

APPENDIX H

WATER RESOURCES

This appendix contains the following:

- Water Resources Assessment

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**Proposed Runway 5L/23R Replacement Project
Raleigh-Durham International Airport**

Water Resources Assessment

December 6, 2022

Prepared for:

**Raleigh-Durham Airport Authority and
Federal Aviation Administration**



Prepared by:



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SUMMARY OF WATER RESOURCE FINDINGS

The Raleigh-Durham Airport Authority (RDUAA or Airport) proposes to relocate existing runway 5L/23R 537 feet west of its current location (Appendix A, Figure 1). This includes the runway itself and all other associated construction tasks. To assess the potential environmental impacts associated with this project, an Environmental Assessment (EA) is being conducted by the Airport and Federal Aviation Administration (FAA), to fulfill actions necessary under the National Environmental Policy Act (NEPA). The location of potential jurisdictional Waters of the United States (WOTUS) is a subset of the necessary natural resource survey tasks required to complete this EA. Three Oaks Engineering, Inc. (Three Oaks) has been tasked with compiling a water resources assessment to accomplish this task.

Three Oaks conducted delineations of potential WOTUS within the 1,436-acre Detailed Study Area (DSA) on the following dates: 2021 – July 15, 20-21 | August 4-5, 10-11, 17, 19, and 31 | September 8, 15, and 27 | October 4; 2022 – August 11. A 1,218-acre subset of the DSA was then reviewed by regulatory agencies (referred to as the Jurisdictional Determination [JD] Review Area) on August 25 and 26, 2022 (Appendix A, Figures 2-5; 8). After evaluation of the JD Review Area, the total potential jurisdictional features within the DSA are as follows: 38 potentially jurisdictional streams, 6 potentially jurisdictional non-stream surface waters, 5 non-jurisdictional ponds constructed in uplands, 51 potentially jurisdictional wetlands, and three non-Section 404 wetland features that are protected under federal Executive Order 11990 (Tables 1,2,4, and 5).

Water resources within the DSA are part of the Neuse River Basin. Therefore, streamside riparian zones within the DSA were also assessed since they are potentially protected under the Neuse River Basin Riparian Buffer Rules administered by the North Carolina Division of Water Resources (NCDWR) (Table 3; Appendix A, Figures 6-7).

Potential jurisdictional areas identified with the JD Review Area were field-verified by the United States Army Corps of Engineers (USACE). The USACE subsequently issued a hybrid Preliminary Jurisdictional Determination (PJD)/Approved Jurisdictional Determination (AJD) for the JD Review Area on November 22, 2022 (Action ID No. SAW-2022-01559). The remaining portions of the DSA outside of the JD Review Area have not been verified by regulatory agencies. If required in the future, it is anticipated that these areas would also be covered under a similar hybrid PJD/AJD.



LIST OF ACRONYMS

AJD – Approved Jurisdictional Determination
B – Stream Classification B per the North Carolina Department of Environmental Quality
C – Stream Classification C per the North Carolina Department of Environmental Quality
CWA – Clean Water Act
DSA – Detailed Study Area
EA – Environmental Assessment
EPA – Environmental Protection Agency
FAA – Federal Aviation Administration
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map
HQP – High Quality Waters
JD – Jurisdictional Determination
NCDEQ – North Carolina Department of Environmental Quality
NCDWR – North Carolina Division of Water Resources
NCSAM – North Carolina Stream Assessment Method
NCWAM – North Carolina Wetland Assessment Method
NEPA – National Environmental Policy Act
NRCS – Natural Resources Conservation Service
NSW – Nutrient Sensitive Waters
OHWM – Ordinary High Water Mark
ORW – Outstanding Resource Waters
PJD – Preliminary Jurisdictional Determination
RDU – Raleigh-Durham International Airport
RDUAA – Raleigh-Durham Airport Authority
SWITC – Surface Water Identification Training Course
TBD – To Be Determined
Three Oaks – Three Oaks Engineering, Inc.
USACE – United States Army Corps of Engineers
USGS – United States Geological Survey
UT – Unnamed Tributary
WOTUS – Waters of the United States
WS – Water Supply Watershed



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1.0 INTRODUCTION

The following Water Resources Assessment has been completed to support the Environmental Assessment (EA) document and provide information on potential jurisdictional resources within the 1,436-acre Detailed Study Area (DSA; Appendix A, Figure 1).

2.0 METHODOLOGY

Site-specific investigations of vegetation, soils, and hydrology were conducted by qualified delineators to determine the presence of potential streams, wetlands, and/or other surface water features within the DSA. Field work was conducted on the following dates: 2021 – July 15, 20-21 | August 4-5, 10-11, 17, 19, and 31 | September 8, 15, 27 | October 4; 2022 – August 11. Wetlands were identified and delineated by use of the routine onsite inspection methods developed by the United States Army Corps of Engineers (USACE) in accordance with the 1987 “Corps of Engineers Wetlands Delineation Manual”, the USACE “Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0)”, and any other additional regional or national USACE guidance or regulations that were issued up to the time the field work was completed. Streams were identified and delineated following protocols set forth by both USACE and the North Carolina Division of Water Resources (NCDWR). USACE stream methodology follows the “National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams,” while NCDWR methodology follows both the NCDWR Surface Water Identification Training Course (SWITC) and the “Methodology for Identification of Intermittent and Perennial Streams and their Origins, Version 4.11.”

The baseline conditions were thoroughly investigated through pedestrian surveys and formal surveying of the extent of all streams/wetlands/surface waters within the DSA. Water resources identified within a 1,218-acre subset of the DSA (referred to as the Jurisdictional Determination [JD] Review Area) were then reviewed by regulatory agencies on August 25 and 26, 2022.

Each wetland or other water resource potentially within either Environmental Protection Agency (EPA) Clean Water Act (CWA) or Executive Order 11990 jurisdiction are summarized in this document and fully described, documented, classified, and mapped in a separate JD package. Field data sheets for each water resource feature are also incorporated into the JD package. The USACE issued a hybrid Preliminary Jurisdictional Determination (PJD)/Approved Jurisdictional Determination (AJD) for the JD Review Area on November 22, 2022 (Action ID No. SAW-2022-01559). The remaining portions of the DSA outside of the JD Review Area have not been verified by regulatory agencies. If required in the future, it is anticipated that these areas would also be covered under a similar hybrid PJD/AJD.

Principal personnel contributing to the field work and document are provided in Appendix B.



3.0 WATER RESOURCES

3.1 Surface Waters

Surface waters include streams, rivers, lakes, ponds, estuaries, and oceans. Identified features may be subject to the CWA, Rivers and Harbors Act, and state statutes protecting surface waters. Potentially jurisdictional surface waters within the DSA are part of the Neuse River Basin (United States Geological Survey [USGS] Hydrologic Unit Code [HUC] 03020201).

3.1.1 Potentially Jurisdictional Streams

To be considered potentially jurisdictional under CWA Section 404 by USACE, a stream feature needs to exhibit an Ordinary High Water Mark (OHWM). The OHWM defines the lateral extent of non-tidal aquatic features in the absence of adjacent wetlands in the United States. The federal regulatory definition of the OHWM (33 CFR 328.3[c][7]) states:

“The term ordinary high water mark means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as [a] clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.” A set of indicators has been developed to determine the presence of an OHWM.

To be considered jurisdictional under CWA Section 401 by NCDWR, a stream feature needs to possess characteristics indicative of a jurisdictional feature, as defined by the state. Per the state Methodology for Identification of Intermittent and Perennial Streams and Their Origins (Version 4.11), a feature is considered jurisdictional, and classified as either a Perennial or Intermittent stream, if it meets the following criteria:

Intermittent - A well-defined channel that contains water for only part of the year, typically during winter and spring when the aquatic bed is below the water table. The flow may be heavily supplemented by stormwater runoff. An intermittent stream often lacks the biological and hydrological characteristics commonly associated with the conveyance of water (as defined in North Carolina Administrative Code 15A NCAC 02B .0233[2][g]). Intermittent Streams typically score between ≥ 19 and < 30 on the NCDWR Stream Form, Version 4.11.

Perennial - A well-defined channel that contains water year-round during a year of normal rainfall with the aquatic bed located below the water table for most of the year. Groundwater is the primary source of water for a perennial stream, but it also carries stormwater runoff. A perennial stream exhibits the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water (as defined in North Carolina Administrative Code 15A NCAC 02B .0233[2][i]). Perennial Streams typically score ≥ 30 on the NCDWR Stream Form, Version 4.11.



Thirty-eight potentially jurisdictional stream features were identified in the DSA (Table 1). The location of each potential stream is shown on Figures 2-8 (Appendix A). Only features that meet the Section 404 definition of a jurisdictional stream (e.g., presence of an OHWM) were considered potential streams and included in the table. Features within the JD Review Area were verified by USACE as possessing an OHWM; features within the DSA, but outside of the JD Review Area were determined to possess an OHWM by Three Oaks only. For features included in this table, their NCDWR Classification is also provided based on either the NCDWR Stream Form, Version 4.11 or best professional judgement.

North Carolina Stream Assessment Method (NCSAM) and NCDWR Stream Identification Forms for features within the JD Review Area only are included in a separate JD Package. All features within the DSA have been designated as warm water streams for the purposes of stream mitigation.

There are no designated Outstanding Resource Waters (ORW), High Quality Waters (HQW), or Water Supply I or II (WS-I or WS-II) Watersheds within the DSA or within 1.0 mile downstream of the DSA. The North Carolina 2022 Final 303(d) list of impaired waters identifies Little Brier Creek and Brier Creek within the DSA as impaired because of a Polychlorinated Biphenyl Fish Tissue Advisory (Assessment Unit Nos. 27-33-4-1 and 27-33-4).

Table 1. Potentially jurisdictional streams in the DSA

Stream Name	Map ID	NCDWR Index Number	NCDWR Best Usage Classification ¹	NCDWR Classification	NCSAM Rating ²	Within JD Review Area	Length (ft.)
Brier Creek	Brier Creek	27-33-4	C; NSW	Perennial	*	No	1,103
Little Brier Creek	Little Brier Creek	27-33-4-1	C; NSW	Perennial	*	No	1,407
Unnamed Tributary (UT) to Stirrup Iron Creek	S1	27-33-4-2	C; NSW	Perennial	*	Yes	1,967
UT to Stirrup Iron Creek	S2	27-33-4-2	C; NSW	Intermittent	*	Yes	191
				Perennial	*		29

Table 1. Potentially jurisdictional streams in the DSA (continued)

Stream Name	Map ID	NCDWR Index Number	NCDWR Best Usage Classification ¹	NCDWR Classification	NCSAM Rating ²	Within JD Review Area	Length (ft.)
UT to Stirrup Iron Creek	S3	27-33-4-2	C; NSW	Intermittent	*	Yes	160
UT to Stirrup Iron Creek	S4	27-33-4-2	C; NSW	Intermittent	*	Yes	226
UT to Stirrup Iron Creek	S6	27-33-4-2	C; NSW	Intermittent	*	Yes	28
				Intermittent		No	541
				Perennial		No	39
UT to Stirrup Iron Creek	S7	27-33-4-2	C; NSW	Intermittent	*	No	481
UT to Stirrup Iron Creek	S8	27-33-4-2	C; NSW	Perennial	*	No	571
UT to Brier Creek	S9	27-33-4	C; NSW	Intermittent	*	Yes	984
				Perennial	*		455
UT to Brier Creek	S12	27-33-4	C; NSW	Perennial	*	Yes	966
UT to Brier Creek	S13	27-33-4	C; NSW	Intermittent	*	Yes	391

Table 1. Potentially jurisdictional streams in the DSA (continued)

Stream Name	Map ID	NCDWR Index Number	NCDWR Best Usage Classification ¹	NCDWR Classification	NCSAM Rating ²	Within JD Review Area	Length (ft.)
UT to Brier Creek	S14	27-33-4	C; NSW	Intermittent	*	Yes	173
UT to Brier Creek	S15	27-33-4	C; NSW	Intermittent	*	Yes	40
UT to Brier Creek	S16	27-33-4	C; NSW	Intermittent	*	No	176
UT to Brier Creek	S17	27-33-4	C; NSW	Intermittent	*	No	138
UT to Brier Creek	S18	27-33-4	C; NSW	Intermittent	*	No	32
UT to Little Brier Creek	S20	27-33-4-1	C; NSW	Perennial	*	Yes	324
UT to Little Brier Creek	S21	27-33-4-1	C; NSW	Perennial	*	Yes	609
UT to Little Brier Creek	S22	27-33-4-1	C; NSW	Intermittent	*	Yes	110



Table 1. Potentially jurisdictional streams in the DSA (continued)

Stream Name	Map ID	NCDWR Index Number	NCDWR Best Usage Classification ¹	NCDWR Classification	NCSAM Rating ²	Within JD Review Area	Length (ft.)
UT to Little Brier Creek	S23	27-33-4-1	C; NSW	Intermittent	*	Yes	378
UT to Little Brier Creek	S24	27-33-4-1	C; NSW	Perennial	*	Yes	163
UT to Little Brier Creek	S25	27-33-4-1	C; NSW	Intermittent	Low/Low	Yes	431
				Perennial	*		461
UT to Little Brier Creek	S26	27-33-4-1	C; NSW	Intermittent	Low/Low	Yes	249
				Perennial	*		1,700
UT to Little Brier Creek	S29	27-33-4-1	C; NSW	Perennial	*	No	398
UT to Little Brier Creek	S30	27-33-4-1	C; NSW	Intermittent	*	Yes	438
				Intermittent		No	175
UT to Little Brier Creek	S33	27-33-4-1	C; NSW	Intermittent	*	Yes	167
				Intermittent		No	170
UT to Little Brier Creek	S34	27-33-4-1	C; NSW	Intermittent	*	Yes	1,089
				Intermittent		No	53

Table 1. Potentially jurisdictional streams in the DSA (continued)

Stream Name	Map ID	NCDWR Index Number	NCDWR Best Usage Classification ¹	NCDWR Classification	NCSAM Rating ²	Within JD Review Area	Length (ft.)
UT to Little Brier Creek	S35	27-33-4-1	C; NSW	Intermittent	*	Yes	187
UT to Little Brier Creek	S37	27-33-4-1	C; NSW	Intermittent	Low/Low	Yes	416
UT to Little Brier Creek	S39	27-33-4-1	C; NSW	Intermittent	*	Yes	874
				Perennial	*	Yes	659
				Perennial		No	1,025
UT to Little Brier Creek	S40	27-33-4-1	C; NSW	Perennial	*	Yes	160
UT to Little Brier Creek	S41	27-33-4-1	C; NSW	Intermittent	Low/Low	Yes	229
				Perennial	*		432
UT to Little Brier Creek	S42	27-33-4-1	C; NSW	Intermittent	*	Yes	881
UT to Sycamore Creek	S43	27-33-9	B; NSW	Intermittent	*	Yes	267
UT to Sycamore Creek	S44	27-33-9	B; NSW	Intermittent	*	Yes	67

Table 1. Potentially jurisdictional streams in the DSA (continued)

Stream Name	Map ID	NCDWR Index Number	NCDWR Best Usage Classification ¹	NCDWR Classification	NCSAM Rating ²	Within JD Review Area	Length (ft.)
UT to Little Brier Creek	S45	27-33-4-1	C; NSW	Perennial	*	Yes	84
UT to Little Brier Creek	S46	27-33-4-1	C; NSW	Perennial	Low	Yes	14
						Total	22,308

¹ – C - Waters protected for uses such as aquatic life propagation, survival and maintenance of biological integrity (including fishing and fish), wildlife, secondary contact recreation, and agriculture. Secondary contact recreation means wading, boating, other uses not involving human body contact with water, and activities involving human body contact with water where such activities take place on an infrequent, unorganized, or incidental basis.

B - Waters protected for all Class C uses in addition to primary contact recreation. Primary contact recreation means swimming, diving, water skiing, and similar uses involving human body contact with water where such activities take place in an organized manner or on a frequent basis.

NSW – Supplemental classification intended for waters needing additional nutrient management due to being subject to excessive growths of microscopic or macroscopic vegetation.

² – Streams exhibiting characteristics conducive to them receiving moderate to higher functional rating and/or mitigation values are represented by an asterisk (*).

Note 1: The USACE will make the determination for compensatory mitigation during the permitting phase of the Project.

Note 2: Streams S19 and S36 do not exist within the DSA. Streams S5, S10, S11, S27, S28, S31, S32, and S38 were removed from the JD Review Area during the field verification site visit.



3.1.2 Non-stream Surface Waters

Eleven non-stream surface waters (i.e., ponds, basins, and/or tributaries) were identified in the DSA (Table 2; Appendix A, Figures 2-8). Of those 11 features, six were determined to be potentially jurisdictional. The remaining five were located within the JD Review Area and determined to be non-Section 404 ponds constructed in upland by USACE during their field verification site visit (noted below). These five features were excluded under the Approved JD for the project.

Table 2. Non-stream surface waters in the DSA

Map ID	Potentially Section 404 Jurisdictional	NCDWR Best Usage Classification ¹	Within JD Review Area	Area
Brier Creek Reservoir	Yes	C; NSW	Yes	133.3
			No	0.09
Little Brier Creek Reservoir	Yes	C; NSW	Yes	0.01
			No	0.03
Stirrup Iron Creek Reservoir	Yes	C; NSW	No	3.32
P1	No (Constructed in Upland)	N/A	Yes	1.64
P2	No (Constructed in Upland)	N/A	Yes	0.08
P3	Assumed (since in area not covered in JD)	C; NSW	No	0.37
P5	Yes	C; NSW	Yes	0.29
P9	No (Constructed in Upland)	N/A	Yes	0.26
P10	Yes (Assumed based on downslope wetland connection)	C; NSW	Yes	1.70
P11	No (Constructed in Upland)	N/A	Yes	0.03
B2	No (Constructed in Upland)	N/A	Yes	0.07
			Total	141.19

¹ – See Table 1 footnotes for a description of the Best Usage Classifications.

3.1.3 Riparian Buffers

This project is located within the Neuse River Basin (USGS HUC 03020201). Streams within this basin are protected by the Neuse River Riparian Buffer Rules, enforced by NCDEQ – NCDWR. To be subject to Neuse River Riparian Buffer Rules, potential streams need to be present on either USGS topographic mapping (Appendix A, Figure 3) or Natural Resources Conservation Service (NRCS) soil survey mapping (Appendix A, Figure 6) (or both).



Per riparian buffer rules, there are two riparian buffer zones that apply to a buffered stream or open water, extending a total of 50 feet outward, perpendicularly from the edge of a feature. Zone One abuts the stream or open water and extends 30 feet perpendicularly from the top of bank (or edge of water) outward, on both sides of a feature. Zone Two starts at the outside edge of Zone One and extends an additional 20 feet perpendicularly from Zone One outward, on both sides of the feature.

Table 3 identifies which jurisdictional features are buffered per the Neuse River Riparian Buffer Rules. The features requiring riparian buffers are shown on Figure 7 (Appendix A). Streams/open waters designated as "Not Subject" were not present on either mapping type; therefore, they are not subject to the riparian buffer rules. Riparian buffers will be preserved to the greatest extent practicable. For unavoidable impacts to these buffers, a buffer impact plan will be submitted to the state for authorization under the Neuse River Riparian Buffer Rules.

Table 3. Riparian buffers in the DSA

Map ID	River Basin Buffer	Zone 1 Area (sq. ft.)	Zone 2 Area (sq. ft.)	Feature Total (sq. ft.)
Brier Creek	Subject	67,458	44,551	112,009
Little Brier Creek	Subject	83,913	54,189	138,102
S1	Subject	117,862	74,057	191,919
S2	Subject	11,374	8,052	19,426
S3	Subject	11,198	9,128	20,326
S4	Subject	12,734	9,445	22,179
S6	Subject	35,192	22,557	57,749
S7	Subject	33,861	26,698	60,559
S8	Subject	32,586	18,600	51,186

Table 3. Riparian buffers in the DSA (continued)

Map ID	River Basin Buffer	Zone 1 Area (sq. ft.)	Zone 2 Area (sq. ft.)	Feature Total (sq. ft.)
S9	Subject	93,189	70,084	163,273
S12	Subject	57,820	39,766	97,586
S13	Subject	26,230	20,564	46,794
S14	Subject	10,064	7,893	17,957
S15	Subject	5,214	6,617	11,831
S16	Not Subject	N/A	N/A	N/A
S17	Not Subject	N/A	N/A	N/A
S18	Not Subject	N/A	N/A	N/A
S20	Subject	17,671	9,774	27,445
S21	Subject	32,207	22,083	54,290
S22	Subject	6,113	4,514	10,627
S23	Subject	24,195	17,585	41,780

Table 3. Riparian buffers in the DSA (continued)

Map ID	River Basin Buffer	Zone 1 Area (sq. ft.)	Zone 2 Area (sq. ft.)	Feature Total (sq. ft.)
S24	Subject	11,301	9,098	20,399
S25	Subject	55,989	39,504	95,493
S26	Subject	128,203	94,481	222,684
S29	Subject	26,682	20,921	47,603
S30	Subject	37,911	26,514	64,425
S33	Subject	22,177	17,996	40,173
S34	Subject	67,774	45,754	113,528
S35	Subject	14,032	12,494	26,526
S37	Subject	27,244	20,364	47,608
S39	Subject	150,003	100,172	250,175
S40	Subject	9,179	6,927	16,106
S41	Subject	43,685	32,289	75,974

Table 3. Riparian buffers in the DSA (continued)

Map ID	River Basin Buffer	Zone 1 Area (sq. ft.)	Zone 2 Area (sq. ft.)	Feature Total (sq. ft.)
S42	Subject	54,436	37,843	92,279
S43	Subject	18,704	14,248	32,952
S44	Subject	5,236	4,882	10,118
S45	Subject	7,853	7,530	15,383
S46	Not Subject	N/A	N/A	N/A
Brier Creek	Subject	379,381	218,639	598,020
Little Brier Creek	Subject	12,088	11,101	23,189
Stirrup Iron Creek	Subject	42,639	27,853	70,492
P3	Subject	17,788	14,992	32,780
P5	Subject	15,735	7,938	23,673
P10	Subject	41,028	30,401	71,429
	Total	1,867,949	1,268,098	3,136,047

3.2 Potentially Jurisdictional Wetlands

3.2.1 Potentially Jurisdictional Wetlands per Section 404

For regulatory purposes under the CWA, the term “wetlands” means areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Areas covered with water for such a short time that there is no effect on moist-soil vegetation are not considered wetlands, nor are the waters of streams, reservoirs, and deep lakes. Wetlands provide many benefits to the human, biological, and hydrological environment, including habitat for fish and wildlife, water quality improvement, flood storage, and opportunities for recreation. Identified features may also be subject to state statutes protecting wetlands.

Fifty-one potentially jurisdictional wetland features were identified within the DSA (Table 4). The locations of these wetlands are shown on Figures 2-8 (Appendix A). Wetlands identified as “Undisturbed” on mapping and in the table exhibit characteristics similar to what is expected for their North Carolina Wetland Assessment Method (NCWAM) wetland type(s) in terms of hydrology, hydrophytic vegetation, and soil. Wetlands identified as “Disturbed” are compromised in one or more of these categories.

All wetlands in the DSA are located within the Neuse River Basin (USGS HUC 03020201). USACE wetland determination forms and NCWAM forms that represent each site within the JD Review Area only are included in a separate JD Package. Features within the DSA, but outside of the JD Review Area, were determined to be potentially jurisdictional by Three Oaks; however, these features have not been reviewed by USACE.

Table 4. Potentially jurisdictional wetlands in the DSA

Map ID	NCWAM Classification	NCWAM Rating ¹	Hydrologic Classification	Within JD Review Area	Area (ac.)
W2	Nontidal Freshwater Marsh	*	Riparian	Yes	0.01
W3	Floodplain Pool	*	Riparian	Yes	< 0.01
W5	Nontidal Freshwater Marsh	*	Riparian	Yes	0.01
W7	Headwater Forest	*	Riparian	No	0.06
W8	Headwater Forest	*	Riparian	Yes	0.04
W9	Headwater Forest	*	Riparian	No	0.44
W10	Bottomland Hardwood Forest	*	Riparian	No	0.12

Table 4. Potentially jurisdictional wetlands in the DSA (continued)

Map ID	NCWAM Classification	NCWAM Rating ¹	Hydrologic Classification	Within JD Review Area	Area (ac.)
W11	Headwater Forest	*	Riparian	Yes	0.07
W12	Headwater Forest	*	Riparian	Yes	0.11
W13	Headwater Forest	*	Riparian	Yes	0.17
W14 ²	Nontidal Freshwater Marsh	Medium	Riparian	Yes	2.25
W15	Nontidal Freshwater Marsh	Medium	Riparian	Yes	0.05
W16	Headwater Forest	*	Riparian	Yes	0.07
W17 ²	Nontidal Freshwater Marsh	Medium	Riparian	Yes	0.01
W18 ²	Nontidal Freshwater Marsh	Medium	Riparian	Yes	0.02
W19 ²	Nontidal Freshwater Marsh	Medium	Riparian	Yes	0.07
W20 ²	Nontidal Freshwater Marsh	Medium	Riparian	Yes	0.02
W21 ²	Nontidal Freshwater Marsh	Medium	Riparian	Yes	0.15
W22 ²	Nontidal Freshwater Marsh	Medium	Riparian	Yes	0.08
W23 ²	Nontidal Freshwater Marsh	Medium	Riparian	Yes	0.03
W24 ²	Nontidal Freshwater Marsh	Medium	Riparian	Yes	0.04
W25 ²	Nontidal Freshwater Marsh	Medium	Riparian	Yes	0.17



Table 4. Potentially jurisdictional wetlands in the DSA (continued)

Map ID	NCWAM Classification	NCWAM Rating ¹	Hydrologic Classification	Within JD Review Area	Area (ac.)
W26	Headwater Forest	*	Riparian	Yes	0.23
W27	Headwater Forest	*	Riparian	Yes	0.31
W28 ²	Nontidal Freshwater Marsh	Medium	Riparian	Yes	0.23
W30	Nontidal Freshwater Marsh	*	Riparian	Yes	0.01
W31	Headwater Forest	*	Riparian	Yes	0.05
W32	Nontidal Freshwater Marsh	*	Riparian	No	0.07
W33	Headwater Forest	*	Riparian	No	0.32
W34	Bottomland Hardwood Forest	*	Riparian	No	2.61
W35	Nontidal Freshwater Marsh	*	Riparian	Yes	0.54
W36	Nontidal Freshwater Marsh	*	Riparian	Yes	0.20
W37	Nontidal Freshwater Marsh	*	Riparian	Yes	0.01
W38 ²	Headwater Forest	Medium	Riparian	Yes	0.02
W39 ²	Nontidal Freshwater Marsh	*	Riparian	Yes	0.19
W40 ²	Nontidal Freshwater Marsh	*	Riparian	Yes	0.31
W41	Headwater Forest	*	Riparian	Yes	0.20



Table 4. Potentially jurisdictional wetlands in the DSA (continued)

Map ID	NCWAM Classification	NCWAM Rating ¹	Hydrologic Classification	Within JD Review Area	Area (ac.)
W42 ²	Nontidal Freshwater Marsh	Medium	Riparian	Yes	0.12
W43	Riverine Swamp Forest	*	Riparian	Yes	0.98
W44 ²	Nontidal Freshwater Marsh	*	Riparian	Yes	2.53
W45 ²	Nontidal Freshwater Marsh	*	Riparian	No	< 0.01
W46	Bottomland Hardwood Forest	*	Riparian	No	0.24
W47	Bottomland Hardwood Forest	*	Riparian	No	0.07
W48	Bottomland Hardwood Forest	*	Riparian	No	0.02
W49 ²	Headwater Forest	*	Riparian	Yes	0.03
W50	Headwater Forest/Riverine Swamp Forest/Nontidal Freshwater Marsh	*	Riparian	No	5.88
W51	Floodplain Pool	*	Riparian	No	1.10
W52	Bottomland Hardwood Forest	*	Riparian	No	0.22
W55	Headwater Forest	*	Riparian	Yes	0.07
W57 ²	Headwater Forest	Low	Riparian	Yes	0.26
W59 ²	Headwater Forest	Medium	Riparian	Yes	0.11
				Total	20.93



¹ – Wetlands exhibiting characteristics conducive to them receiving moderate to higher functional rating and/or mitigation values are represented by an asterisk (*).

² – These wetlands were identified as Disturbed.

Note: There are no Wetland features W53, W56, or W58. Wetland features W1, W4, W6, W29, and W54 were removed from the JD Review Area during the JD site visit.

3.2.2 Wetlands Protected Under Executive Order 11990

In addition to the potentially jurisdictional wetland features covered under the CWA, three additional features were not considered Section 404 jurisdictional features, but are protected under federal Executive Order 11990. Under this Executive Order:

Federal agencies are required to “avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.” The stated purpose of this Executive Order is to “minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.”

The three features associated with this project are located in the JD Review Area and are stormwater/sediment basins that USACE deemed as already permitted features since they were present on As-Built construction plans from previous Airport activities. However, at least portions of these features did meet all three wetland criteria and, therefore, are protected under the Executive Order (Table 5).

Table 5. Wetland features already deemed permitted per USACE, but still protected under Executive Order 11990

Map ID (Former Map ID)	Connection	Area
FAA W60 (B1)	S44	0.10
FAA W61 (B6)	S26	1.00
FAA W62 (B8)	S39	1.53
	Total	2.63

Note Former Map ID included so that features can be properly cross-referenced when referring to older versions of this document.

3.3 Riparian Floodplains

Floodplains are lowland areas adjoining inland and coastal waters which are periodically inundated by flood waters, including flood-prone areas of offshore islands. Floodplains are often discussed in terms of the 100-year flood. The 100-year flood is a flood having a 1 percent chance of occurring in any given year. The 100-year flood is also known as the base flood and is symbolized as Zone AE. Floodplains are valued for their natural flood and erosion control, enhancement of biological productivity, and socioeconomic benefits and functions.

When property in floodplains is proposed for lease, easement, right-of-way, or disposal to non-federal public or private entities, the FAA must, in accordance with Executive Order 11988, Floodplain Management: (1) reference in the conveyance those uses that are restricted under identified federal, state, or local floodplain regulations; (2) attach other appropriate restrictions to uses of properties by the grantee or purchaser and any successors, except where prohibited by law; or (3) withhold such properties from conveyance. Identified

floodplains may be subject to the National Flood Insurance Act, Executive Order 11988, and state statutes protecting regulatory floodplains and floodways.

Riparian floodplains were identified within the DSA using Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) mapping (Table 6; Appendix A, Figure 8).

Table 6. Characteristics of FEMA-regulated floodplains in the DSA

Map ID	Floodplain Area (ac.)	FEMA Zone
Brier Creek	147.37	AE, Floodway
	15.05	AE
Little Brier Creek	19.38	AE, Floodway
	33.68	AE
Stirrup Iron Creek	4.94	AE, Floodway
	4.12	AE
Total	224.54	

3.4 Rivers and Harbors Act Section 10 Navigable Waters

No potential streams within the DSA have been designated by the USACE as a Navigable Water under Section 10 of the Rivers and Harbors Act.

4.0 REFERENCES

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- United States Geological Survey. 1951. Durham South, North Carolina, Topographic Quadrangle (7.5-minute series).

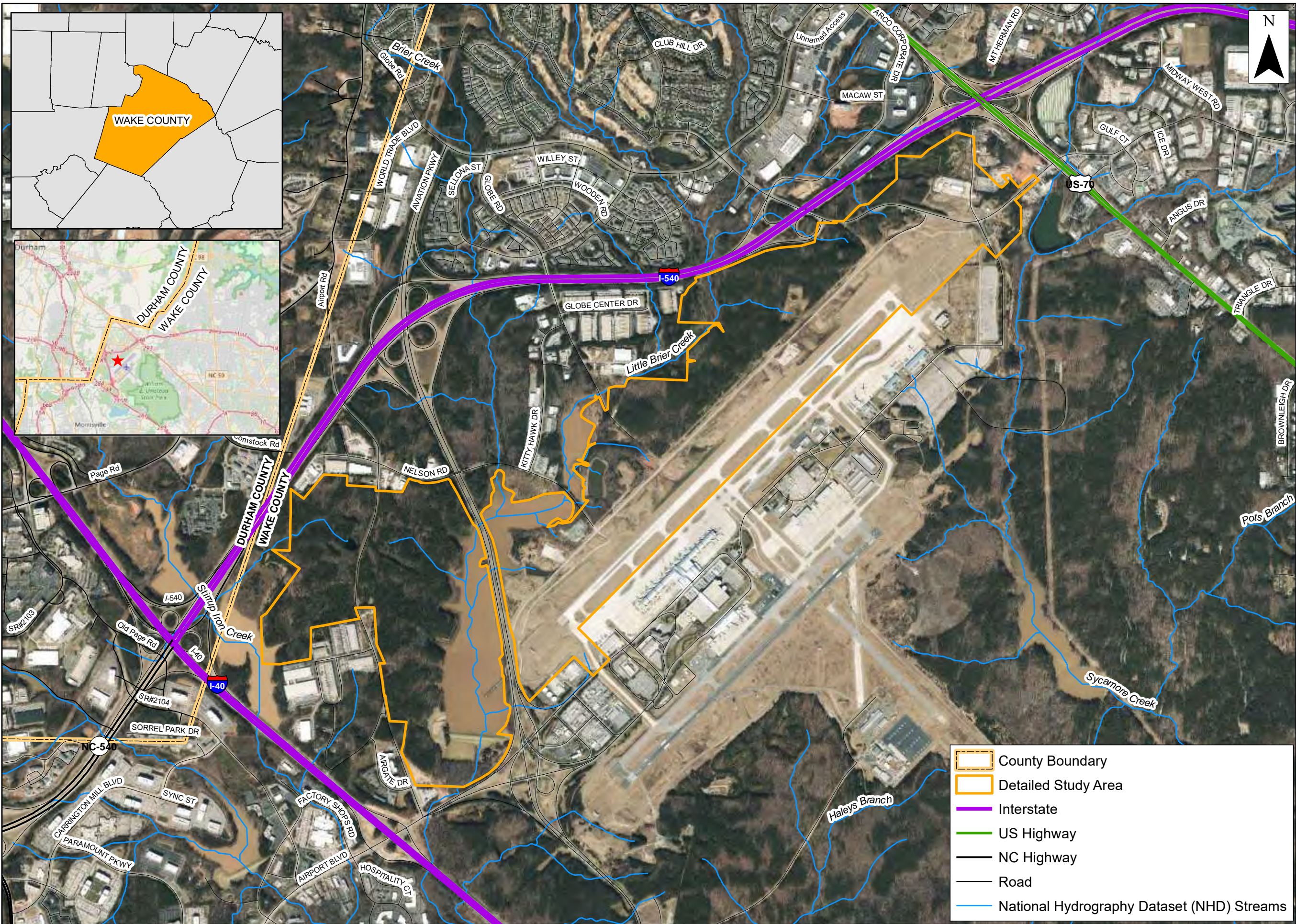


United States Geological Survey. 1987. Southeast Durham, North Carolina, Topographic Quadrangle (7.5-minute series).



