits will have 2 – 11' lanes and 2' usable shoulder. The side slopes will be in accordance with IDM Fig. 55-5A(1). Both sides of the road would use 6(H):1(V) to the clear zone (14 feet) then break at a 3(H):1(V) to tie back into existing ground. The culvert would cross the road and then follow the road until passing the farm field entrance. The end of the structure will have a grated box end section since it will be within the clear zone.

ALTERNATE NO. 5 – NO ACTION

If the structure remains in its existing state, the small structure will continue to deteriorate and could eventually fail creating unsafe roadway conditions and emergency repairs. Due to the small structure size, the existing culvert will continue to experience higher velocities and thus will continue to cause erosion along the west end of the pipe.

MAINTENANCE OF TRAFFIC CONCEPT

This project is not considered a mobility significant project per IDM Section 503-2.02. The following is the temporary traffic control plan concept that shall be used for the project:

A full closure of SR 157 with detour is anticipated for the project due to the type of work. The proposed detour will utilize SR 59 and SR 48. The detour length is approximately 16.4 miles with only 2.3 miles of additional travel. No local detour has been coordinated for this project. Due to the overall length of the detour and the rural setting, it is anticipated that locals will use county roads as a detour. An unofficial detour will be discussed with INDOT and the local agencies will be involved in the discussion regarding the potential damage to county roads due to the unofficial detour. Access to adjoining properties shall be maintained during construction.

ENVIRONMENTAL IMPACTS

Per the INDOT Approved Waters Report, wetlands are present to the south of the structure, the stream south of the structure is considered Waters of the U.S, but the stream to the north is not considered Waters of the U.S. However, the stream to the north does show up as a blue line on the latest USGS Quad Map.

The downstream wetlands will be impacted. However, the impacts are anticipated to be under a tenth of an acre requiring only a regional general permit.

The total impacts to the stream are anticipated to remain under the 300 foot threshold for all alternates. Therefore, if the stream to the north is determined to be a Waters of the U.S. by the U.S. Army Corps of Engineers, the IDEM 401 and USACE 404 permits will not need to be elevated to from the anticipated regional general permits to individual permits.

A Categorical Exclusion (CE) Level 1 was originally anticipated for this project. The recommended alternative will likely require more than 0.5 acres of right-of-way which would require a CE Level 2.

Per the INDOT approved Red Flag Investigation, a cemetery is located within 0.3 miles of the project, but no impacts are anticipated. Thirteen lakes are located with 0.5 miles of the project, no impacts are anticipated to any lake. Three petroleum wells and two surface mines are located with 0.5 miles of the project. Coordination with IDNR will be require for the petroleum wells and not impacts are anticipated for the surface mines. No hazardous materials were found with 0.5 miles of the project. No evidence of endangered species were found within 0.5 miles of the project, however additional coordination is required.

PERMITS REQUIRED

There are two anticipated permits required. The USACE 404 – Regional General Permit and the IDEM 401 – Regional General Permit are anticipated. An IDEM Rule 5 Application may be required if the limits of disturbance exceed one acre in the final design. No other permits are anticipated for the project.

RIGHT-OF-WAY IMPACTS

Existing plans, right of way plans and deeds/grants were requested. None were found. The existing right of way is not known. Based on physical evidence in the field (edge of farm fields and utility poles), the apparent existing right of way is 30' from the roadway centerline on either side of the road.

However, the existing right-of-way is assumed to be at the existing edge of pavement since supporting documentation is not available. It is anticipated the right-of-way will be acquired from three properties – one to the north and two to the south.

Table 4: Right of Way

Alternate No.	Apparent Right of Way Reacquisition	Permanent Right of Way Acquisition	Temporary Right of Way Acquisition
1A, 1B, 3A, & 3B	0.55	0.13	0.00
2A, 2B & 4A	0.50	0.00	0.00

RAILROAD IMPACTS

There are no railroads in the vicinity of the project, so there are no anticipated impacts to railroads.

UTILITY IMPACTS

Per an 811 Design Ticket, only Frontier has facilities in the area. However, during the site visit, overhead utilities were observed on both sides of the road.

The poles along the north side are approximately 9.75 feet off the existing edge of pavement and 25 feet along the south side.

Relocation of the overhead telecommunication utility north of the roadway is anticipated for this project. This project is not anticipated to have a permanent impact to the electric utility along the south of the roadway. However, if an RCB alternate is chosen, the overhead electric lines may need to be de-energized while the RCB is installed.

PRELIMINARY COST ESTIMATE

The preliminary construction cost estimate for each of the alternatives can be found in Table 3. See Appendix F for the quantity calculations, full cost estimate, and the Life Cycle Cost Analysis. The assumed cost of right-of-way was $10,000 for all the alternatives due to the relative similar and minimal acreage required.

The life cycle cost analysis only includes the cost of guardrail replacement due to damage or safety upgrades and the cost of pipe lining if applicable. The life cycle cost analysis does not include the pavement resurfacing, pavement replacement, pavement markings, or any other incidentals that would be considered similar for all options.