Appendix A Figures





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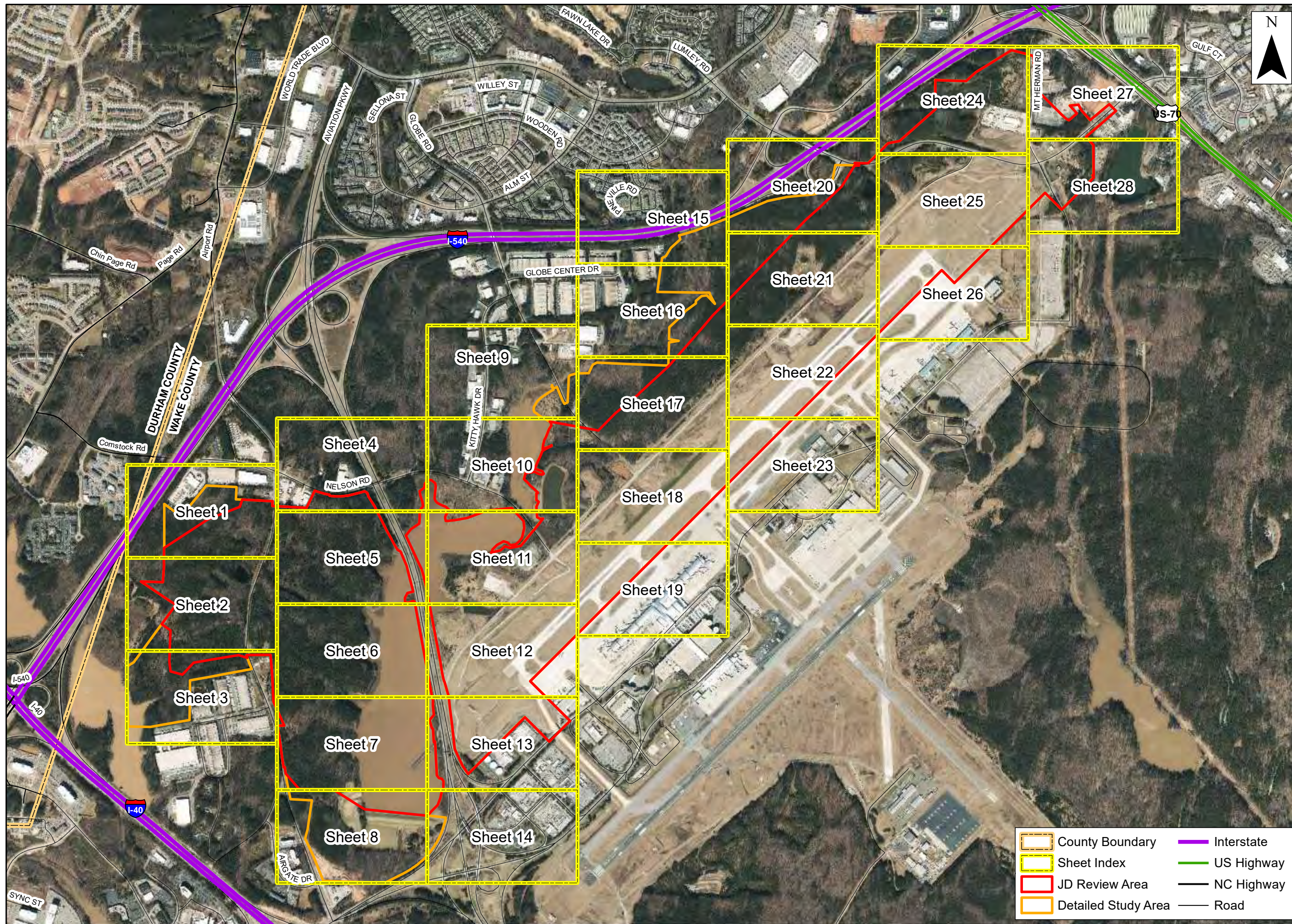
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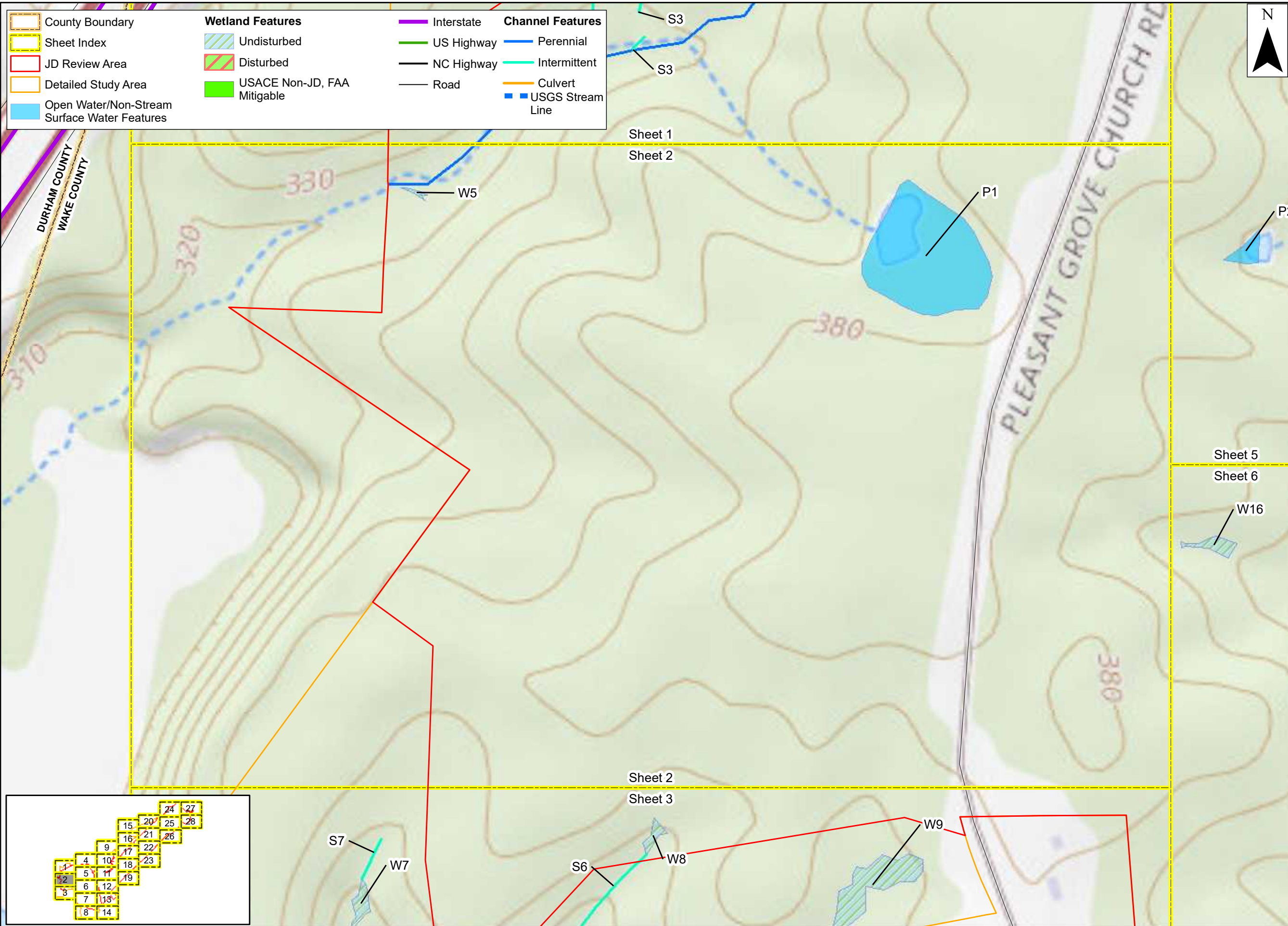
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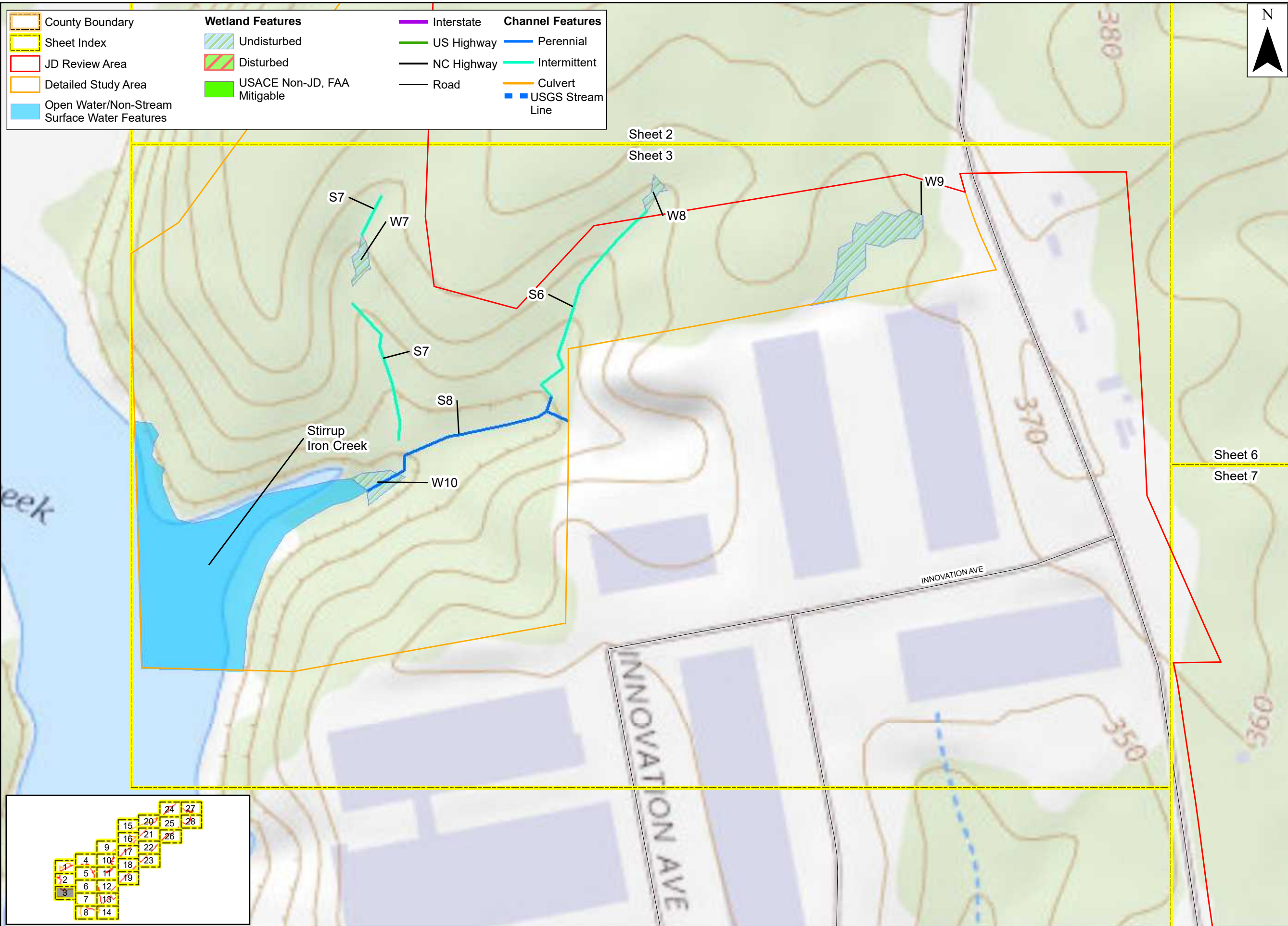
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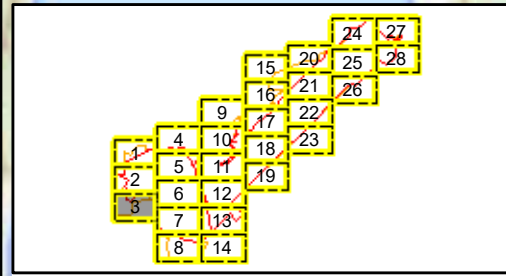
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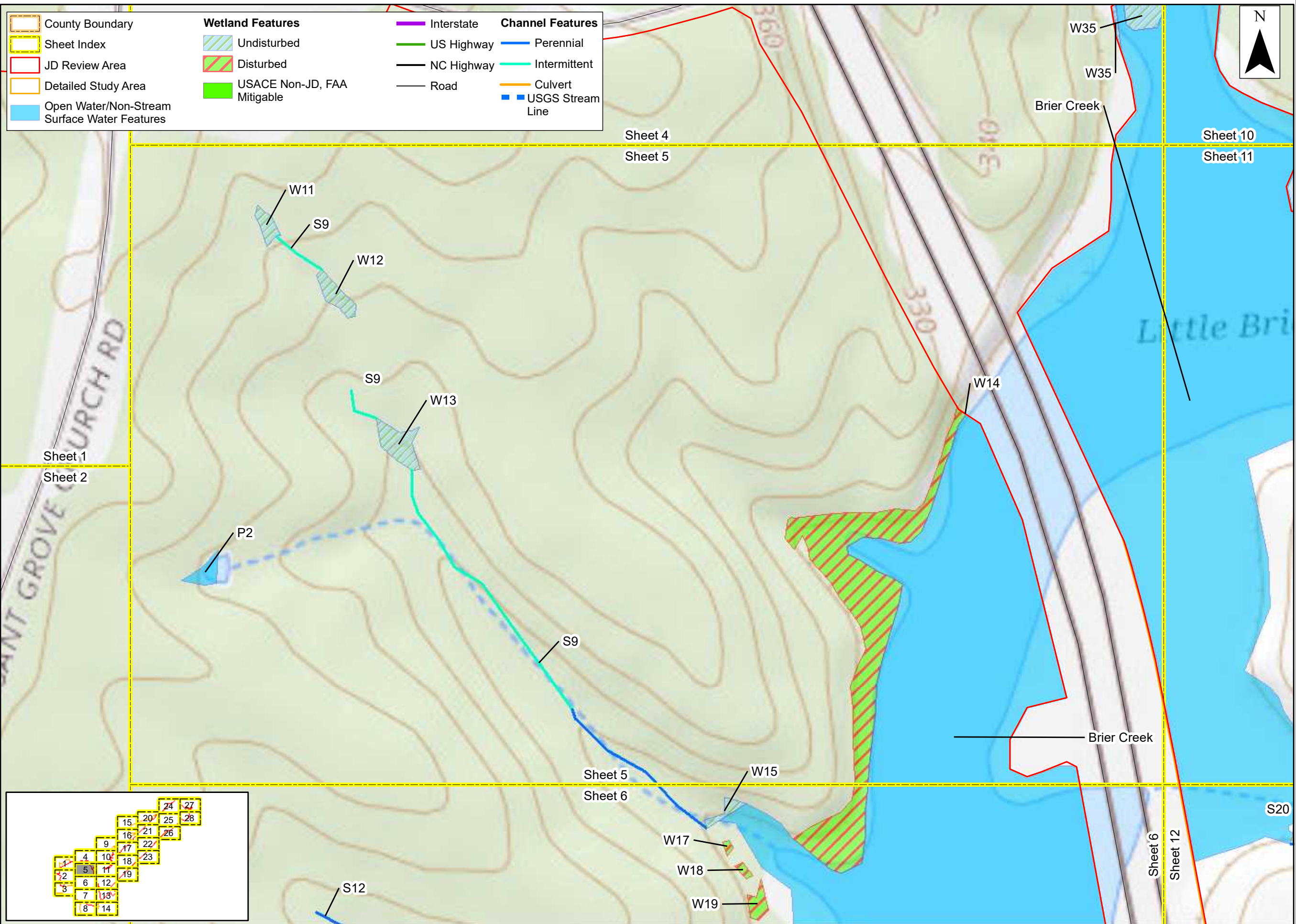
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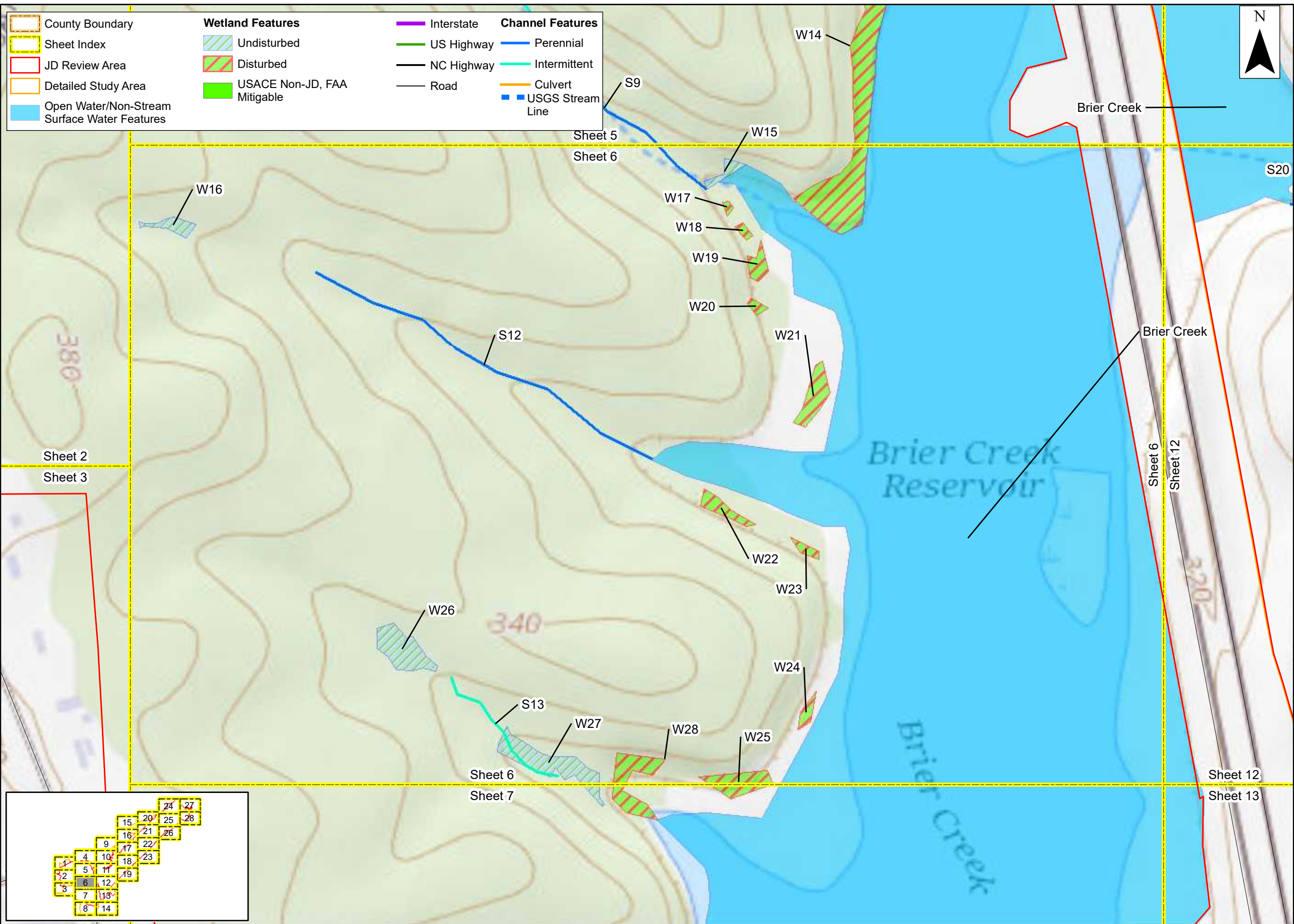
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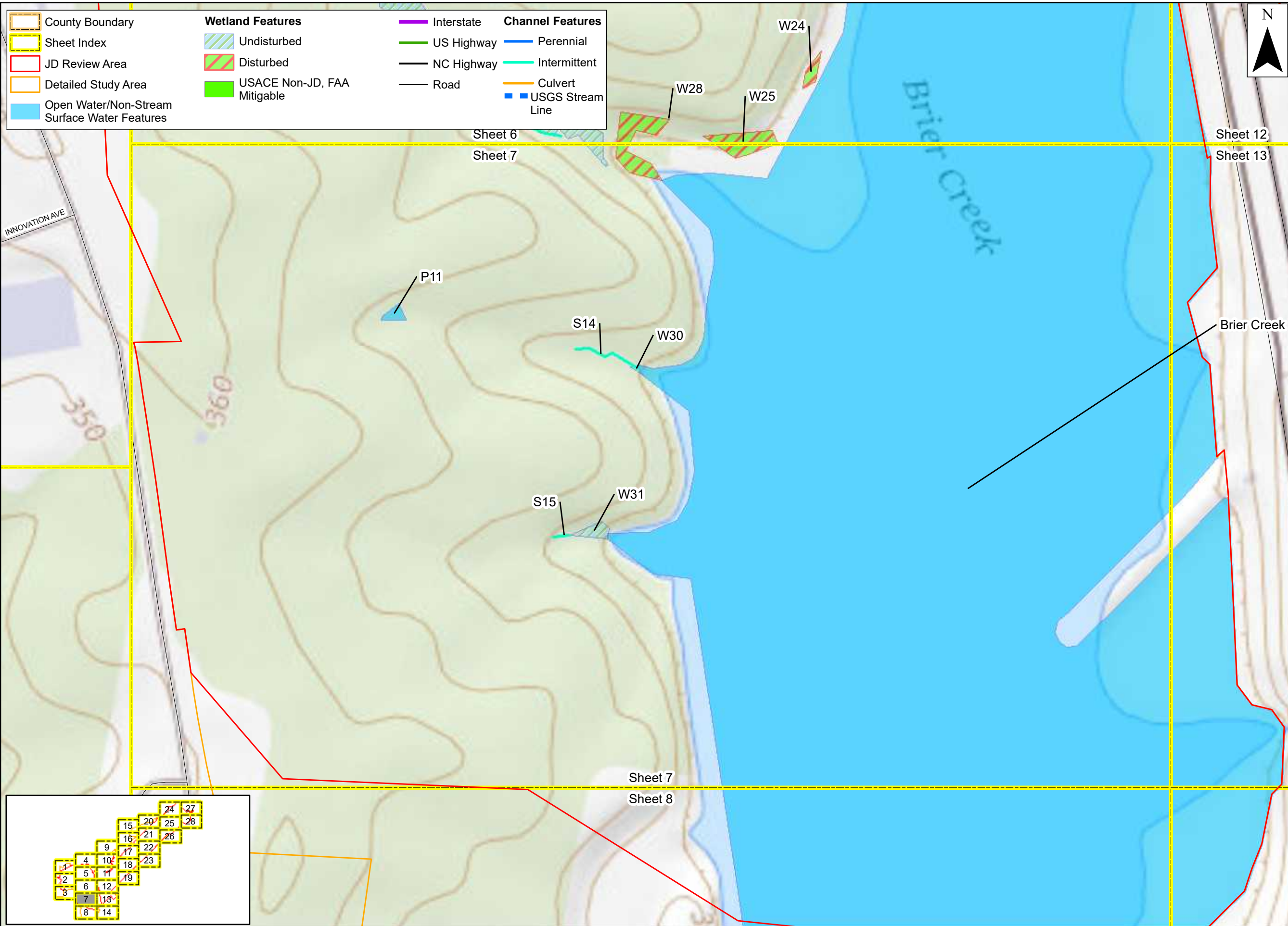
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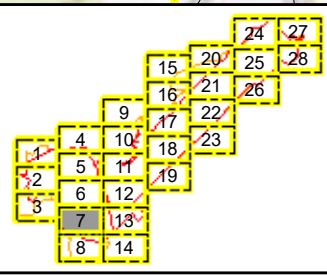
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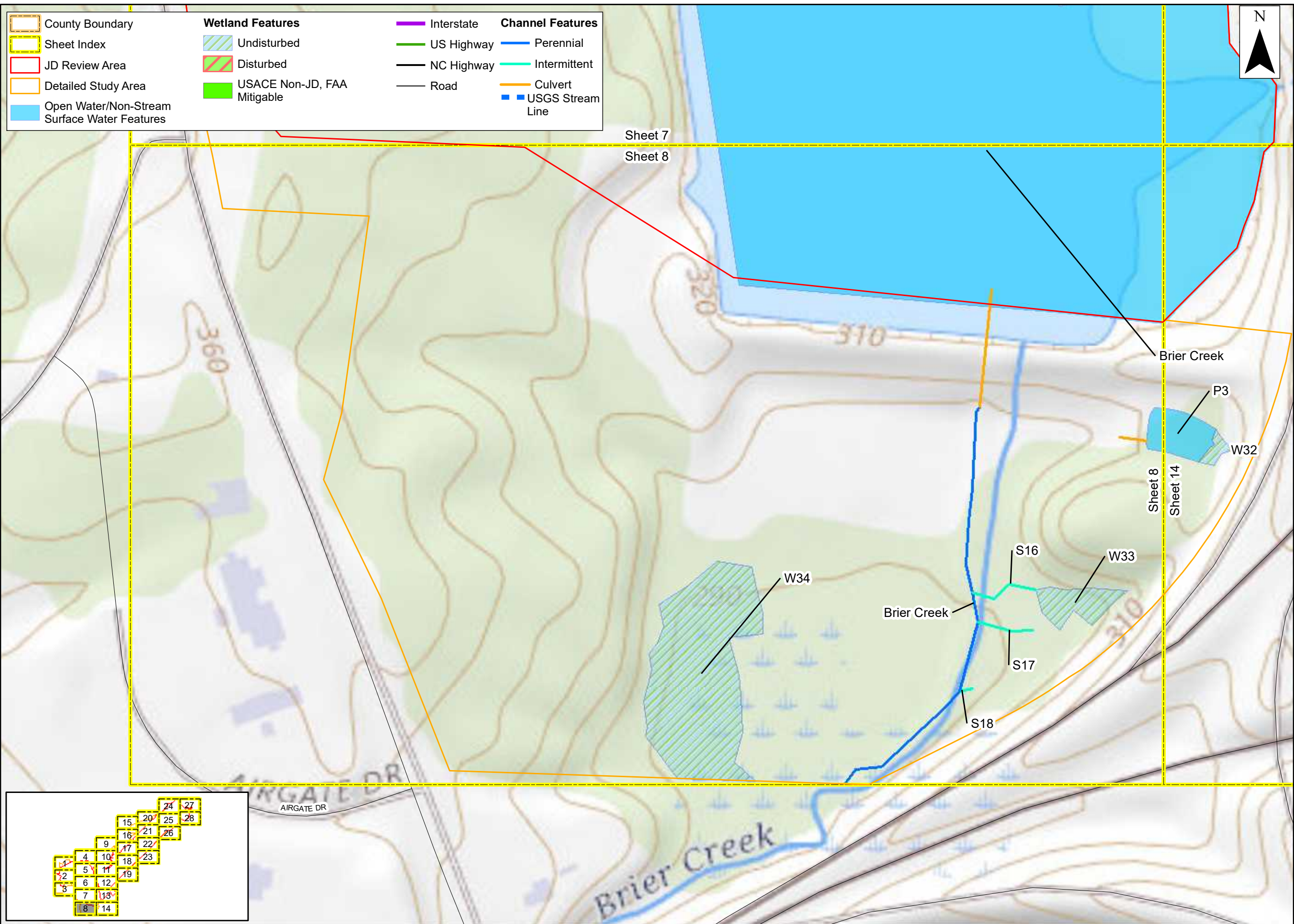
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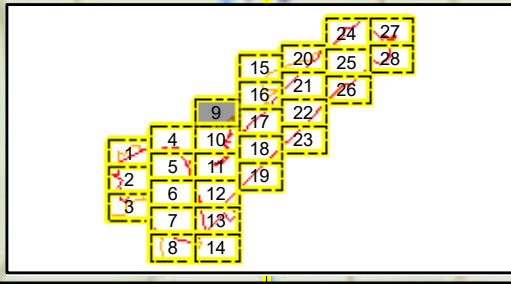
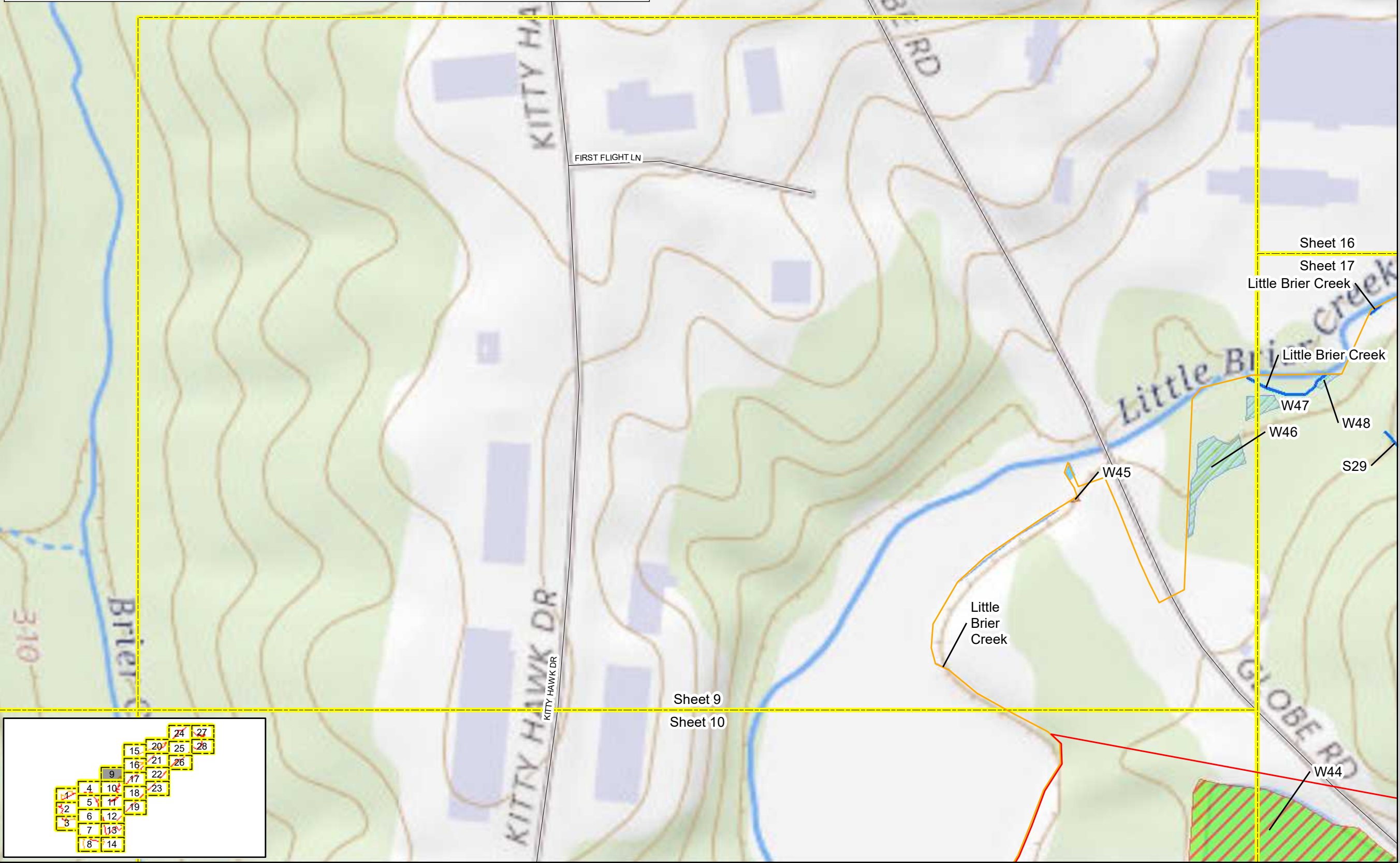
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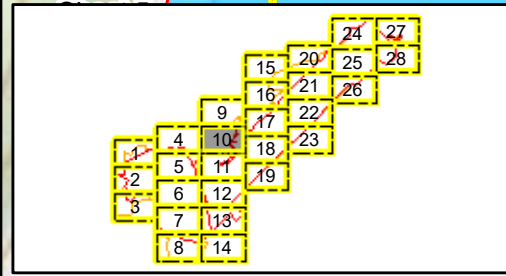
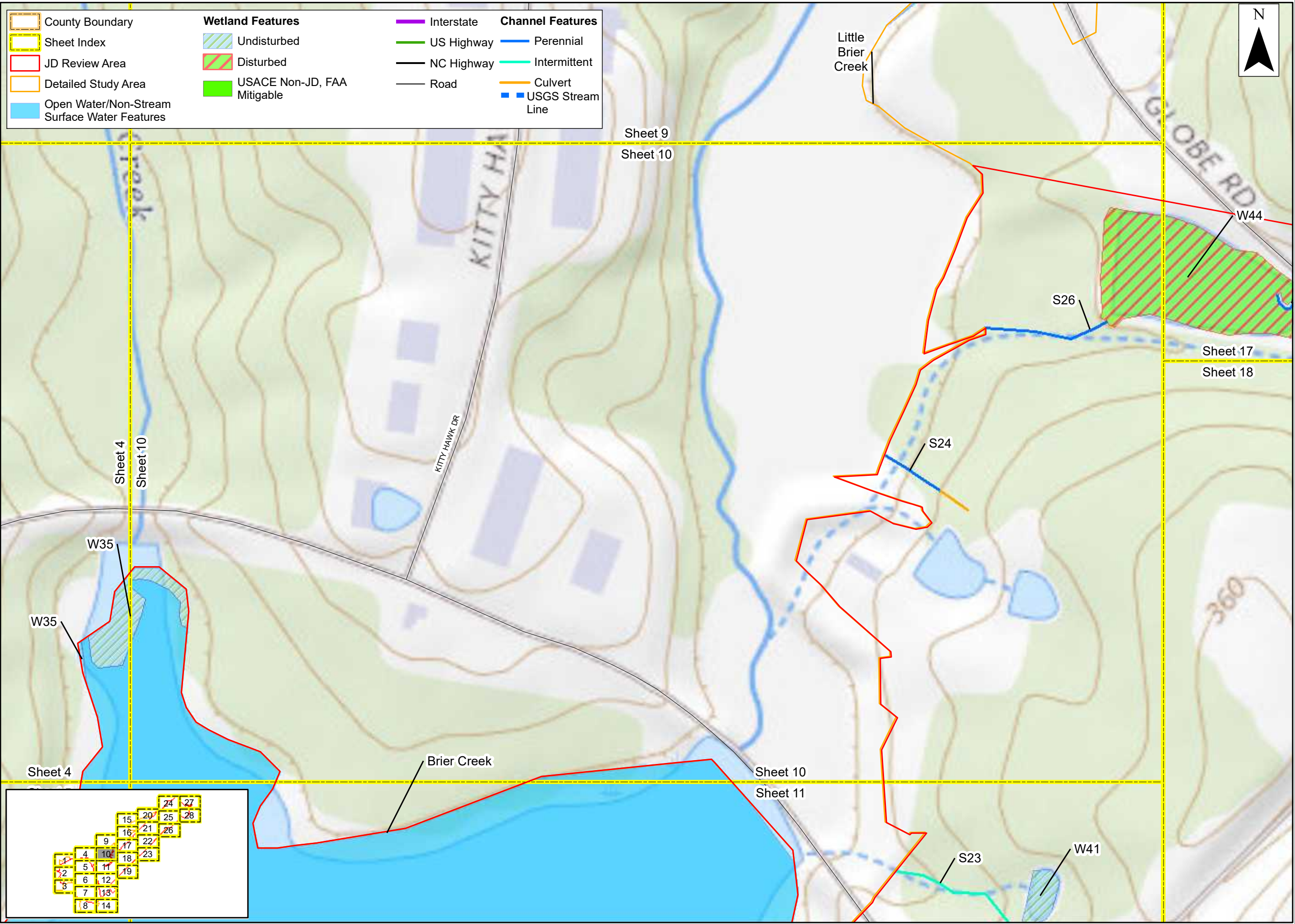
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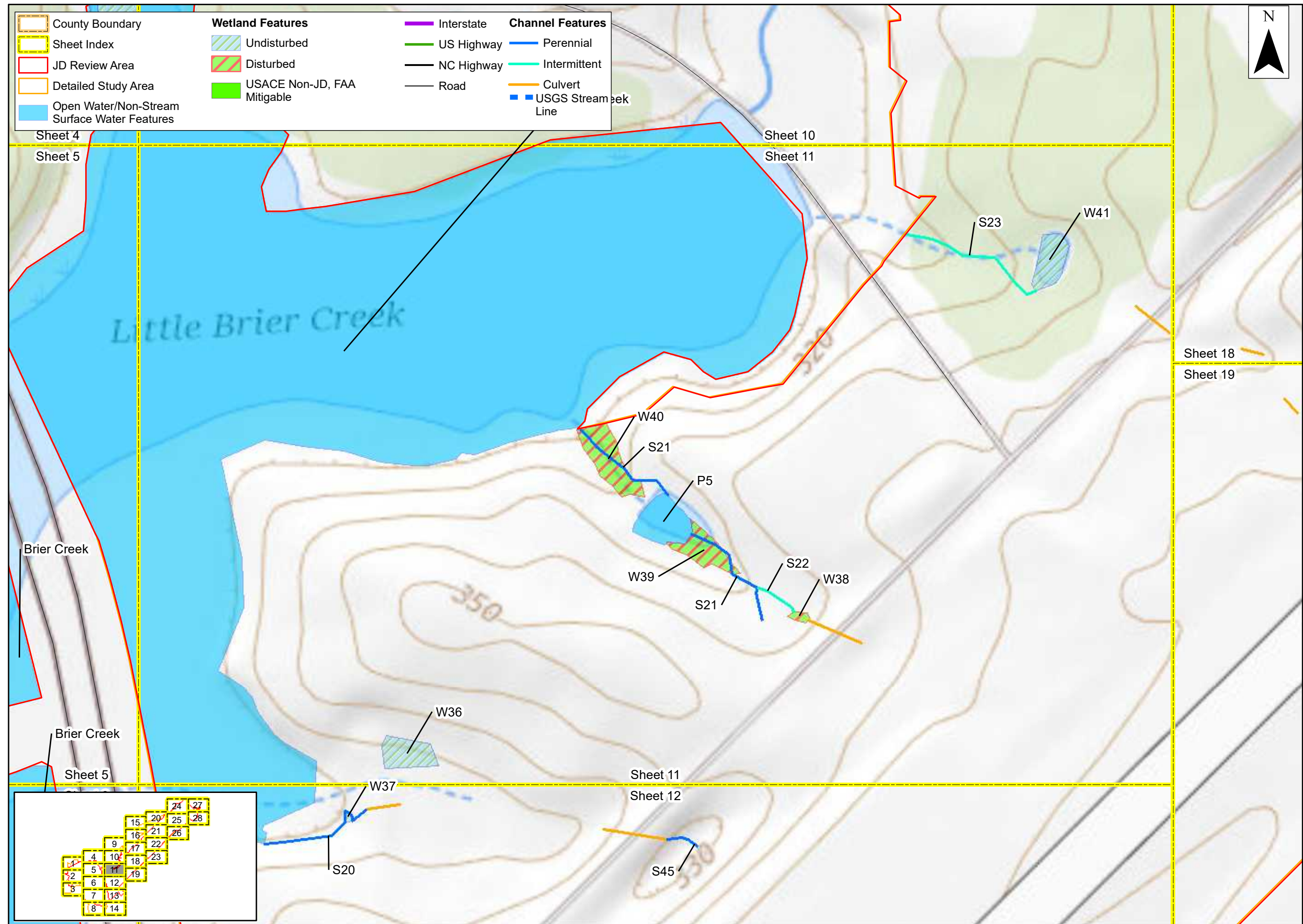
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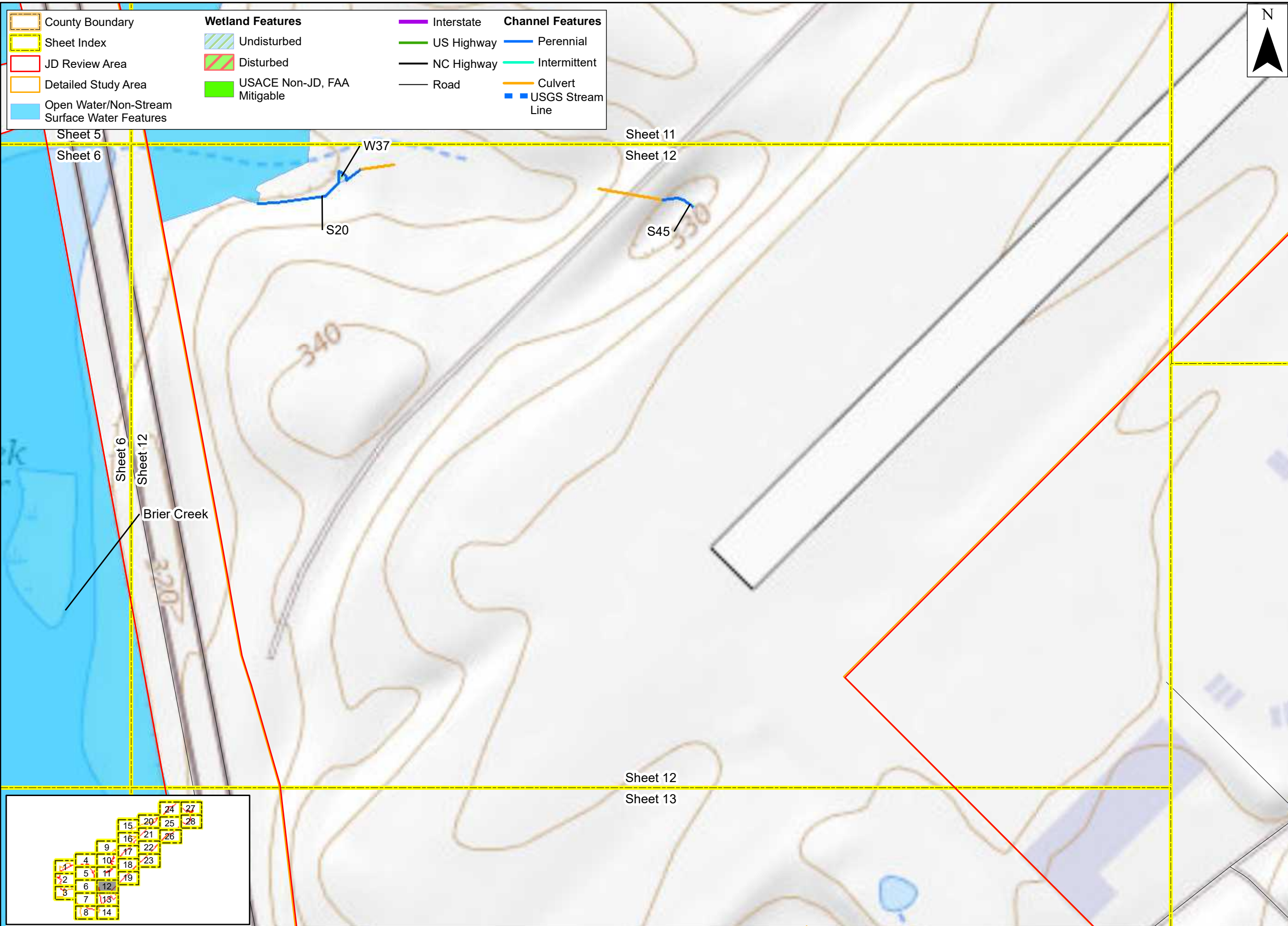
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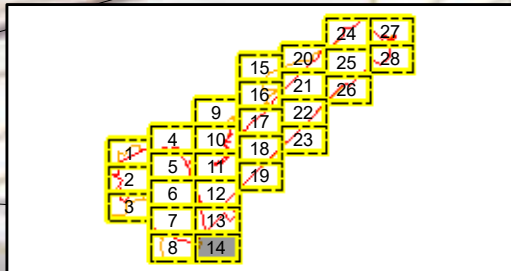
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AVIATION PKWY

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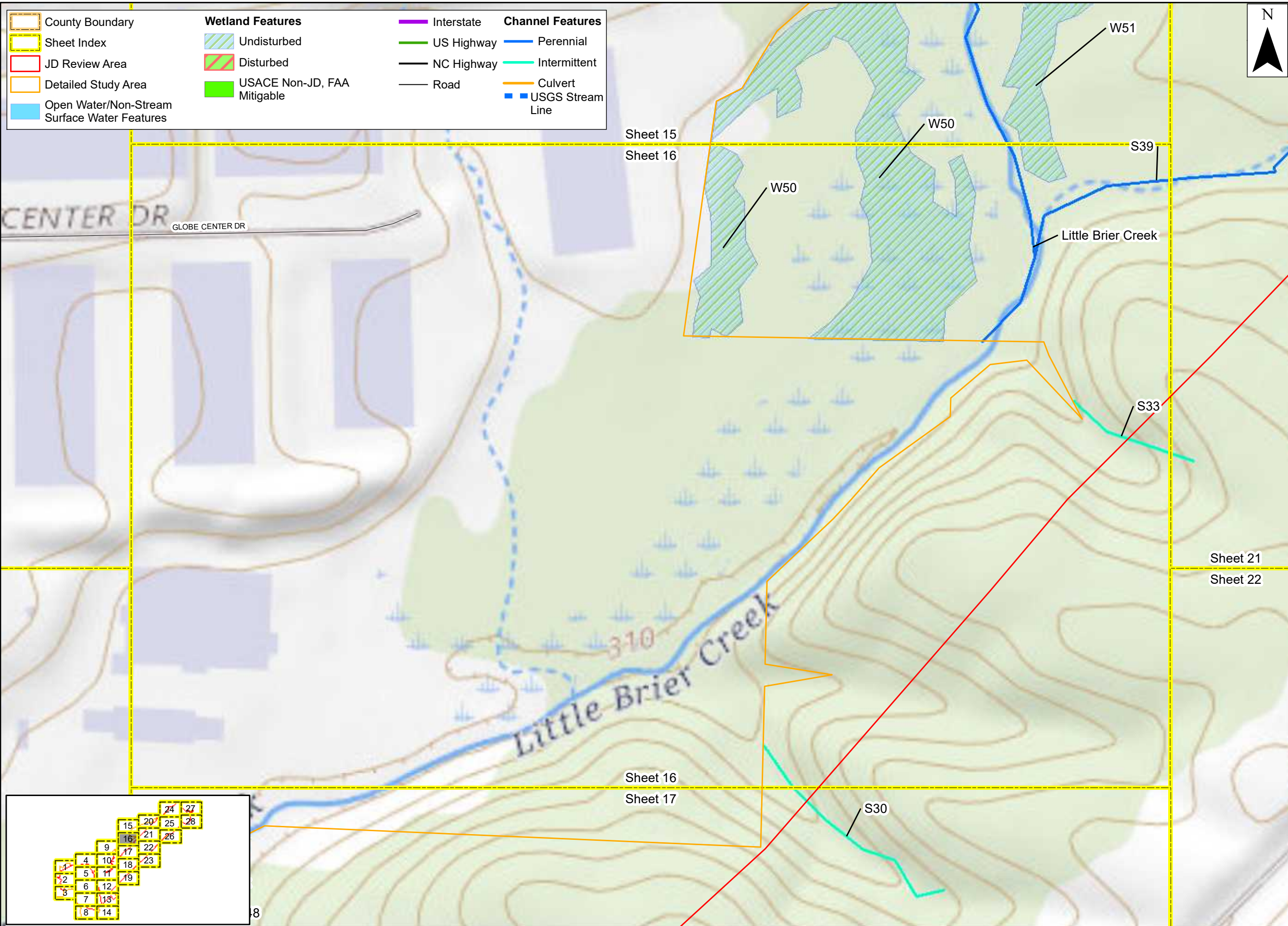
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Little Brier Creek



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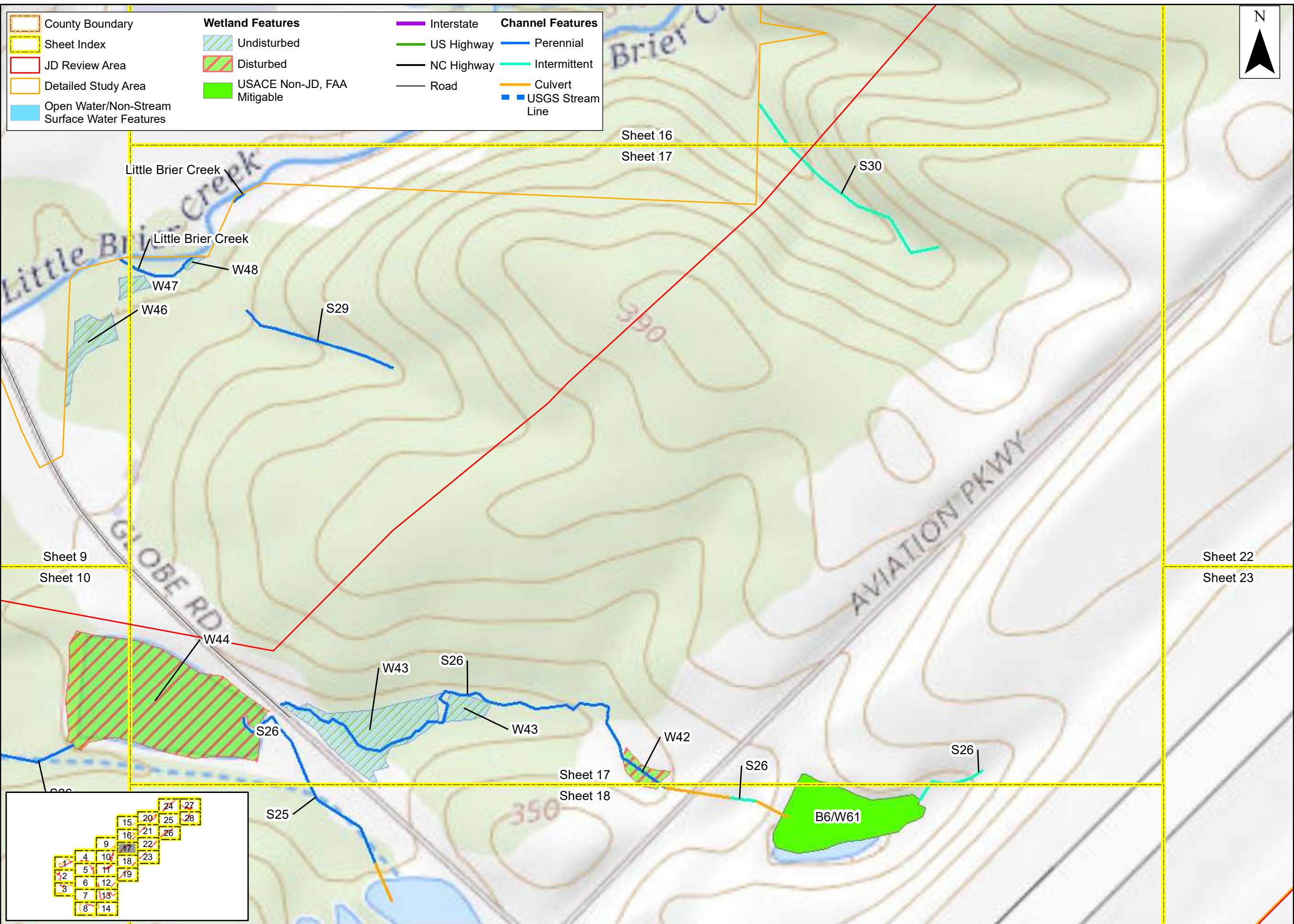
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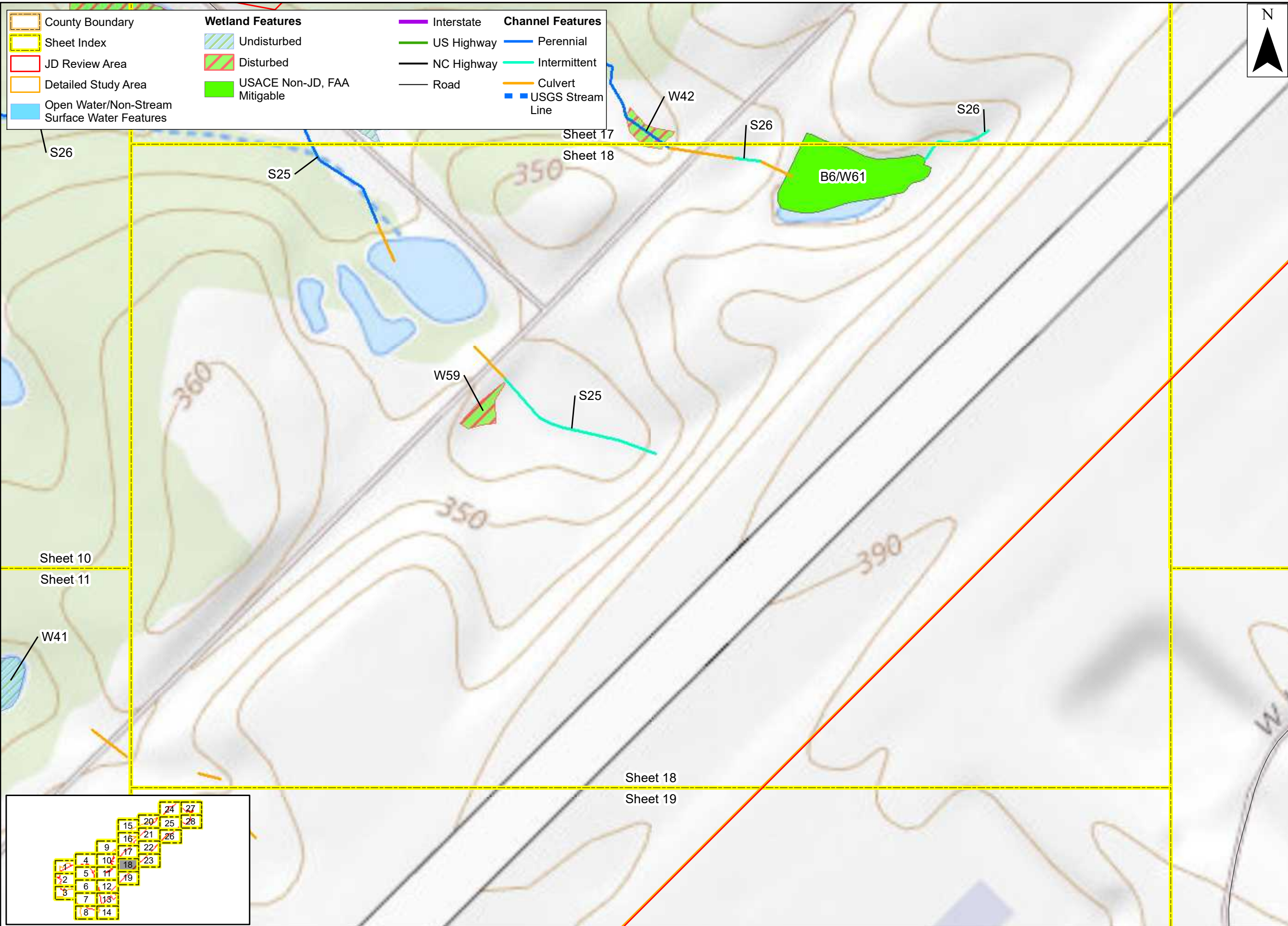
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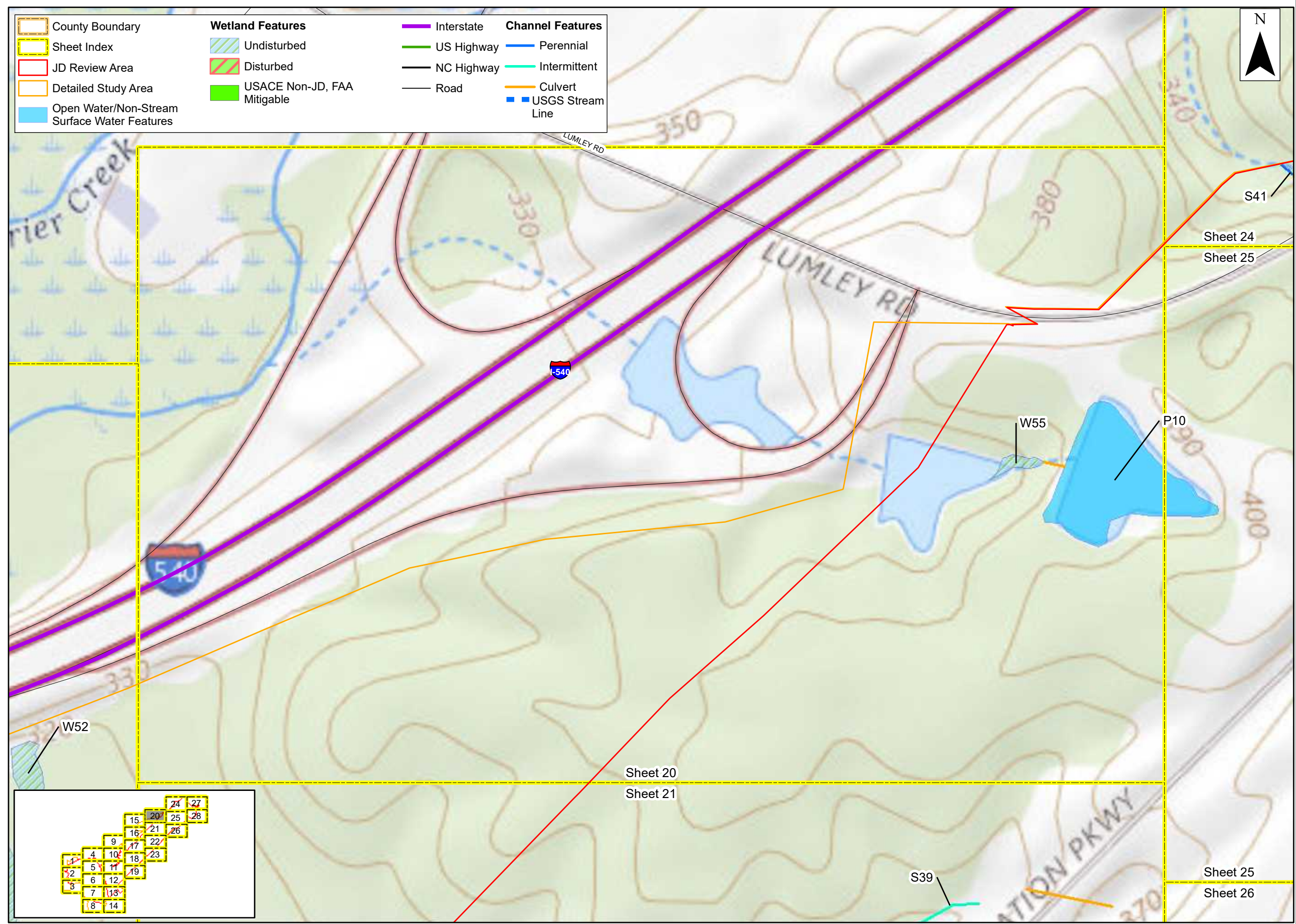
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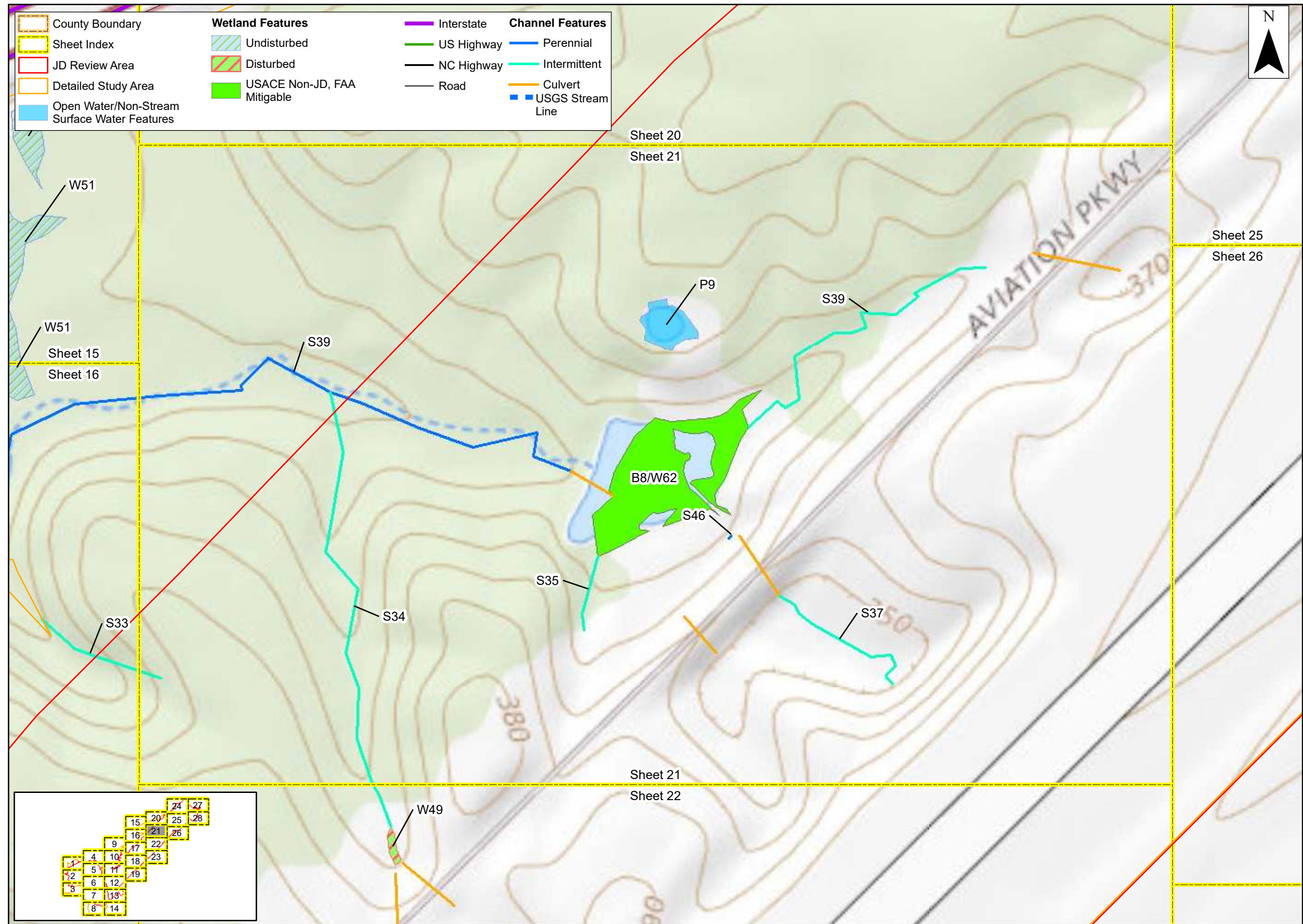
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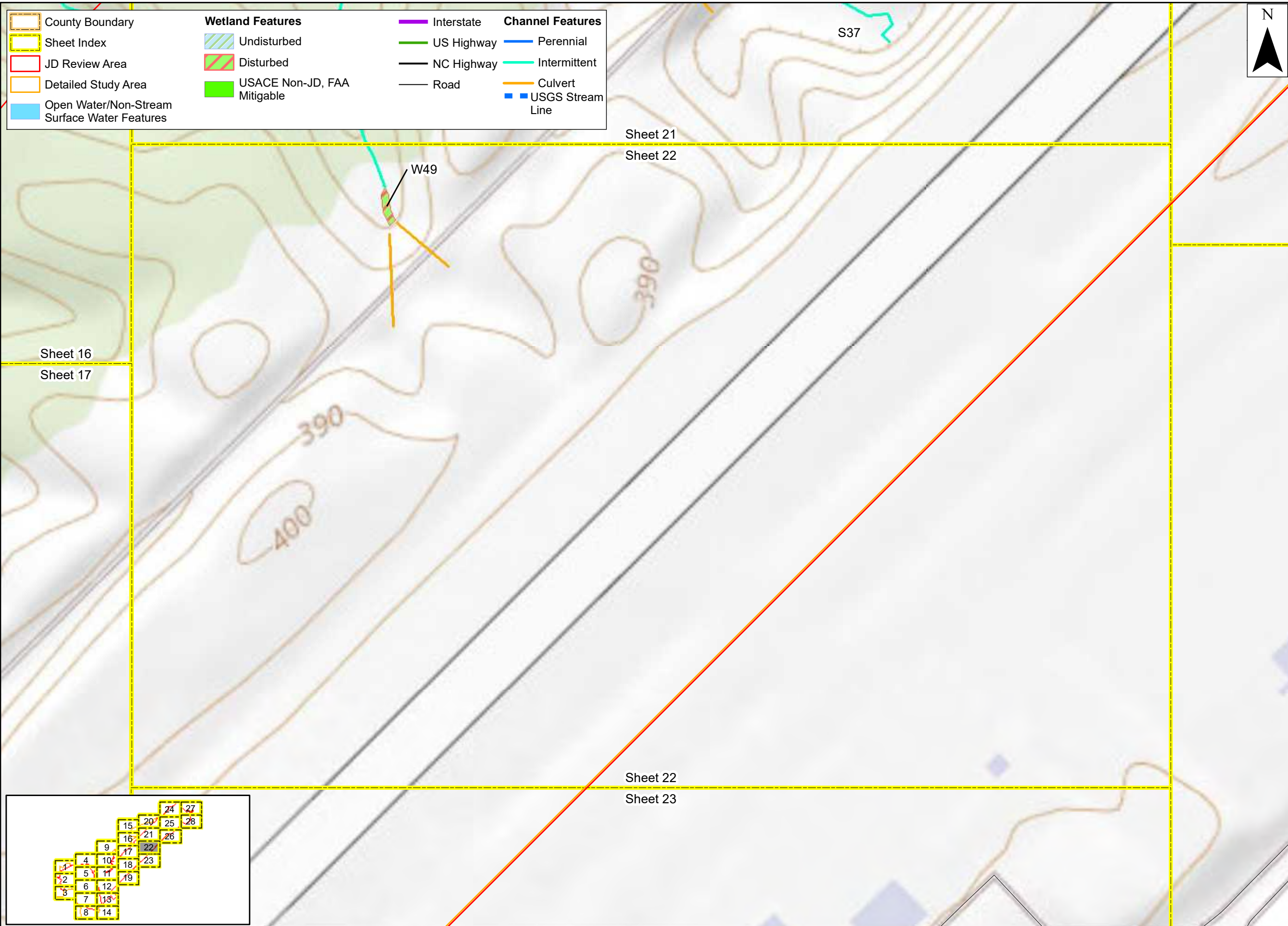
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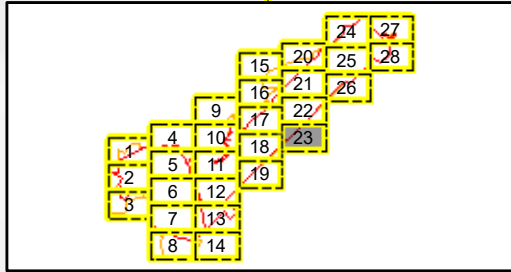


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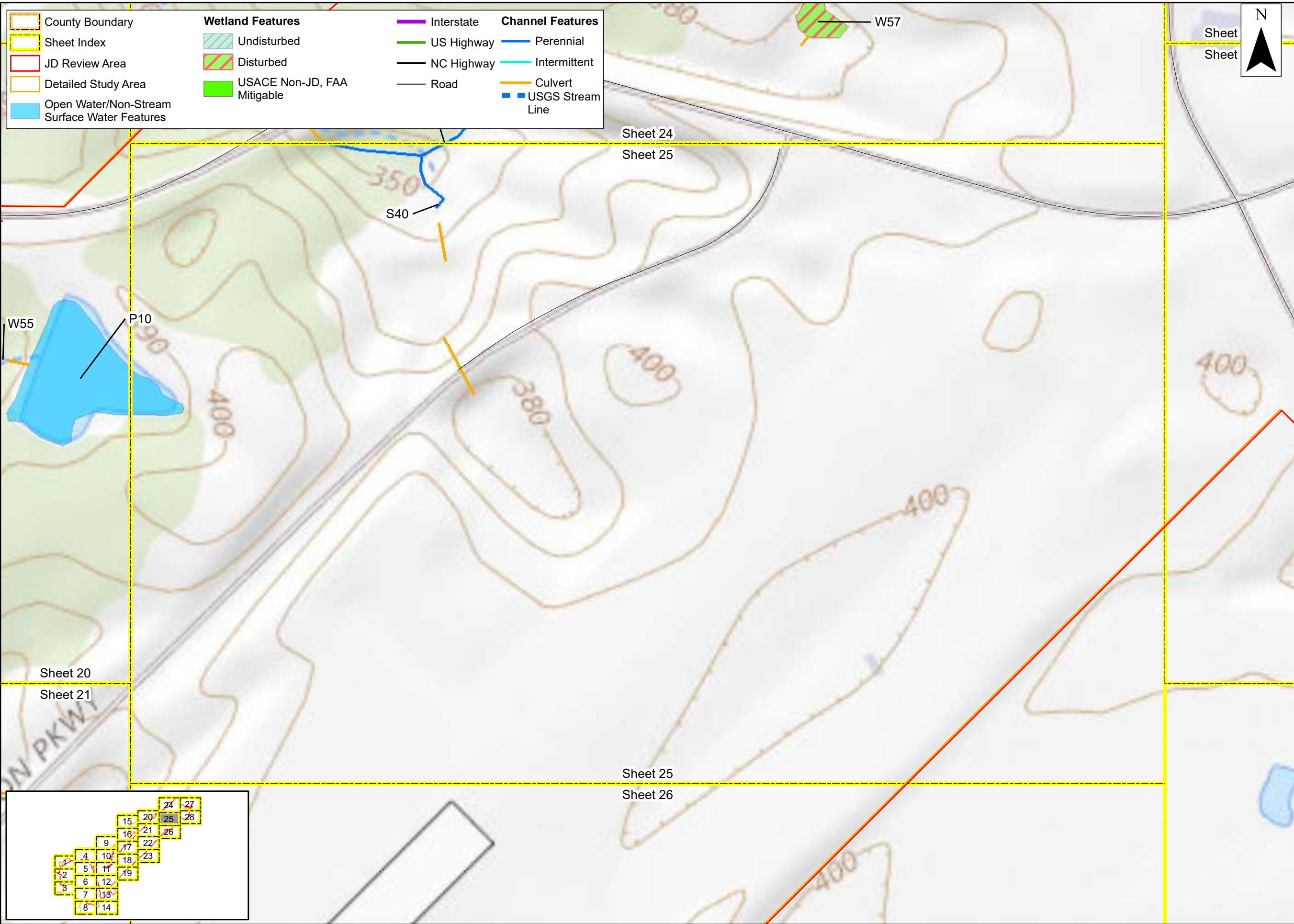
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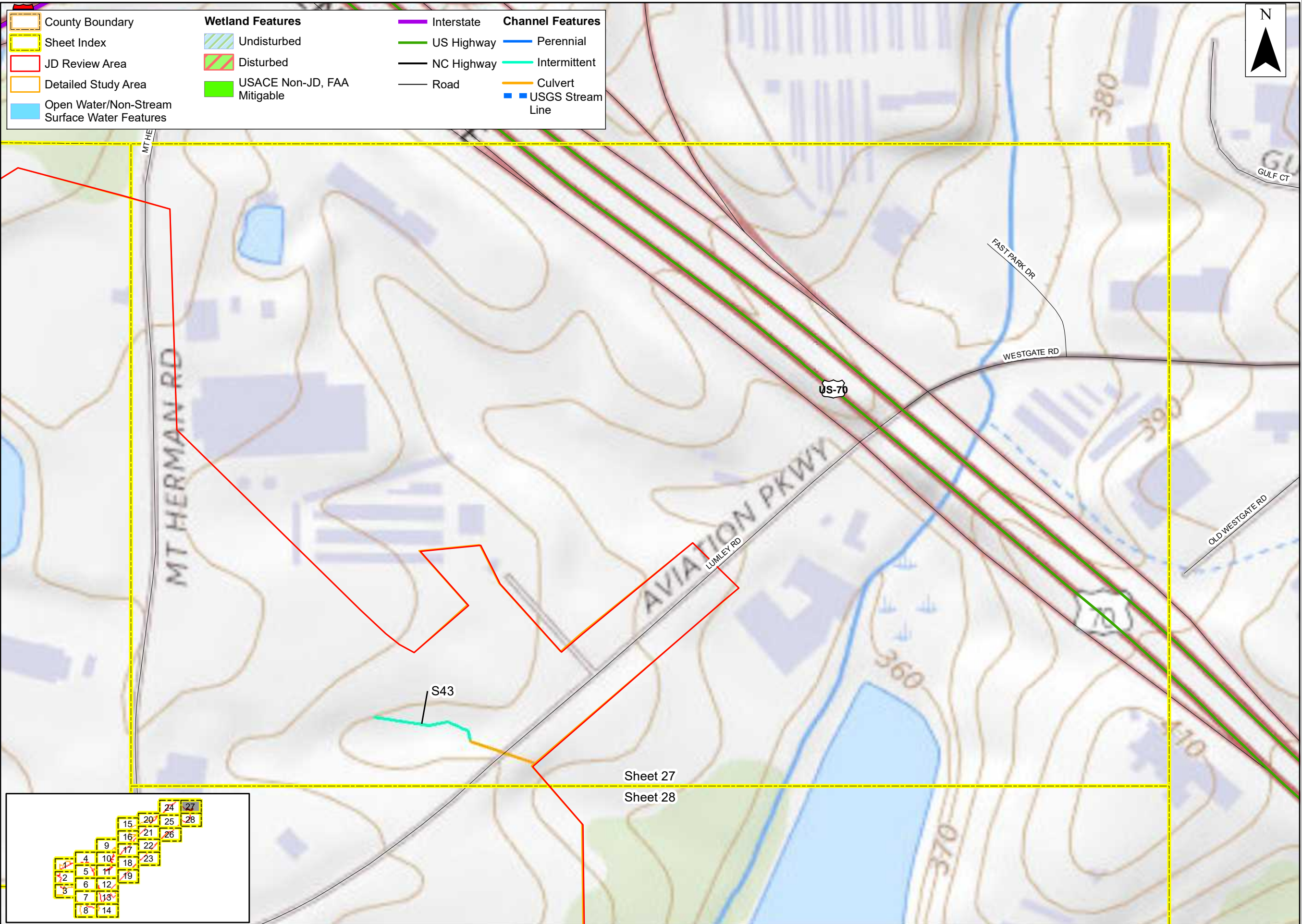
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County Boundary	Wetland Features	Interstate	Channel Features
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JD Review Area	Disturbed	NC Highway	Intermittent
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Open Water/Non-Stream Surface Water Features			USGS Stream Line



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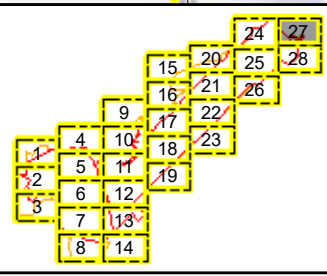
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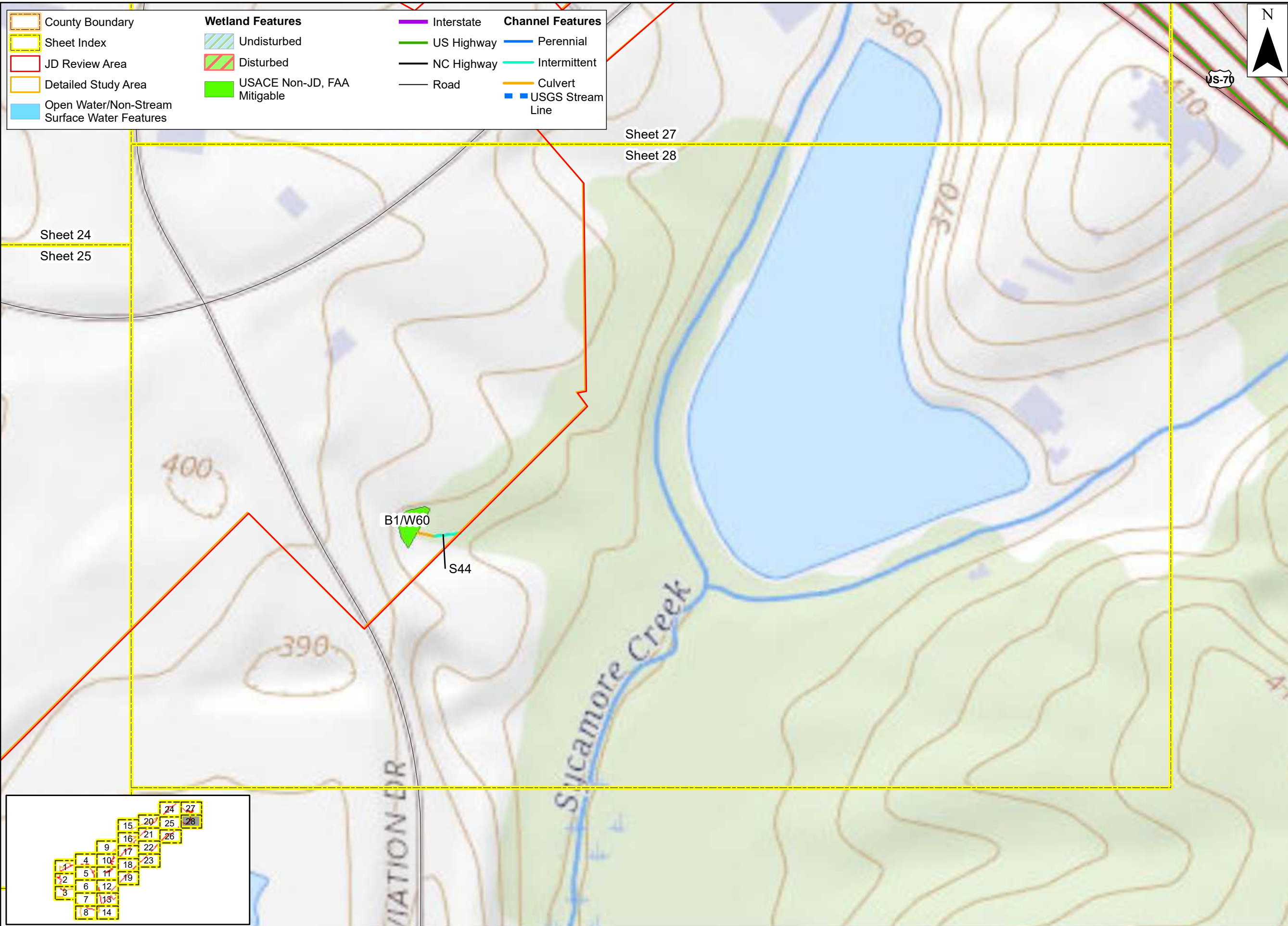
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- Channel Features**
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NC Highway

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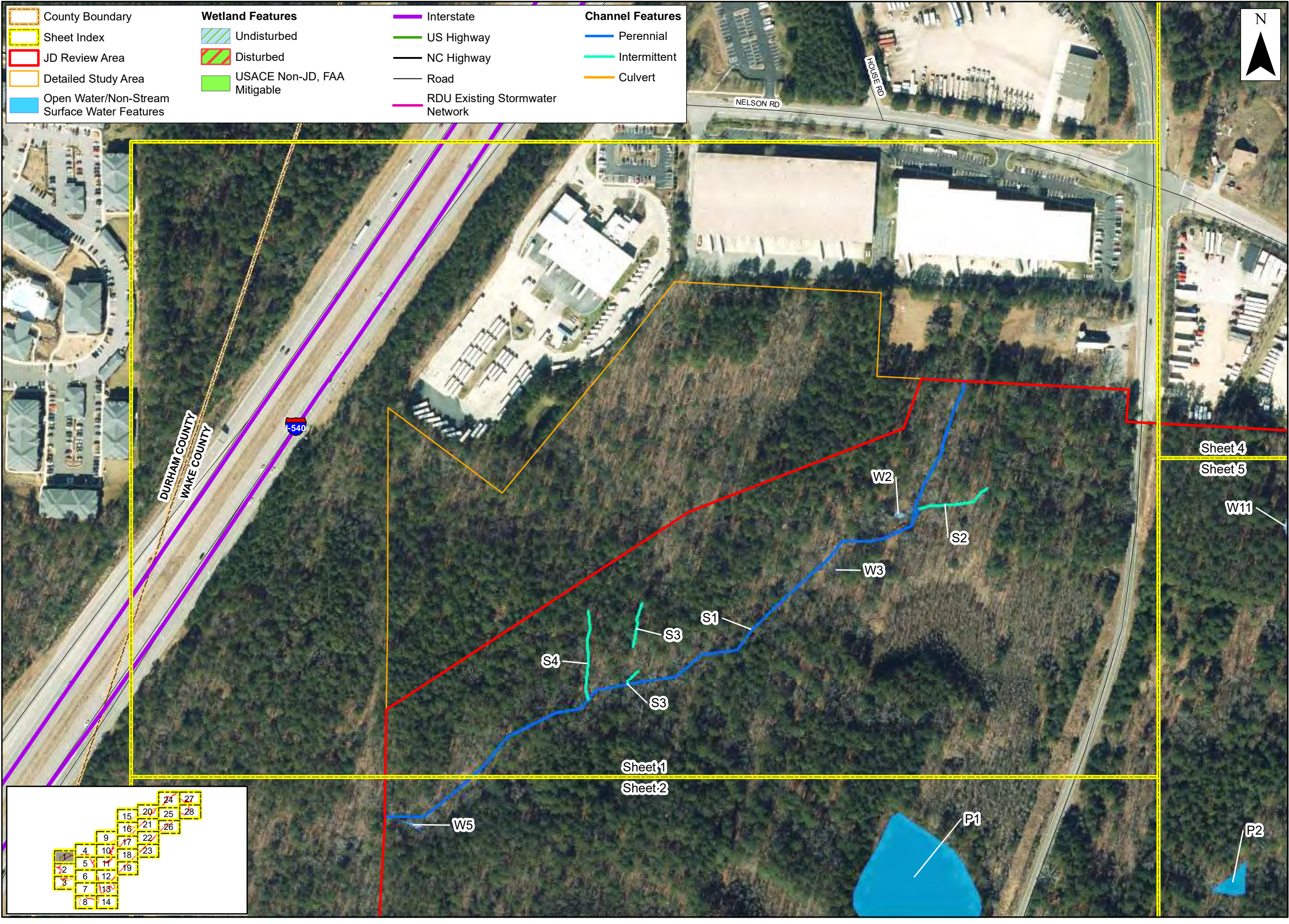
RDU Existing Stormwater Network

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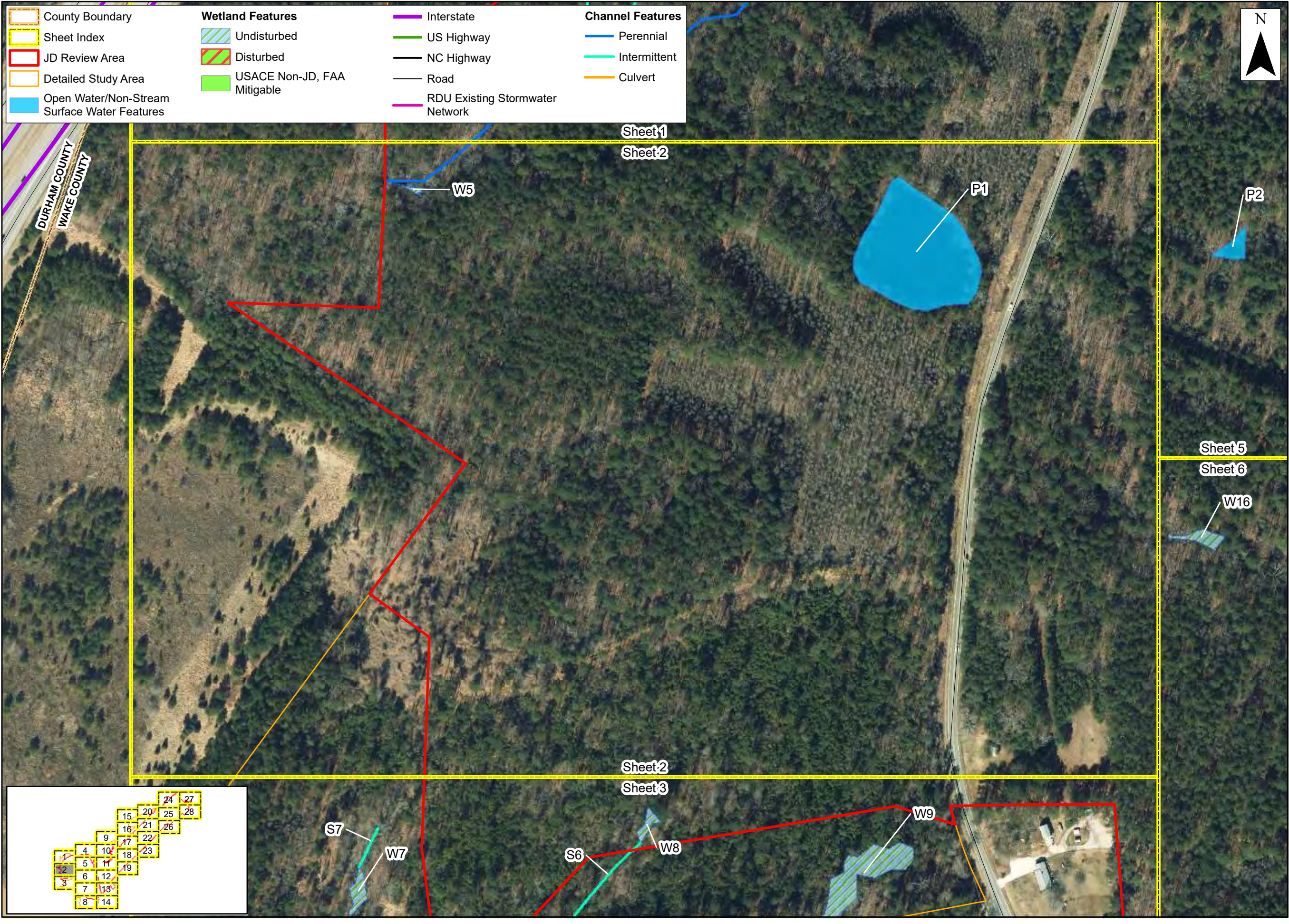
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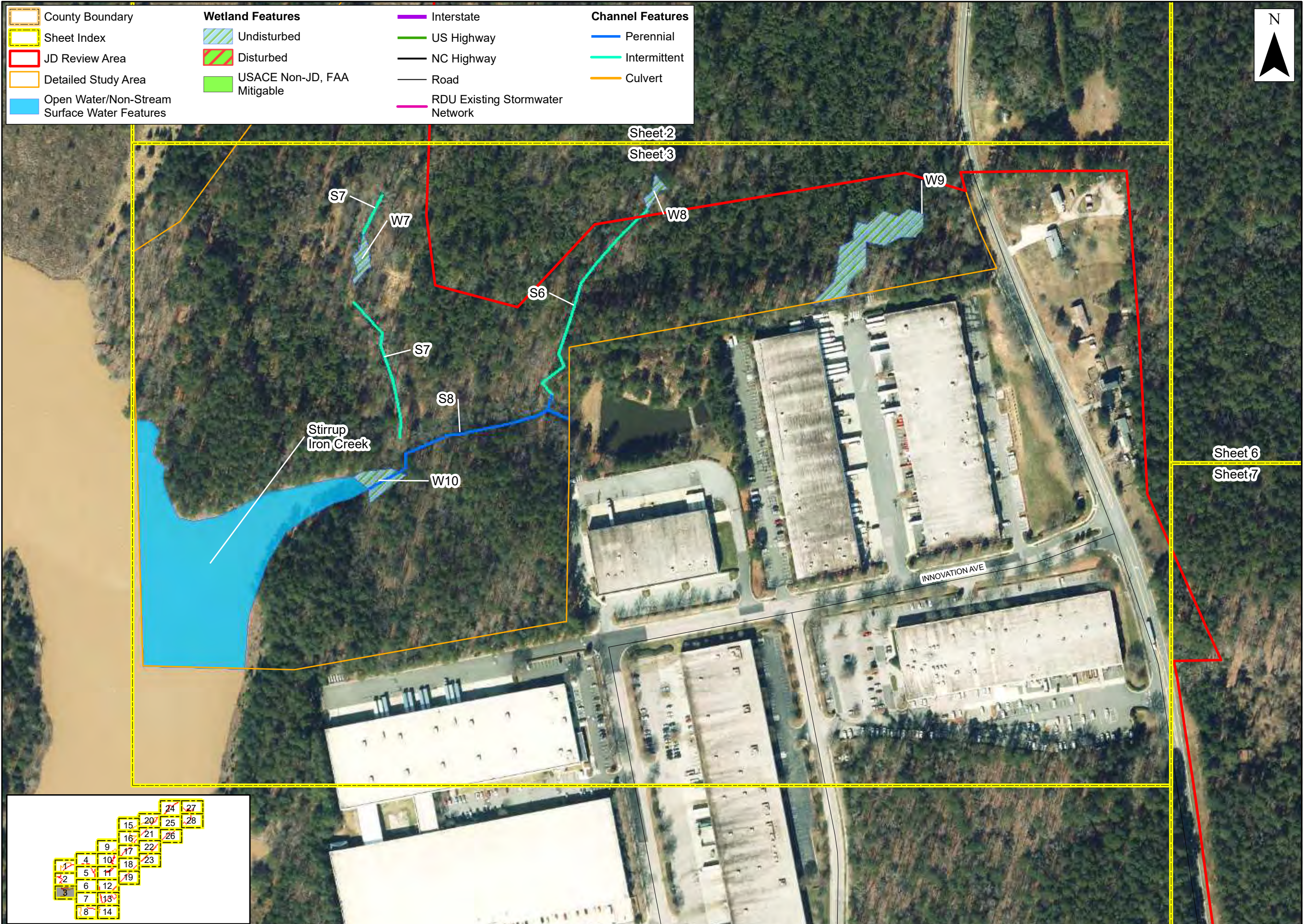
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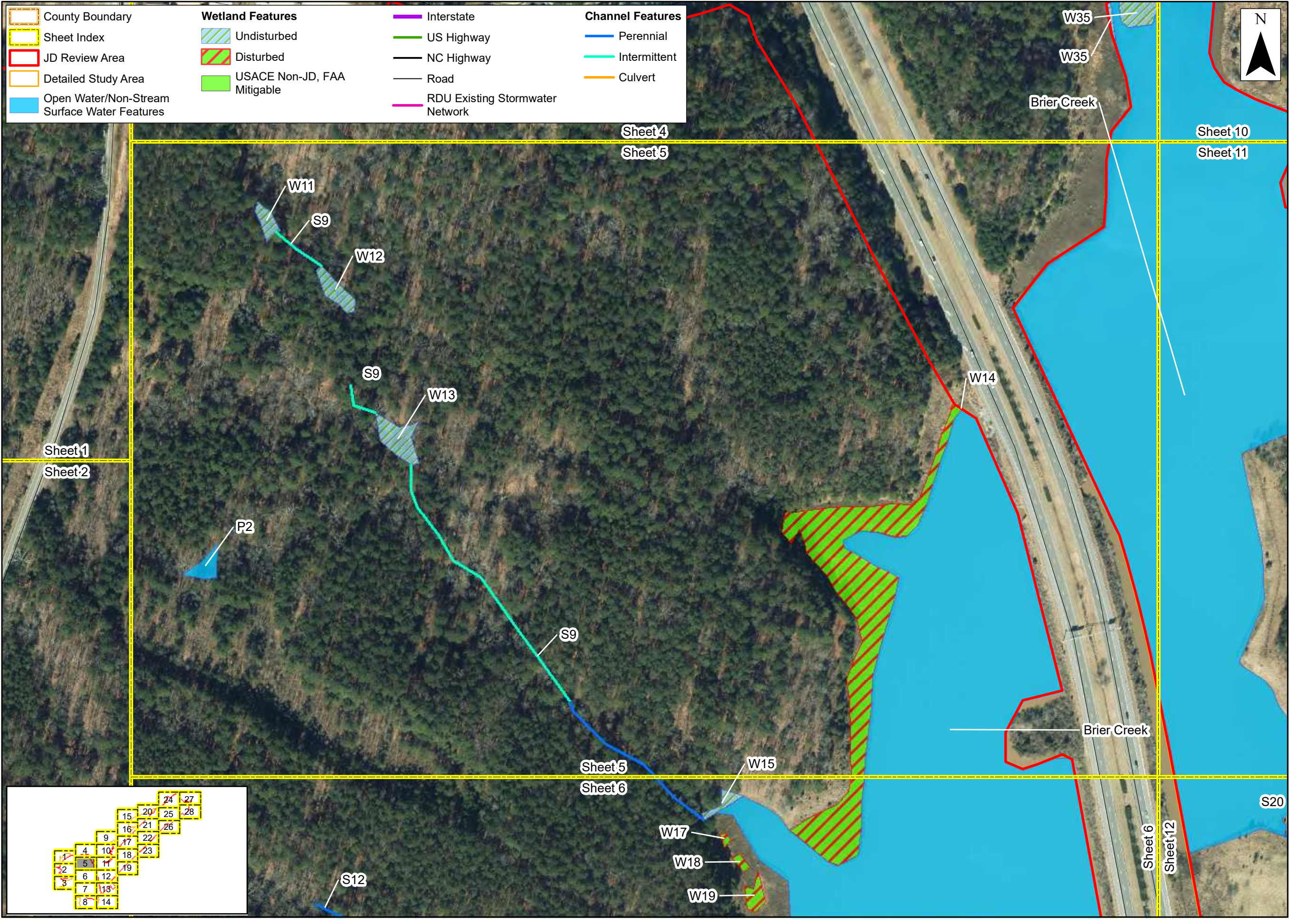
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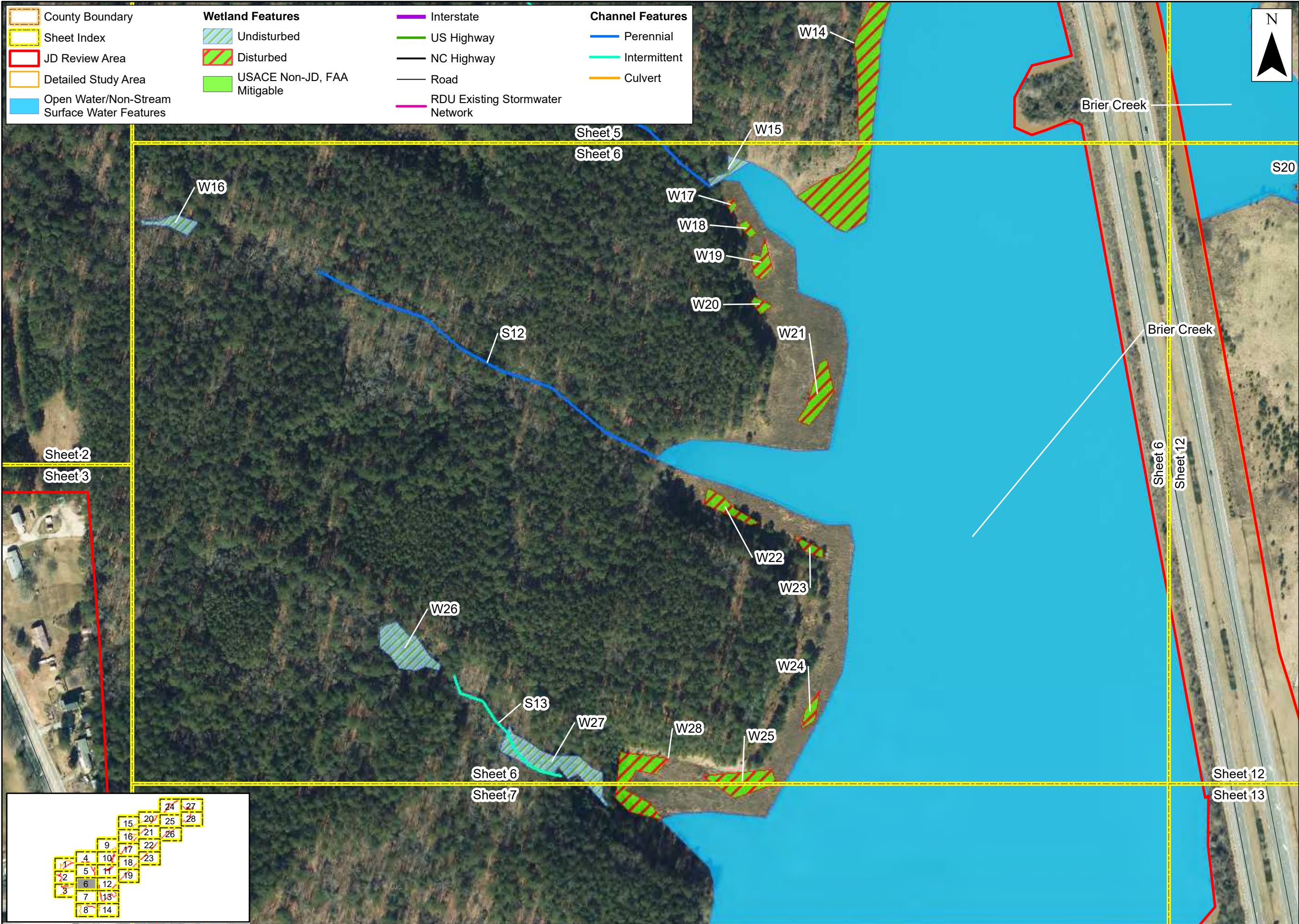
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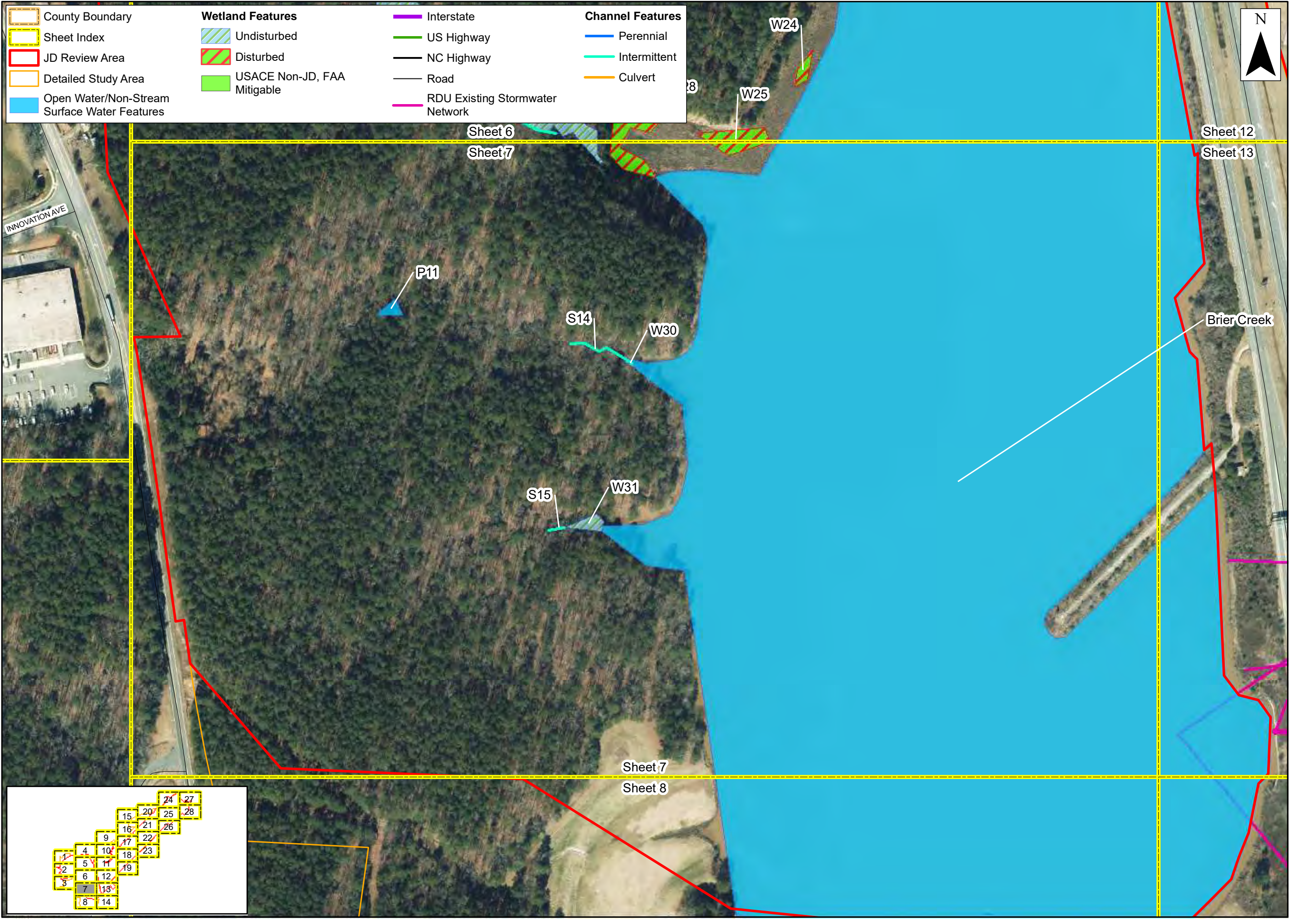
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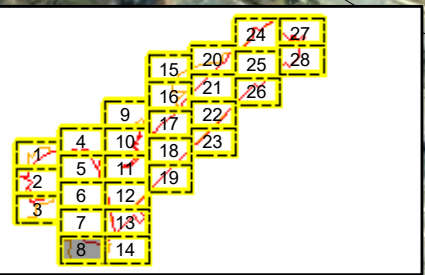
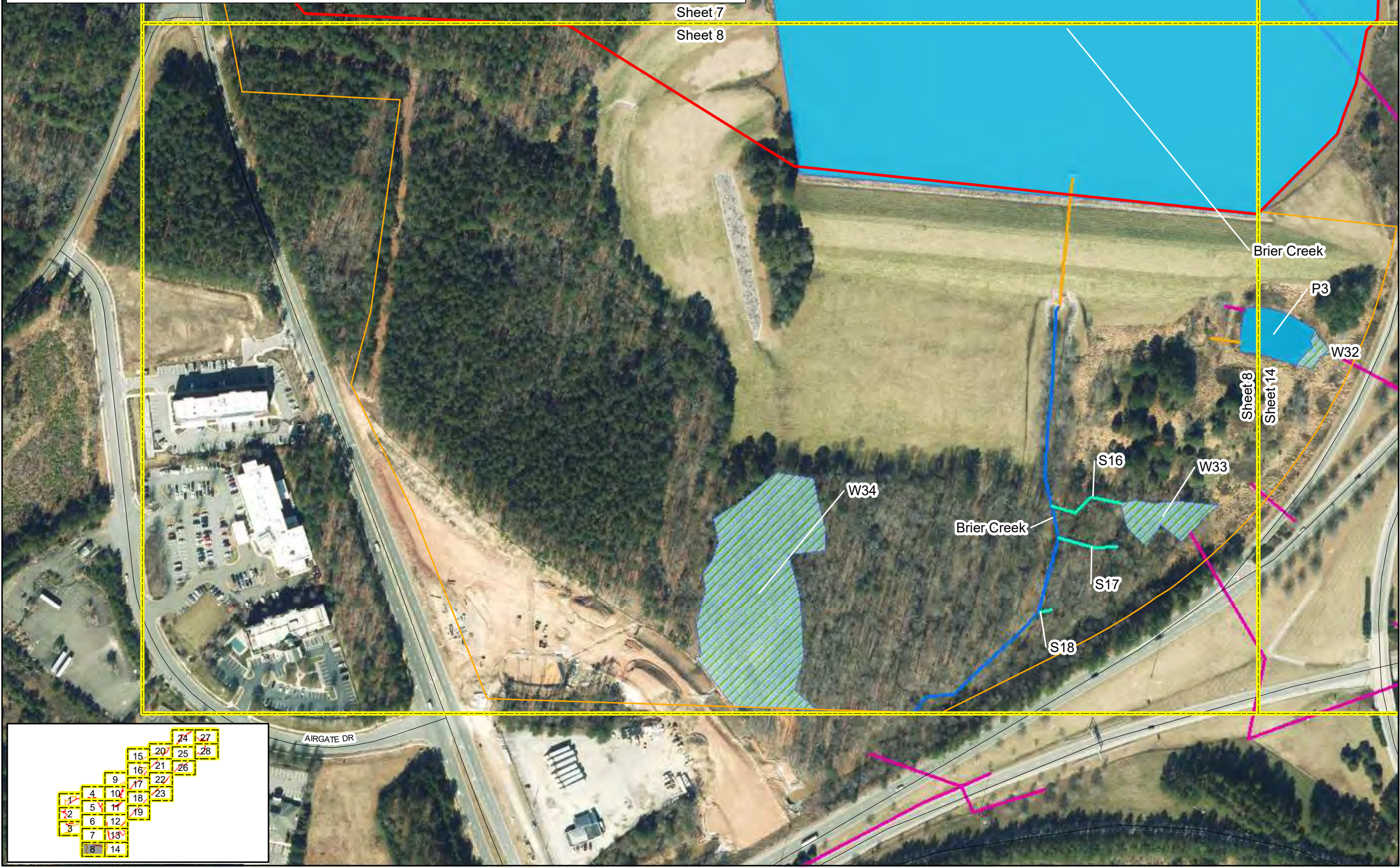
Wetland Features

 Undisturbed
 Disturbed
 USACE Non-JD, FAA Mitigable

Interstate
 US Highway
 NC Highway
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 RDU Existing Stormwater Network