Table 5: Preliminary Cost Estimates for the Alternatives

Alternate No.	Alternative Description	Preliminary Cost Estimate	Preliminary R/W Costs	Life Cycle Additional Costs	Total Initial Cost	Total Life Time Costs
1A	Corrugated Metal Pipe with guardrail & 2:1 Sideslopes	$260,000	$10,000	$88,000	$270,000	$358,000
1B	Reinforced Concrete Box with guardrail & 2:1 Sideslopes	$275,000	$10,000	$13,000	$285,000	$298,000
2A	Corrugated Metal Pipe with guardrail & Retaining Wall	$405,000	$10,000	$88,000	$415,000	$503,000
2B	Reinforced Concrete Box with guardrail & Retaining Wall	$420,000	$10,000	$13,000	$430,000	$443,000
3A	Corrugated Metal Pipe & no guardrail	$245,000	$10,000	$75,000	$255,000	$330,000
3B	**Reinforced Concrete Box & no guardrail**	$260,000	$10,000	$0	$270,000	$270,000
4A	Corrugated Metal Pipe (Brokenback), enclosed ditch & no guardrail	$360,000	$10,000	$75,000	$370,000	$445,000

Based on the initial investment at construction, Alternate No. 1A and 3A are the least expensive. However, when the Total Life Time Cost are accounted for, Alternate No. 3B is the least expensive overall.

The above cost estimate does not account for the additional construction time necessary to build the RCB alternates compared to the CMP alternates.

The recommended alternate is Alternate No. 3B, the Reinforced Concrete Box without guardrail since this alternate provides the lowest lifetime cost. A Level 1 design exception will still be completed to stripe the travel lanes at 9' wide for consistency through the corridor, but the safer section will be constructed.

PHASE COSTS FOR CN/PE/RR/RW/UT

The current SPMS indicates $120,000 for PE, $10,000 for RW, and $247,479 for CN for a total of $377,479.

The recommended alternate costs are estimated at $150,000 for PE, $10,000 for RW, and $260,000 for CN for a total of $420,000

CONCURRENCE

This document was prepared by:

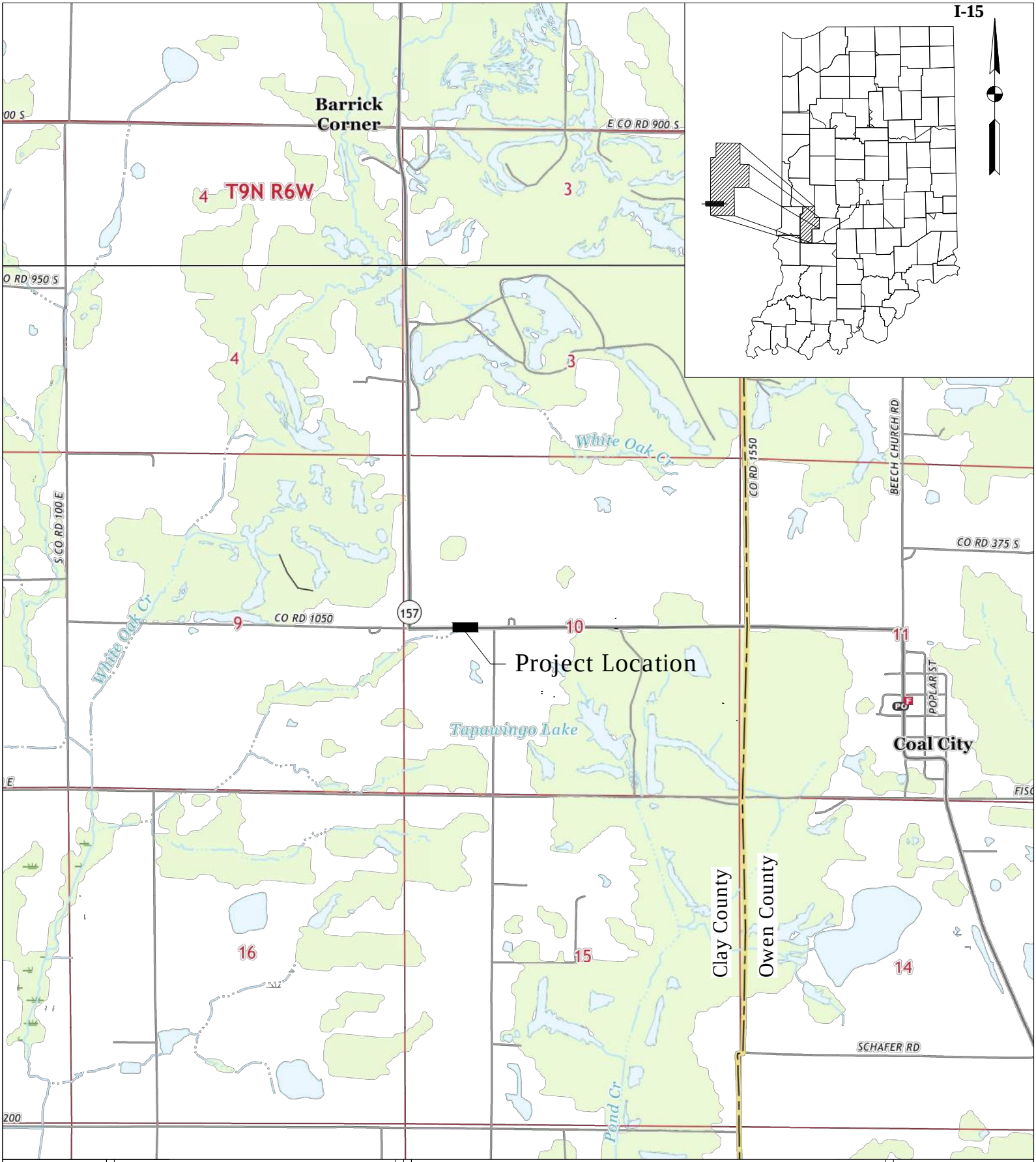
_____[Date]
Nick Bergman, P.E.
Project Manager – Infrastructure Engineering, Inc.