Channel Features

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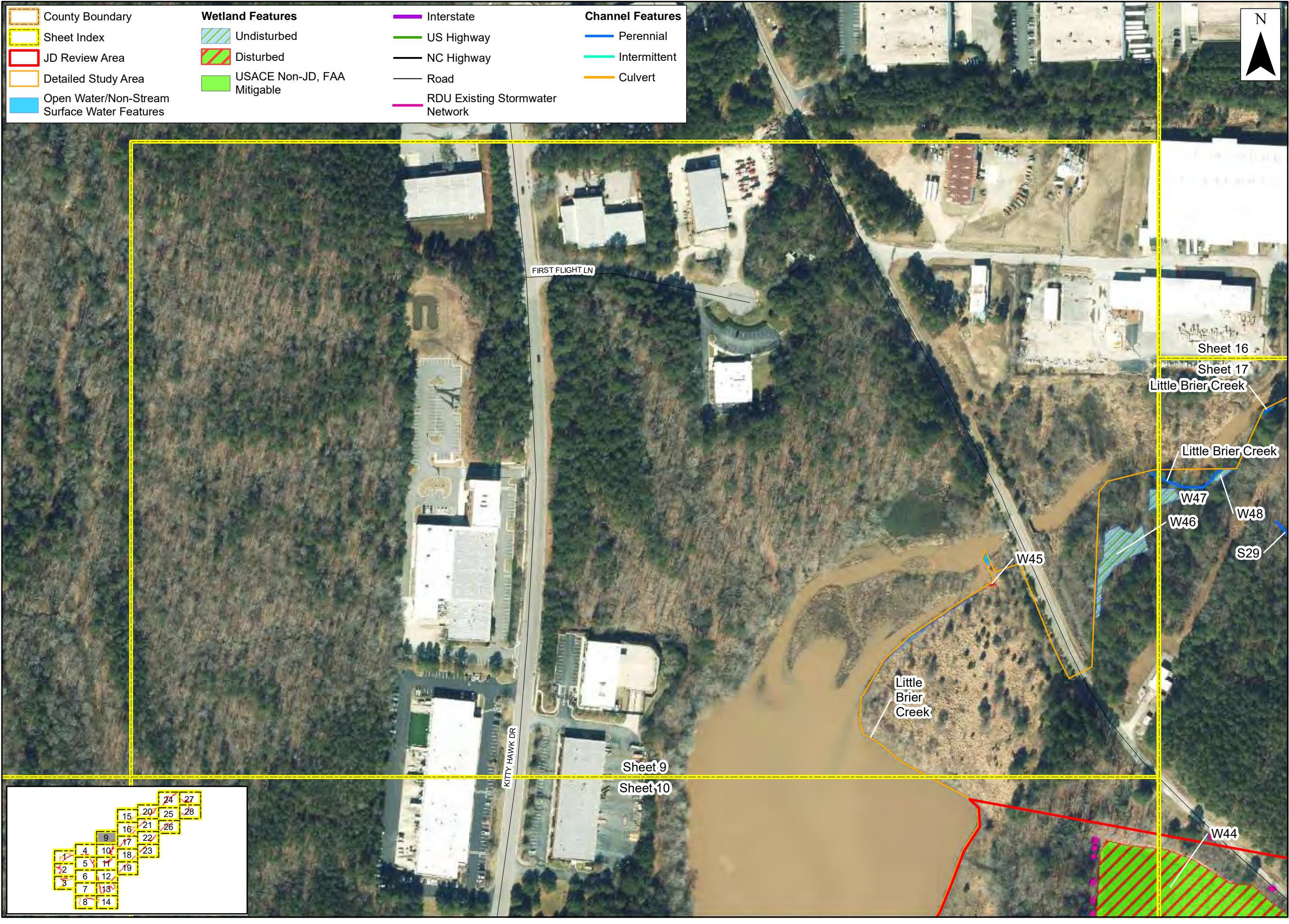
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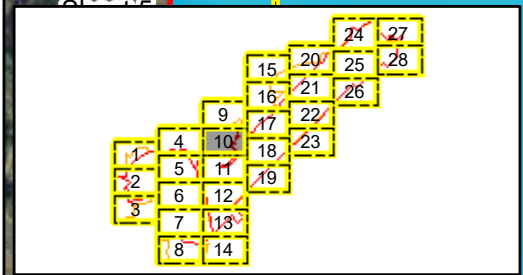
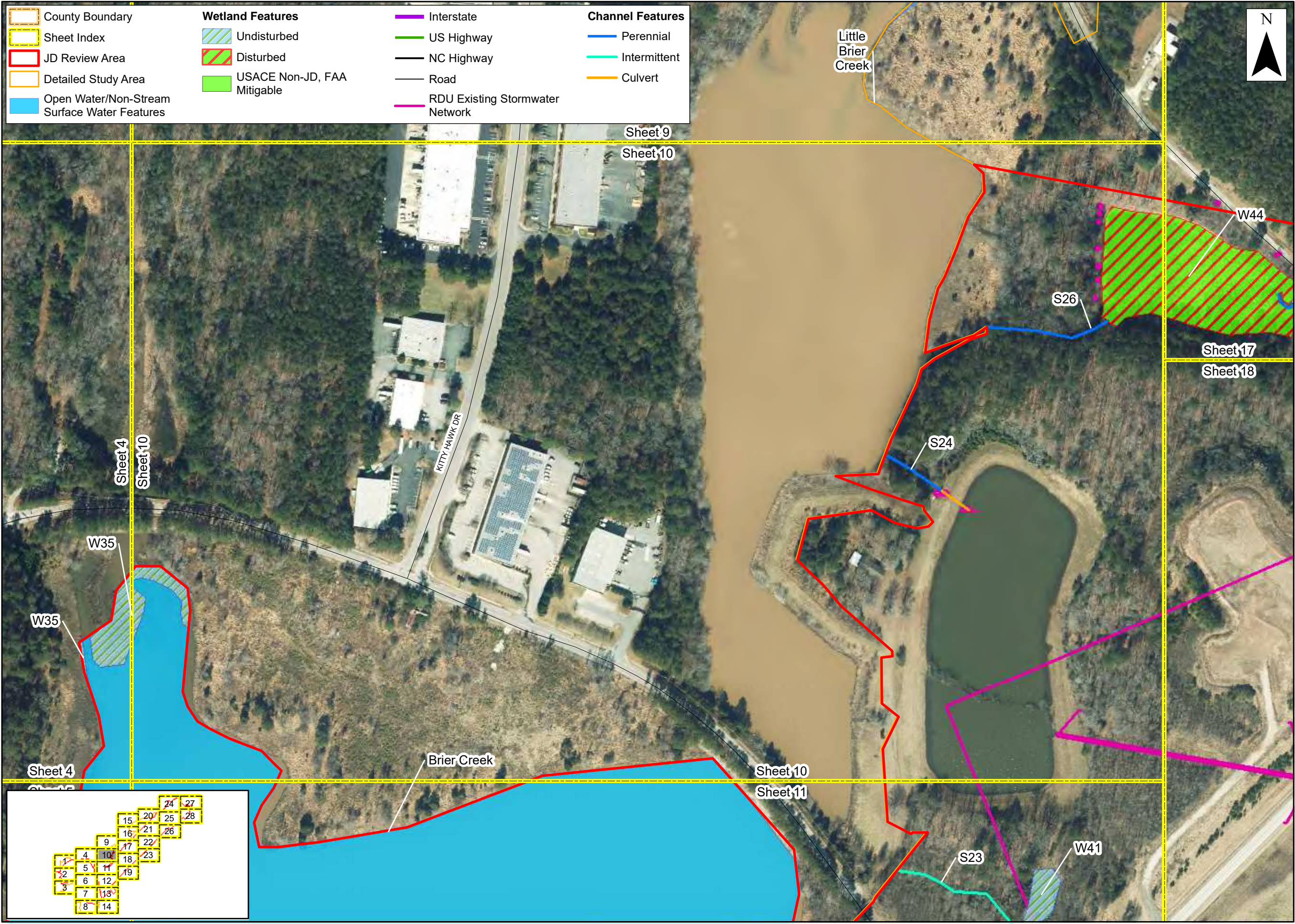
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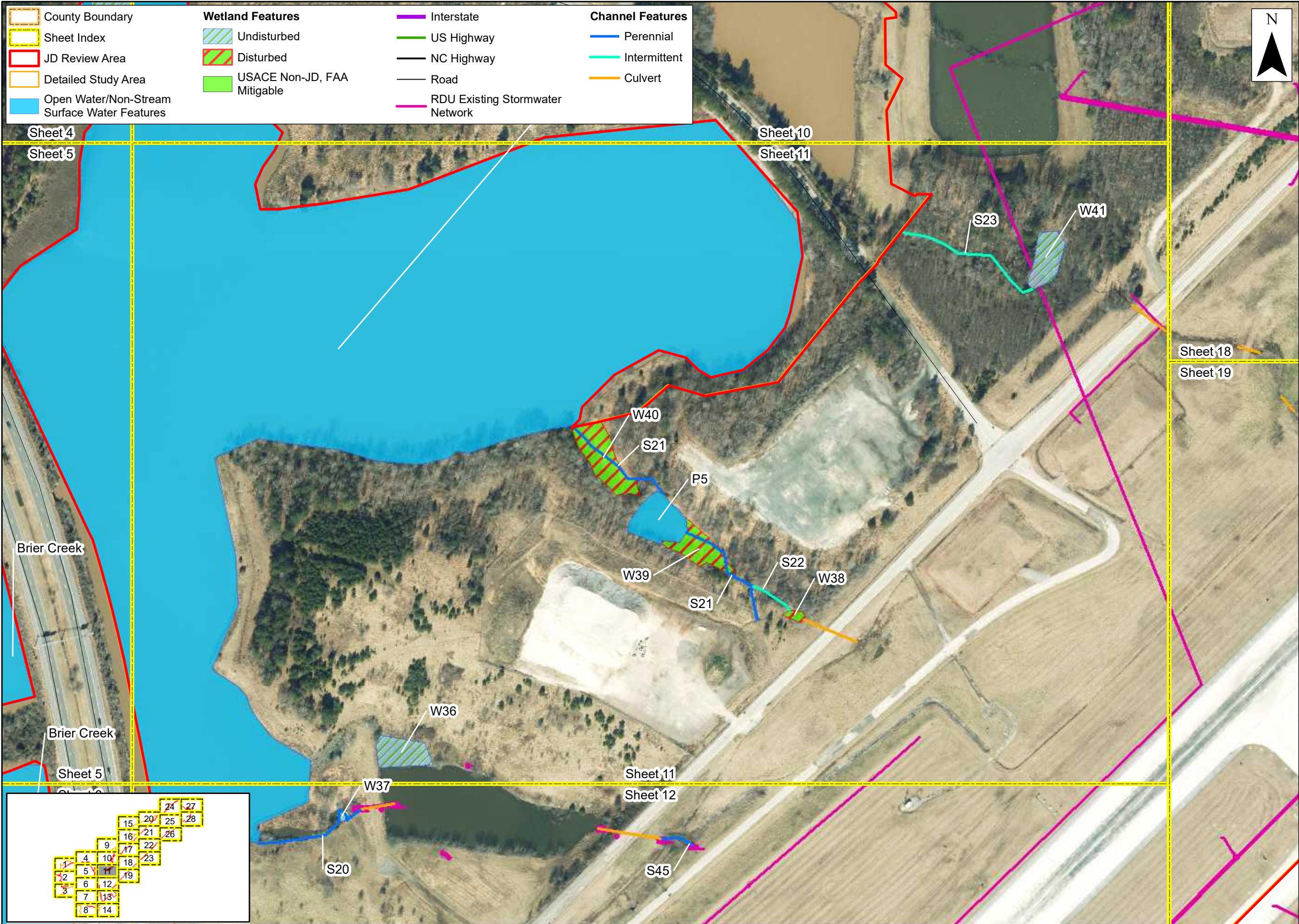
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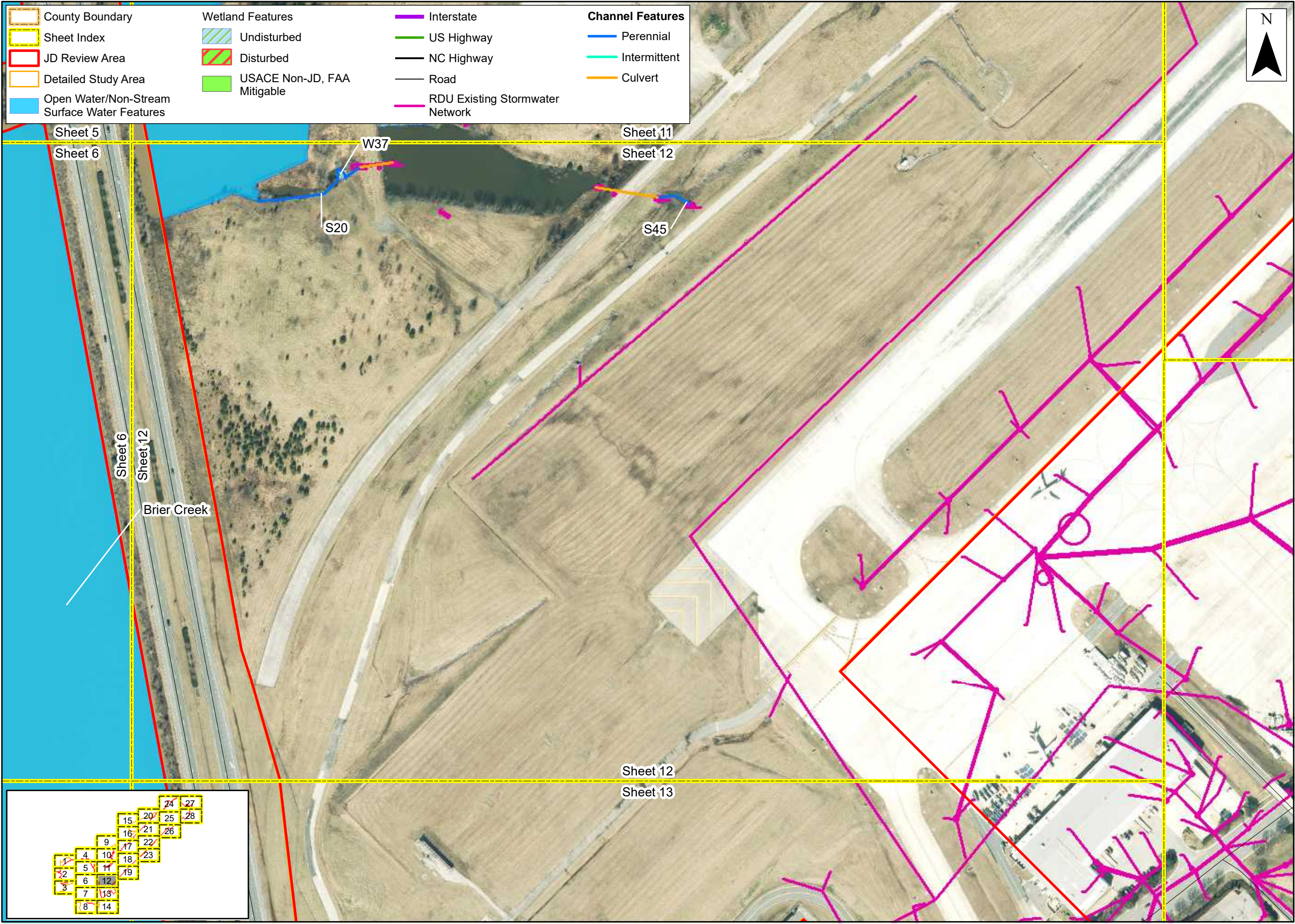
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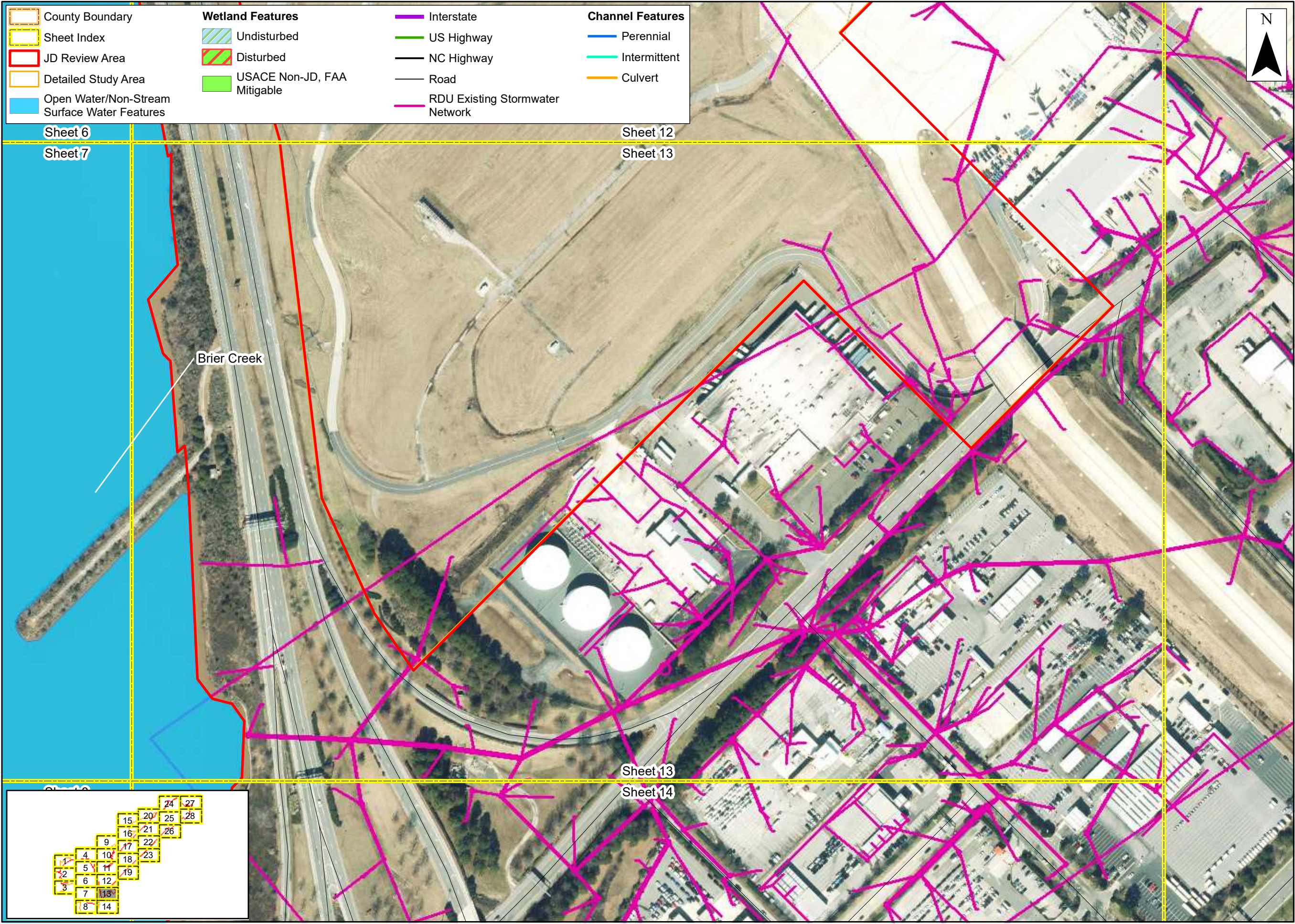
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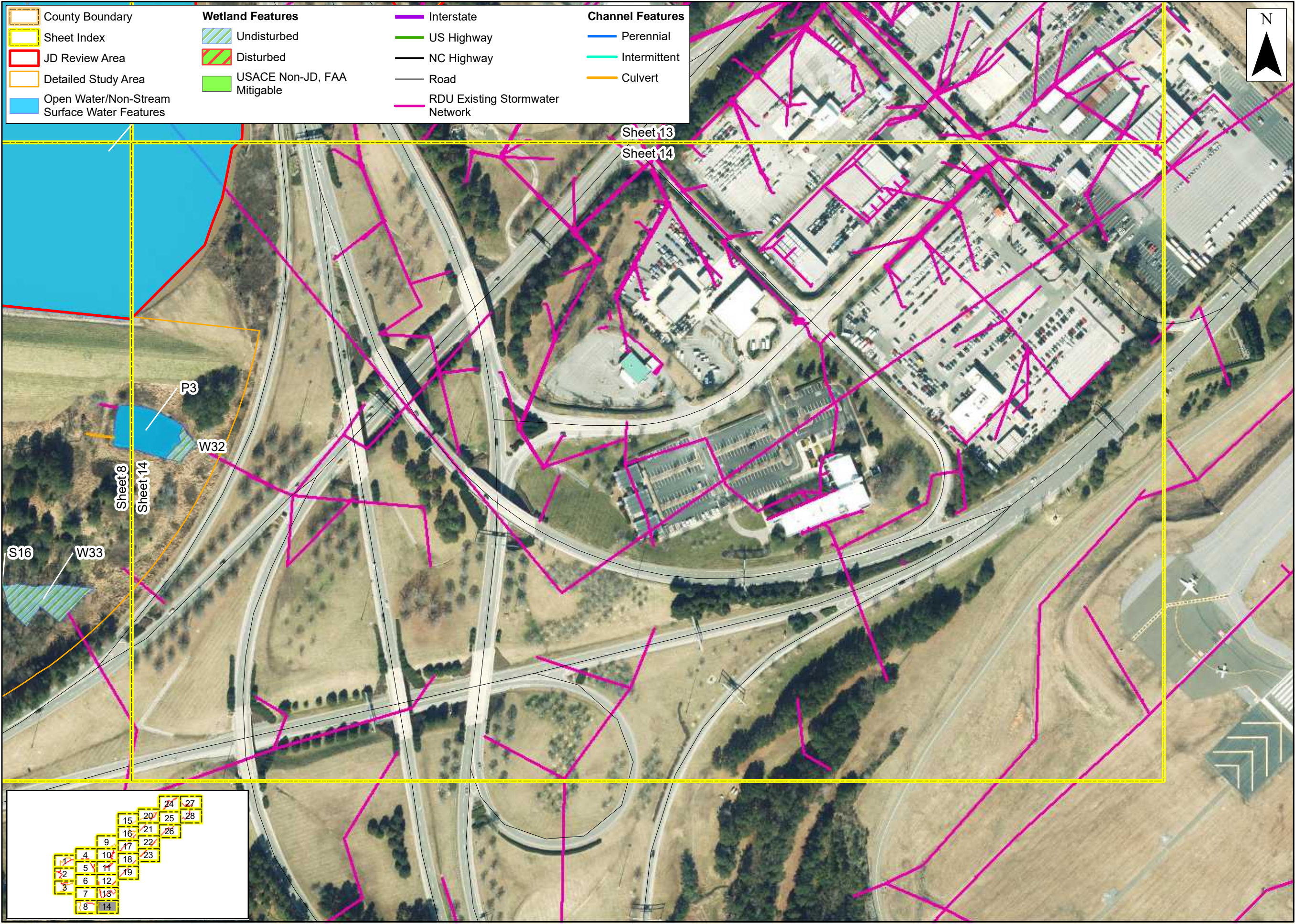
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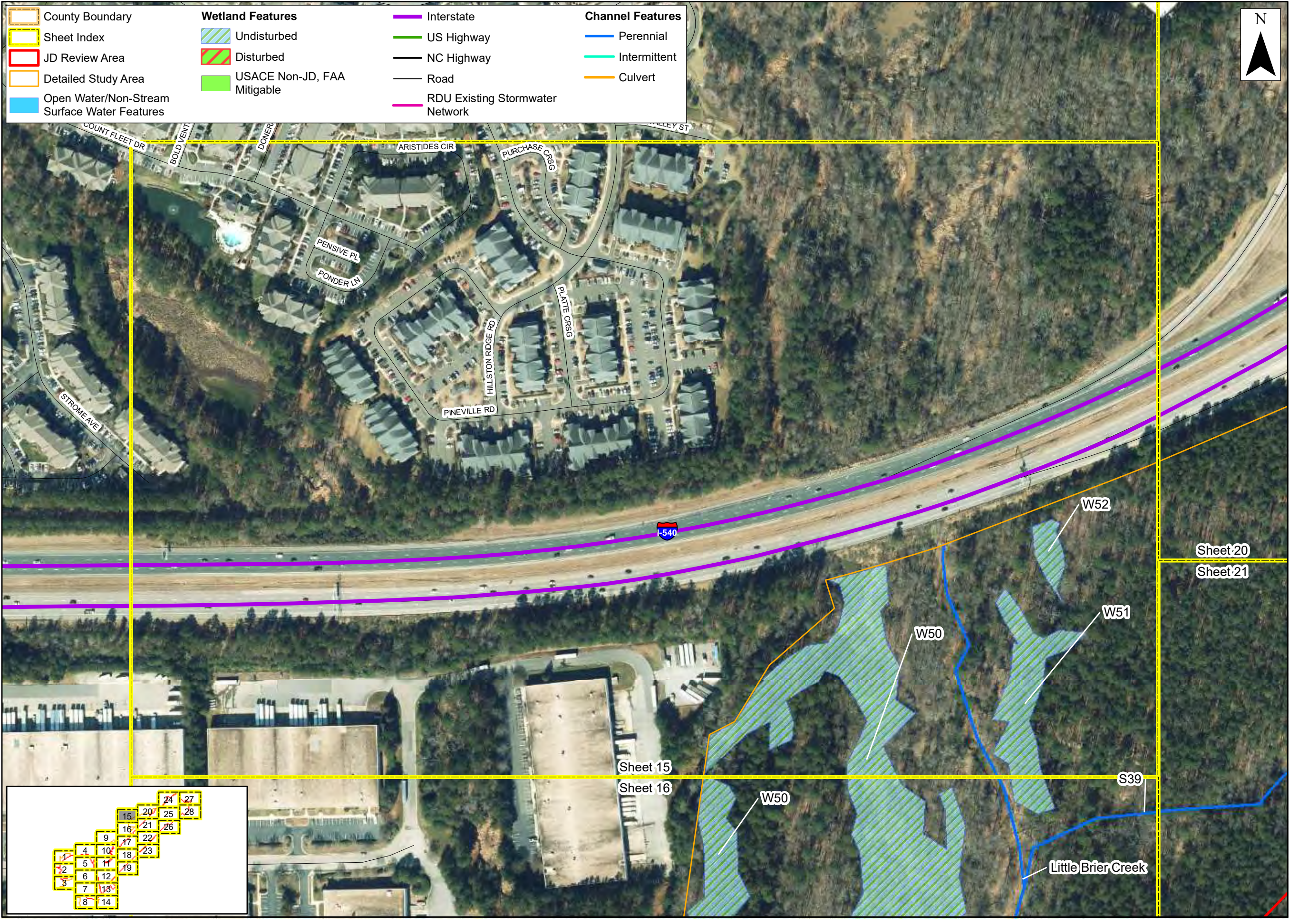
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County Boundary	Wetland Features	Interstate	Channel Features
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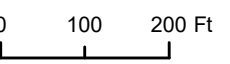
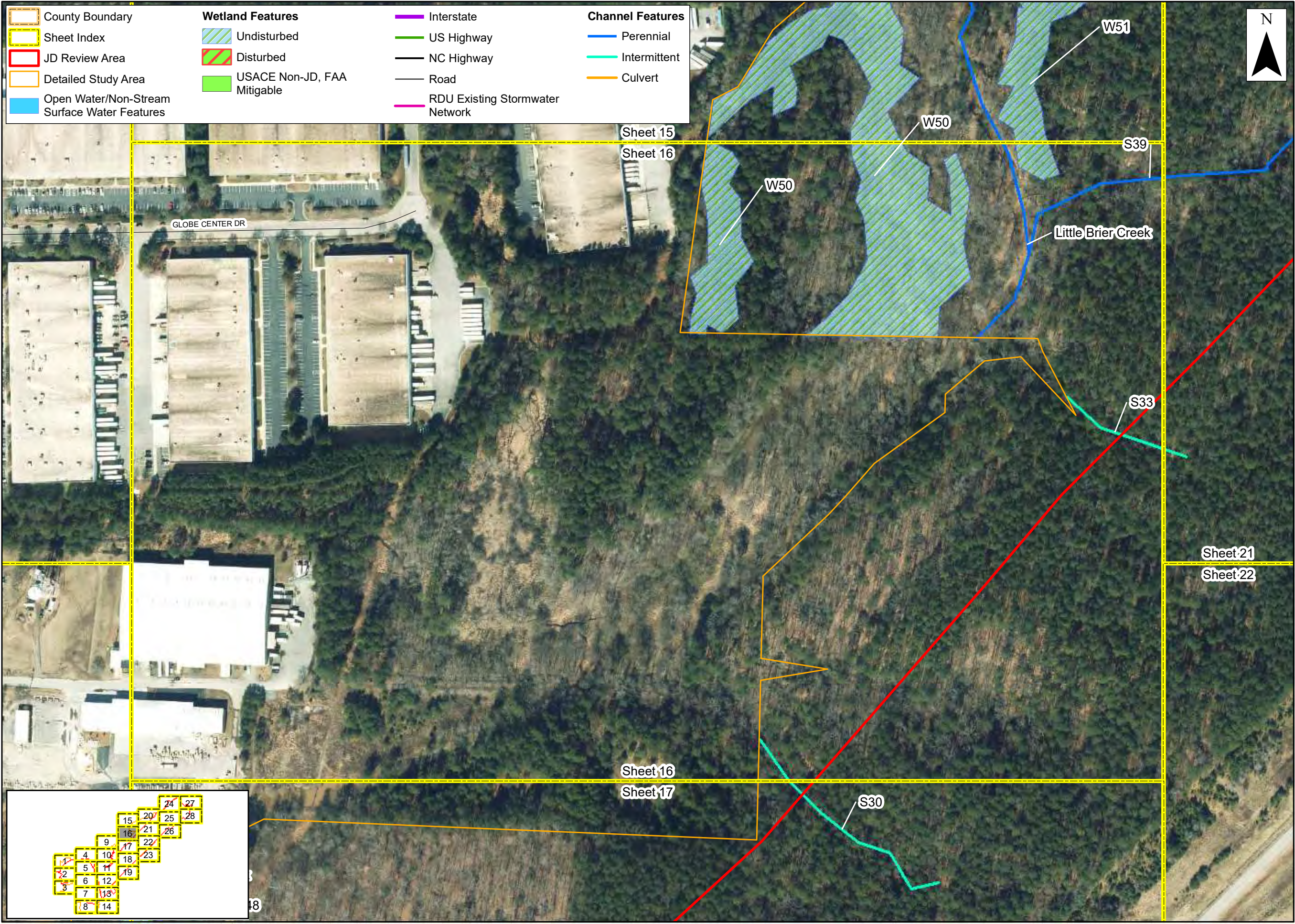
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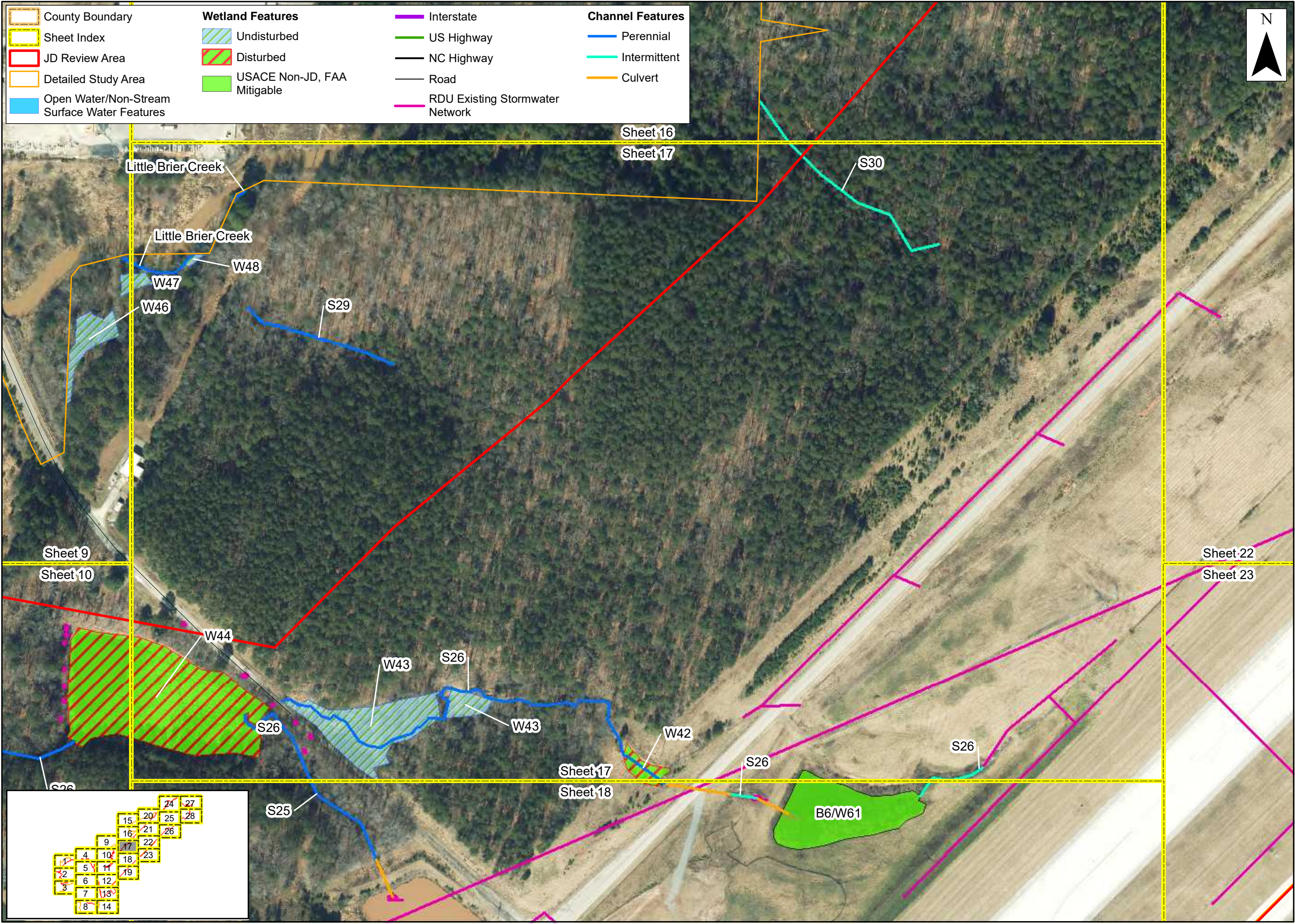
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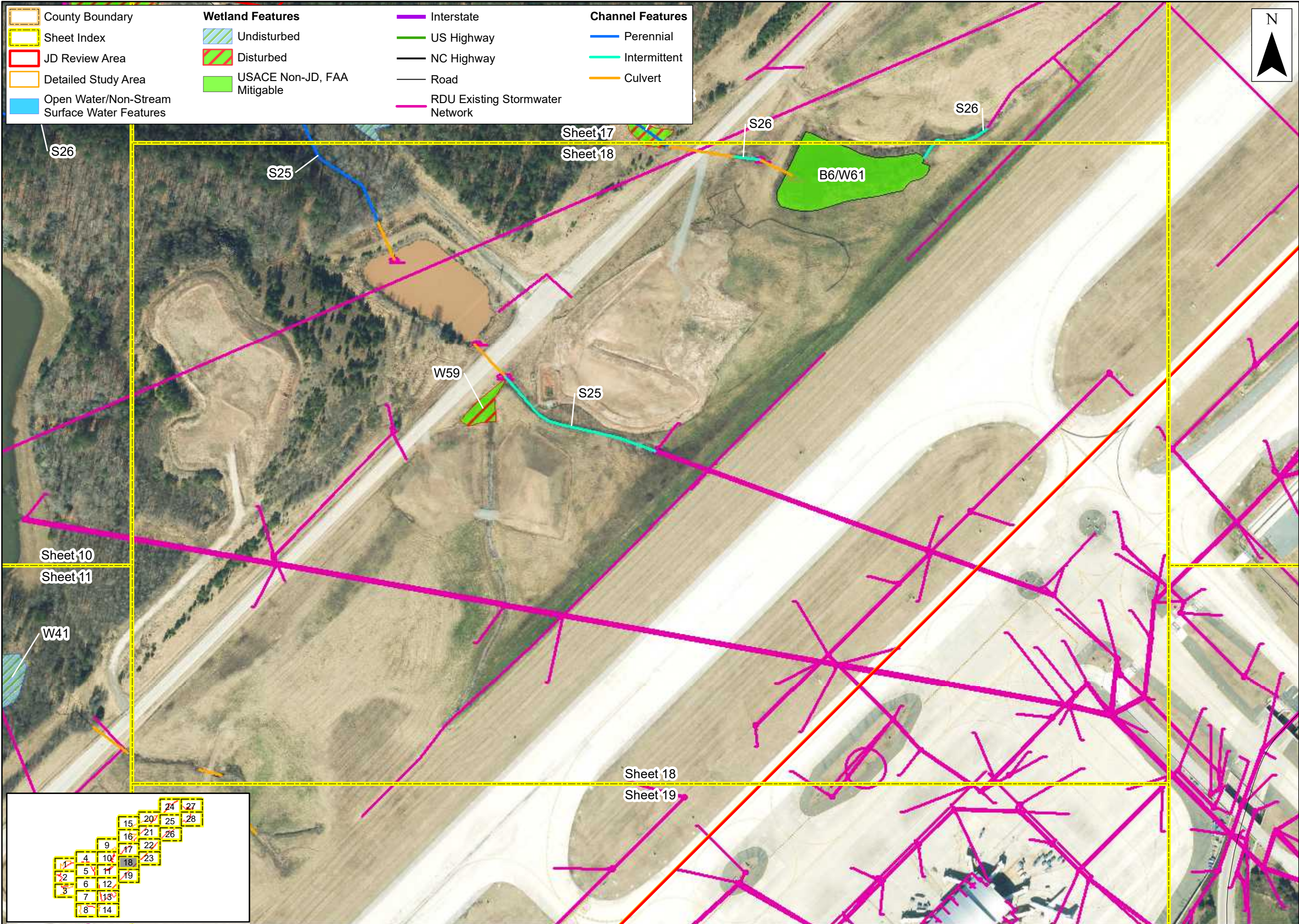
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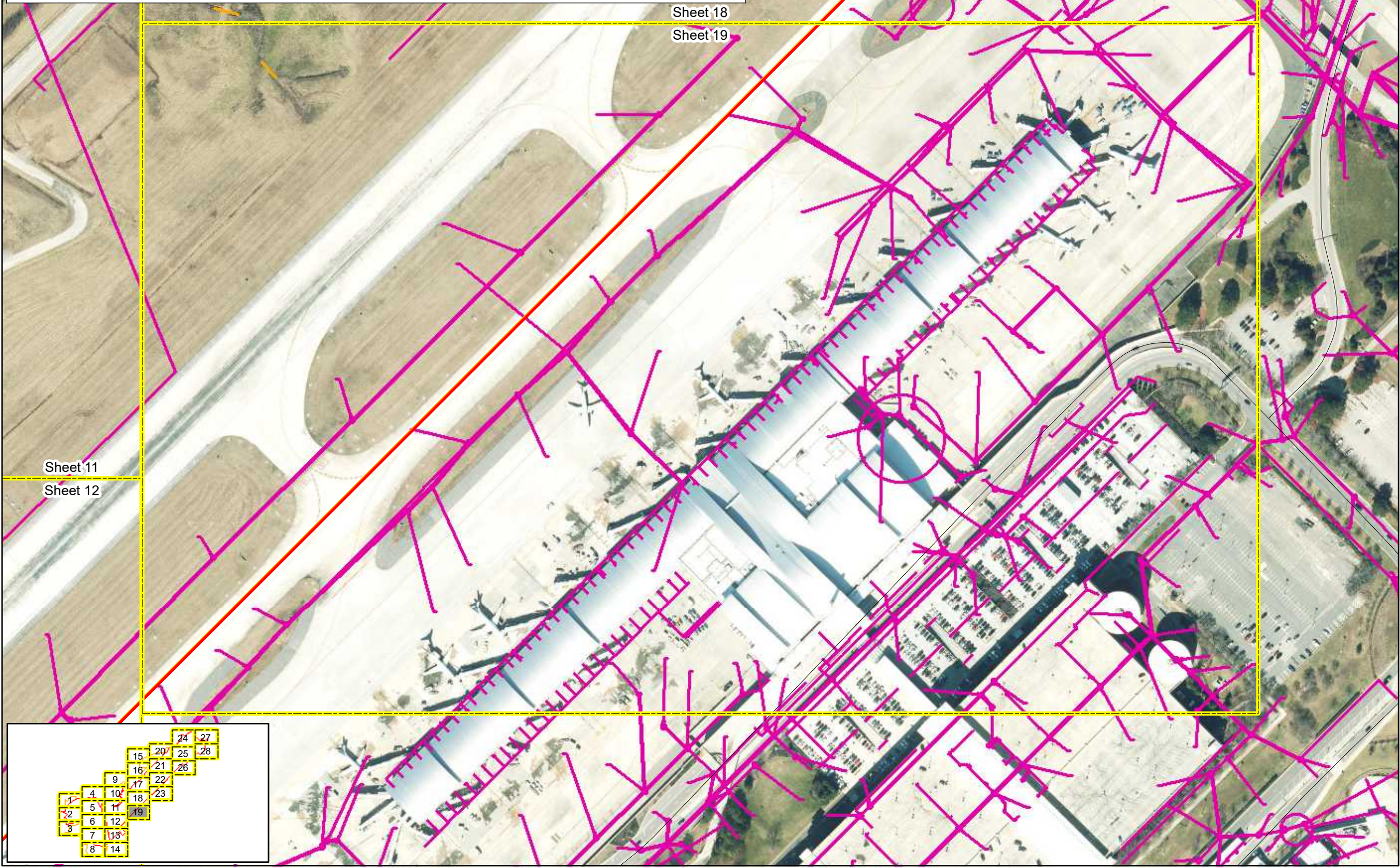
RDU Existing Stormwater Network

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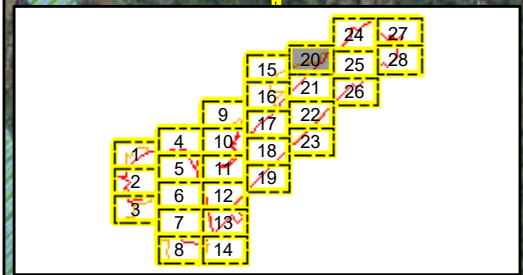
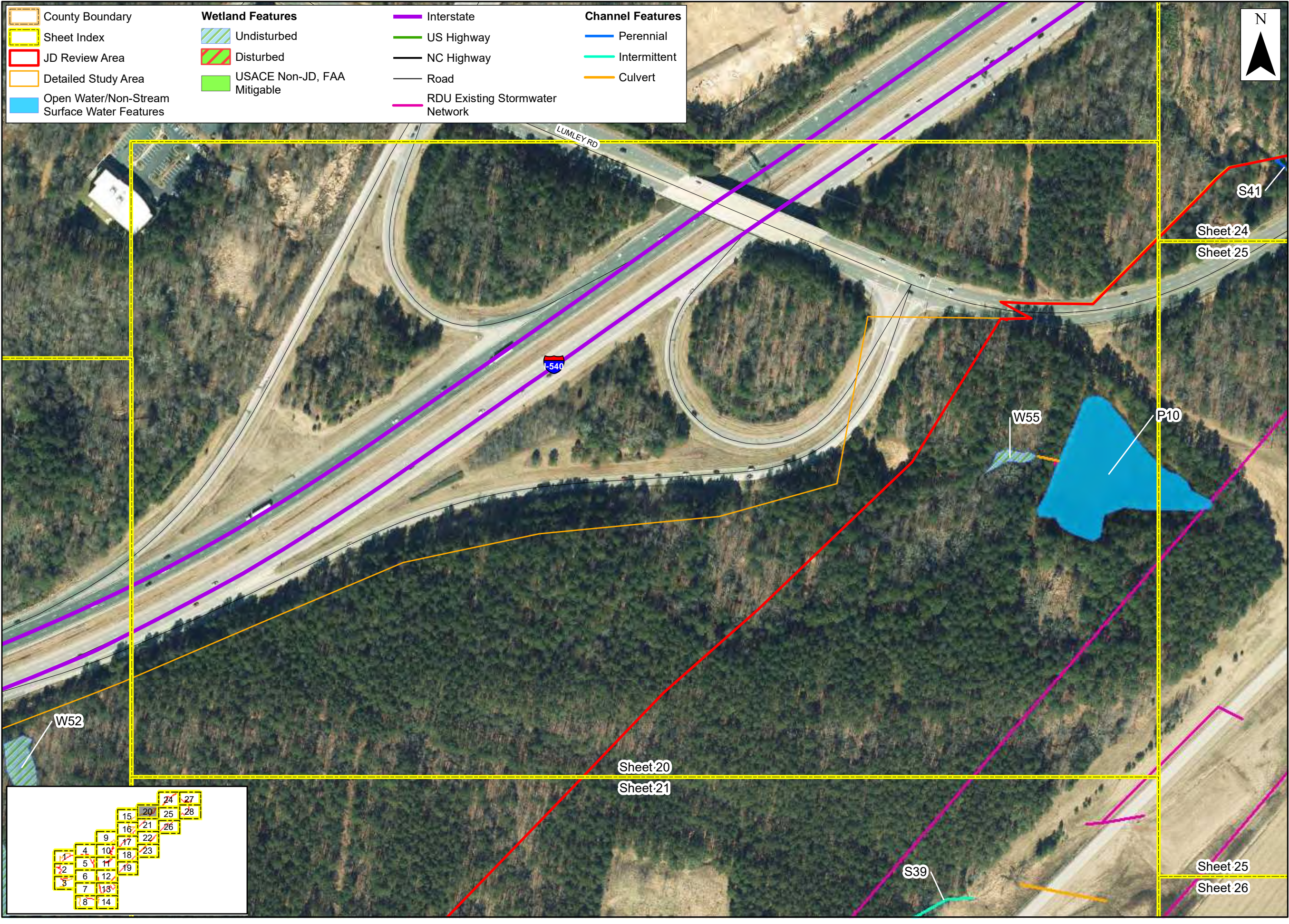
Wetland Features

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 Disturbed
 USACE Non-JD, FAA Mitigable

Interstate
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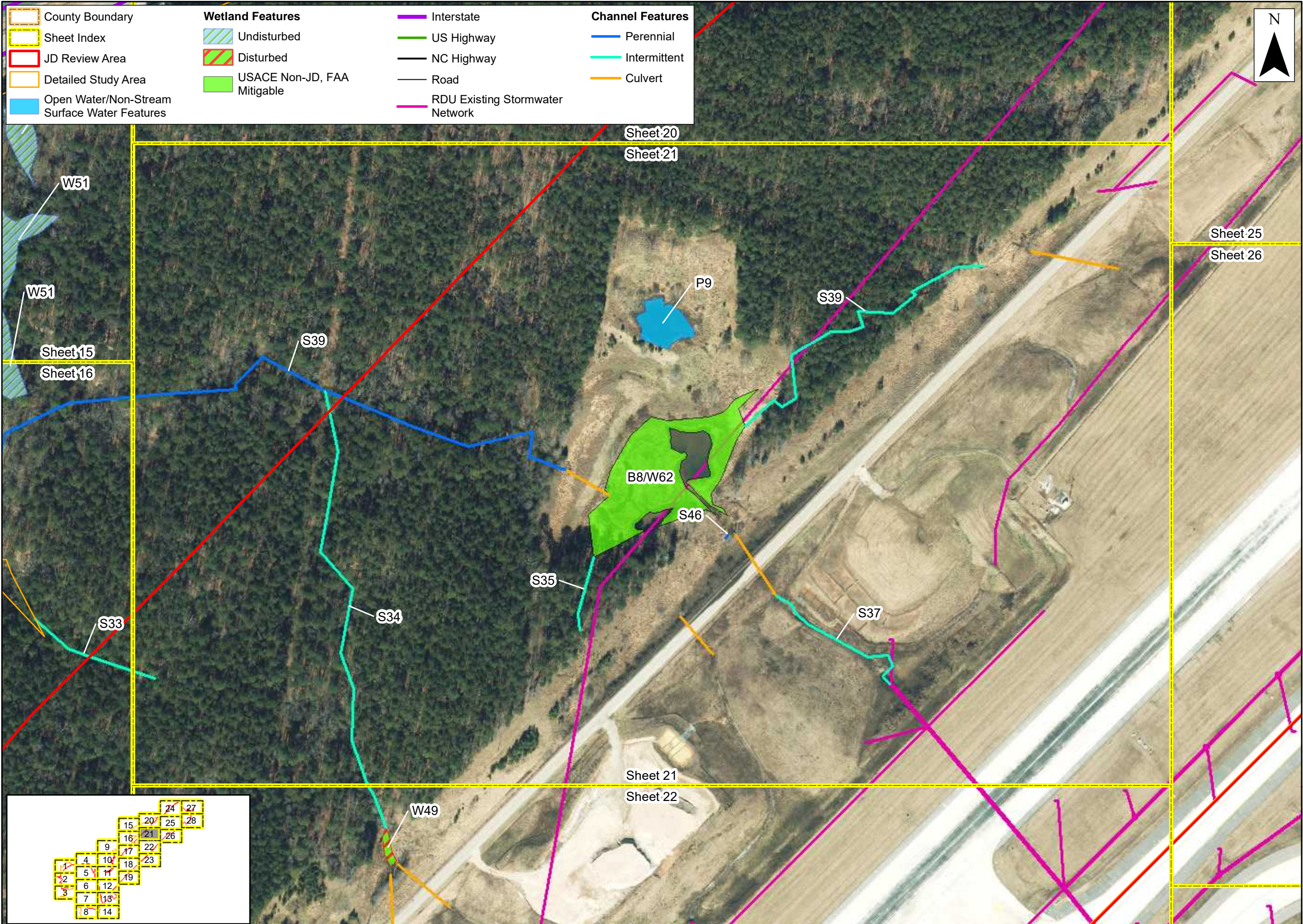
RDU Existing Stormwater Network

Channel Features

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Jurisdictional Features Map Over Orthoimagery