Reviewed by:
Asset Engineer Review
Chris Wheeler, P.E. 4/2/2020 [Date]
[Name]
[Title]

Reviewed by:
Scope Manager Review
Michael L. Eubank 4/3/2020 [Date]
[Name]
[Title]

Reviewed by:
System Asset Manager
Scott J. Chandler 4-20-20 [Date]
[Name]
[Title]

APPENDIX A – PROJECT MAPS



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Project	Date	Scale	Drawn By:	Checked By:
1800147	11/22	1" = 2,000'	NDB	.

SR 246 over UNT to White Oak Creek
Small Structure Replacement
Des. No. 1800147

LOCATION MAP

A-2

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Project	Date	Scale	Drawn By:	Checked By:
1800147	11/22	1" = 80'	NDB	.

SR 157 over UNT to White Oak Creek
Small Structure Replacement
Des. No. 1800147

LOCATION MAP

A-3

APPENDIX B – SITE PHOTOGRAPHS

1. Looking east towards the structure

2. Looking west standing on structure

3. Looking south (downstream) at structure

4. Looking southwest (downstream) at channel

5. Looking west at the north ditch (upstream of structure)

6. Looking west at upstream end of structure

7. Looking at north end of structure – rusted invert

8. Looking south down structure barrel – rusted invert

APPENDIX C – CULVERT INSPECTION REPORT

Culvert Inspection Report

CV 157-011-21.14
SR 157
over

Inspection Date: 07/01/2020

Inspected By: Melvin Hughes

Inspection Type(s): Culvert

TABLE OF CONTENTS

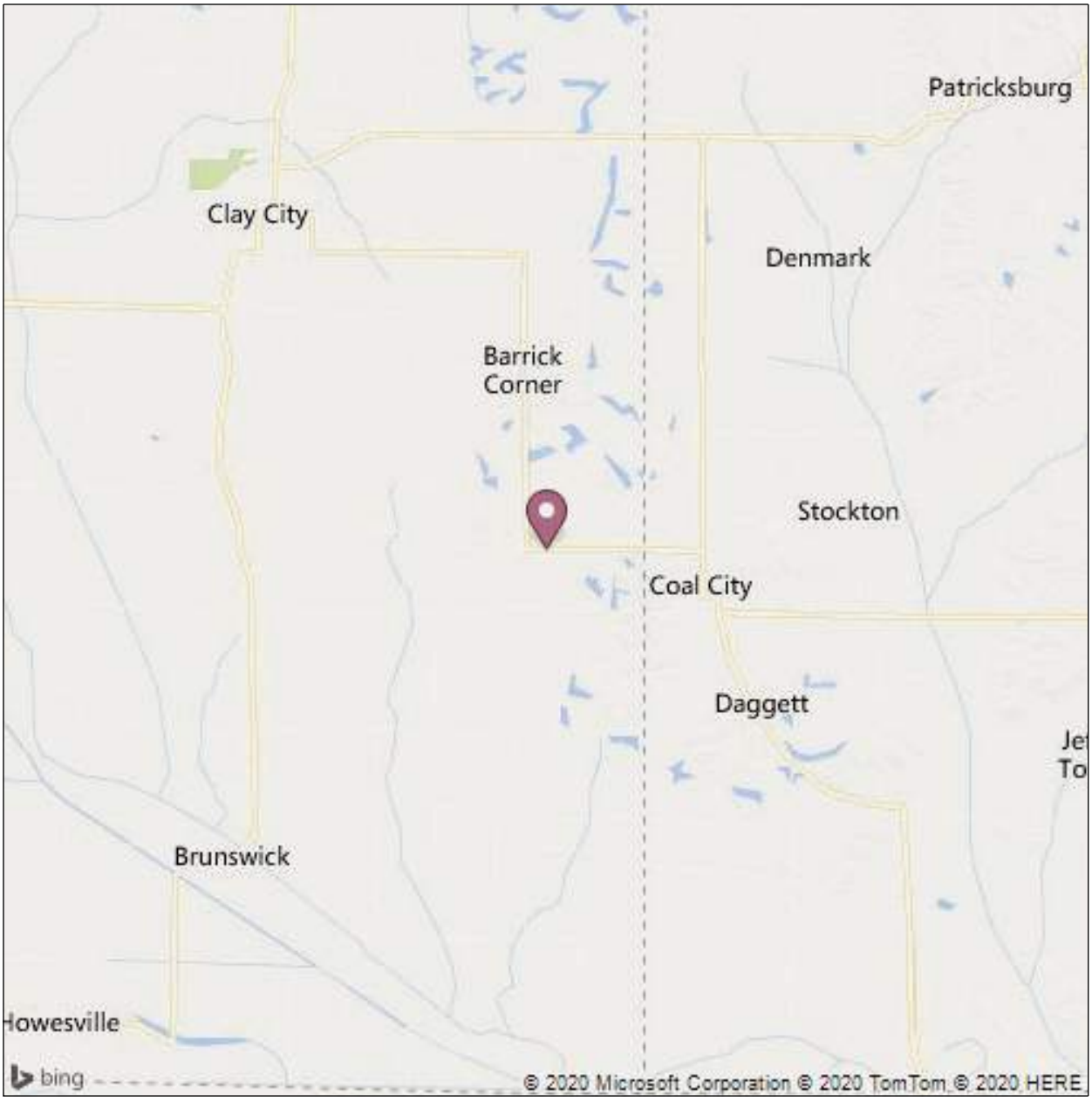
Inspector: Melvin Hughes

Asset Name: CV 157-011-21.14

Inspection Date: 07/01/2020

Facility Carried: SR 157

Culvert Inspection Report



Latitude: 39.23416

Longitude: -87.07022

Inspector: Melvin Hughes
Structure Number: 93000919
Inspection Date: 07/01/2020
Facility Carried: SR 157

Culvert Inspection Report

Executive Summary

2020 Inspection, The structure is in overall poor condition.

Has work scheduled / Des # 1800147 / Contract # R-40576 / Letting on 11/17/2021 / Small structure replacement / Programmed for 2022 / Active.

Structure Number: *CV 157-011-21.14* **Inspector:** Hughes,Melvin

Large Culvert Inspection Report

(8) Asset Code:	*93000919*	(27) Year Built:	*0000*
Asset Name:	*CV 157-011-21.14*	(90) Inspection Date:	*07/01/2020*
OLD Culvert ID:	*157-11-21.14*	(91) Inspection Frequency:	*12*
Team Assignment:	*01*	☐ Additional Treatment Exists	

Identification

(2) Highway Agency District:	*01*	(3) County Code:	*011*
Sub District:	*1100*	Ramp ID:	
(42B) Type of Service (Under):	*5*	☐ Adjacent to Roadway	

(7) Facility Carried: *SR 157* (6) Features Intersected:

(9) Location: *5.19 S SR 246* (9.01) Location Additional Description:

(11) Milepoint: *21.14* (16) Latitude: *39.23416* (17) Longitude: *-87.07022*

Classification:

(104) Highway System of the Inventory Route: *0* (26) Functional Classification of Inventory Route: *02*

Geometric Data

Culvert: Kind of Material: *3. Steel* Culvert: Type of Structure: *3. Pipe* Min Est Fill Cover (ft): *1.00*

Culvert: Max. Horizontal Opening (ft.): *0005.1000* Culvert: Max. Vertical Opening (ft.): *0003.9000* (34) Skew: *5*

Barrel Length (ft.): *42.0* Original Culvert Shape: *Elliptical*

Measurement Remarks:

Structure Additional Description: *Corrugated Metal Pipe 3.9' X 5.1' CMP*

Openings:

Direction	Opening Latitude	Opening Longitude	Direction	Opening Latitude	Opening Longitude
1.			3.		
2.			4.		

Openings Comments:

☐ **Follow Up Required:**

**If checked, please describe for follow up:

Endangered Species

Bats: seen or heard under structure? *	*N*
Birds/swallows/nests seen? Empty nests present?	*N*

* If yes, add one photo to the dropdown field

General Condition Ratings

(36A) Bridge Railings:	*N*	(36C) Approach Guardrail:	*N*
(36B) Transitions:	*N*	(36D) Approach Guardrail Ends:	*N*

Culvert:

(62) Culvert - Rating:	*4*
(62) Culvert Rating Comments:	*Bottom of the pipe is rusted out. see photos.*

Deck:

(58) Deck:	*N*
(58a) Deck Comments:	

Superstructure:

(59) Superstructure:	*N*
(59.01) Superstructure Comments:	

Substructure:

(60) Substructure:	*N*
(60.01) Substructure Comments:	
CV-Headwall/Anchor Rating	*N*
CV-Wingwalls Rating	*N*

Channel:

(61) Channel and Channel Protection:	*6*
(61.01) Channel and Channel Protection Comments:	*There is moderate bank erosion at the north end and minor channel scour at the south end of the structure. The channel flows from north to south.*
Bank Erosion Rating:	*6*
Drift/Sediment Rating	*8*
Channel Alignment Rating	*6*

☐ **Check this box if culvert has OBSTRUCTED flow**

Describe Obstruction:

Overtopping Frequency:	*1*
Overtopping Frequency Comments:	

Inspector: Melvin Hughes
Structure Number: 93000919
Inspection Date: 07/01/2020
Facility Carried: SR 157

Culvert Inspection Report

Pictures

PHOTO 1

Description Road alignment looking west

PHOTO 2

Description Road alignment looking east

Inspector: Melvin Hughes
Structure Number: 93000919
Inspection Date: 07/01/2020
Facility Carried: SR 157

Culvert Inspection Report

Pictures

PHOTO 3

Description Asphalt condition above the structure

PHOTO 4

Description North profile

Inspector: Melvin Hughes
Structure Number: 93000919
Inspection Date: 07/01/2020
Facility Carried: SR 157

Culvert Inspection Report

Pictures

PHOTO 5

Description South profile

PHOTO 6

Description Looking north through the pipe

Inspector: Melvin Hughes
Structure Number: 93000919
Inspection Date: 07/01/2020
Facility Carried: SR 157

Culvert Inspection Report

Pictures

PHOTO 7

Description Looking south through the pipe

PHOTO 8

Description Upstream channel alignment looking east

Inspector: Melvin Hughes
Structure Number: 93000919
Inspection Date: 07/01/2020
Facility Carried: SR 157