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JD Review Area

Detailed Study Area

Open Water/Non-Stream Surface Water Features

Wetland Features

Undisturbed

Disturbed

USACE Non-JD, FAA Mitigable

Interstate

US Highway

NC Highway

Road

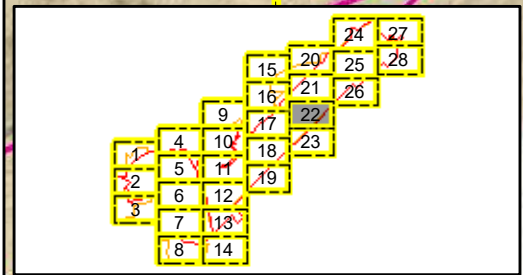
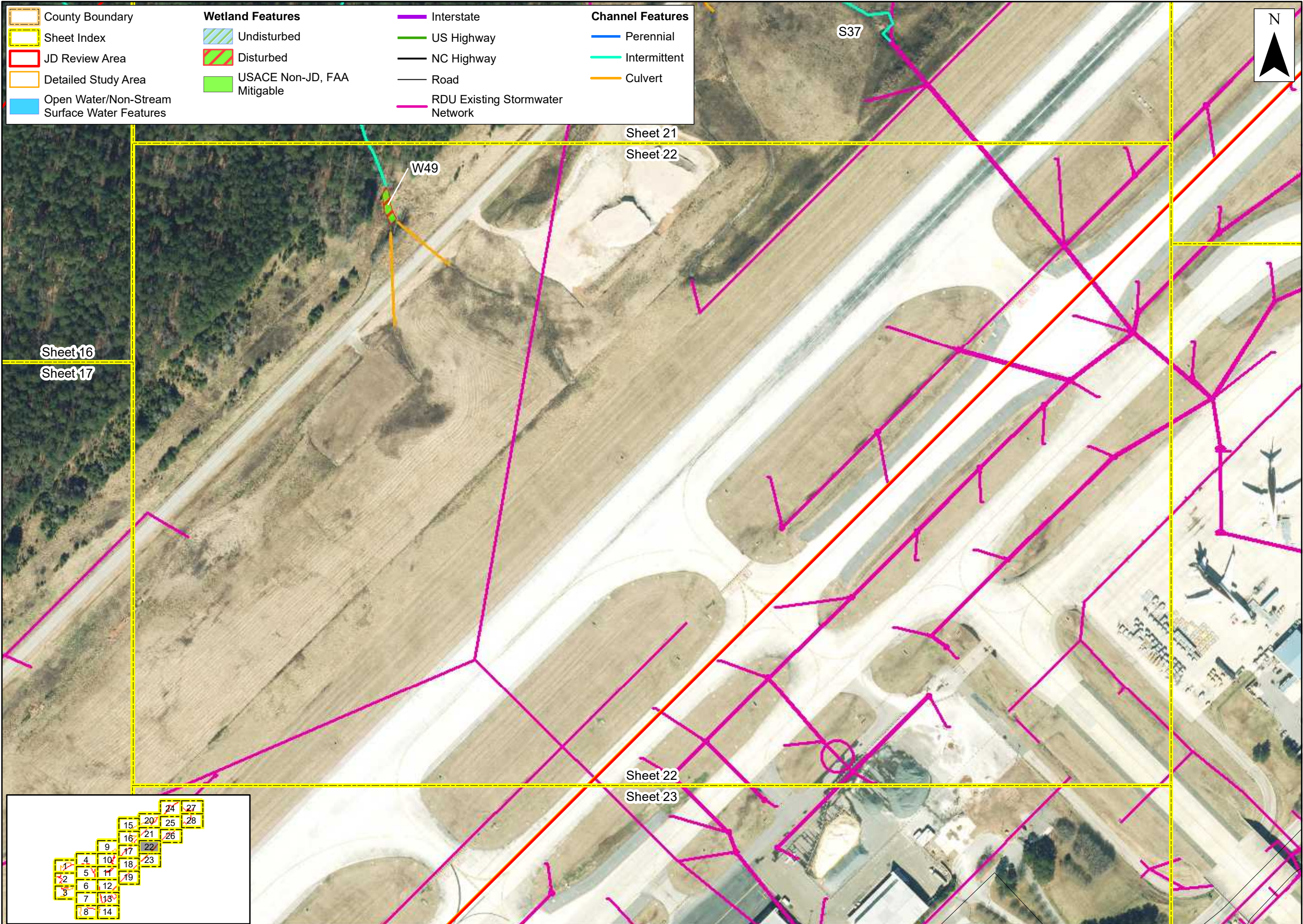
RDU Existing Stormwater Network

Channel Features

Perennial

Intermittent

Culvert



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Wetland Features

Undisturbed

Disturbed

USACE Non-JD, FAA Mitigable

Interstate

US Highway

NC Highway

Road

RDU Existing Stormwater Network

Channel Features

Perennial

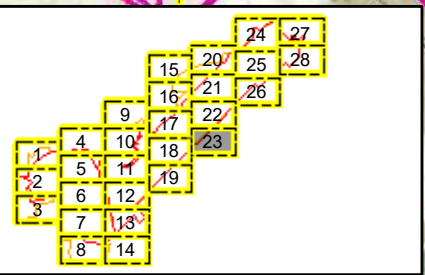
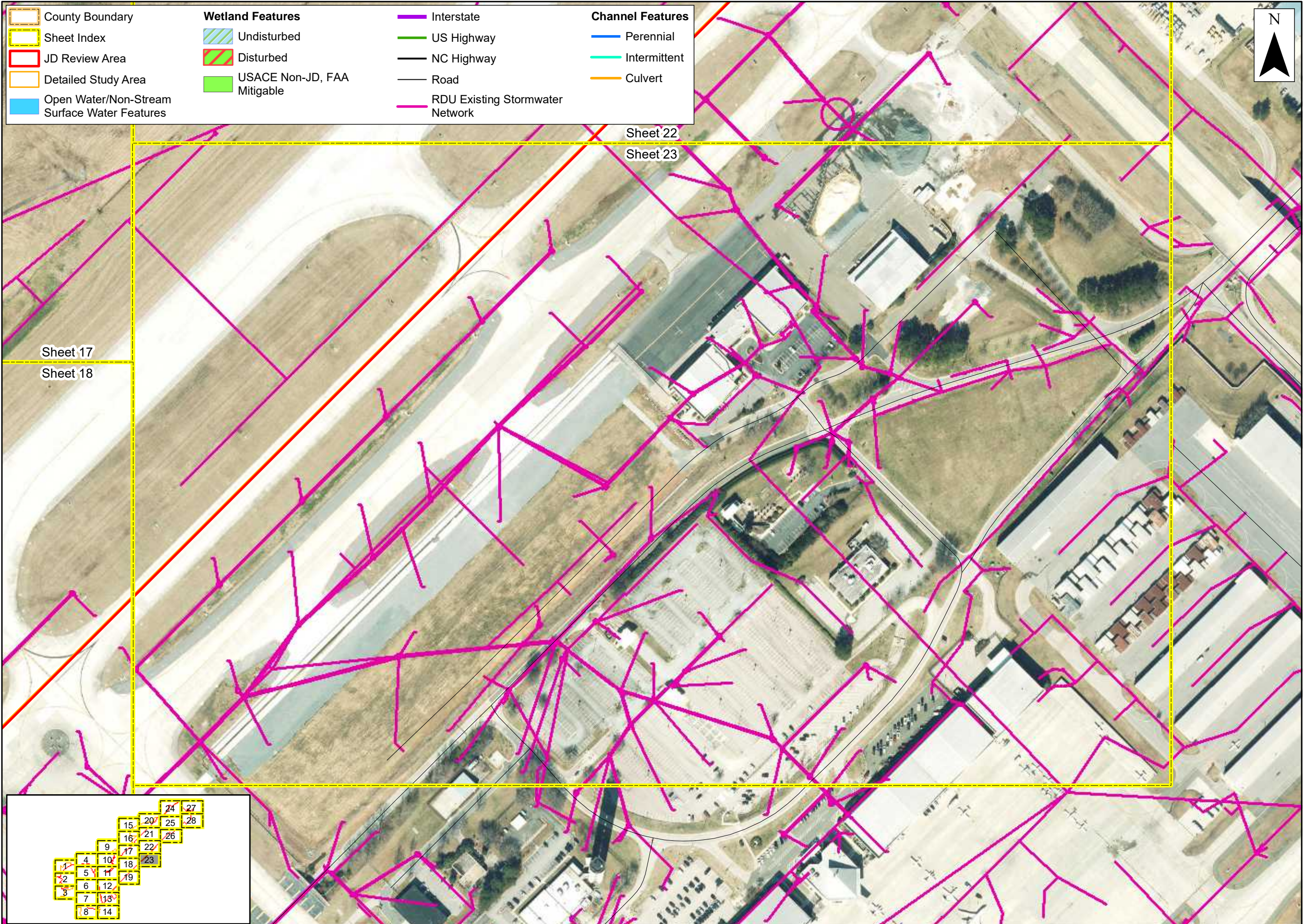
Intermittent

Culvert



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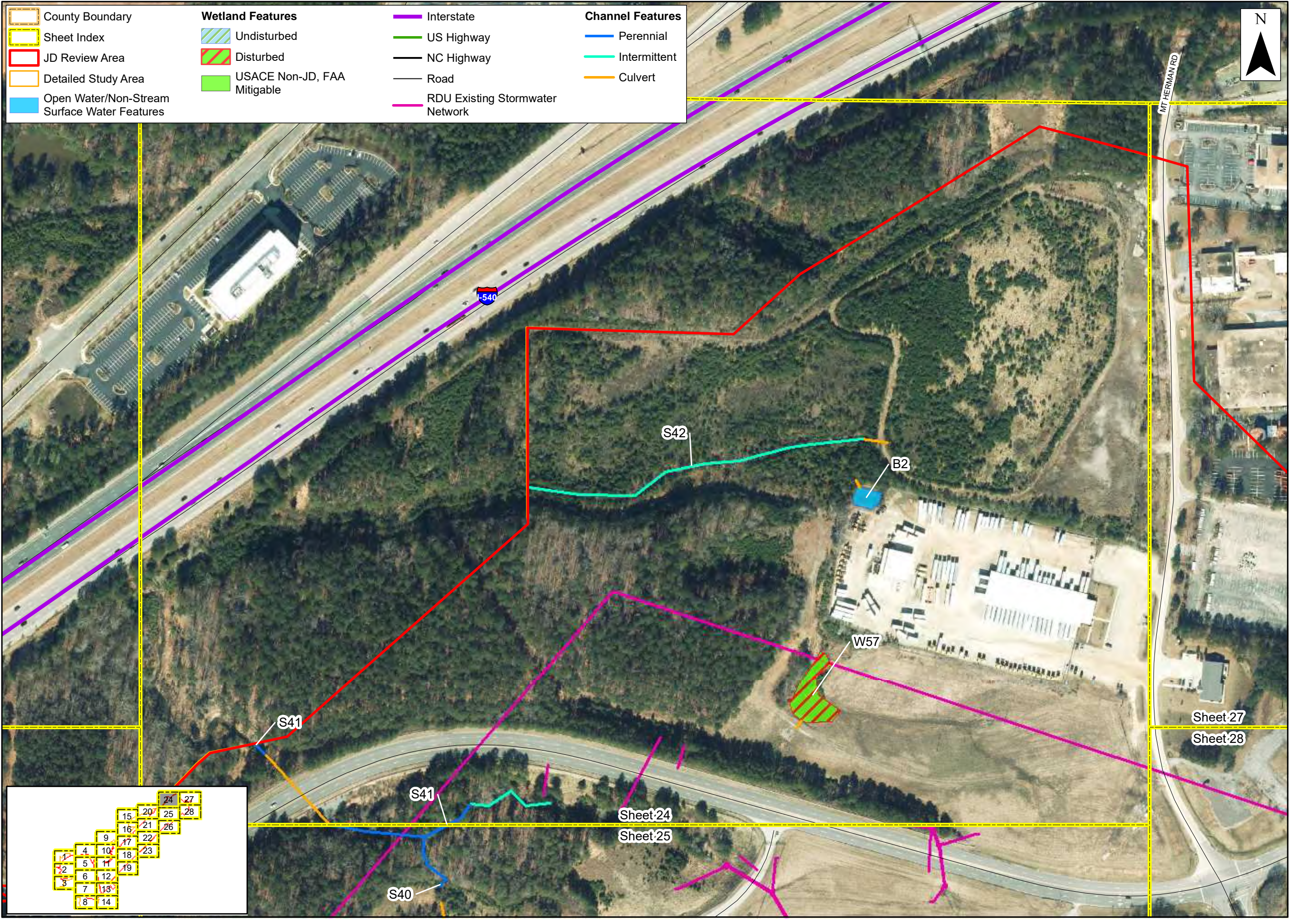
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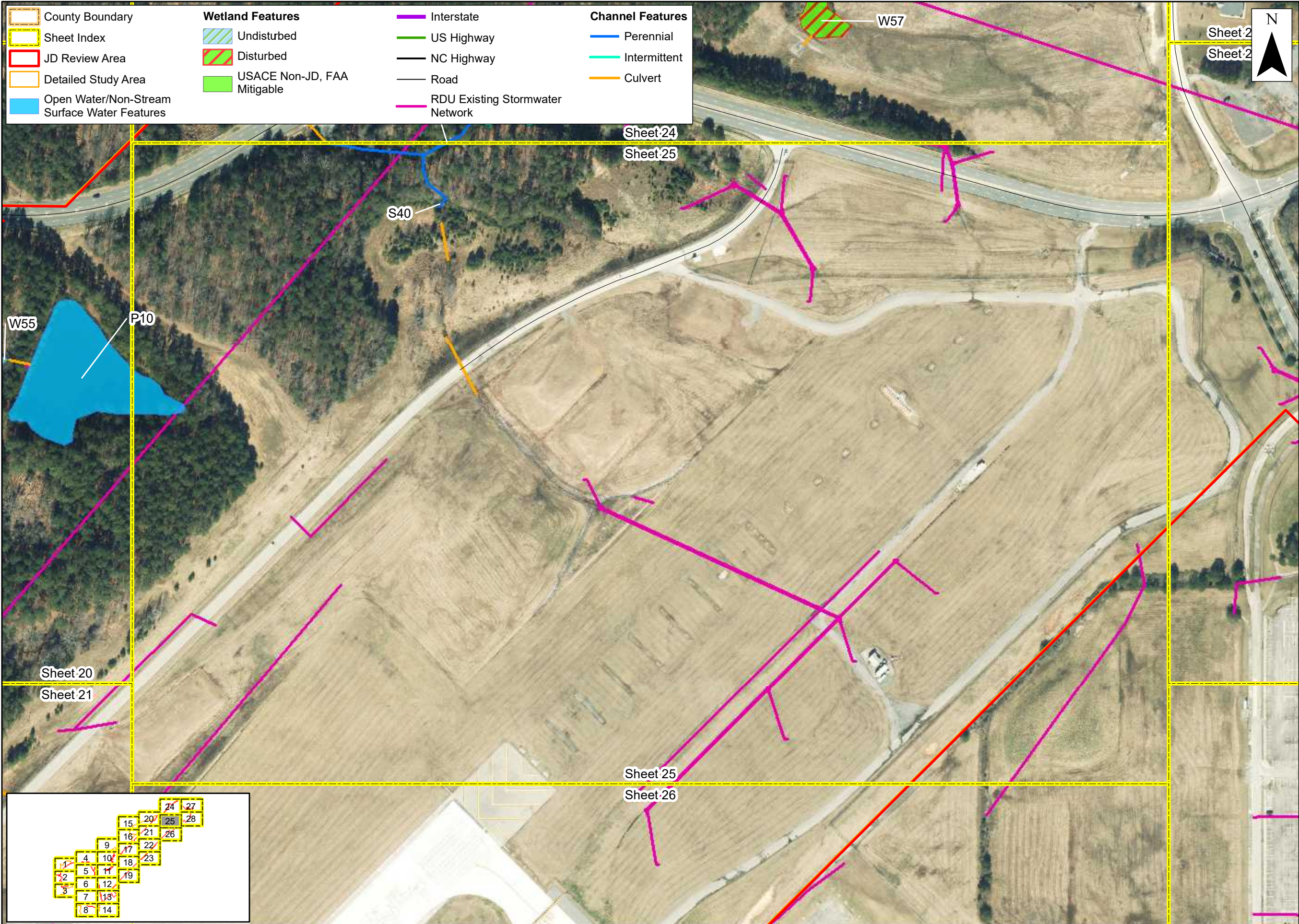
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Wetland Features

Undisturbed

Disturbed

USACE Non-JD, FAA Mitigable

Interstate

US Highway

NC Highway

Road

RDU Existing Stormwater Network

Channel Features

Perennial

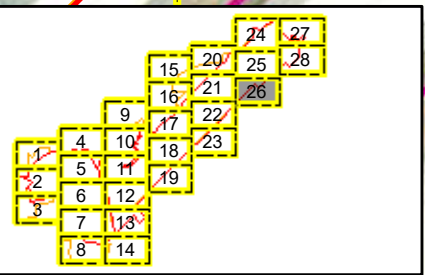
Intermittent

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Open Water/Non-Stream Surface Water Features

Wetland Features

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Disturbed

USACE Non-JD, FAA Mitigable

Interstate

US Highway

NC Highway

Road

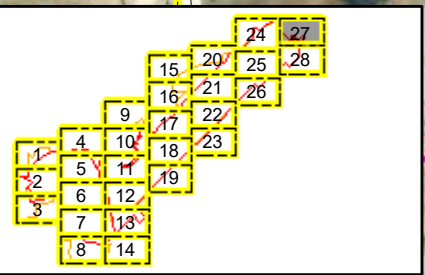
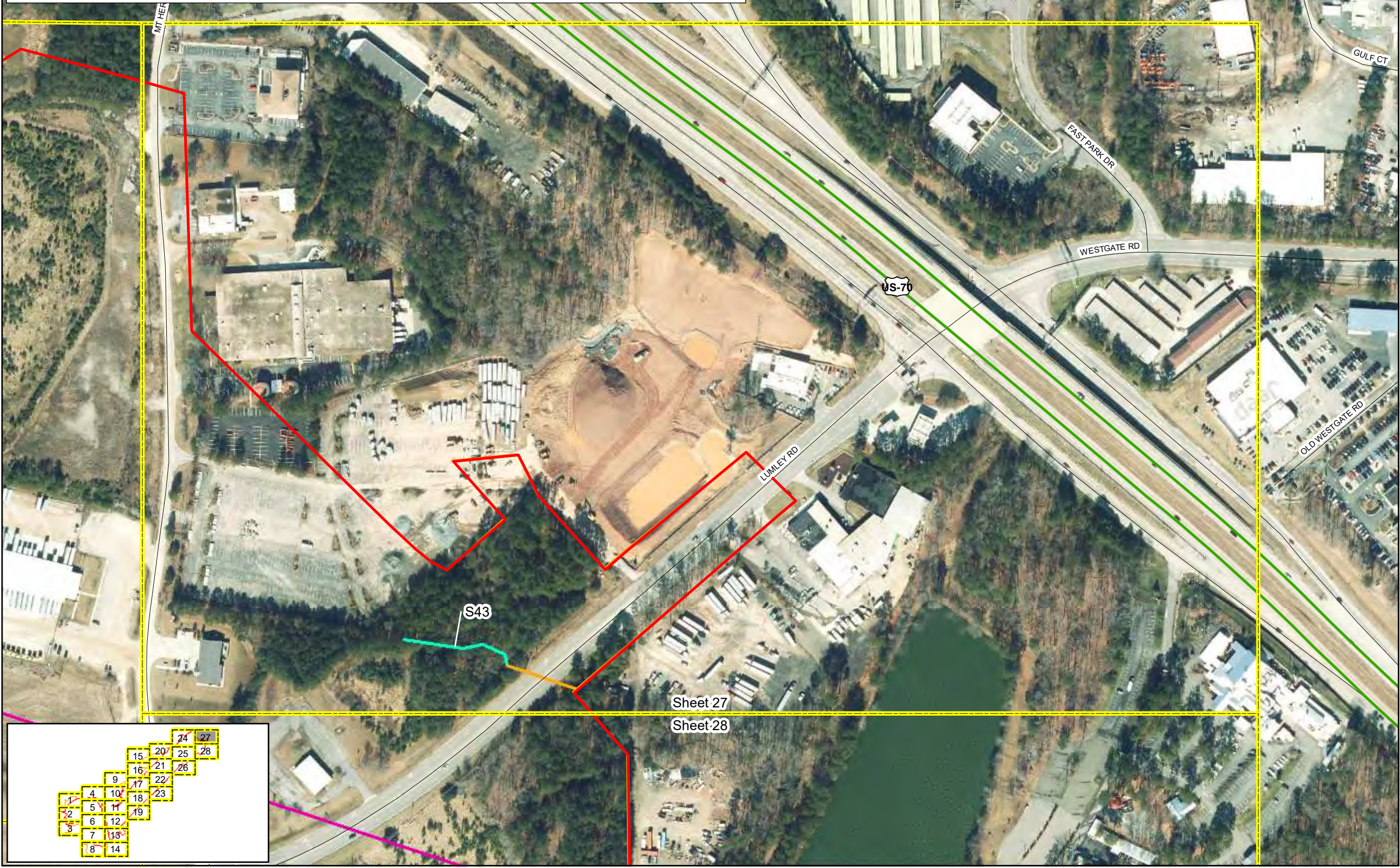
RDU Existing Stormwater Network

Channel Features

Perennial

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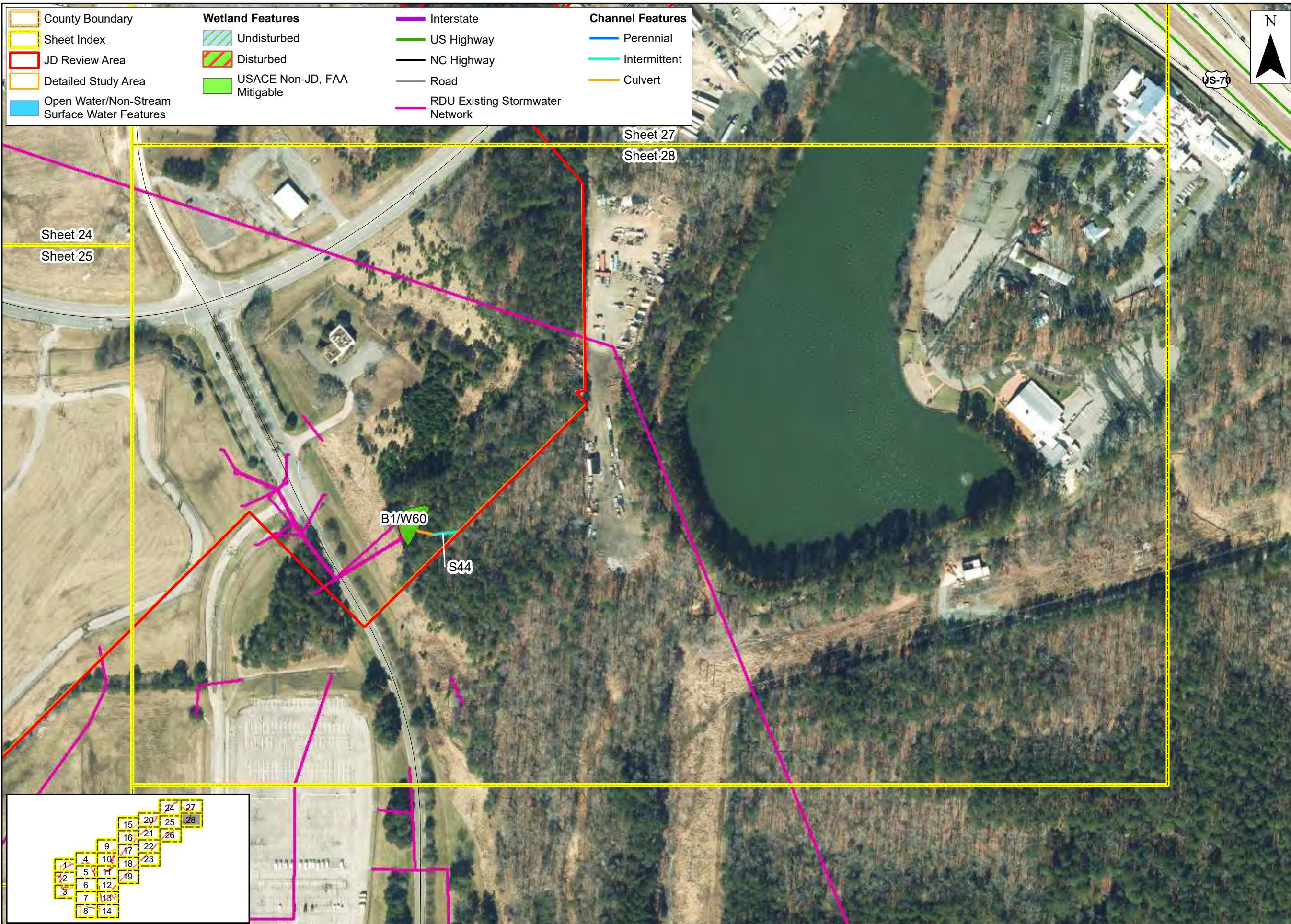
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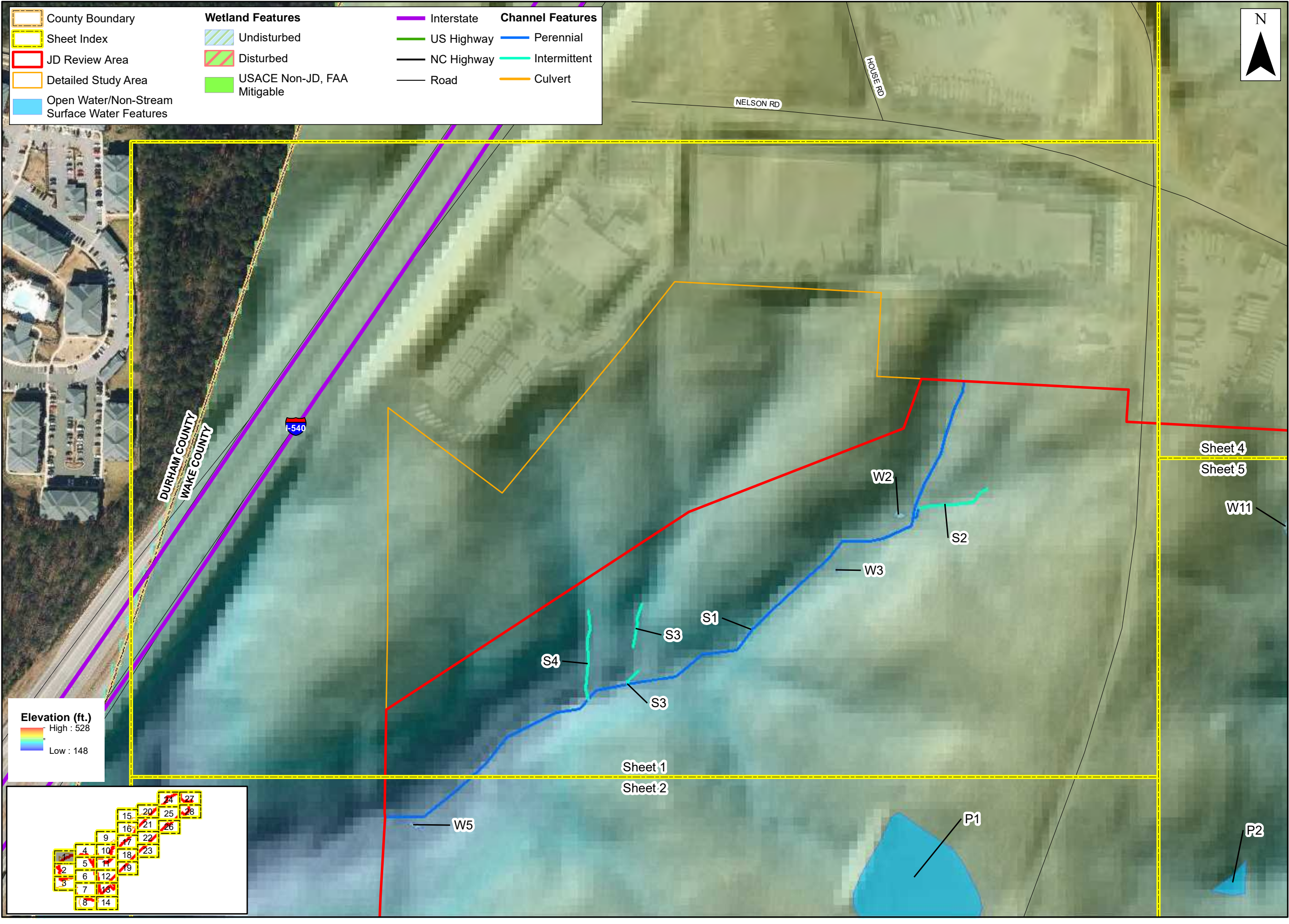
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Interstate

US Highway

NC Highway

Road

Elevation (ft.)

High : 528

Low : 148

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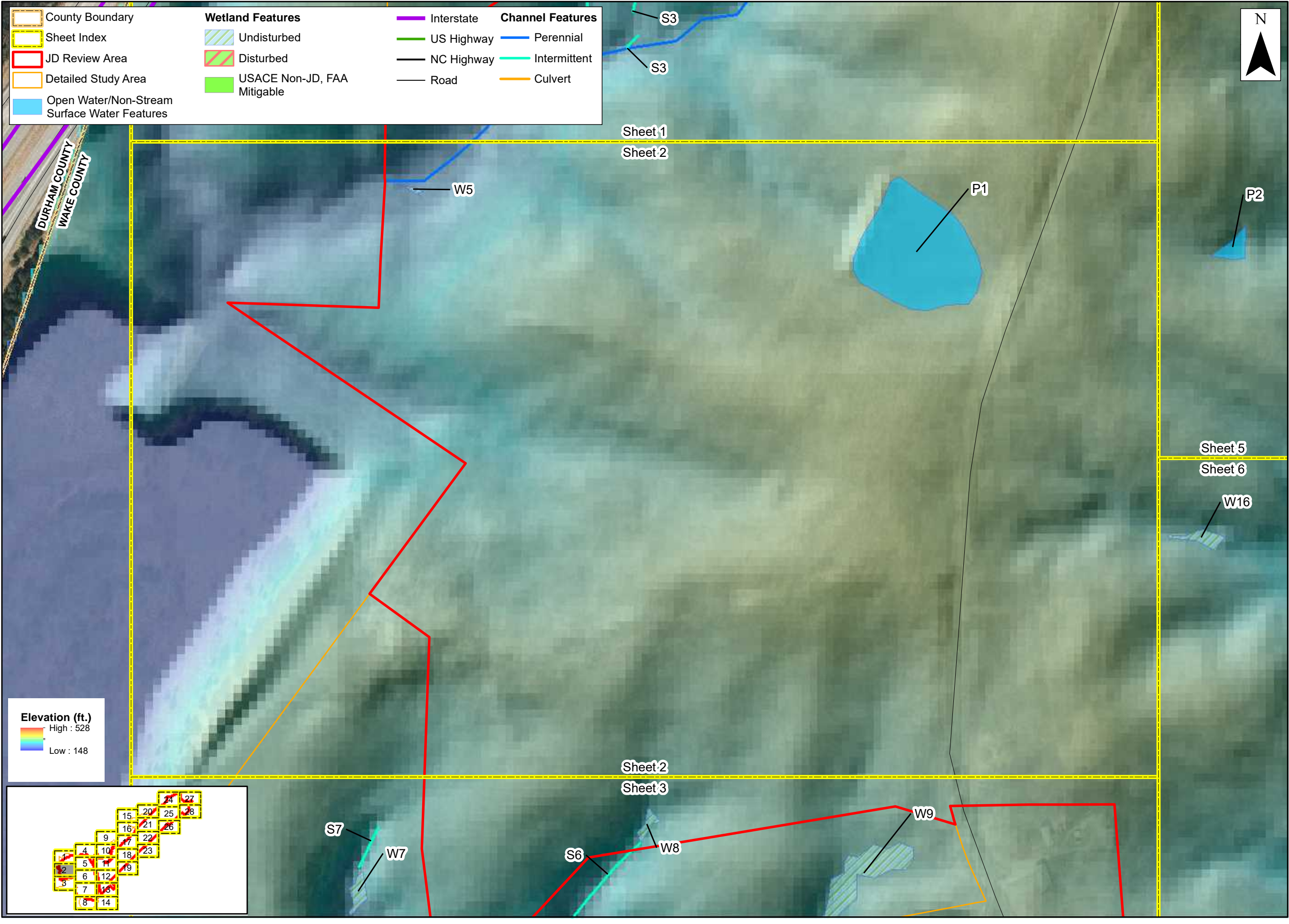
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Elevation (ft.)

High : 528

Low : 148

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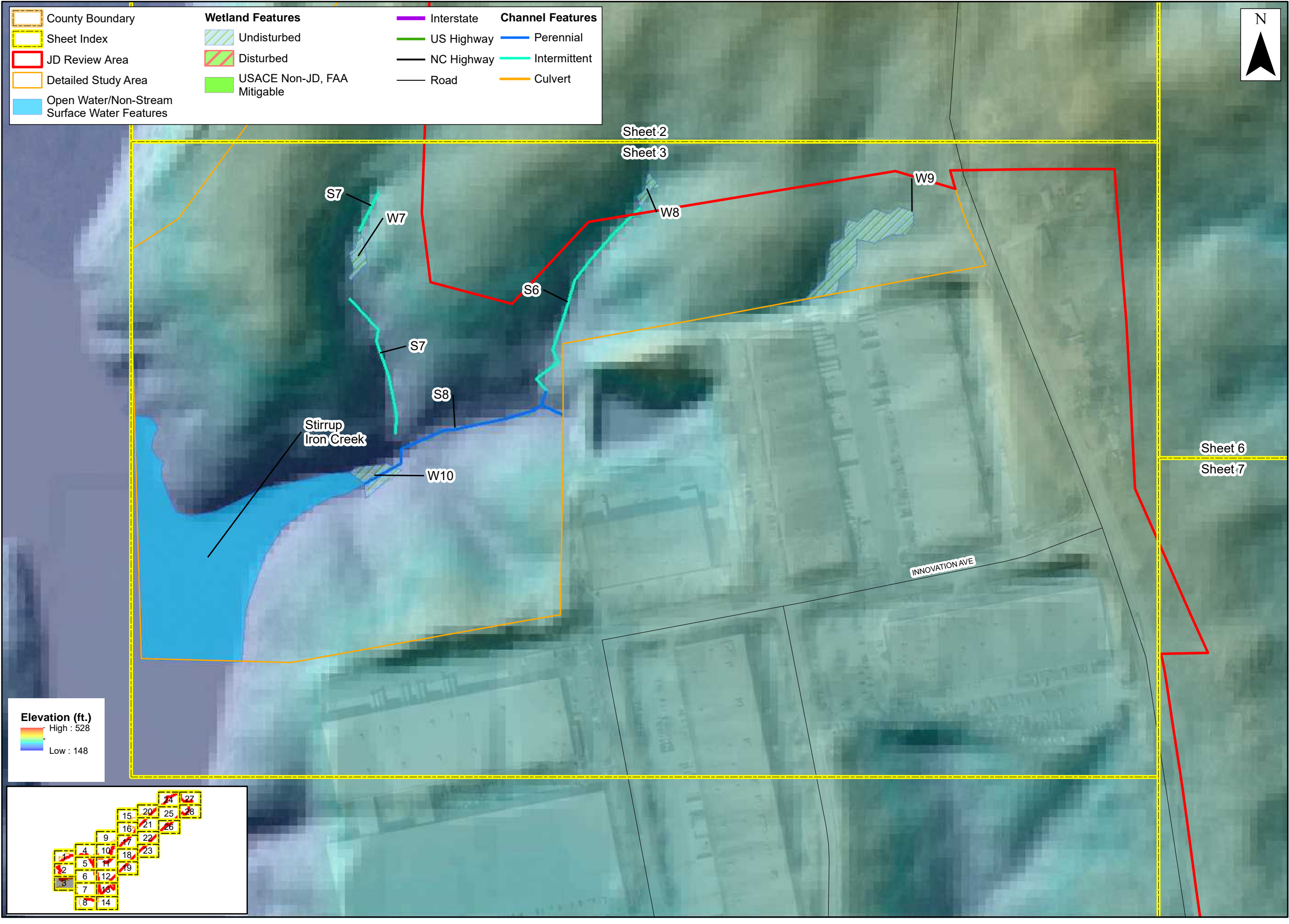
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NELSON RD

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Brier Creek

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S9

W12

Elevation (ft.)
High : 528
Low : 148

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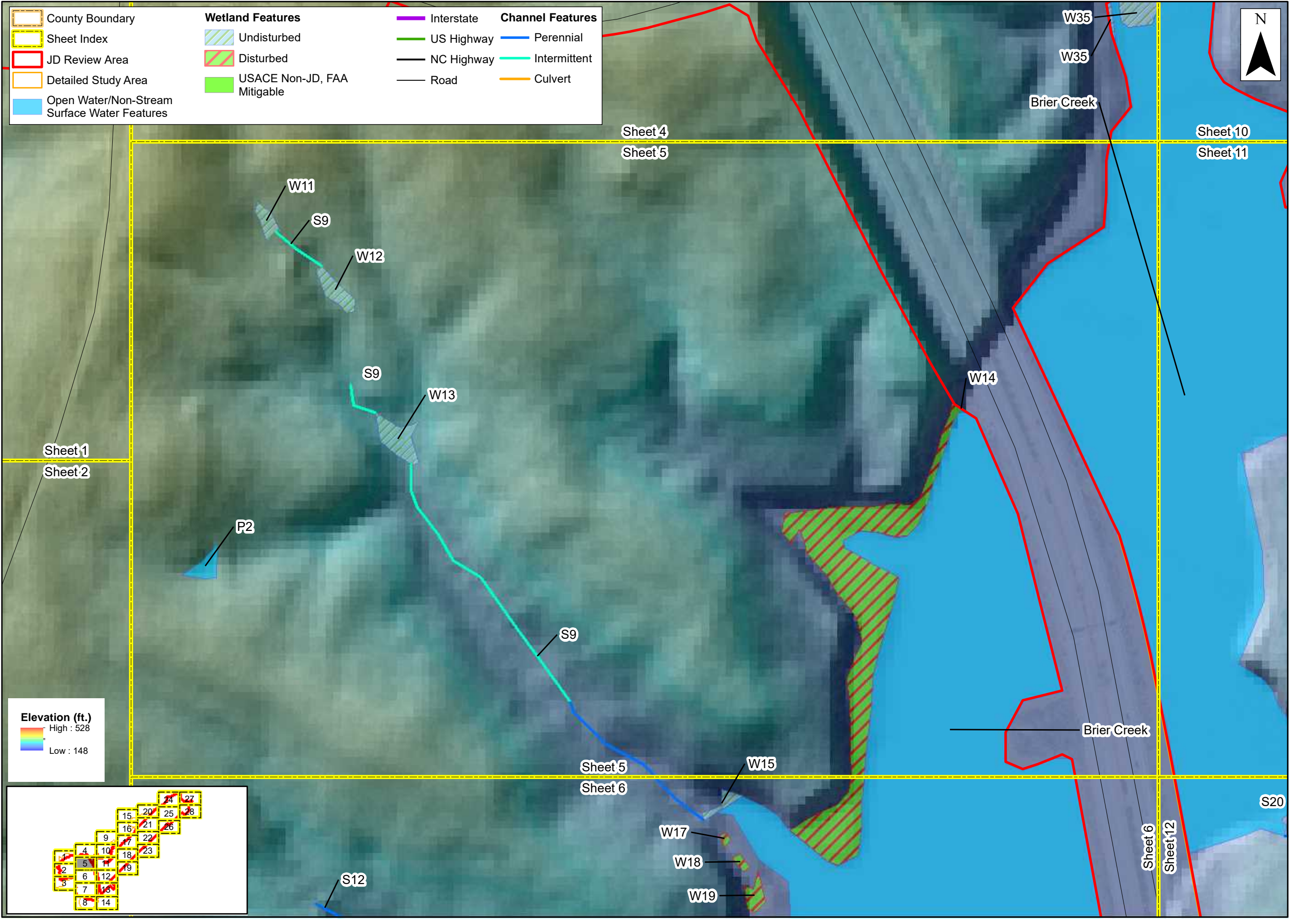
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Interstate

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NC Highway


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Elevation (ft.)

High : 528

Low : 148

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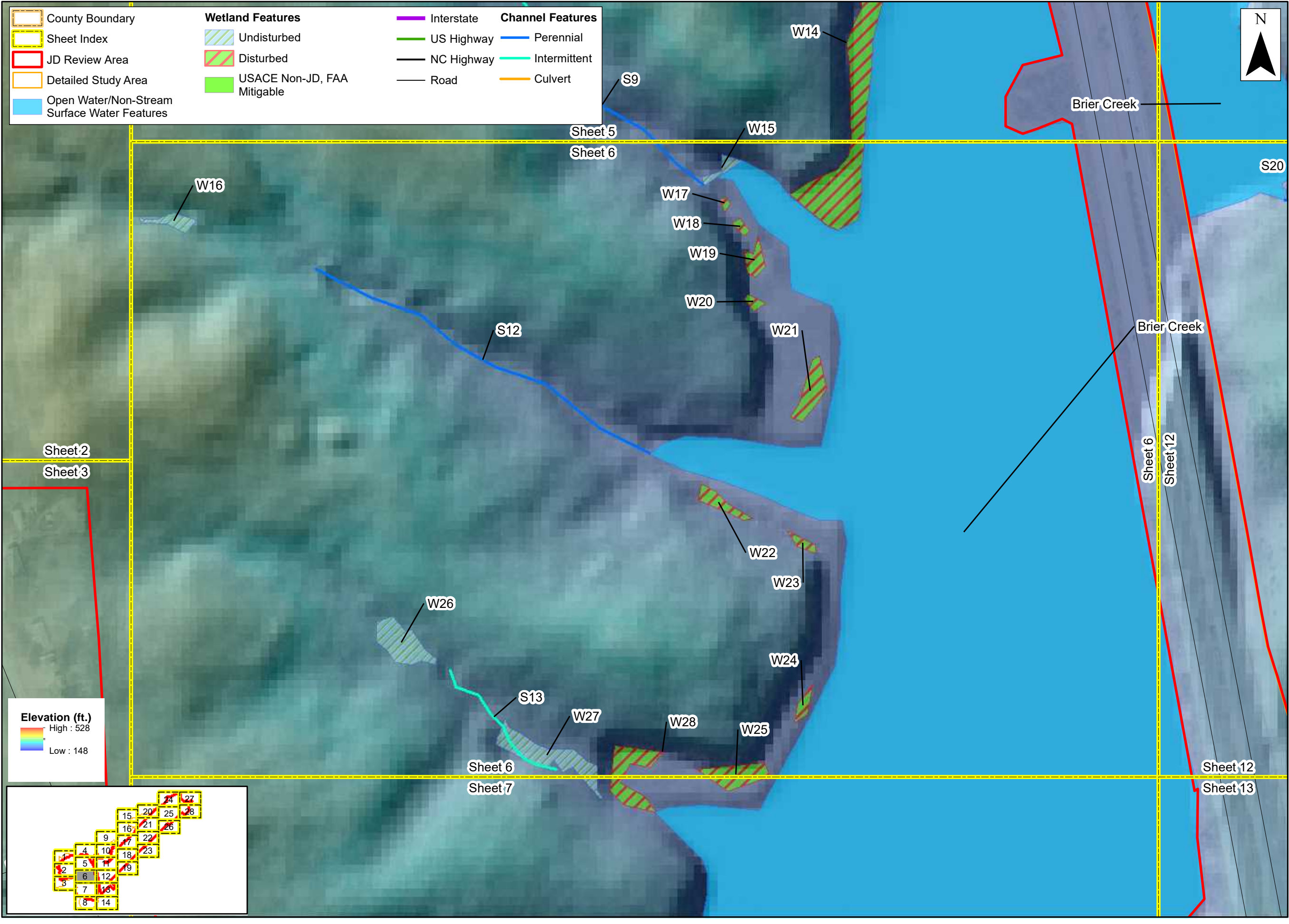
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Culvert

Interstate

US Highway

NC Highway

Road

Elevation (ft.)

High : 528

Low : 148

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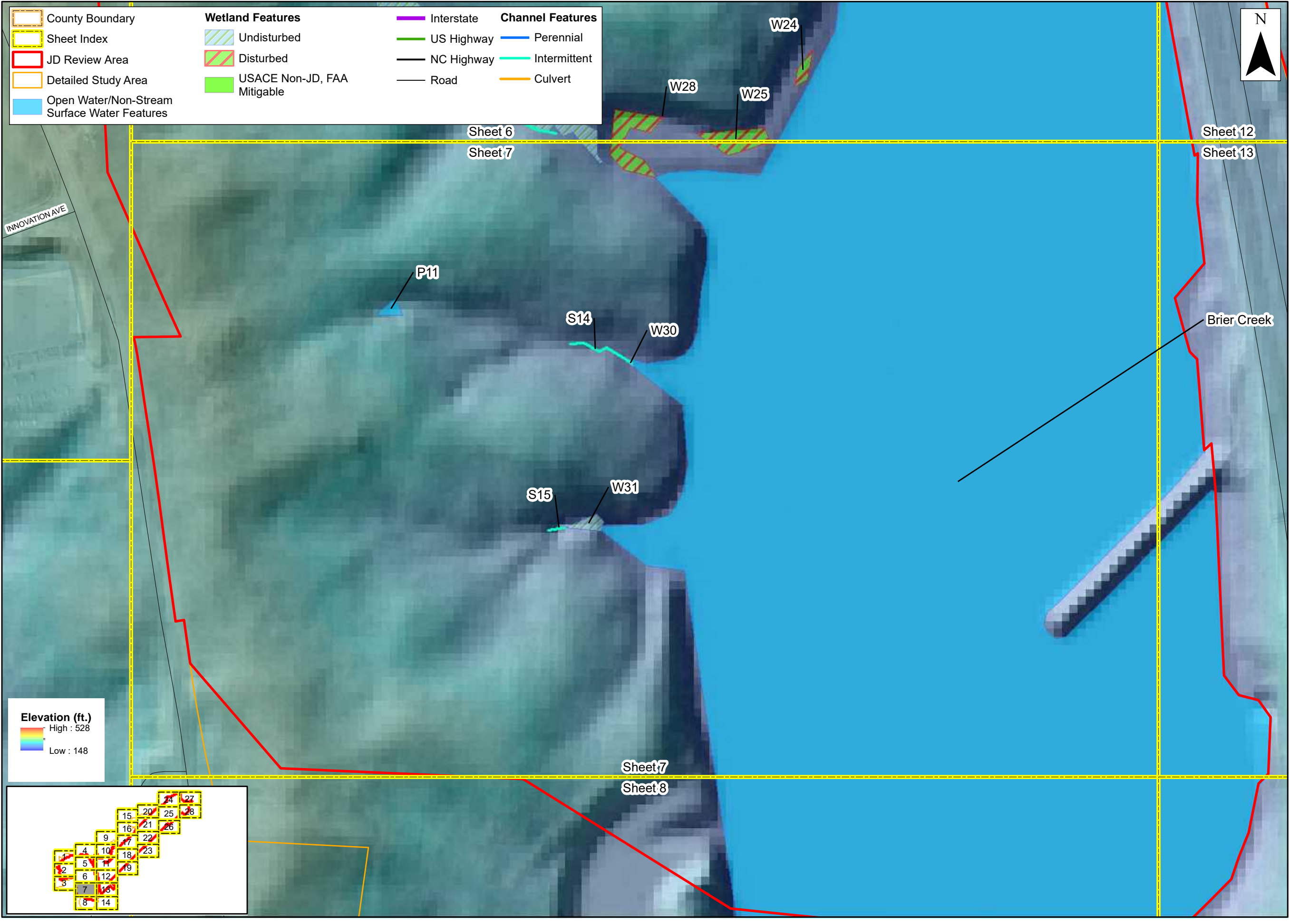
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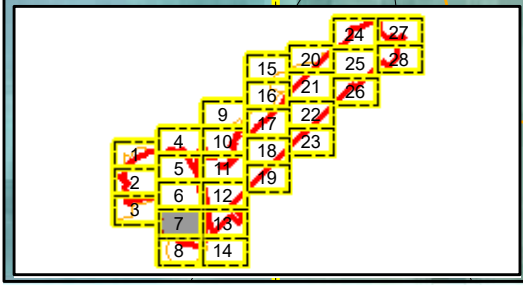
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County Boundary	Wetland Features	Interstate	Channel Features
Sheet Index	Undisturbed	US Highway	Perennial
JD Review Area	Disturbed	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert
Open Water/Non-Stream Surface Water Features			

Elevation (ft.)