Culvert Inspection Report

Pictures

PHOTO 9

Description Downstream channel alignment looking south

APPENDIX D – TRAFFIC DATA

INDIANA DEPARTMENT OF TRANSPORTATION

October 22, 2019 11:25 am

PROJECT TRAFFIC FORECAST REPORT

DES No.: 1800147

SR-157 5.19 mi S of SR 246

From RP 21+14 to RP 21+14

Clay County

Prepared For

Jessica Miller

On

10/09/2019

By

INDOT, Office of Traffic Statistics
Technical Planning Support & Programming Division
Gregory A. Katter, PE, Supervisor
100 N. Senate Ave, N955
Indianapolis, Indiana 46204
INDOTTrafficForecasts@indot.IN.gov

INDIANA DEPARTMENT OF TRANSPORTATION

October 22, 2019 11:25 am

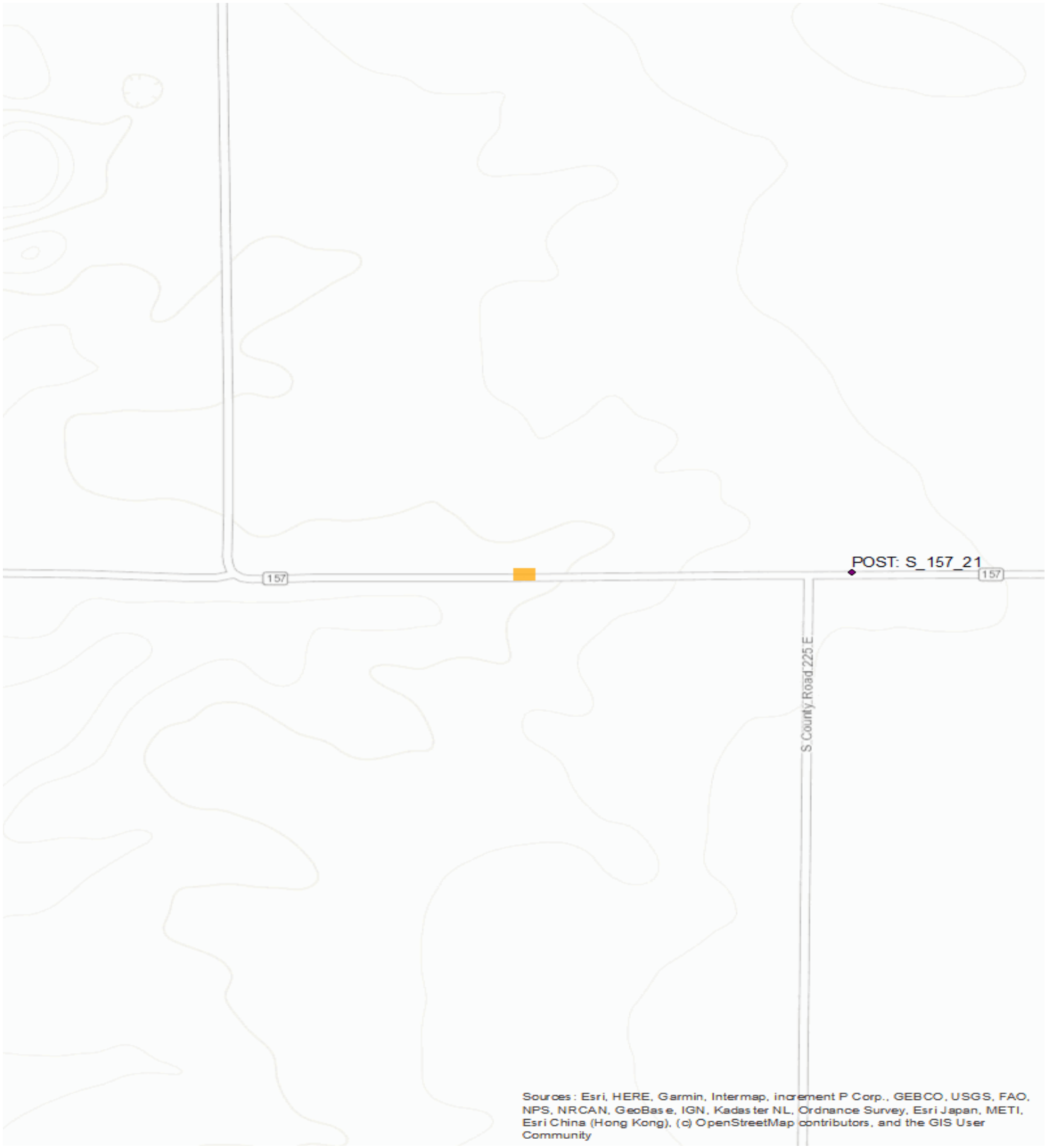
PROJECT TRAFFIC FORECAST REPORT

Table of Contents

INDIANA DEPARTMENT OF TRANSPORTATION

October 22, 2019 11:25 am

PROJECT TRAFFIC FORECAST REPORT



INDIANA DEPARTMENT OF TRANSPORTATION

October 22, 2019 11:25 am

PROJECT TRAFFIC FORECAST REPORT

Segment: 1

Segment Name ML_SR157
Route Name ML_SR157
From Measure 20.890
To Measure 20.900

Forecast Year	Projected Annual Average Daily Traffic	Negative AADT	Positive AADT
2018	556	269	286
2022	572	277	294
2024	579	280	298
2026	587	284	302
2028	595	288	306

Design Hourly Volume (DHV) in Design Year as percentage of AADT

Year	DHV
2028	11.87%

Peak Hour Forecast

AM Peak Hour 08:30
PM Peak Hour 04:45

Commercial Vehicles (FHWA Scheme F Classes 4 - 13)

6.30% of AADT
3.03% of DHV

Directional Split

51.44% of AADT Travels in Positive Travel Direction

The per year growth user for this forecast is 0.70% and is applied as a linear growth.

It should be recognized by users of this forecast that the base year AADT has an accuracy of plus or minus 10%. It should also be understood that while this report may include forecasts with up to six apparent significant figures, the accuracy should not be interpreted as being greater than two significant figures. It is the responsibility of designers to exercise professional judgement when using this data to influence decisions.

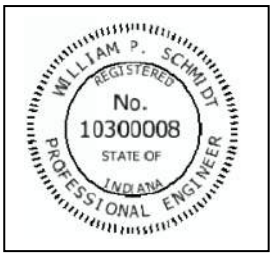
APPENDIX E – INDOT HYDRAULICS APPROVAL LETTER

February 17, 2020

TO: Michael Brinkerhoff, PE
Crawfordsville Bridge Asset Engineer

FROM: Vanessa McCauley, E.I.
Hydraulics Engineer

THROUGH: William Schmidt, PE
Sr. Hydraulics Engineer



SUBJECT: Hydraulic Review REVISION
Des. #: 1800147
County: Clay
Location: SR 157, 5.19 miles South of SR 46
Crossing: UNT of White Oak Creek

After the review of the above noted project, the proposed structure options have been approved. The tables below summarize the hydrologic and hydraulic parameters.

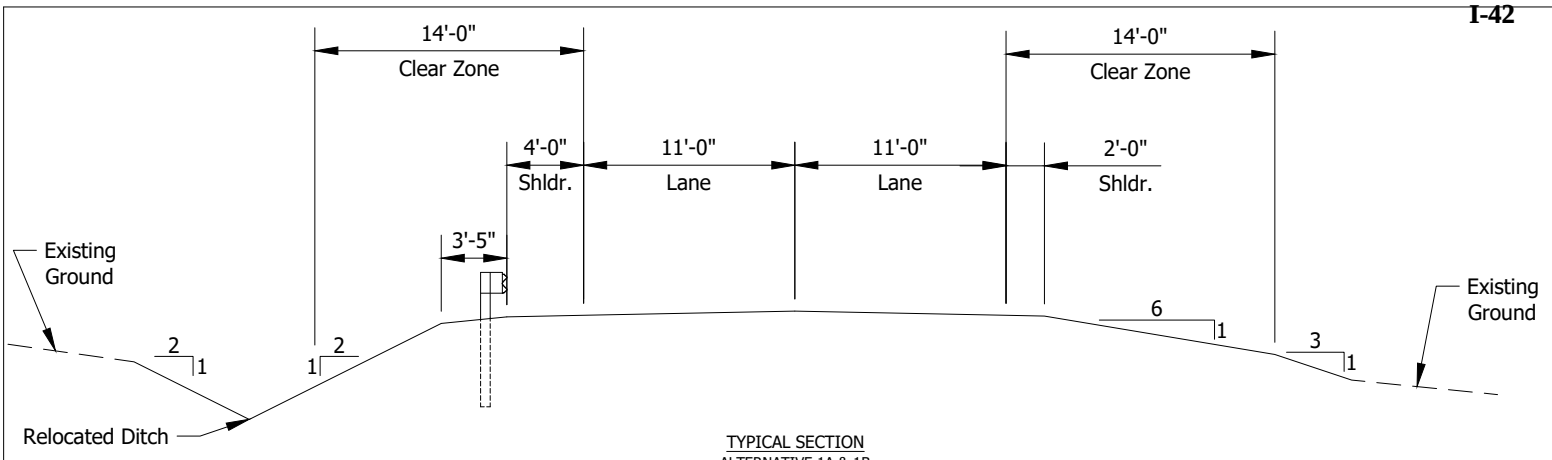
Site Parameters		
Drainage Area	35	acres
Q_{100} Discharge	85.8	cfs
Q_{100} Depth	2.90	ft.

Culvert Properties						
Parameter	**Existing**		**Proposal 1**		**Proposal 2**	
Structure	60" x 46" CMPA		71" x 47" CMPA sumped 12" with flared-end section		5' x 4' RCB sumped 12" with wingwalls	
Road Overflow Area Below Q_{100} Elevation	No		No		No	
Backwater	1.07	ft	1.07	ft	0.77	ft
Q_{100} Headwater Elevation	98.80	ft	98.80	ft	98.50	ft
Outlet Velocity (Q_{50})	8.50	ft/s	8.79	ft/s	9.32	ft/s