High : 528
Low : 148



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The logo for the Research Triangle University (RDU), consisting of the letters 'RDU' in a bold, blue, sans-serif font.

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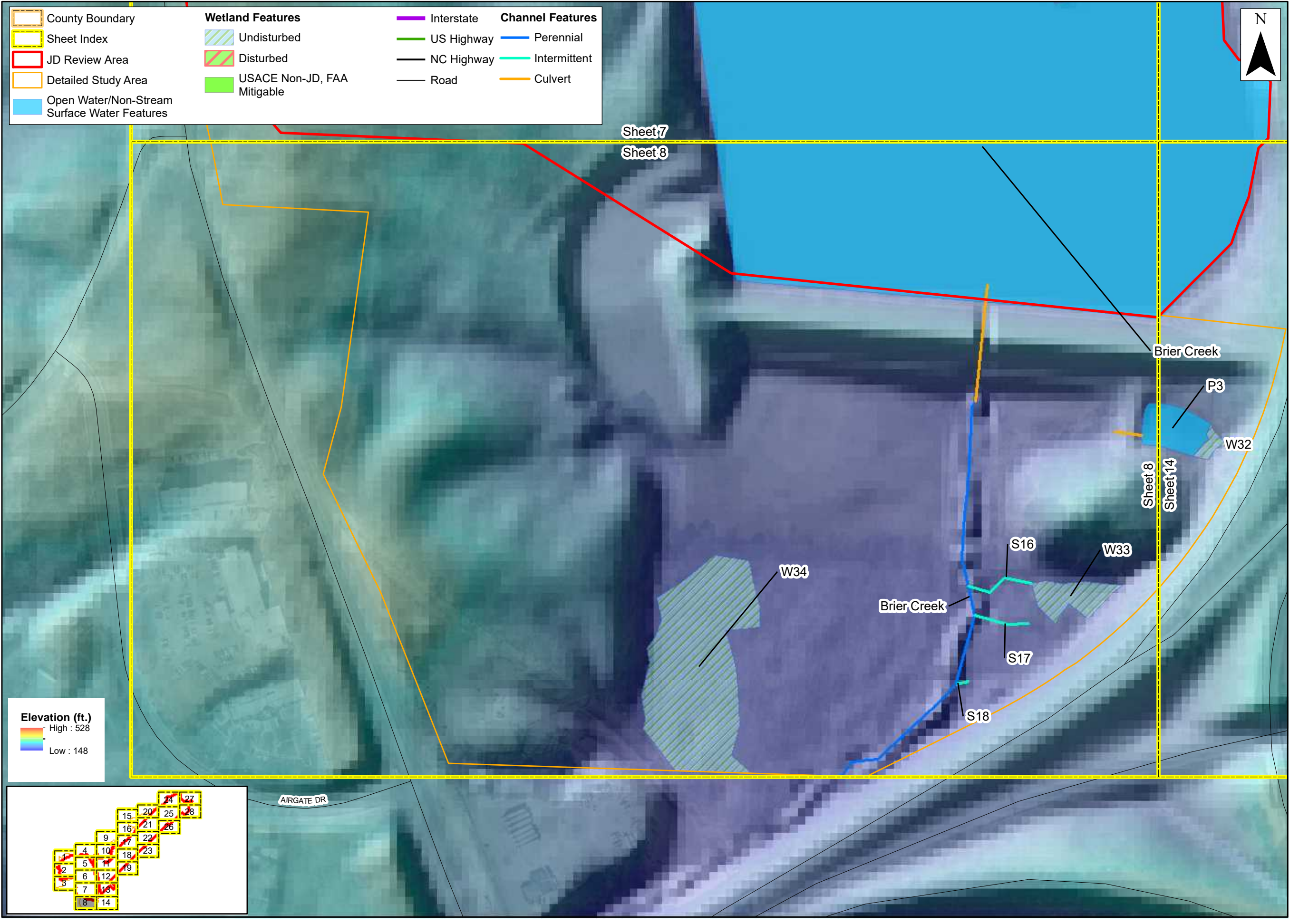
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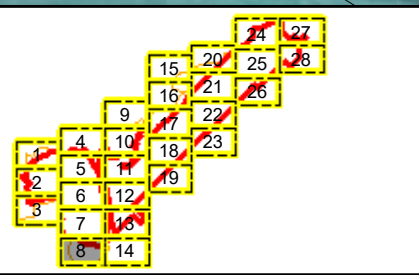
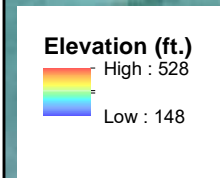
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County Boundary	Wetland Features	Interstate	Channel Features
Sheet Index	Undisturbed	US Highway	Perennial
JD Review Area	Disturbed	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert
Open Water/Non-Stream Surface Water Features			



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Wetland Features

Undisturbed

Disturbed

USACE Non-JD, FAA Mitigable

Interstate

US Highway

NC Highway

Road

Channel Features

Perennial

Intermittent

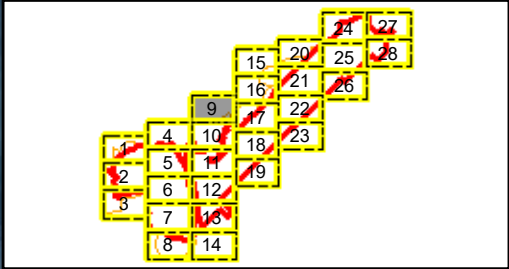
Culvert



Elevation (ft.)

High : 528

Low : 148



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Scale: 0 100 200 Ft

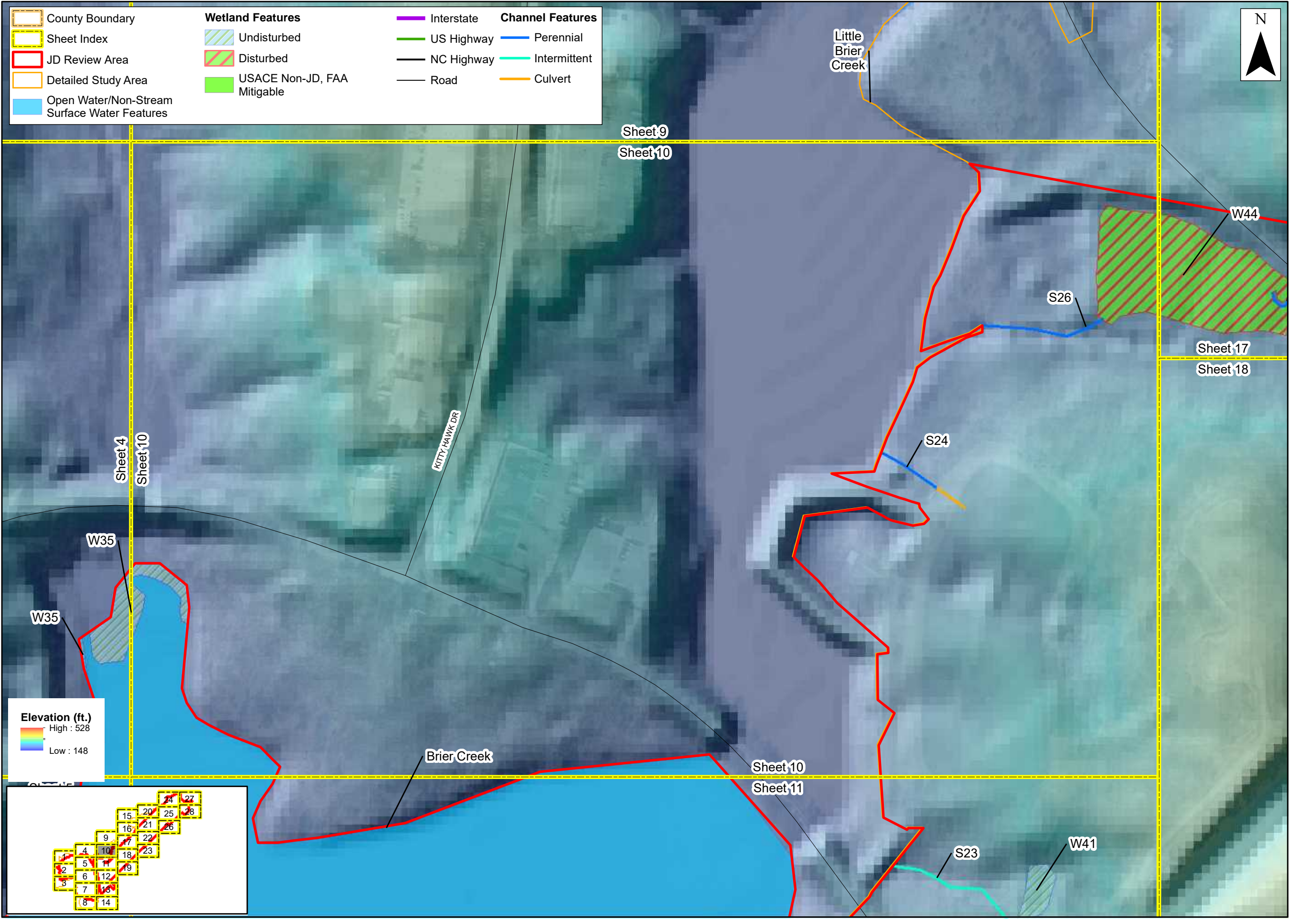
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County Boundary

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Wetland Features

Undisturbed

Disturbed

USACE Non-JD, FAA Mitigable

Channel Features

Interstate

US Highway

NC Highway

Road

Perennial

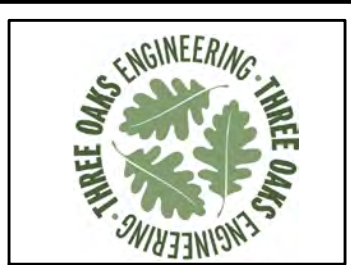
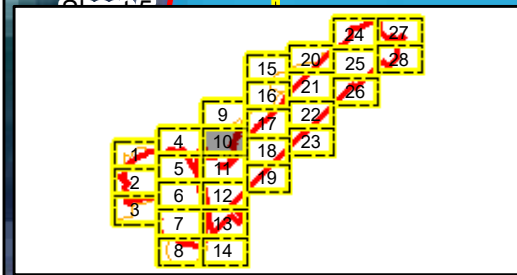
Intermittent

Culvert

Elevation (ft.)

High : 528

Low : 148



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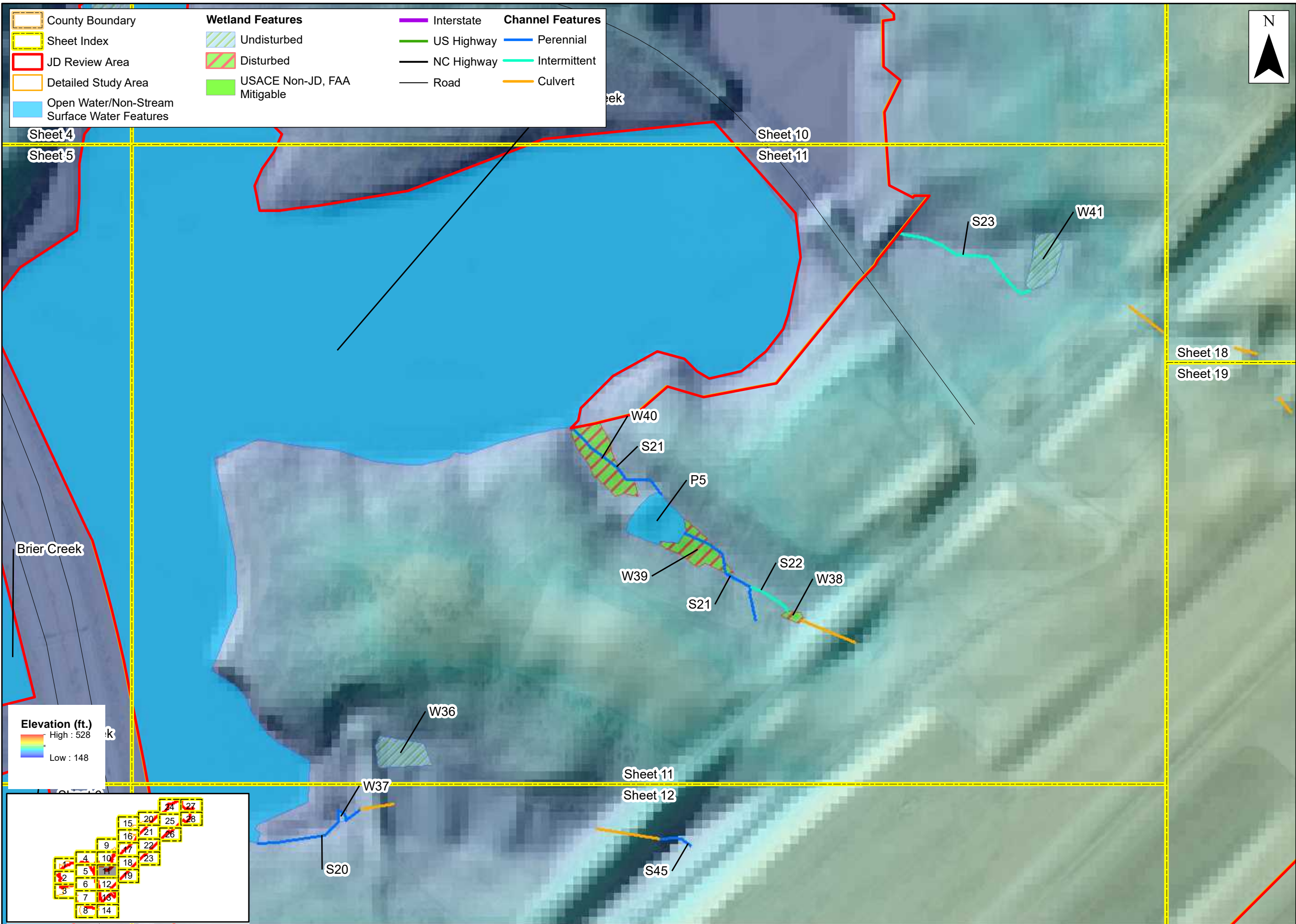
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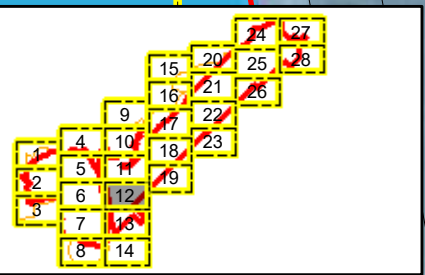


County Boundary	Wetland Features	Interstate	Channel Features
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JD Review Area	Disturbed	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert
Open Water/Non-Stream Surface Water Features			



Elevation (ft.)

High : 528
Low : 148



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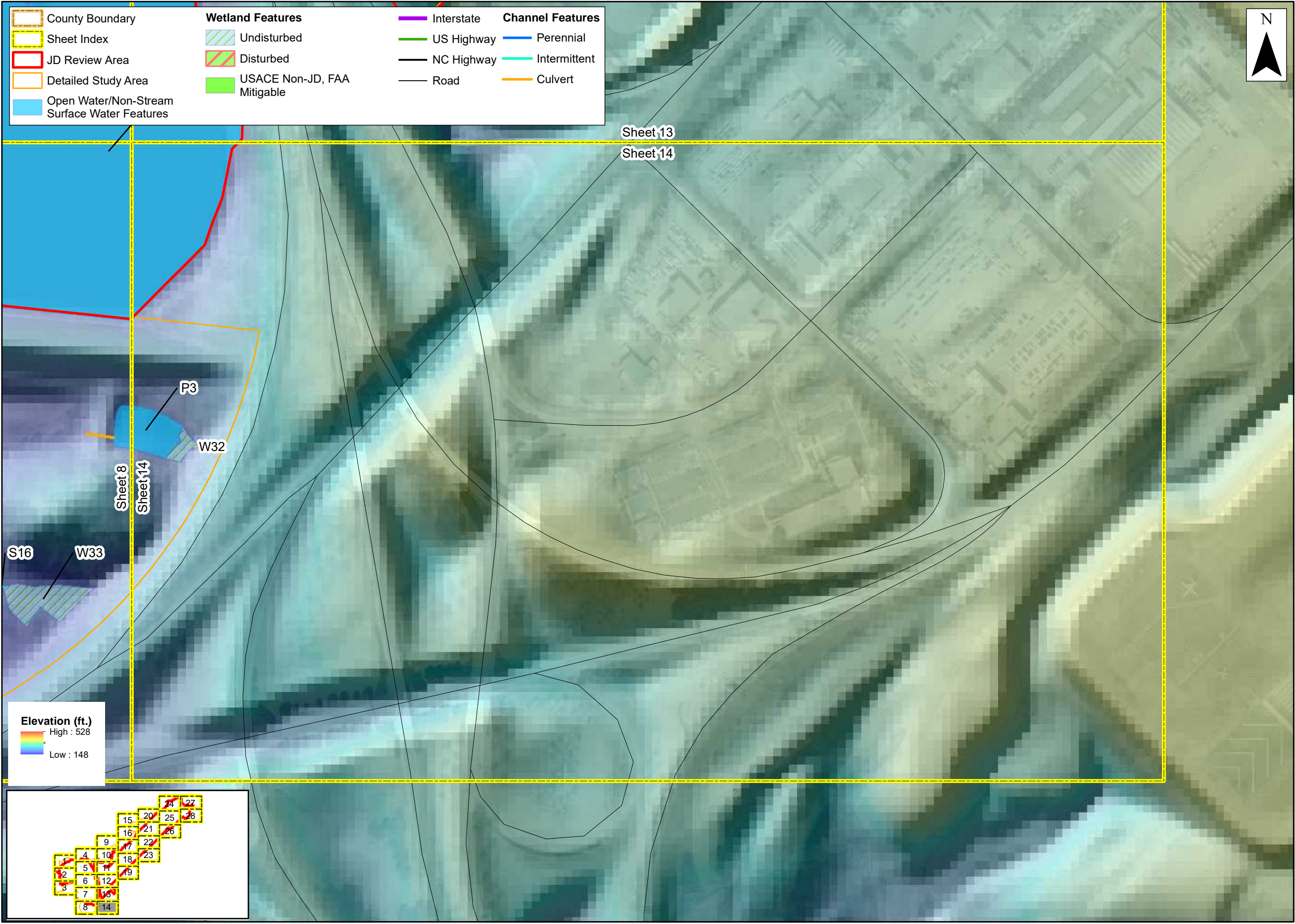
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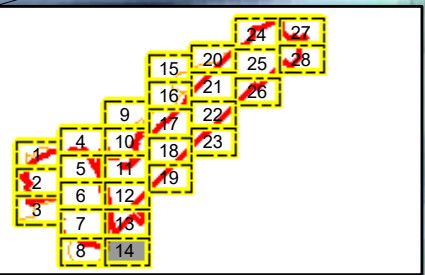
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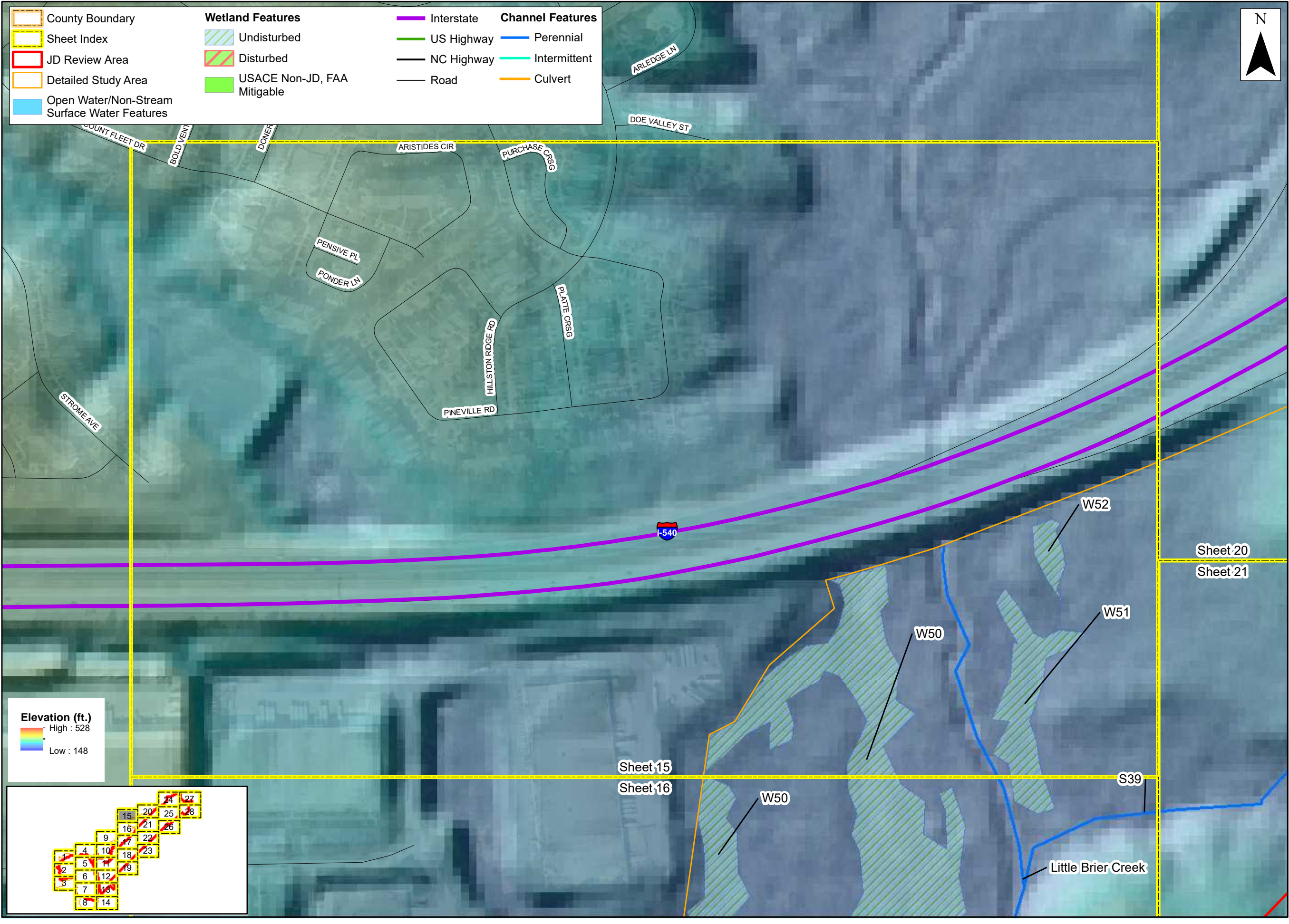
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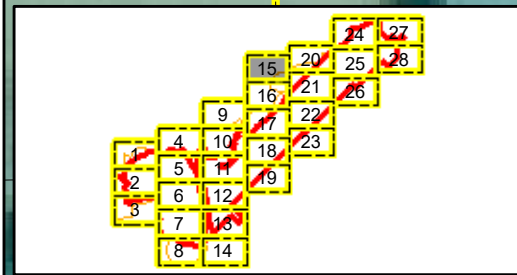
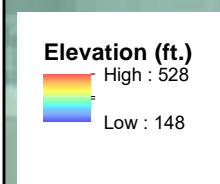
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County Boundary	Wetland Features	Interstate	Channel Features
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JD Review Area	Disturbed	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert
Open Water/Non-Stream Surface Water Features			



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County Boundary

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JD Review Area

Detailed Study Area

Open Water/Non-Stream Surface Water Features

Wetland Features

Undisturbed

Disturbed

USACE Non-JD, FAA Mitigable

Channel Features

Interstate

US Highway

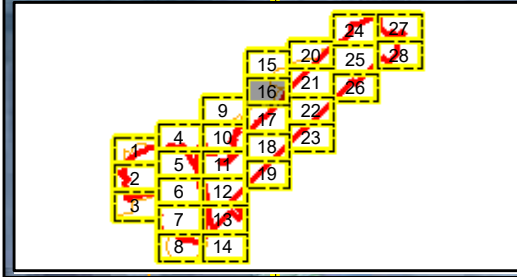
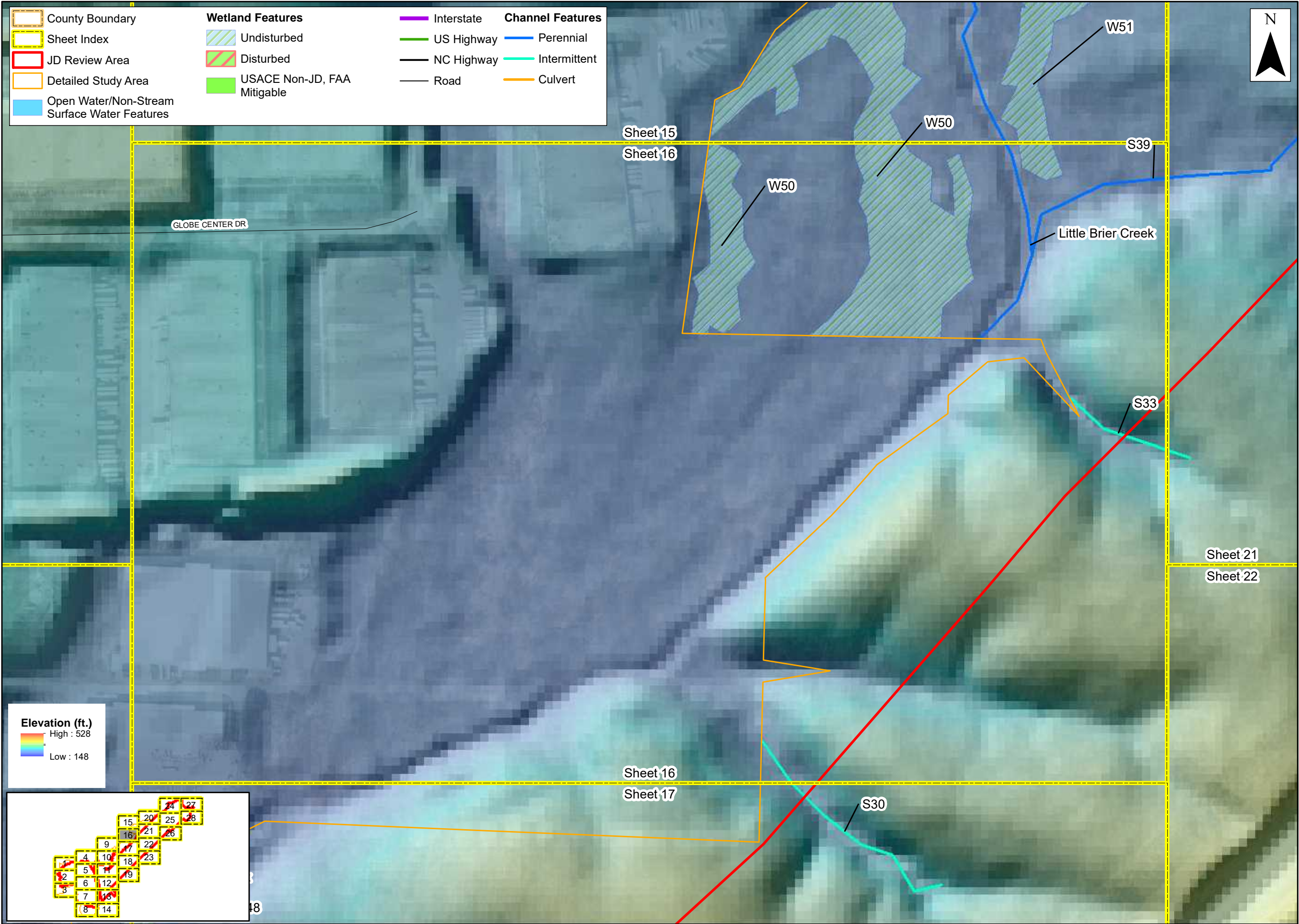
NC Highway

Road

Perennial

Intermittent

Culvert



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Wake County, North Carolina

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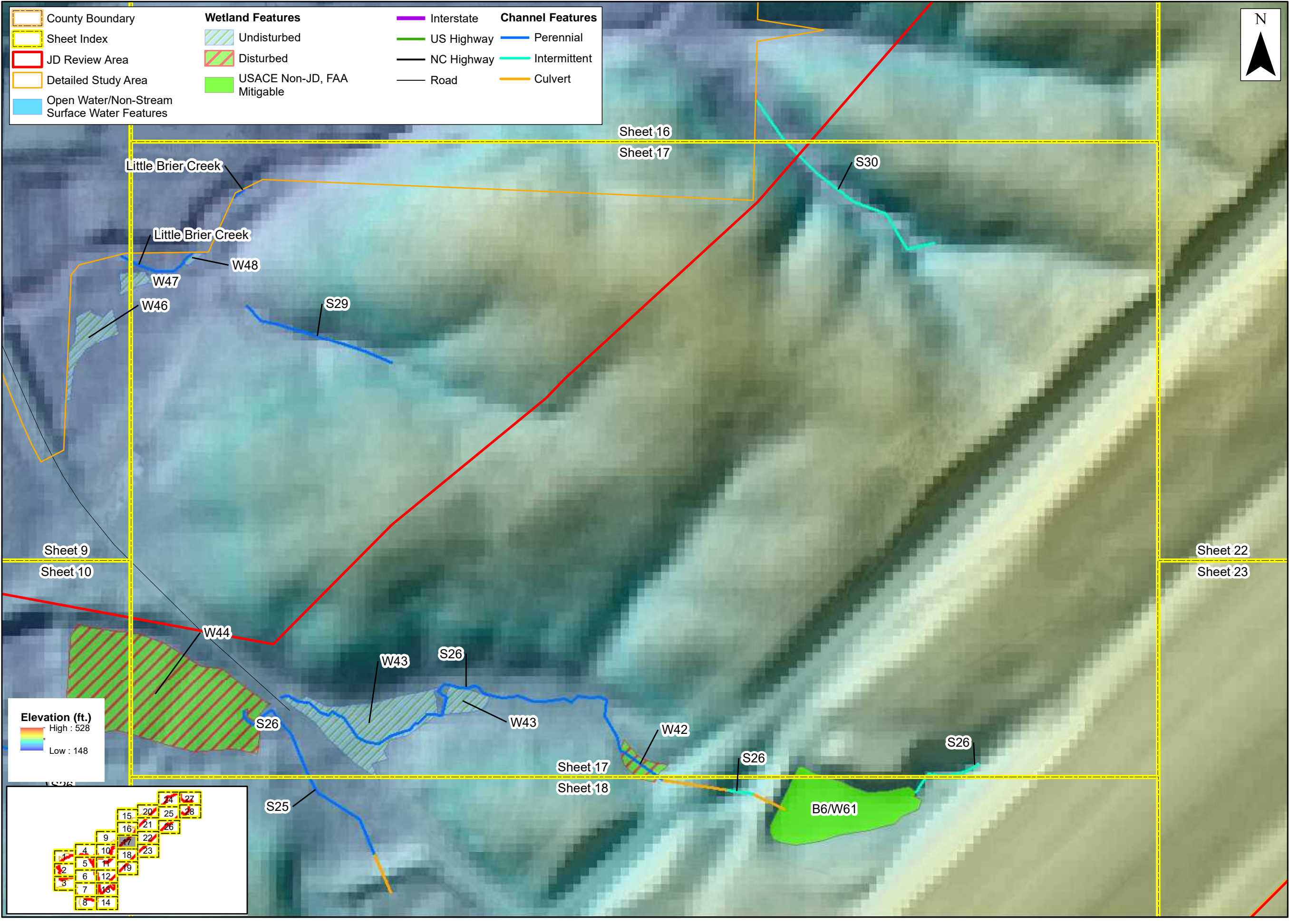
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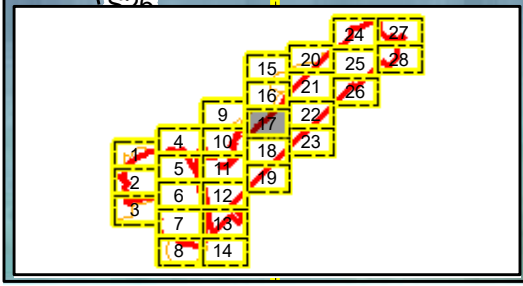


County Boundary	Wetland Features	Interstate	Channel Features
Sheet Index	Undisturbed	US Highway	Perennial
JD Review Area	Disturbed	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert
Open Water/Non-Stream Surface Water Features			



Elevation (ft.)

High : 528
Low : 148



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Wetland Features

Undisturbed

Disturbed

USACE Non-JD, FAA Mitigable

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Channel Features

Perennial

Intermittent

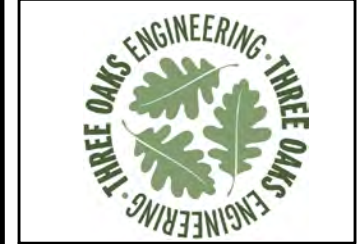
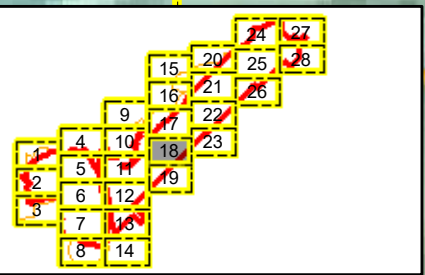
Culvert



Elevation (ft.)

High : 528

Low : 148



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	Open Water/Non-Stream Surface Water Features						

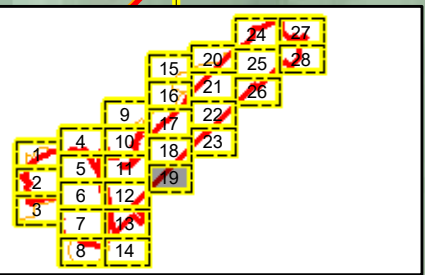


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Elevation (ft.)

High : 528
Low : 148



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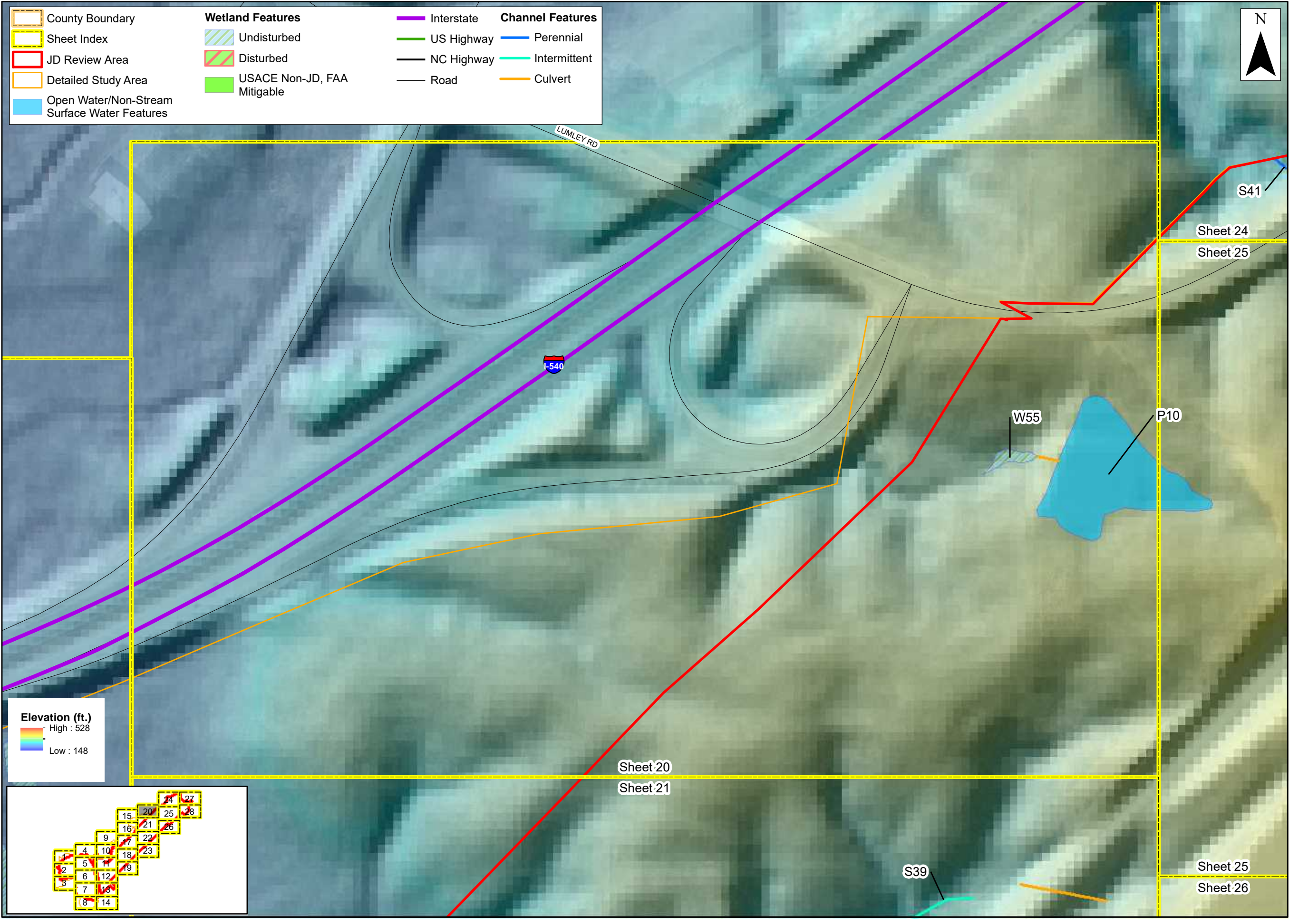
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Perennial

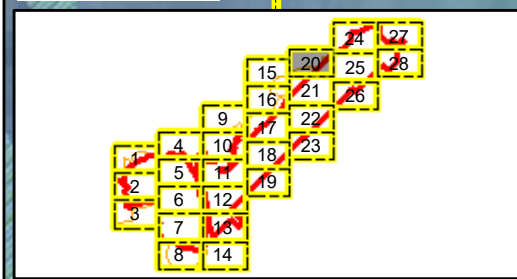
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Culvert

Elevation (ft.)

High : 528

Low : 148



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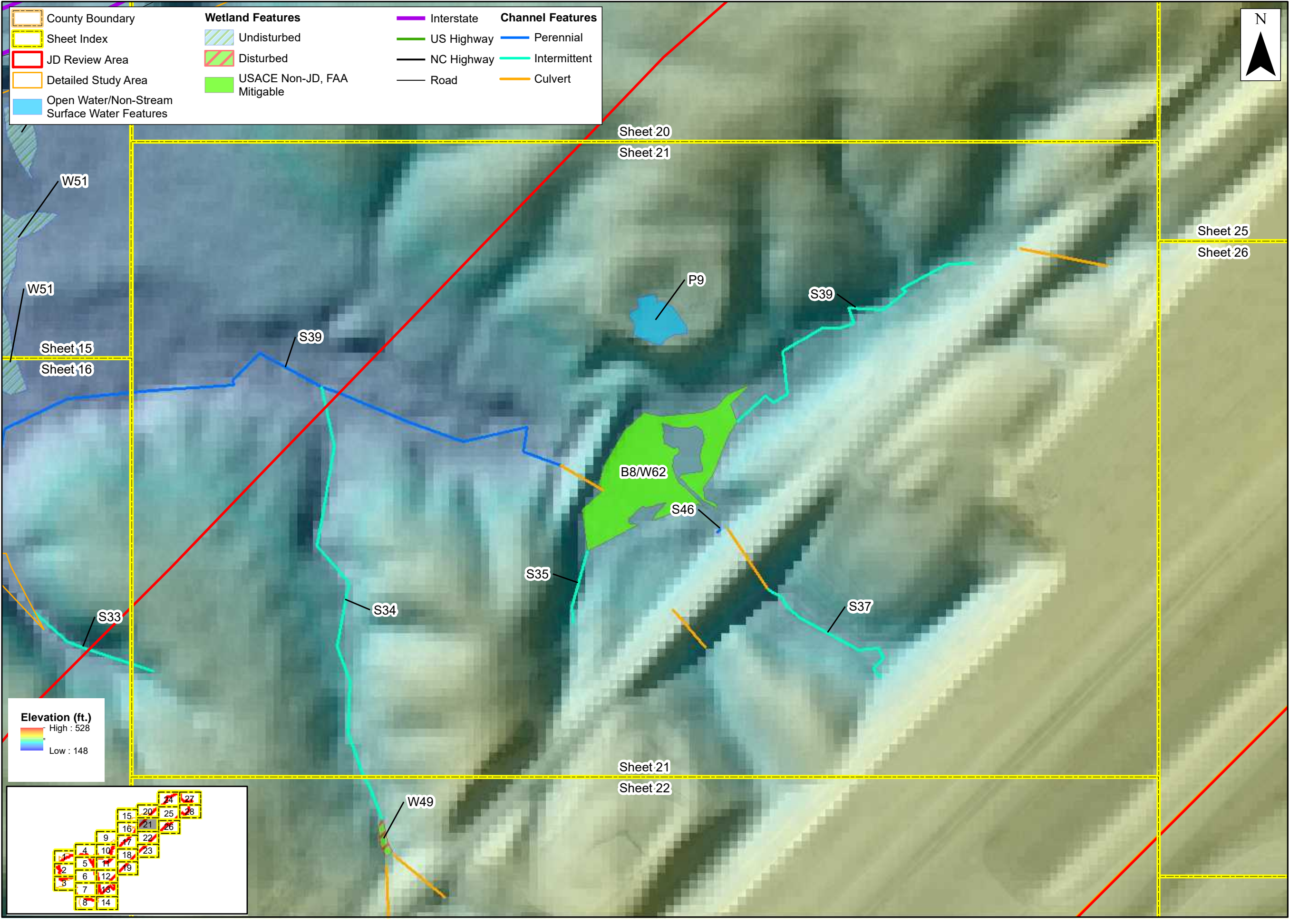
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Elevation (ft.)

High : 528

Low : 148

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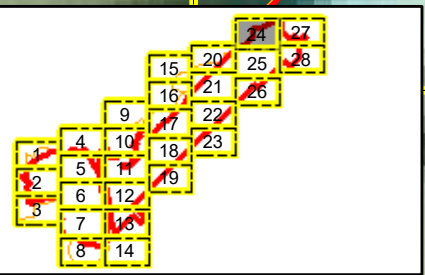
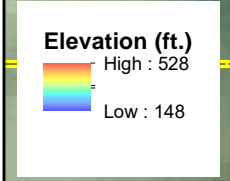
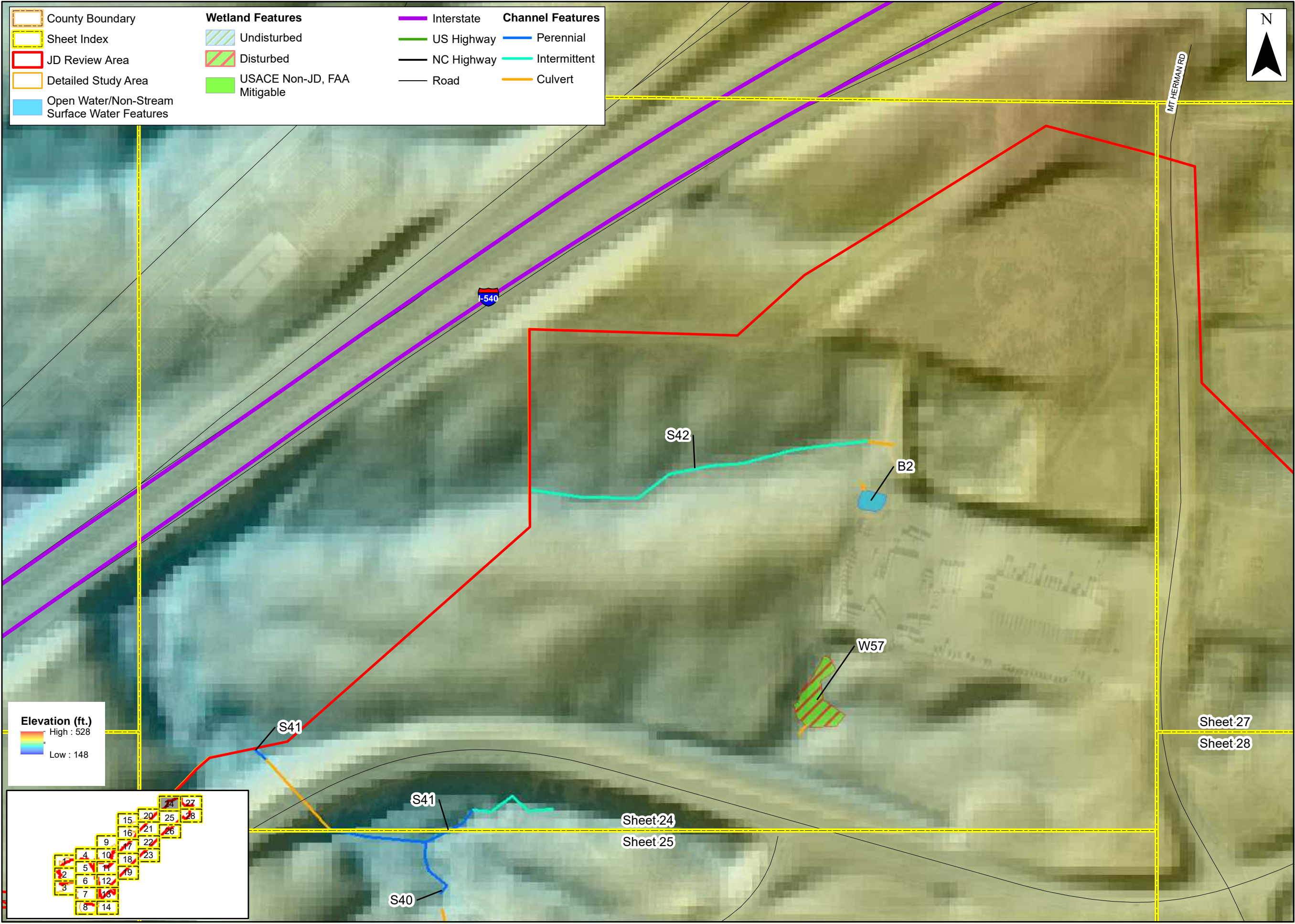
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NC Highway

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Channel Features

Perennial

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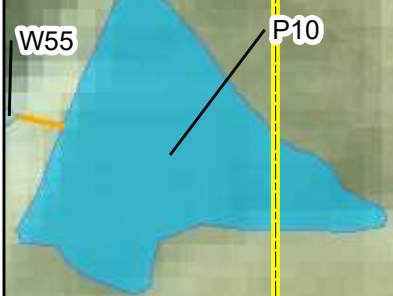
Culvert



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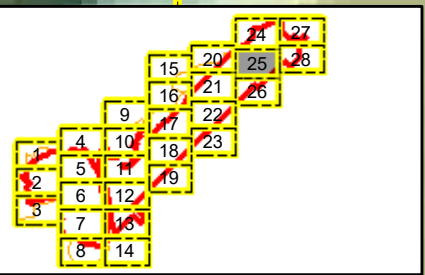
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Elevation (ft.)