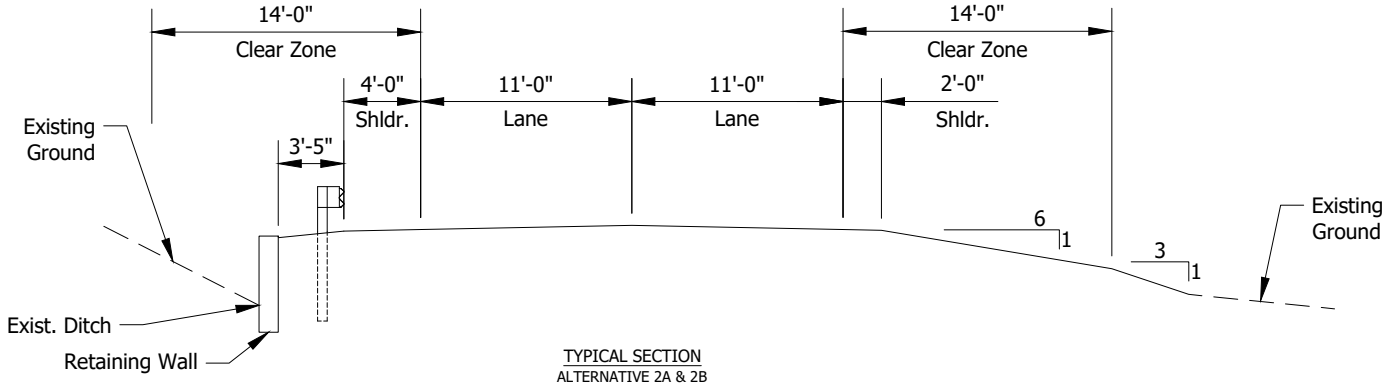
The existing structure, a 60 in span by 46 in rise corrugated metal pipe arch, is in poor condition. There is not sufficient cover for the existing structure. There are two options for this site. One is to replace the structure with a 71 in span by 47 in rise corrugated metal pipe arch sumped 12 in with flared-end section at the inlet. Another option is to replace the structure with a 5 ft span by 4 ft rise reinforced concrete box sumped 12 in with wingwalls (clear height of 3 ft). Class 1 riprap should be placed at the outlet to protect the structure from scour. The above elevations are based on a flowline datum of 93.69 ft. A liner option was not offered because the district requested only replacement options.