High : 528

Low : 148



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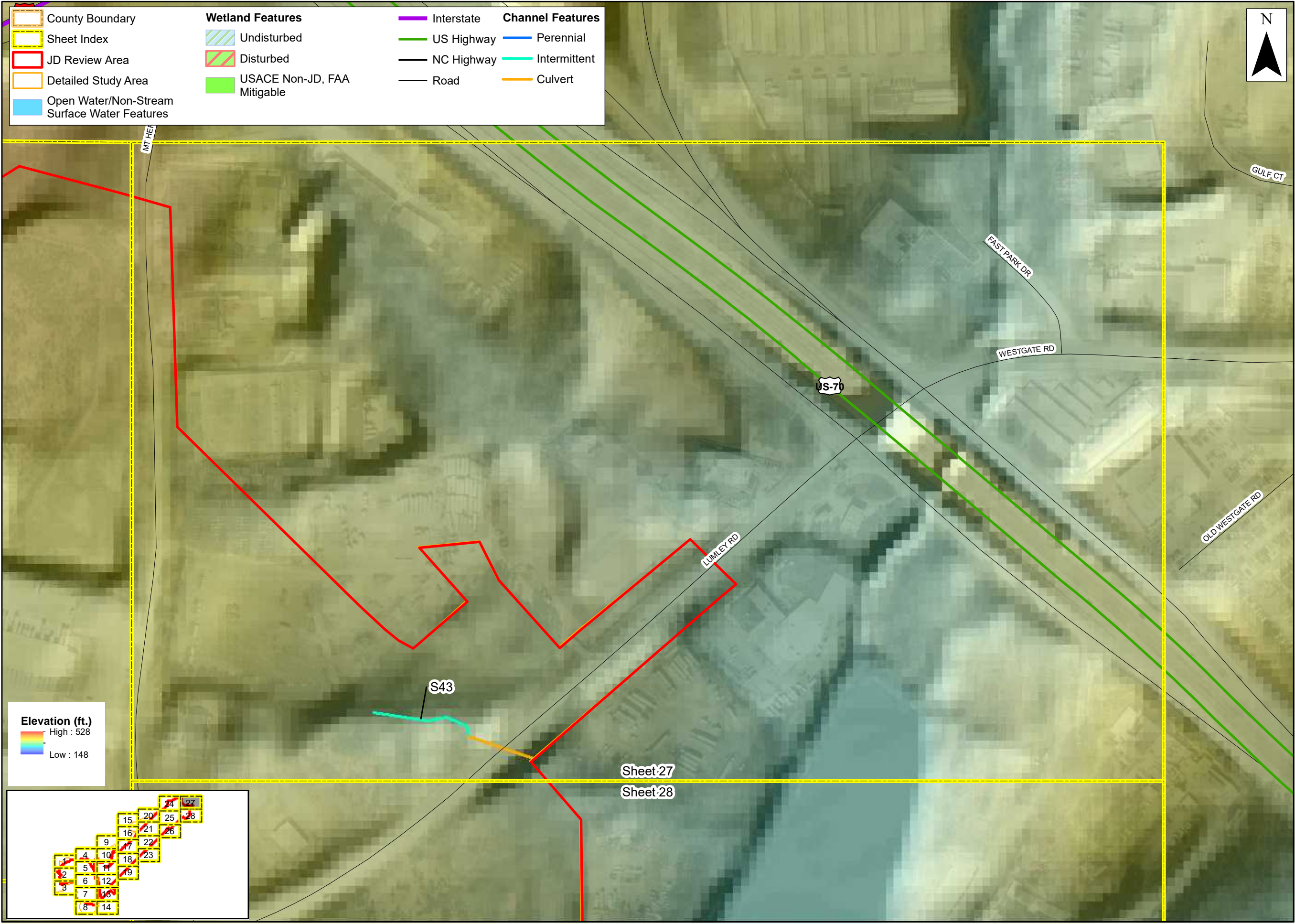
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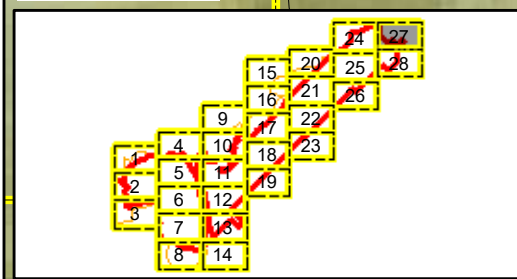
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Culvert

Elevation (ft.)

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Low : 148



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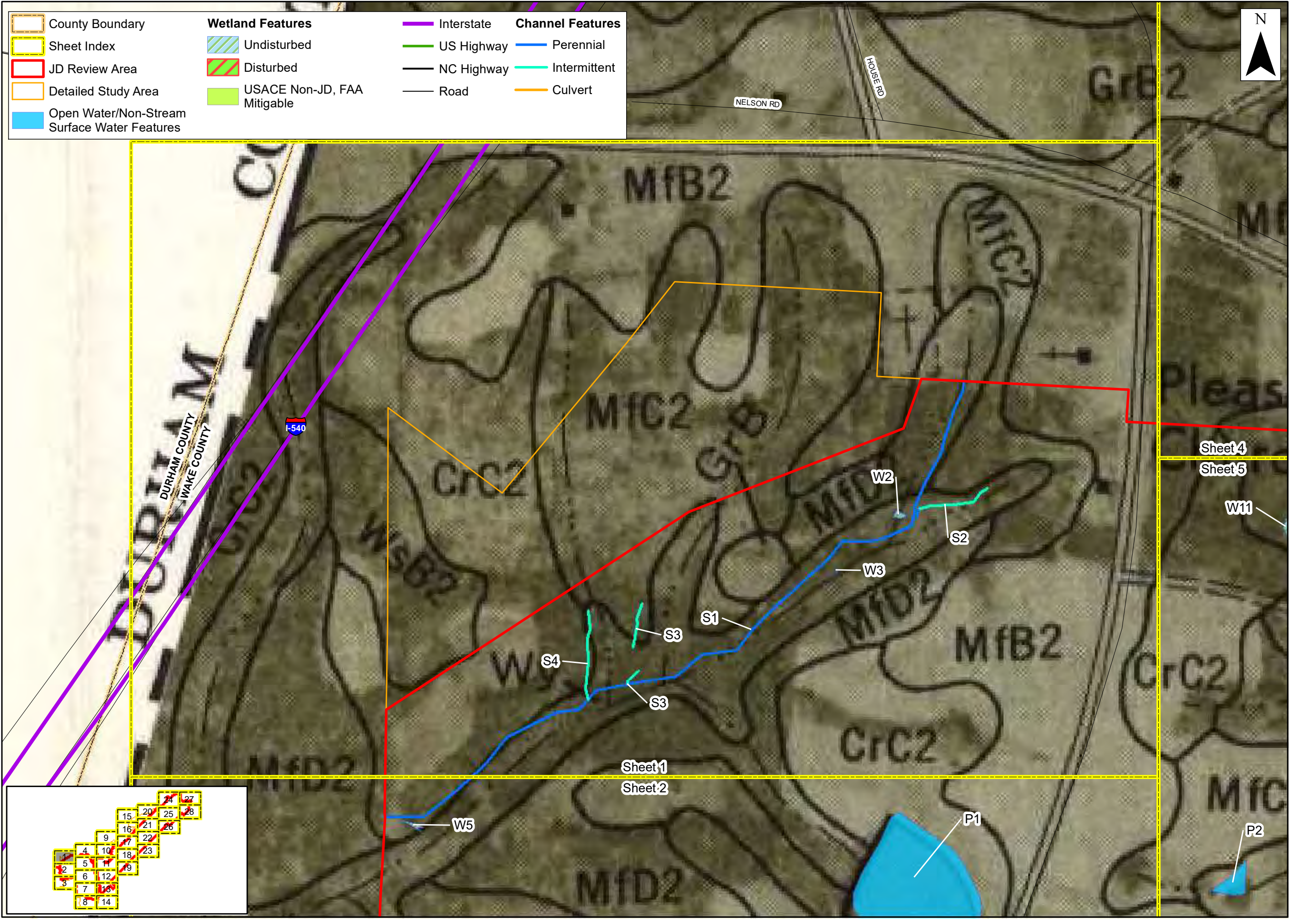
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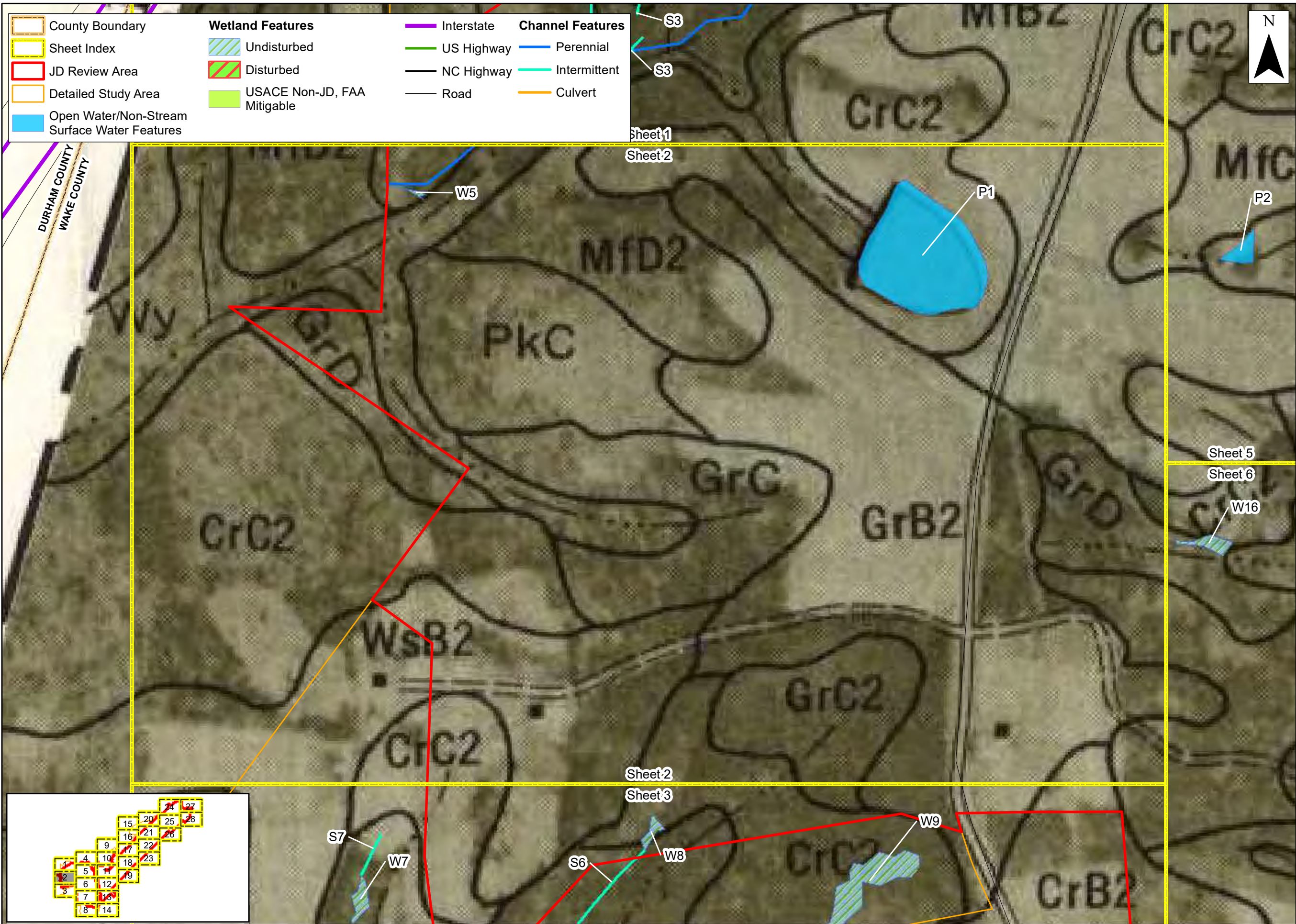
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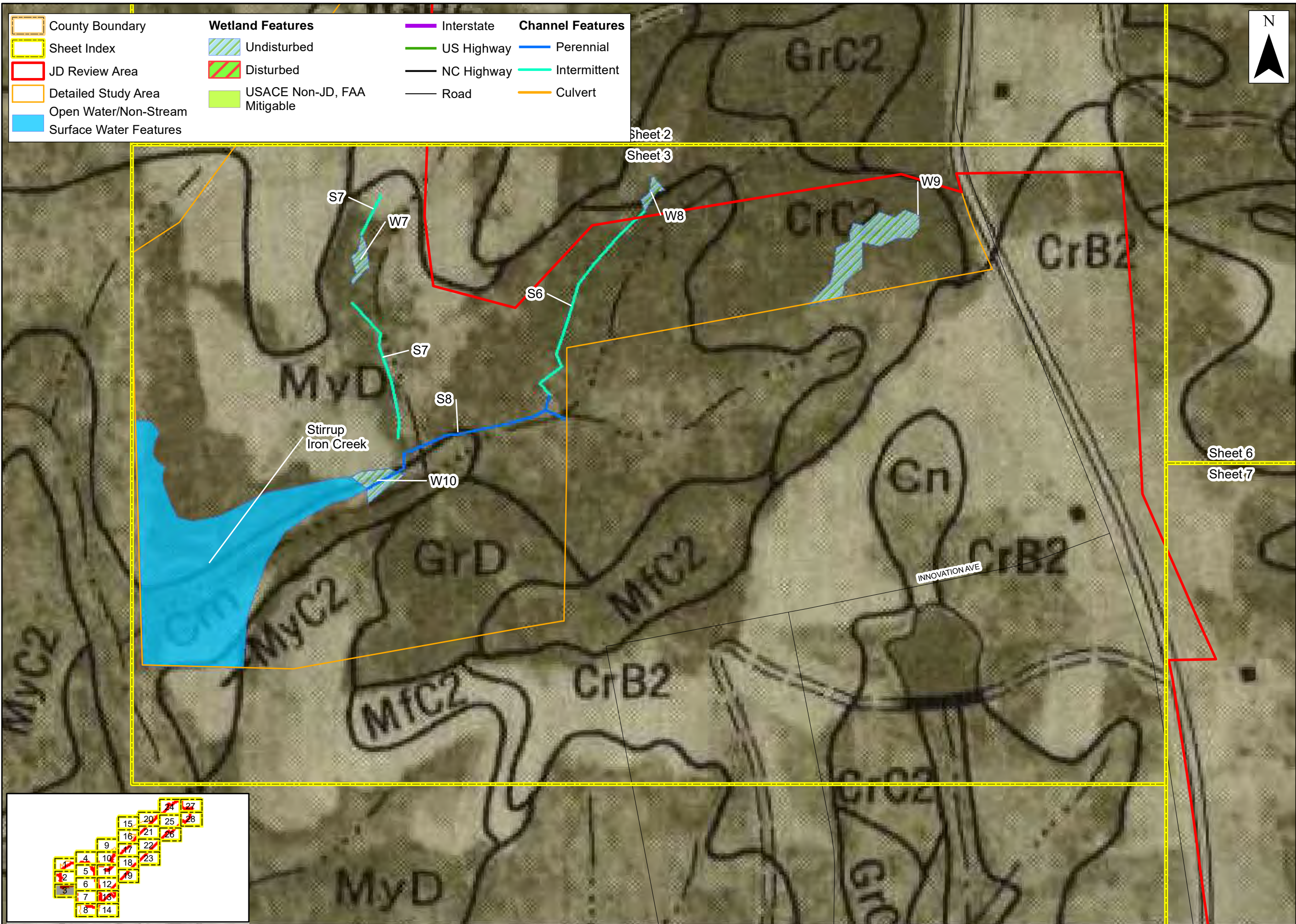
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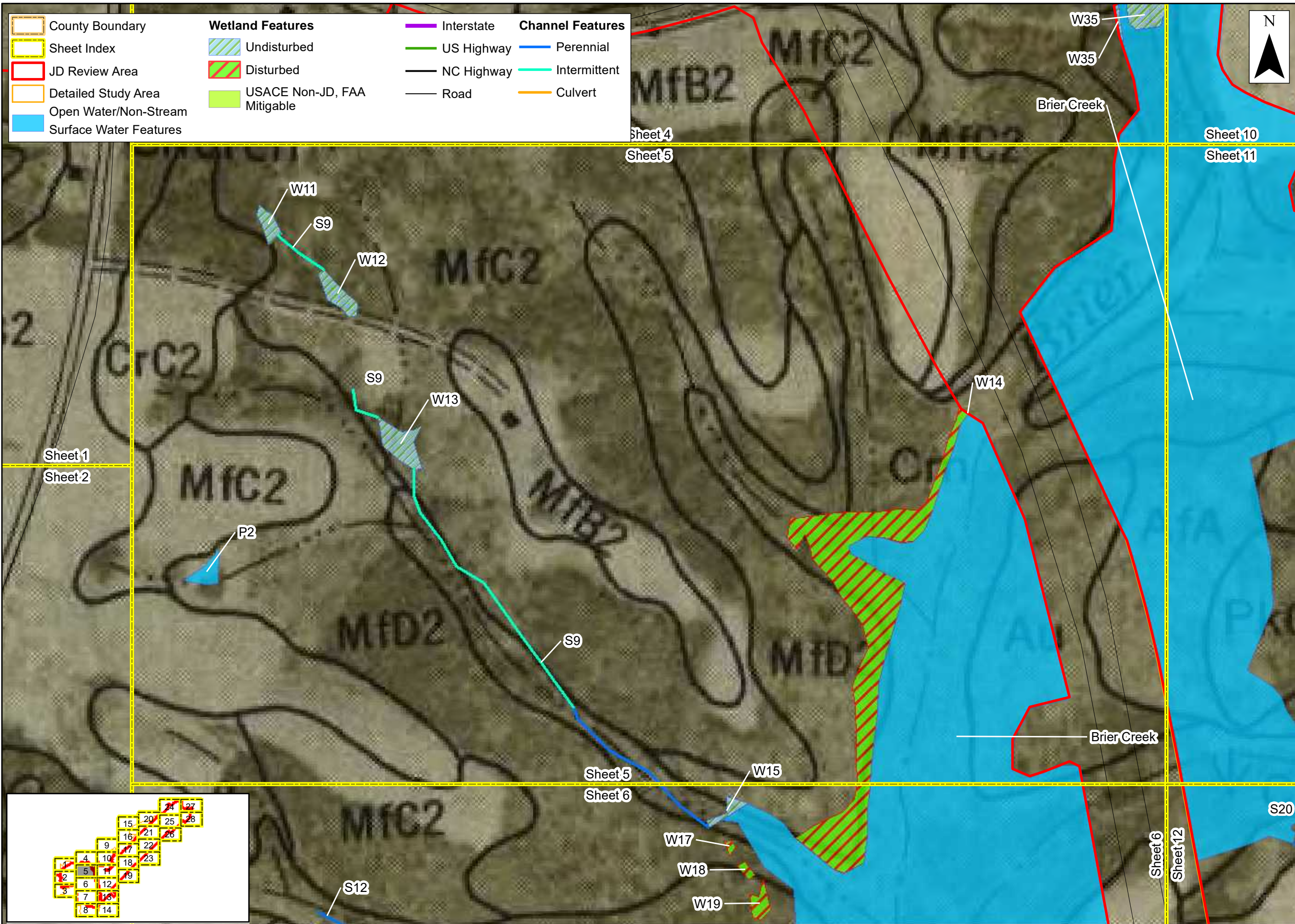
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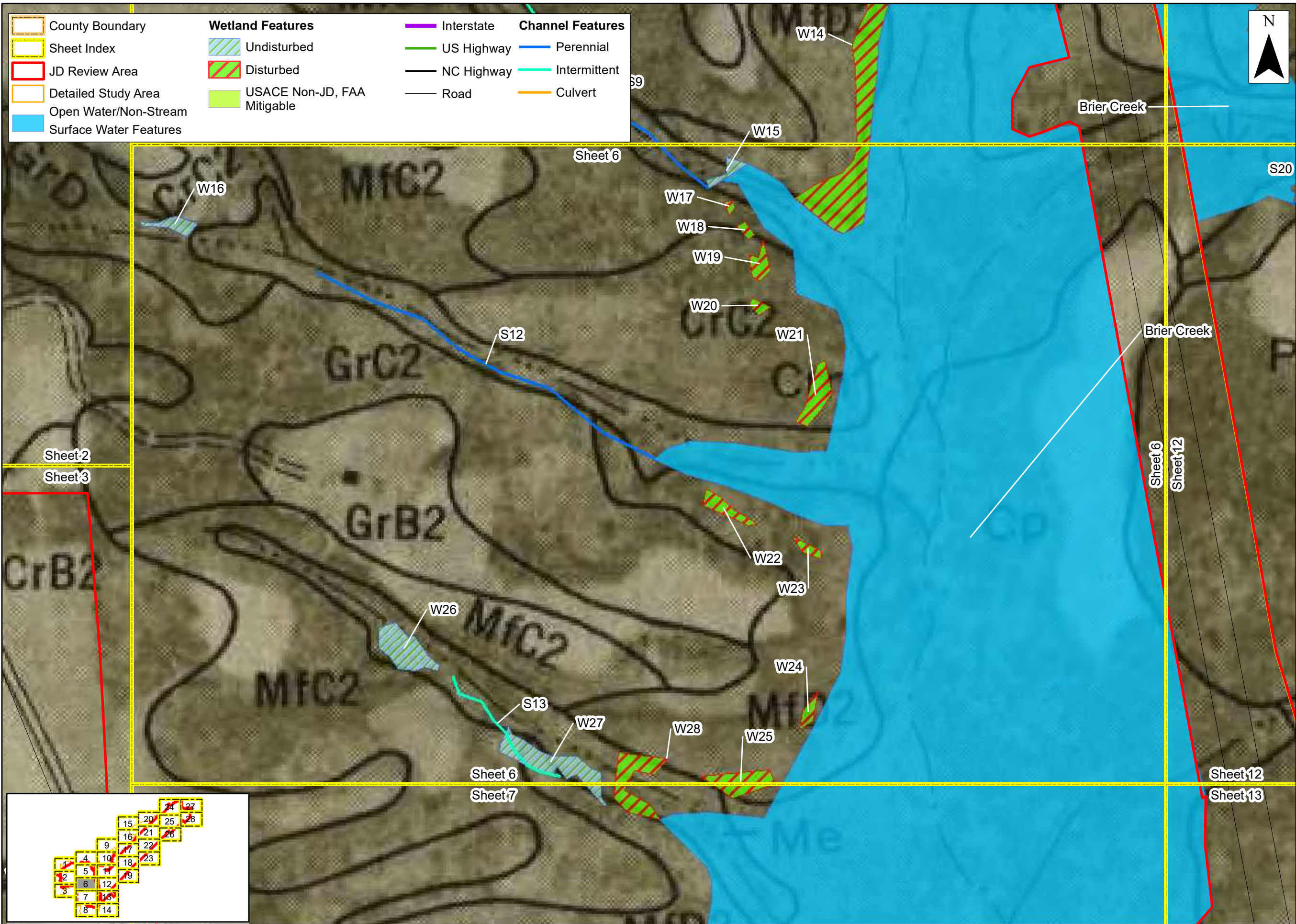
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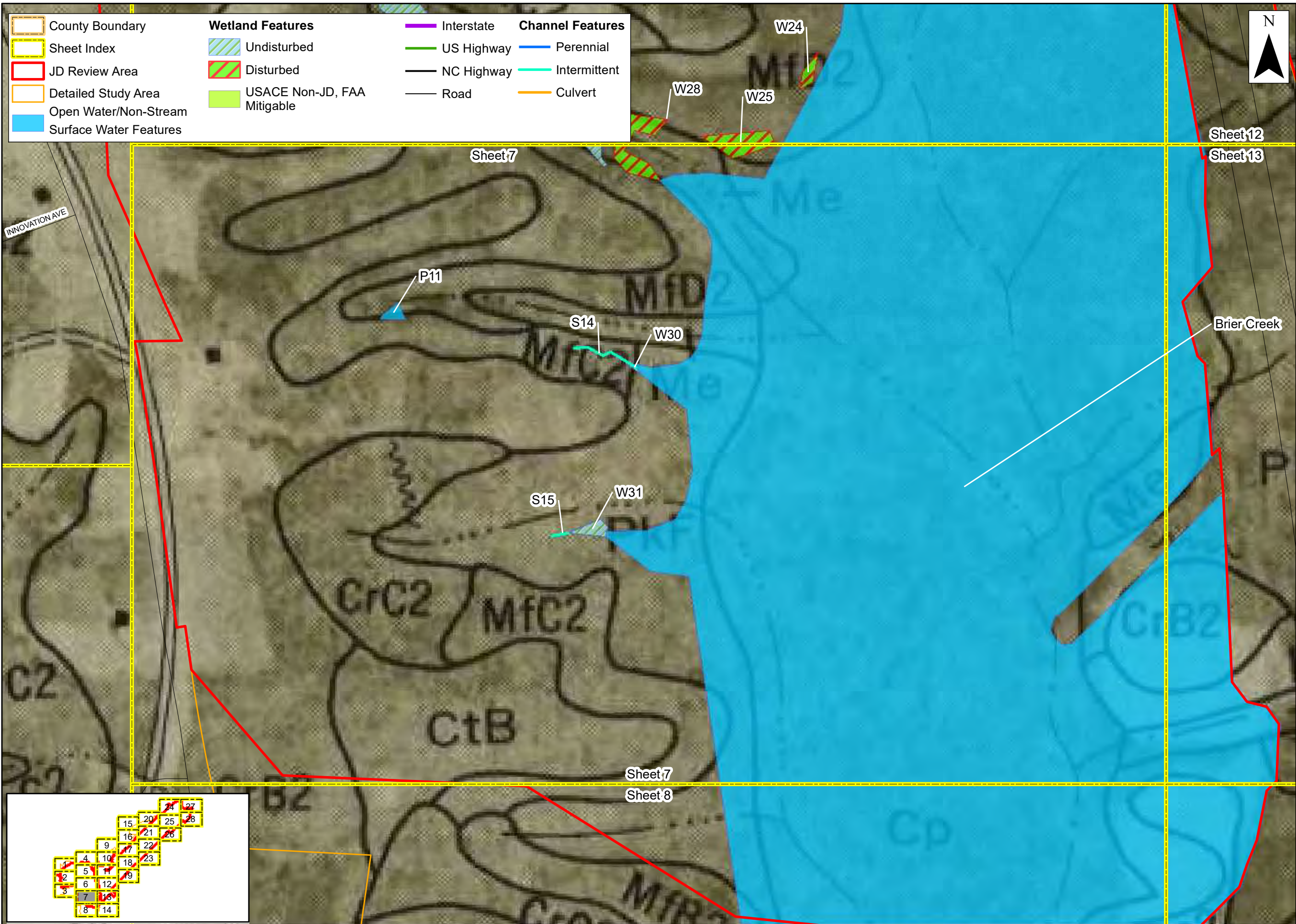
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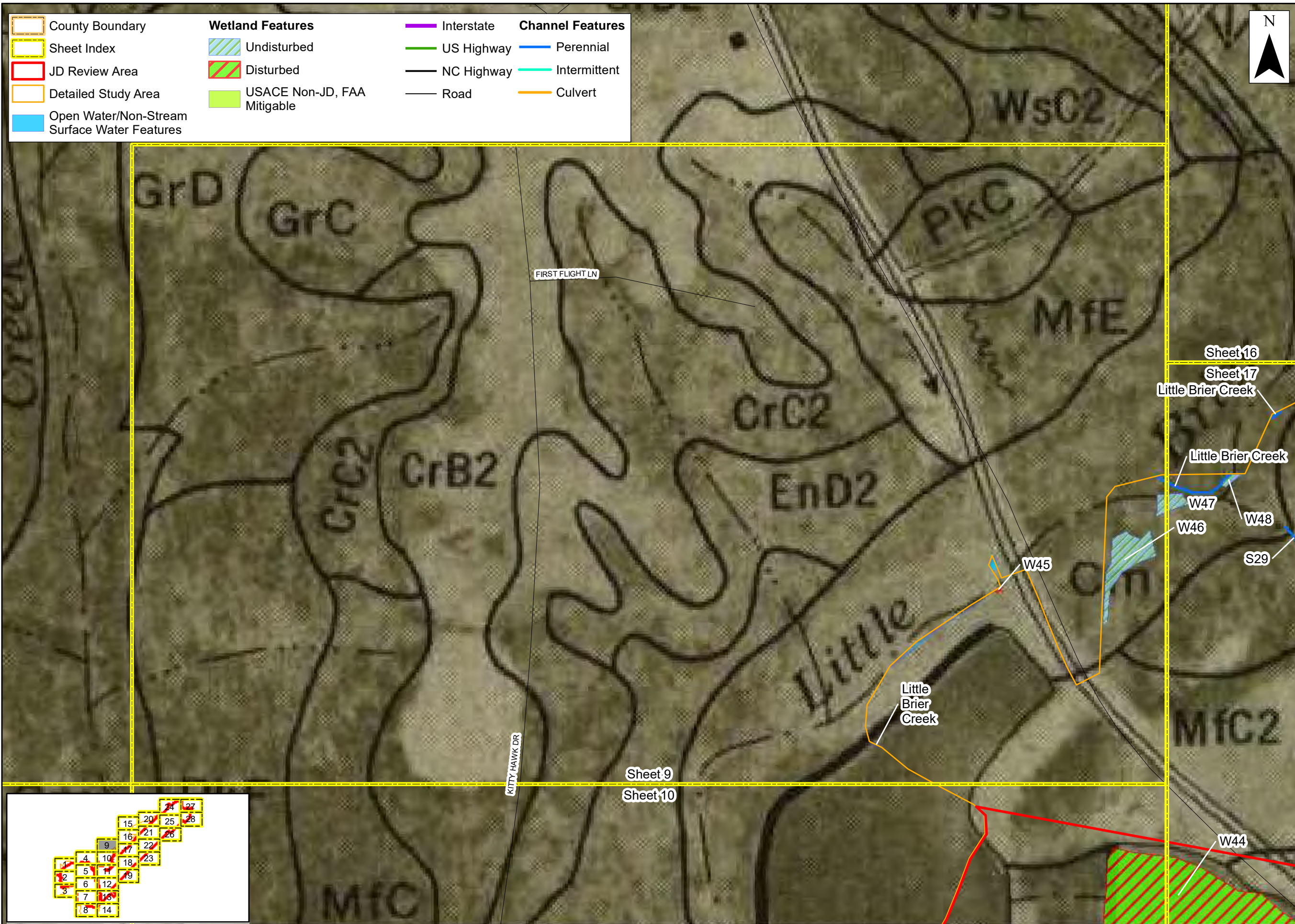
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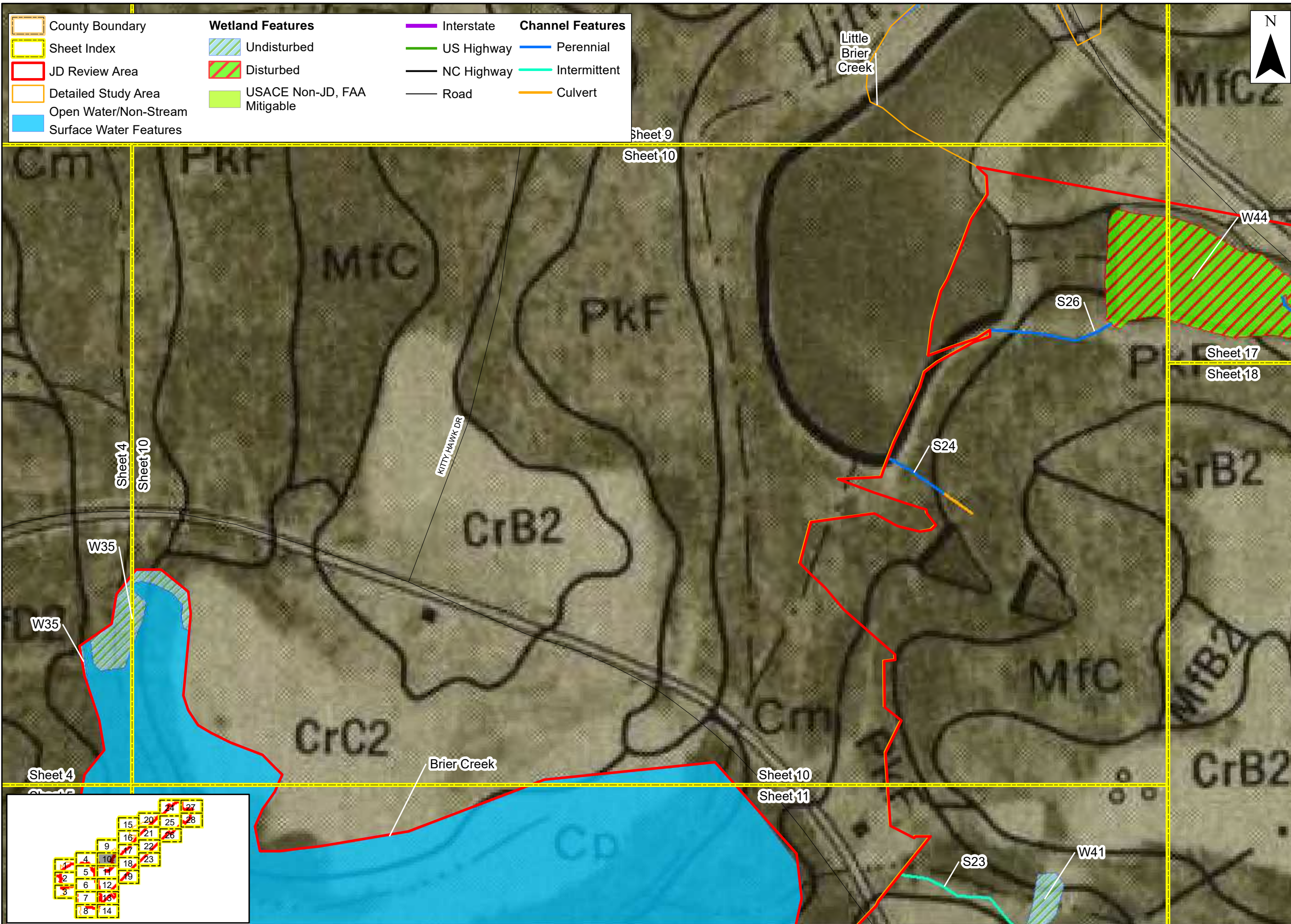
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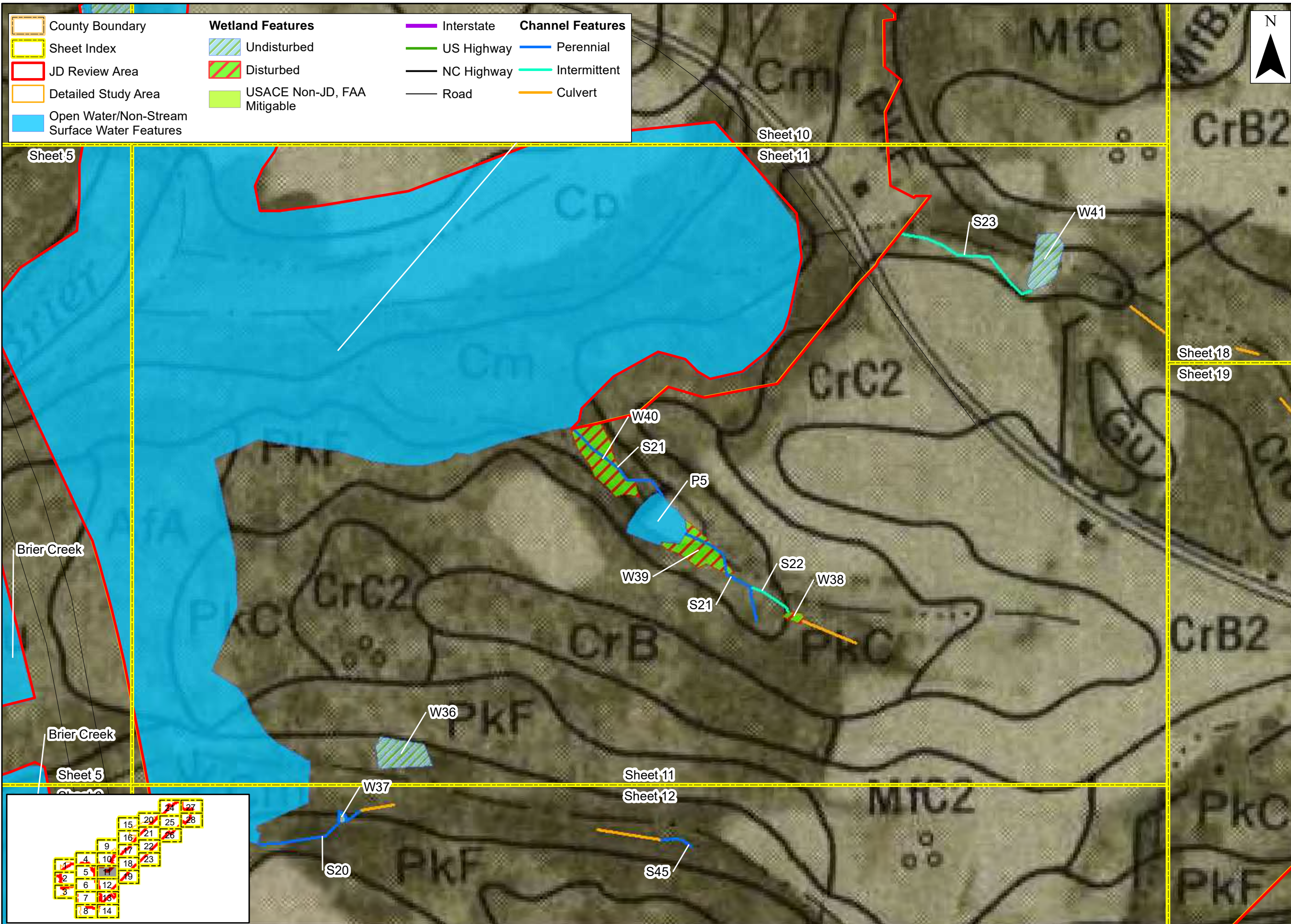
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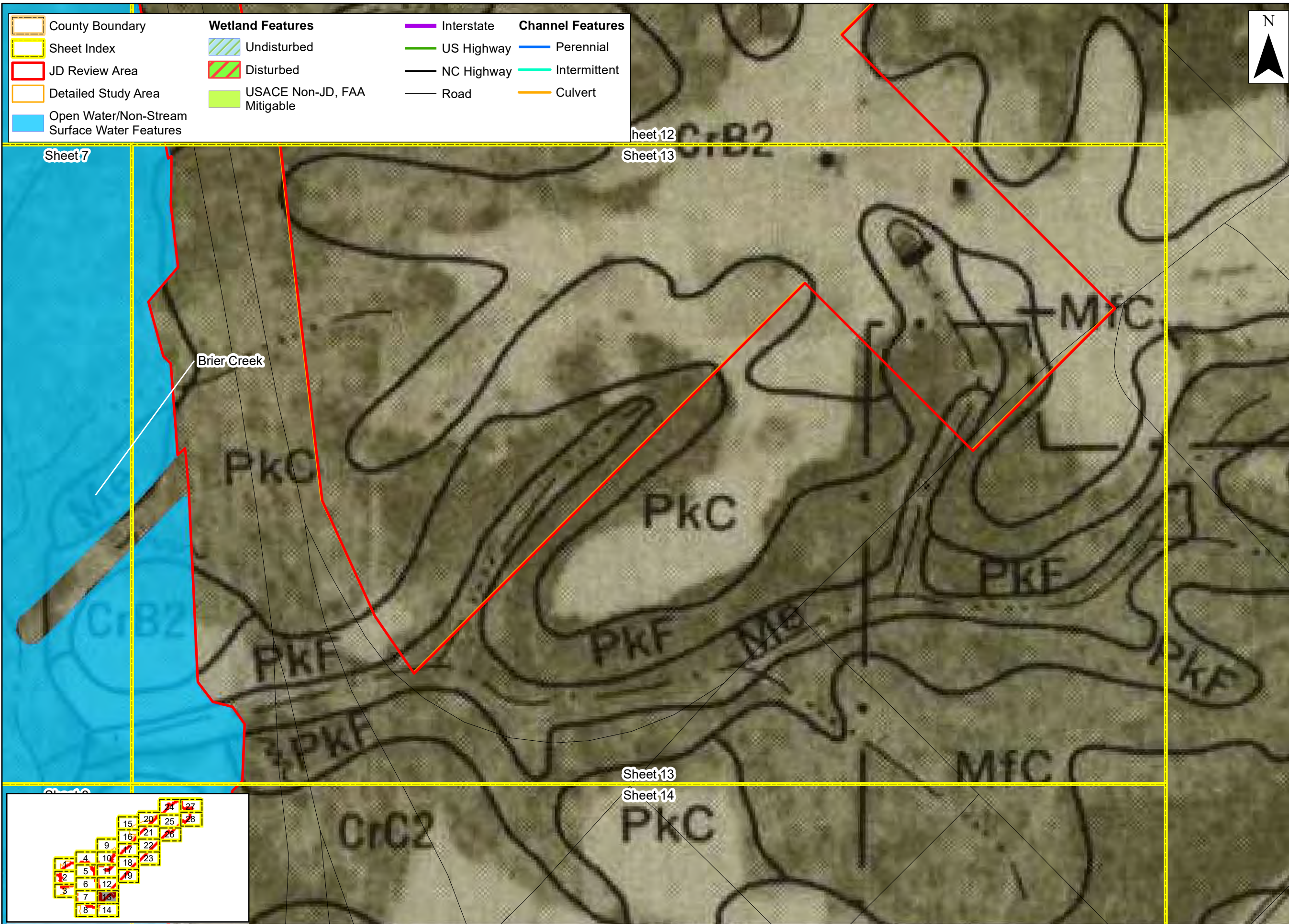
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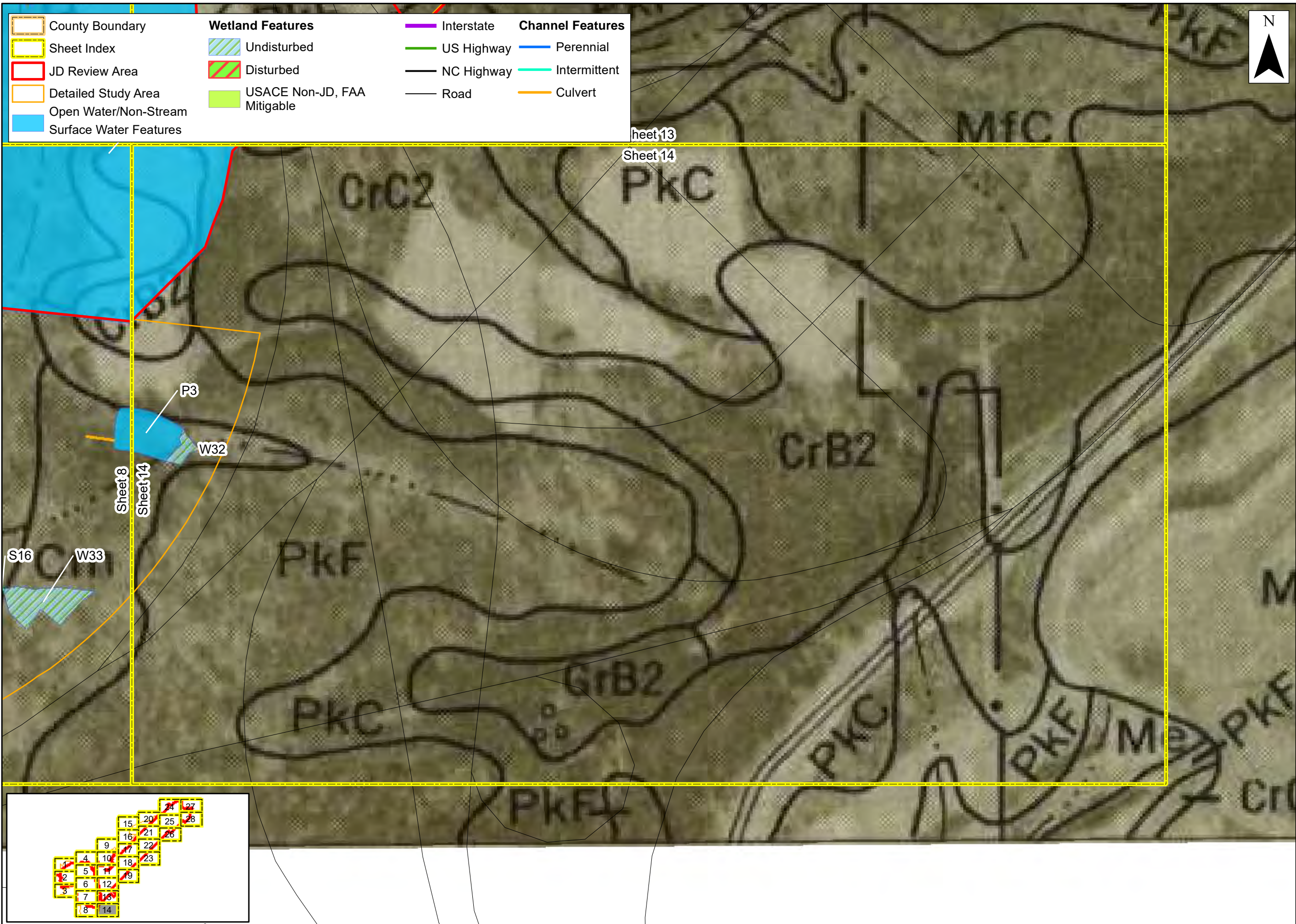
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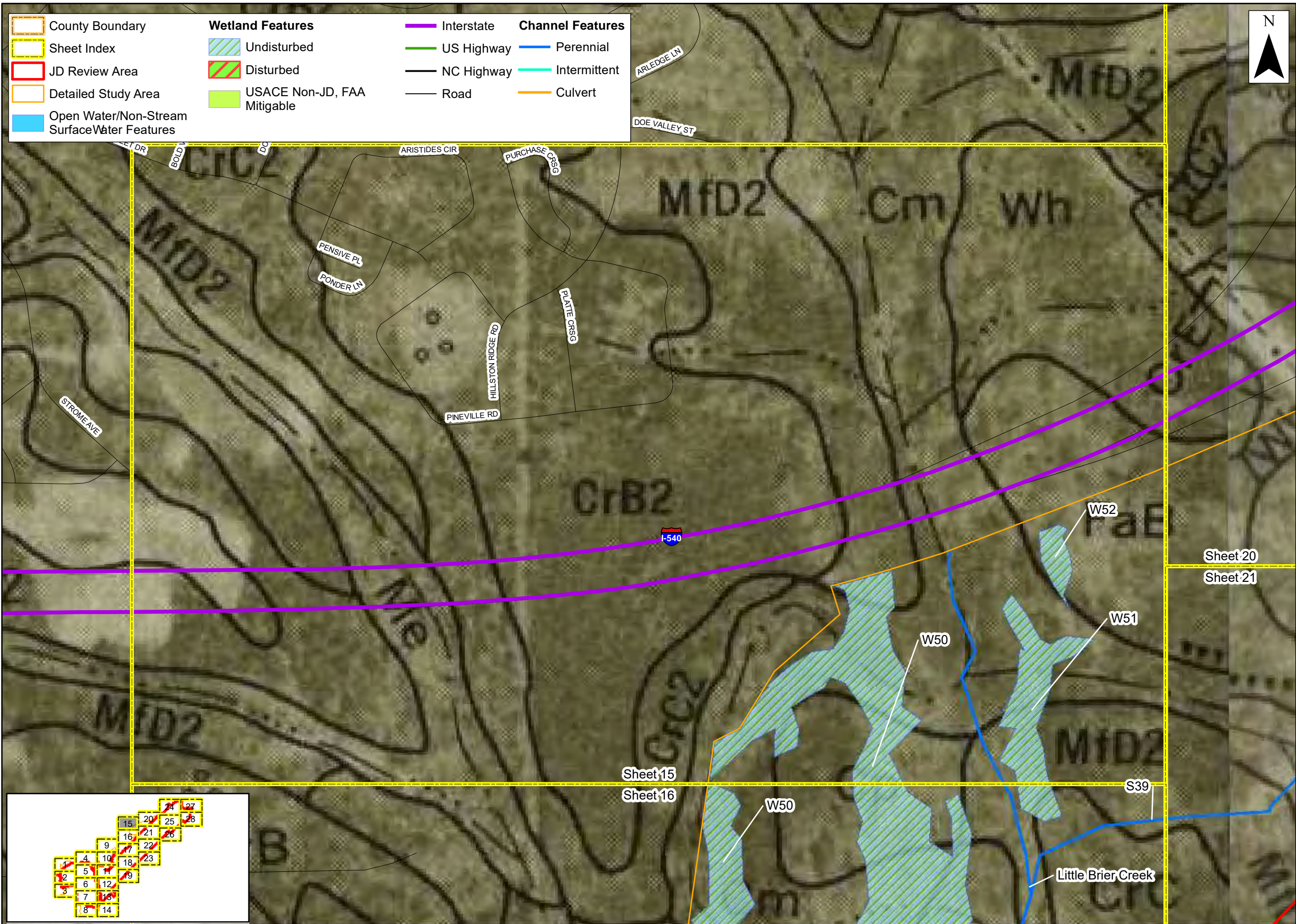
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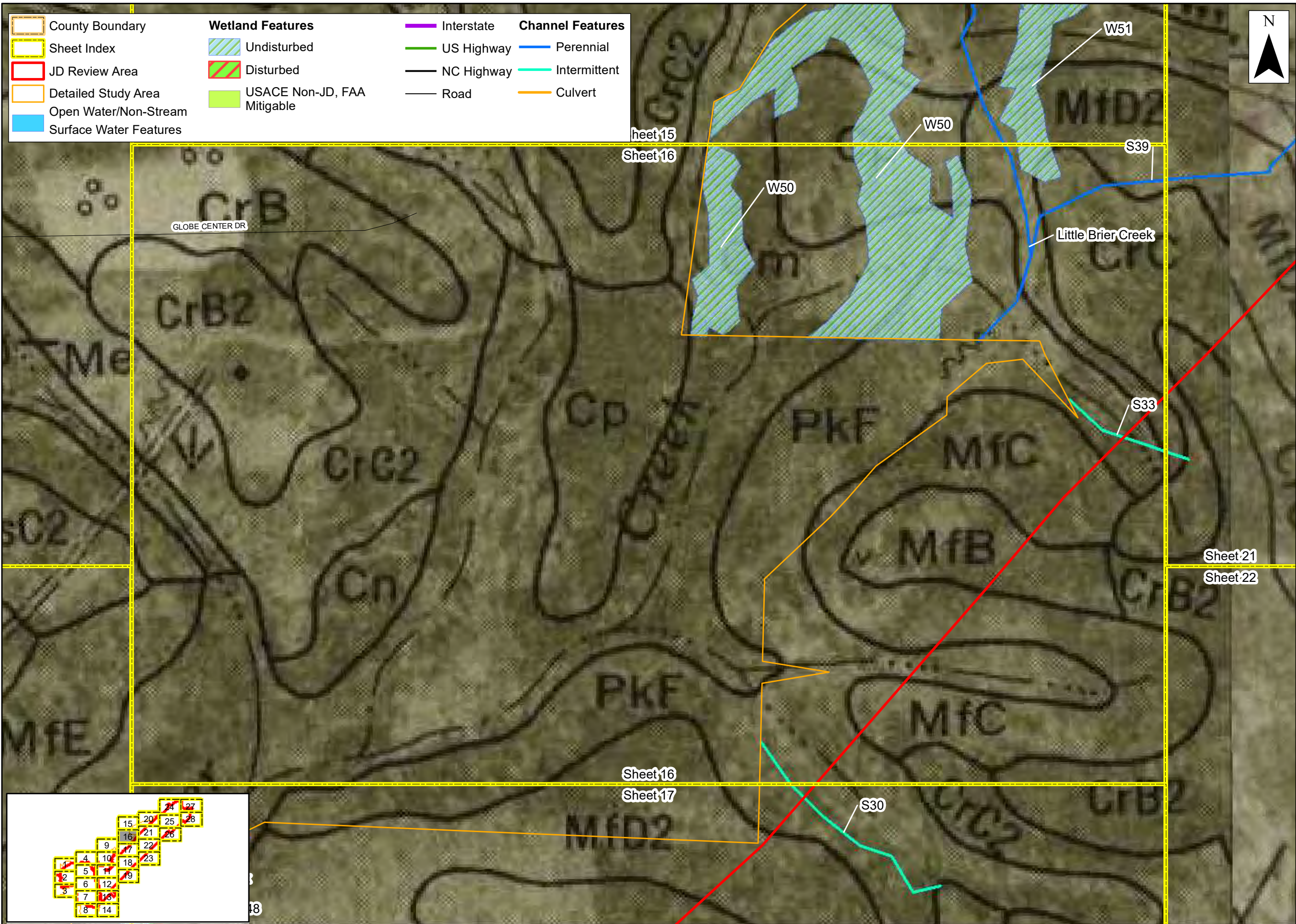
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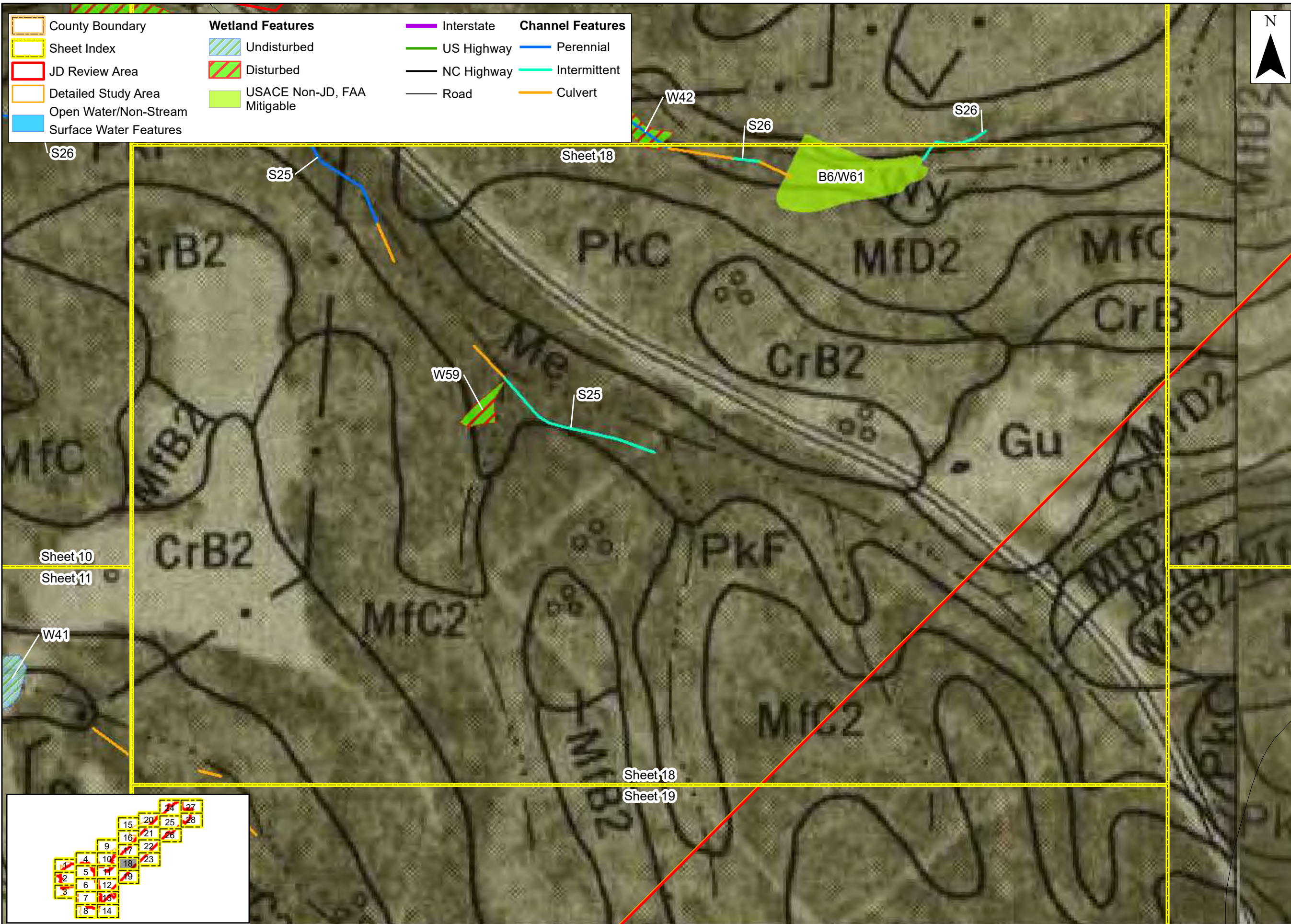
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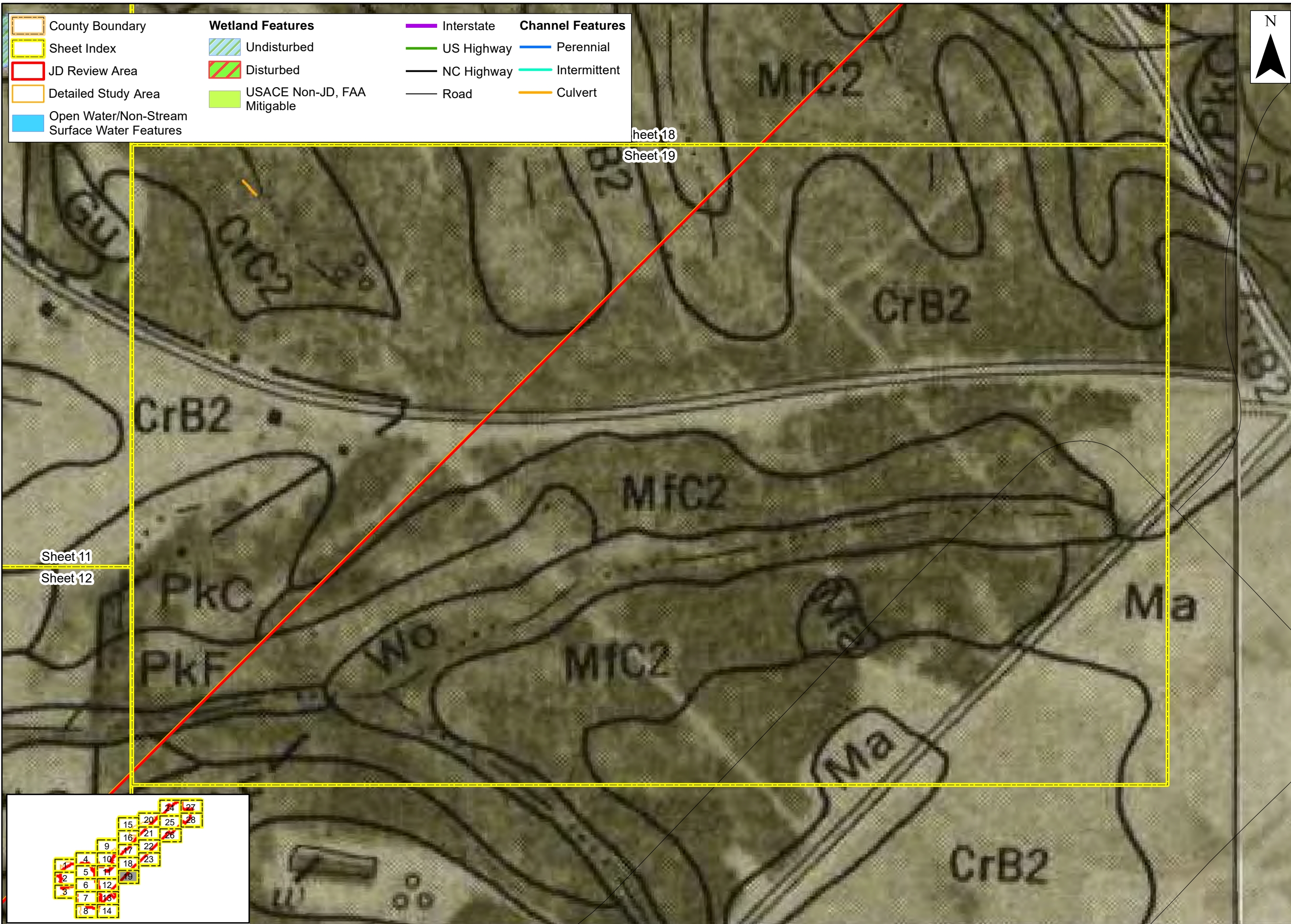
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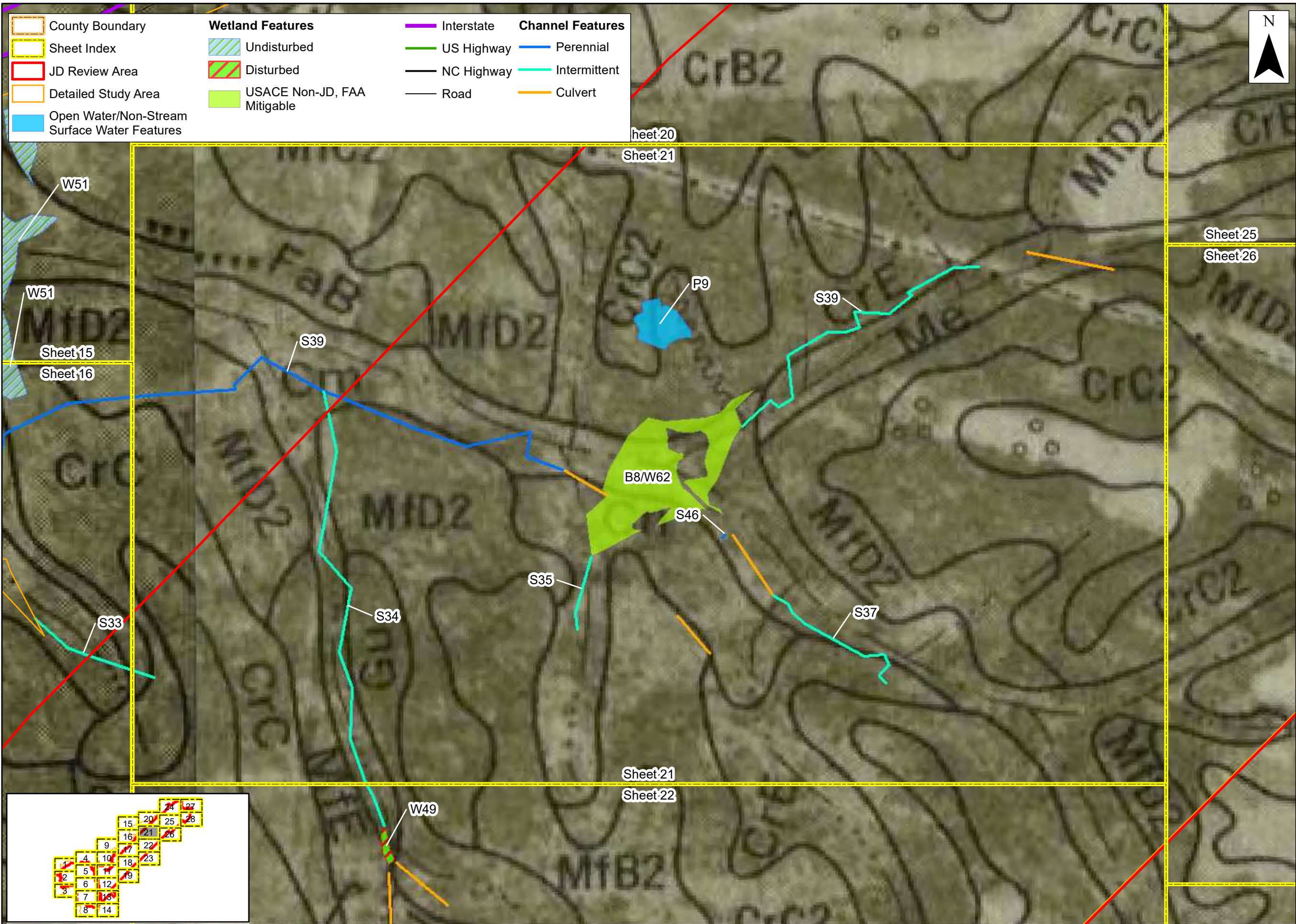
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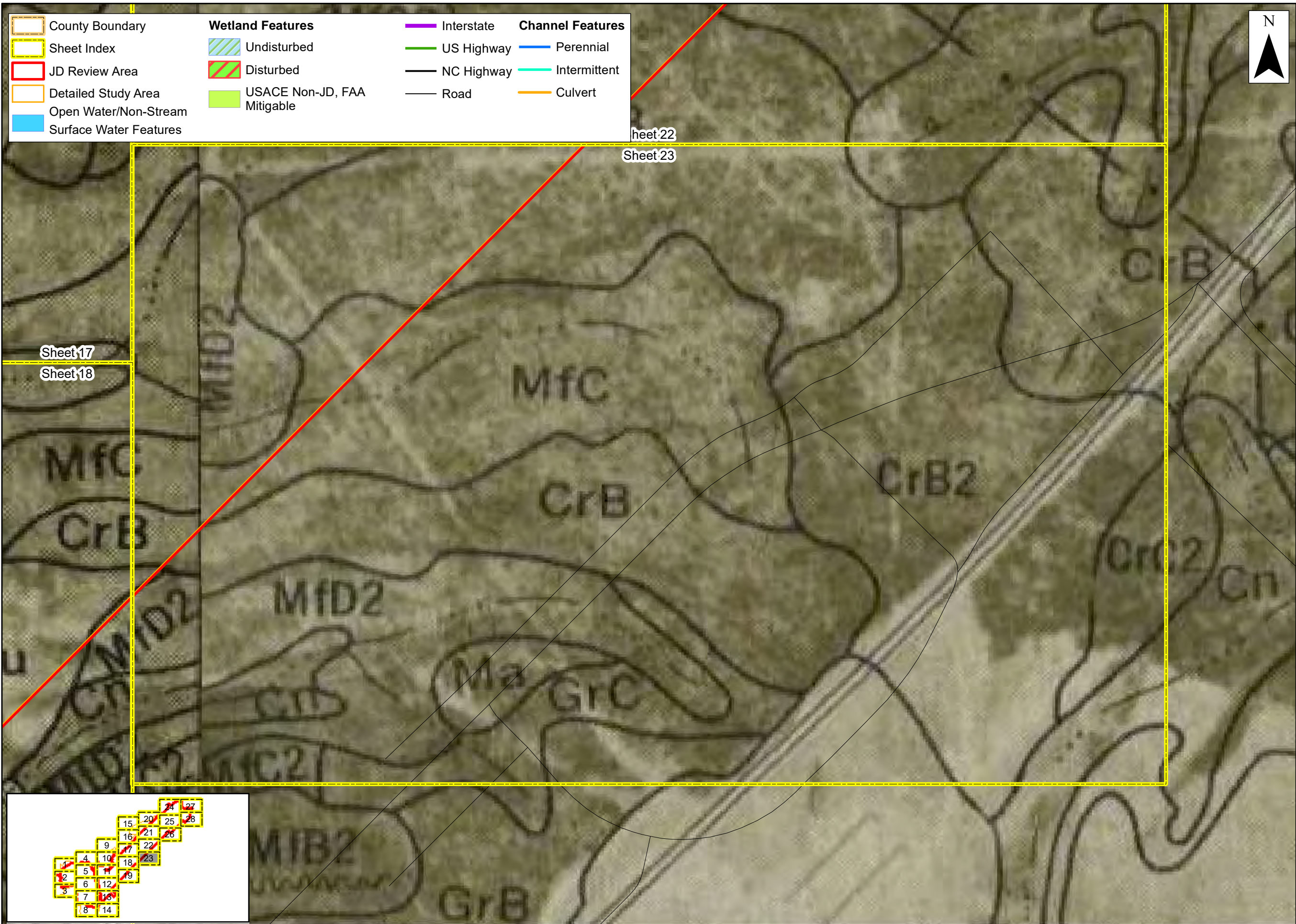
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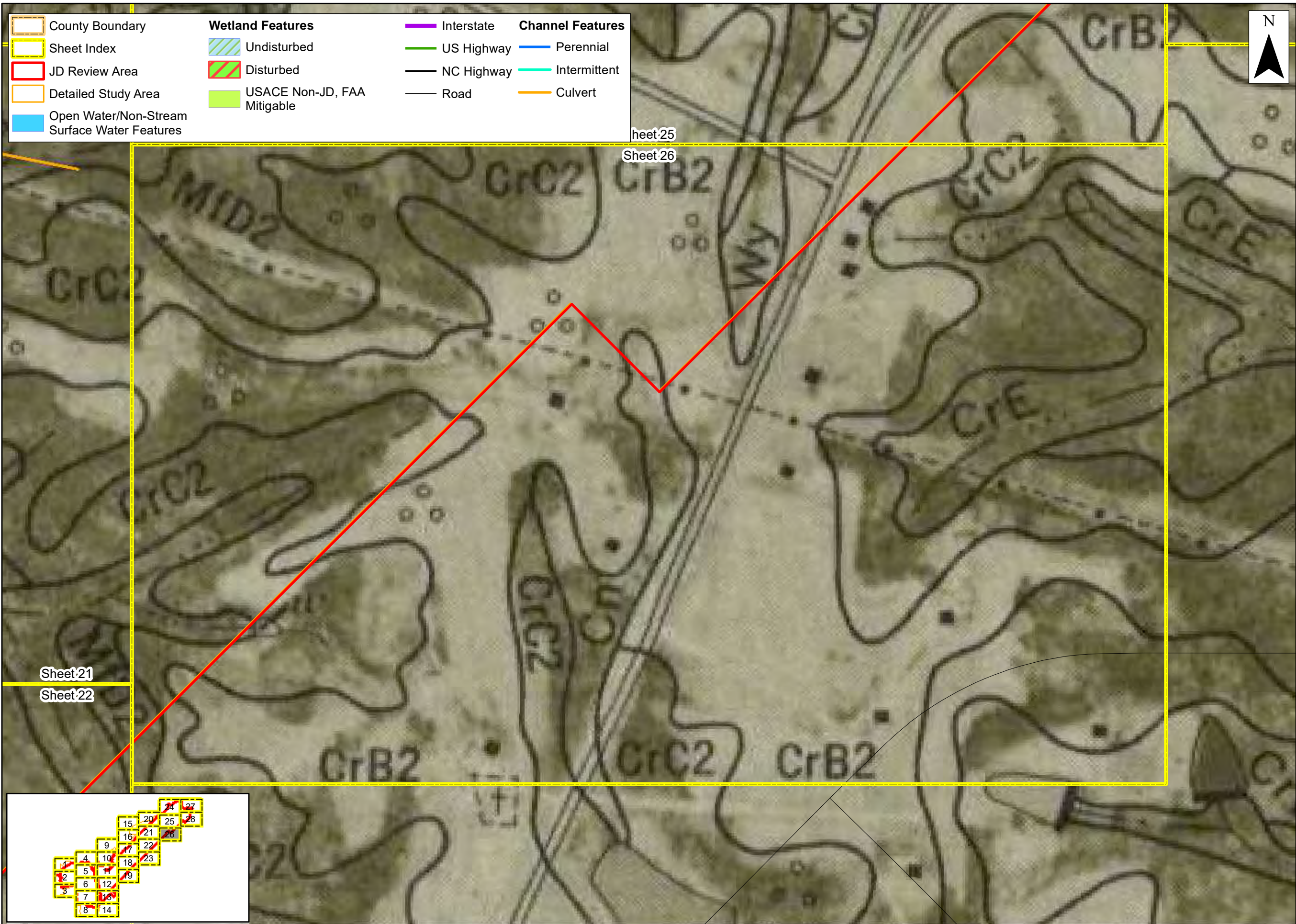
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- | | | | |
|--|-----------------------------|------------|-------------------------|
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| Sheet Index | Undisturbed | US Highway | Perennial |
| JD Review Area | Disturbed | NC Highway | Intermittent |
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| Open Water/Non-Stream Surface Water Features | | | |