If you have any questions or comments, please contact me at (317) 233-2273.
VAM

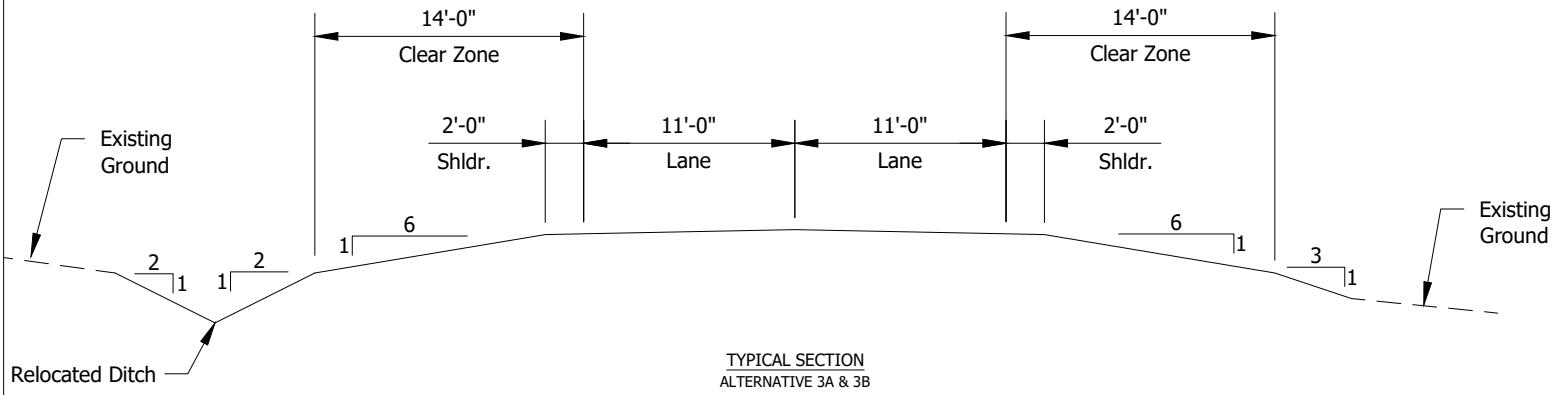
APPENDIX F – TYPICAL SECTIONS



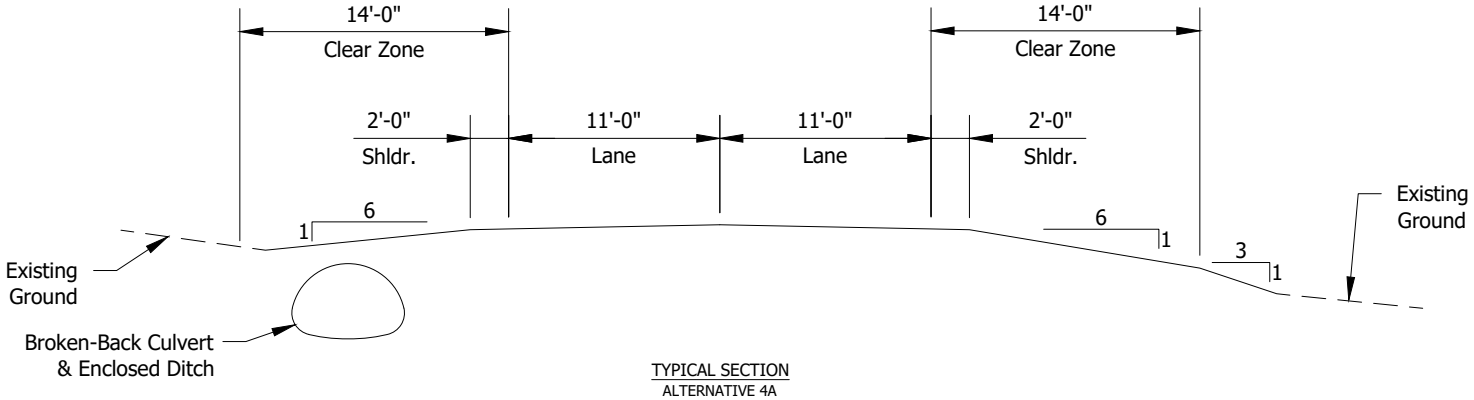
TYPICAL SECTION
ALTERNATIVE 1A & 1B



TYPICAL SECTION
ALTERNATIVE 2A & 2B



TYPICAL SECTION
ALTERNATIVE 3A & 3B



TYPICAL SECTION
ALTERNATIVE 4A

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Project	Date	Scale	Drawn By:	Checked By:
1800147	11/22	1" = 10'	NDB	.

SR 246 over UNT to White Oak Creek
Small Structure Replacement
Des. No. 1800147

F-2

TYPICAL SECTIONS

American Community Survey
Total—Estimate

Product: 2018: ACS 5-Year Estimates Detailed Tables
Geographies: Census Tract

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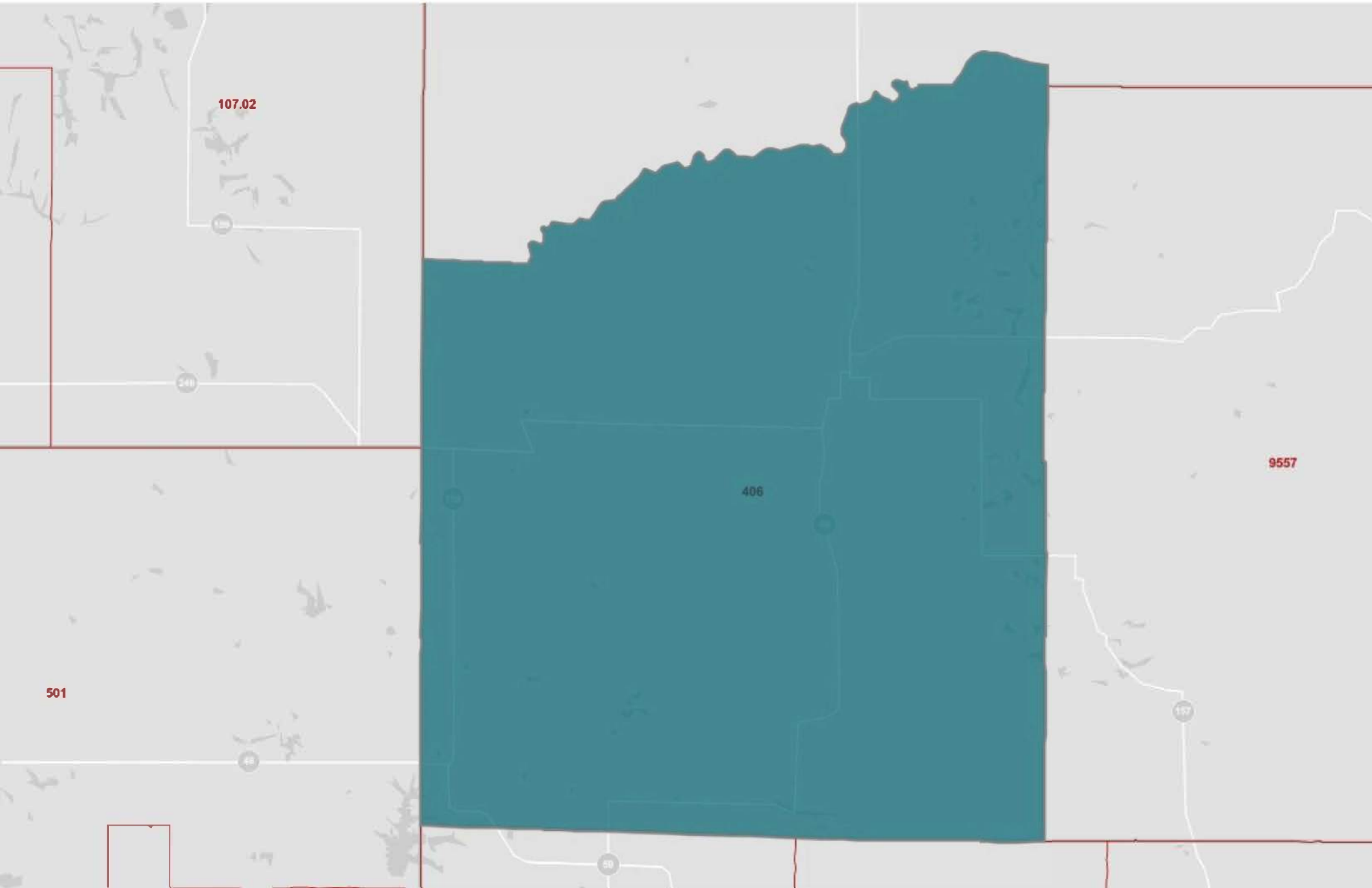

American Community Survey
Total—Estimate

Product: 2018: ACS 5-Year Estimates Detailed Tables
Geographies: County

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