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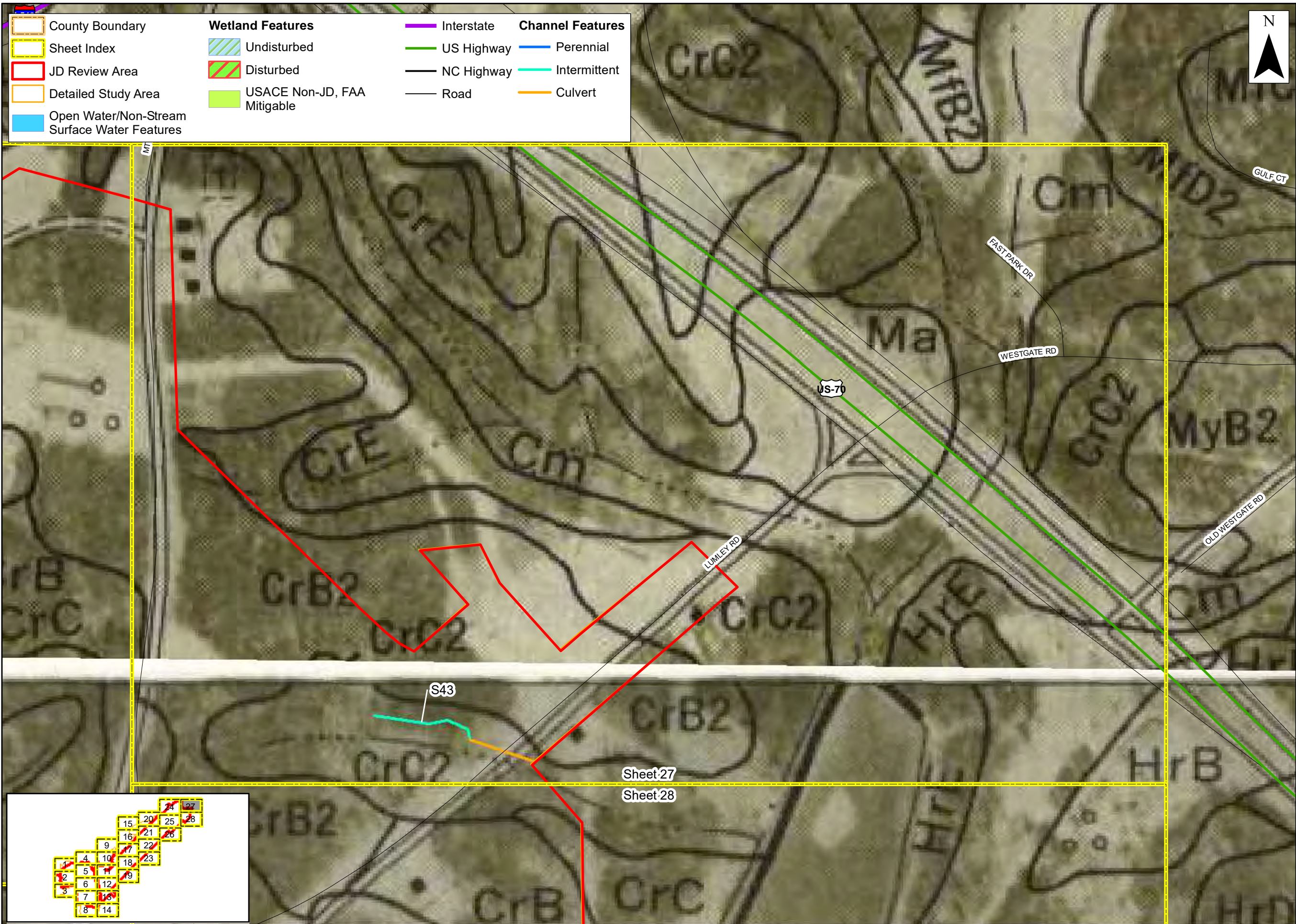
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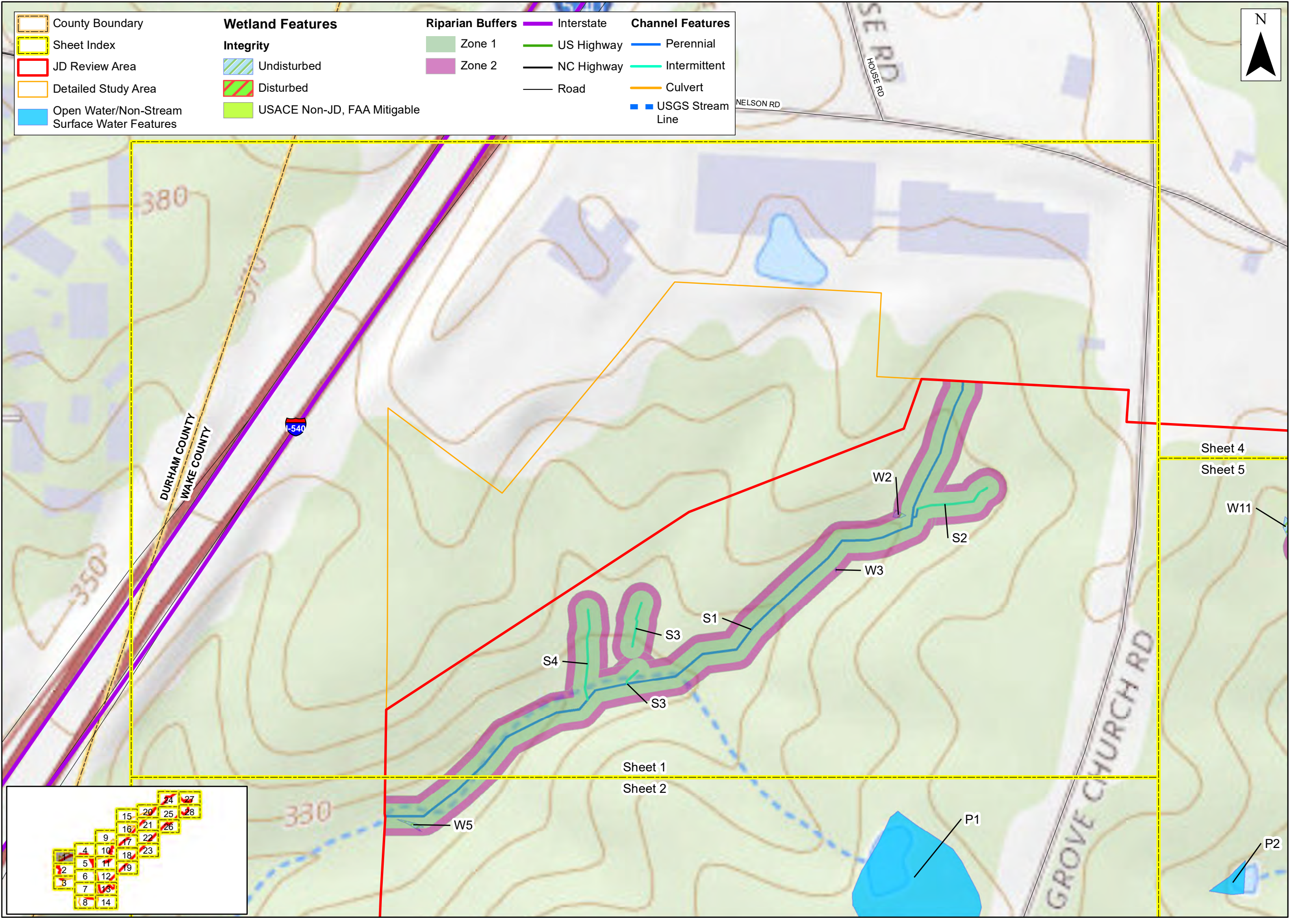
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**Potential Riparian
Buffers**

**Wake County,
North Carolina**

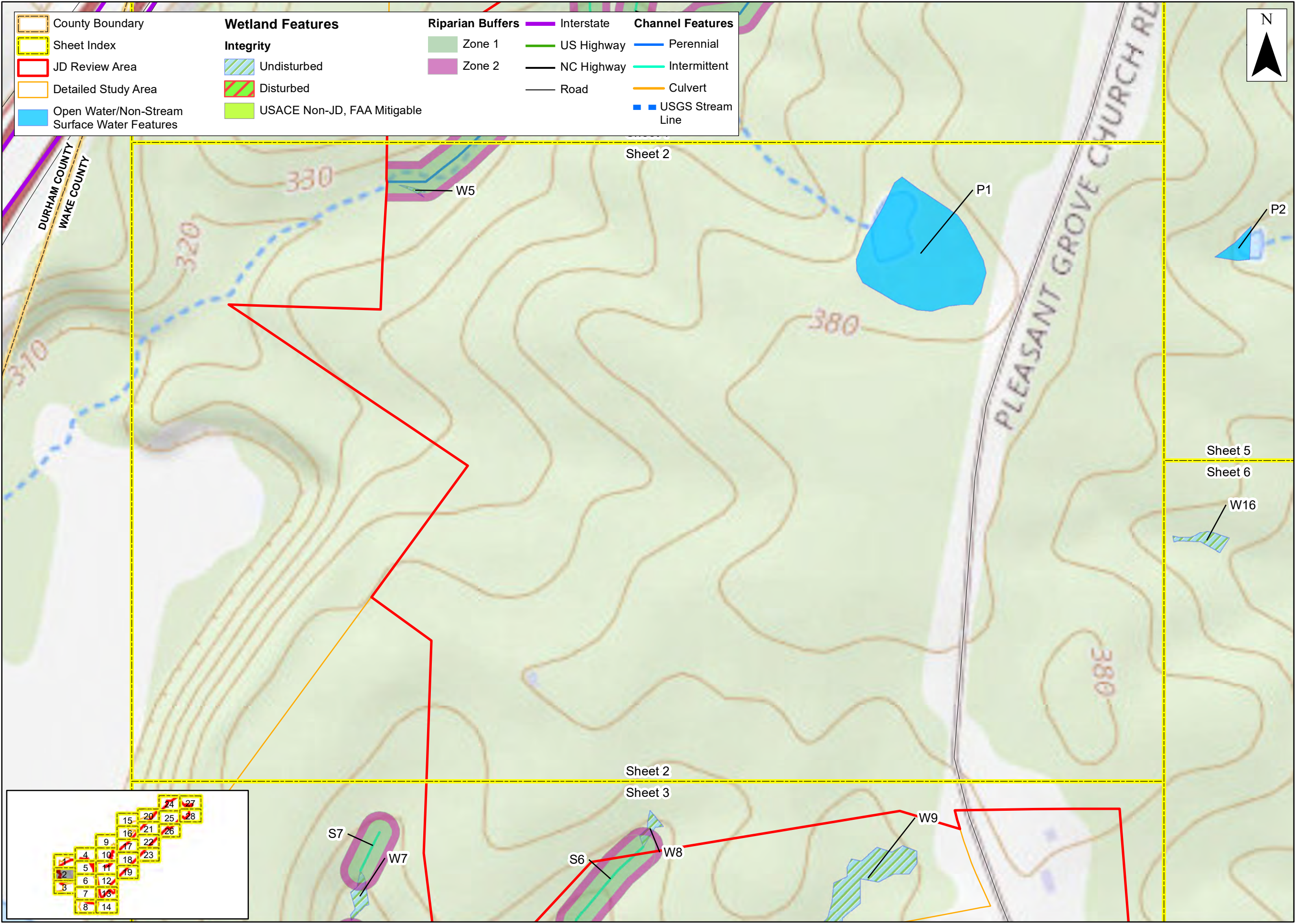
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County Boundary

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Wetland Features

Integrity

Undisturbed

Disturbed

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Riparian Buffers

Zone 1

Zone 2

Channel Features

Interstate

US Highway

NC Highway

Road

Perennial

Intermittent

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USGS Stream Line

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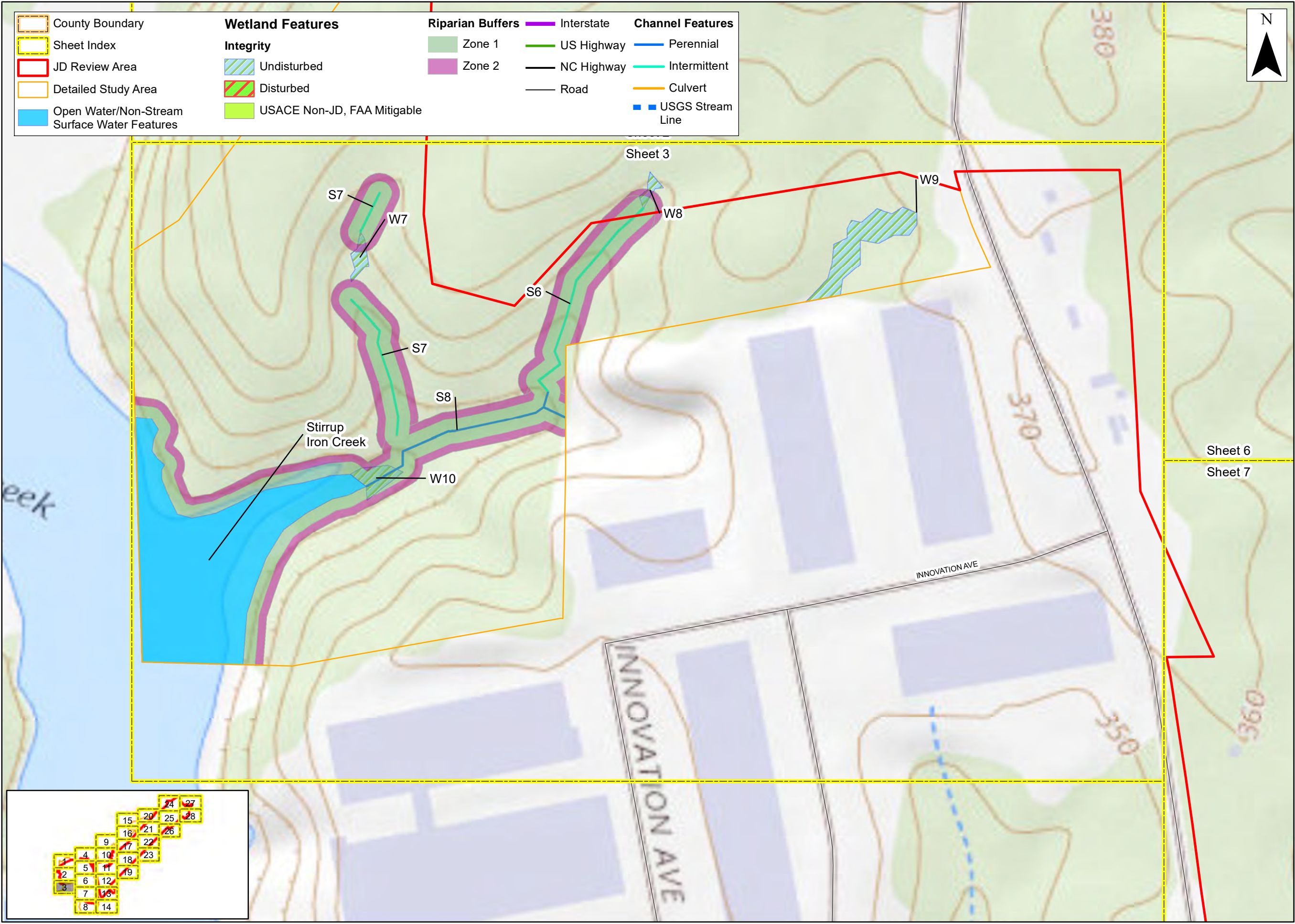
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**Potential Riparian
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County Boundary	Wetland Features	Riparian Buffers	Interstate	Channel Features
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JD Review Area	Undisturbed	Zone 2	NC Highway	Intermittent
Detailed Study Area	Disturbed	Road	Culvert	USGS Stream Line
Open Water/Non-Stream Surface Water Features	USACE Non-JD, FAA Mitigable			



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**Potential Riparian
Buffers**

**Wake County,
North Carolina**

Date:	November 2022	
Scale:		
Job No.:	19-018	
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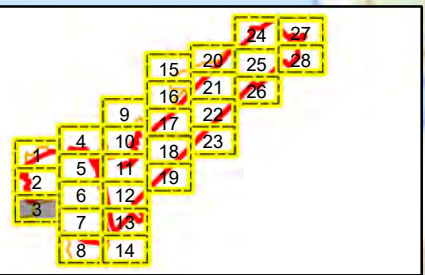
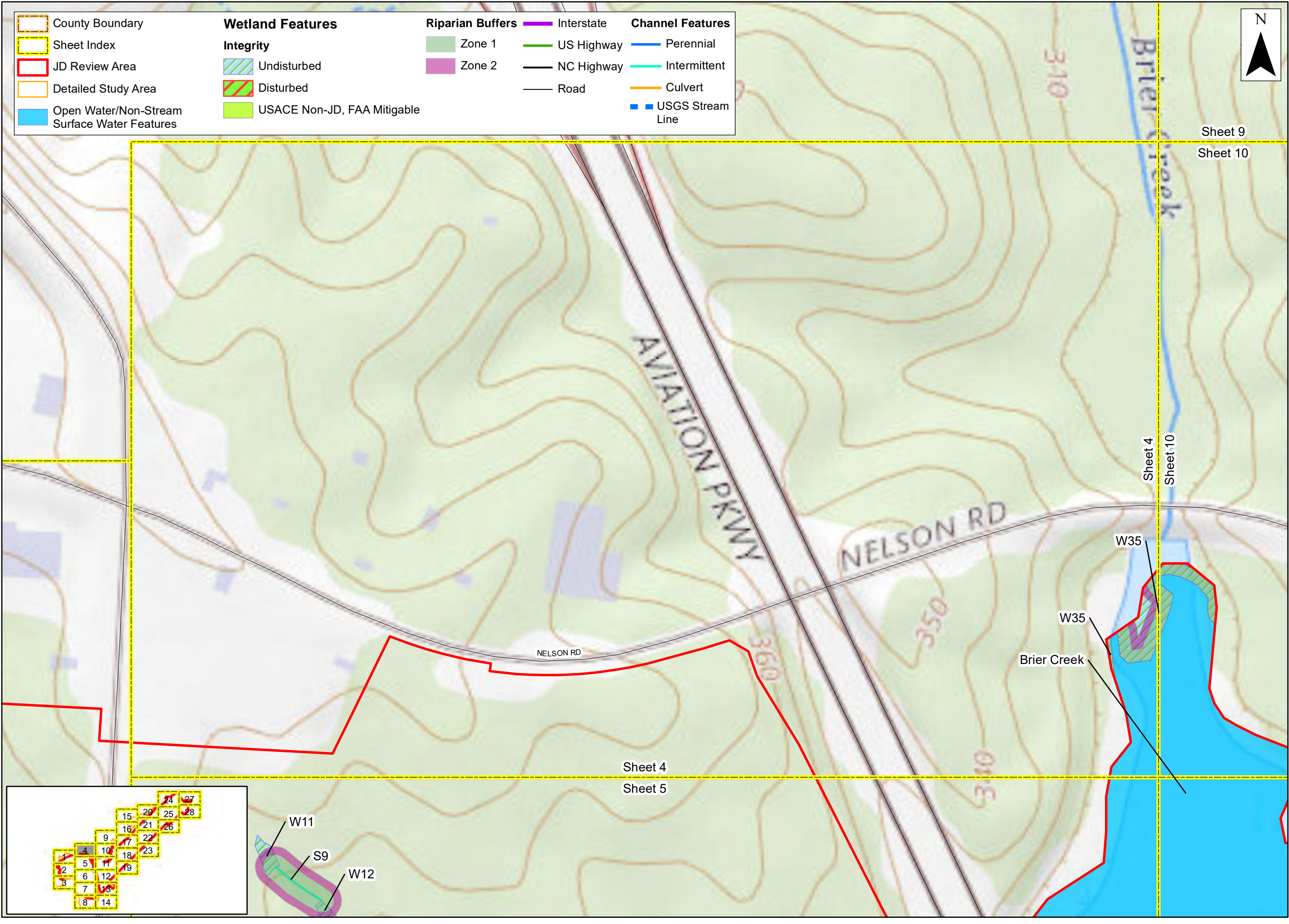


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Detailed Study Area

Open Water/Non-Stream Surface Water Features

Wetland Features

Integrity

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Disturbed

USACE Non-JD, FAA Mitigable

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Interstate

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North Carolina**

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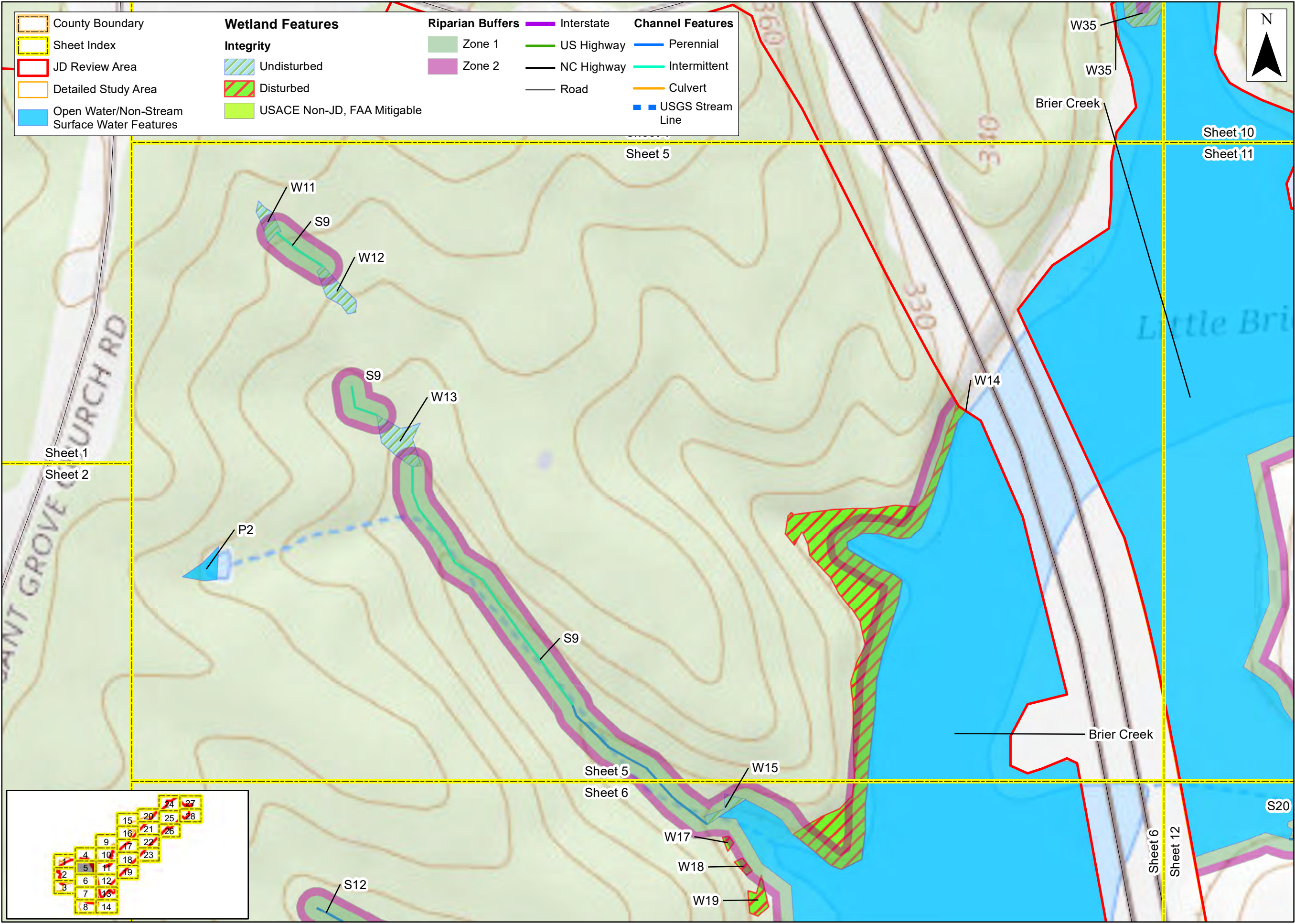
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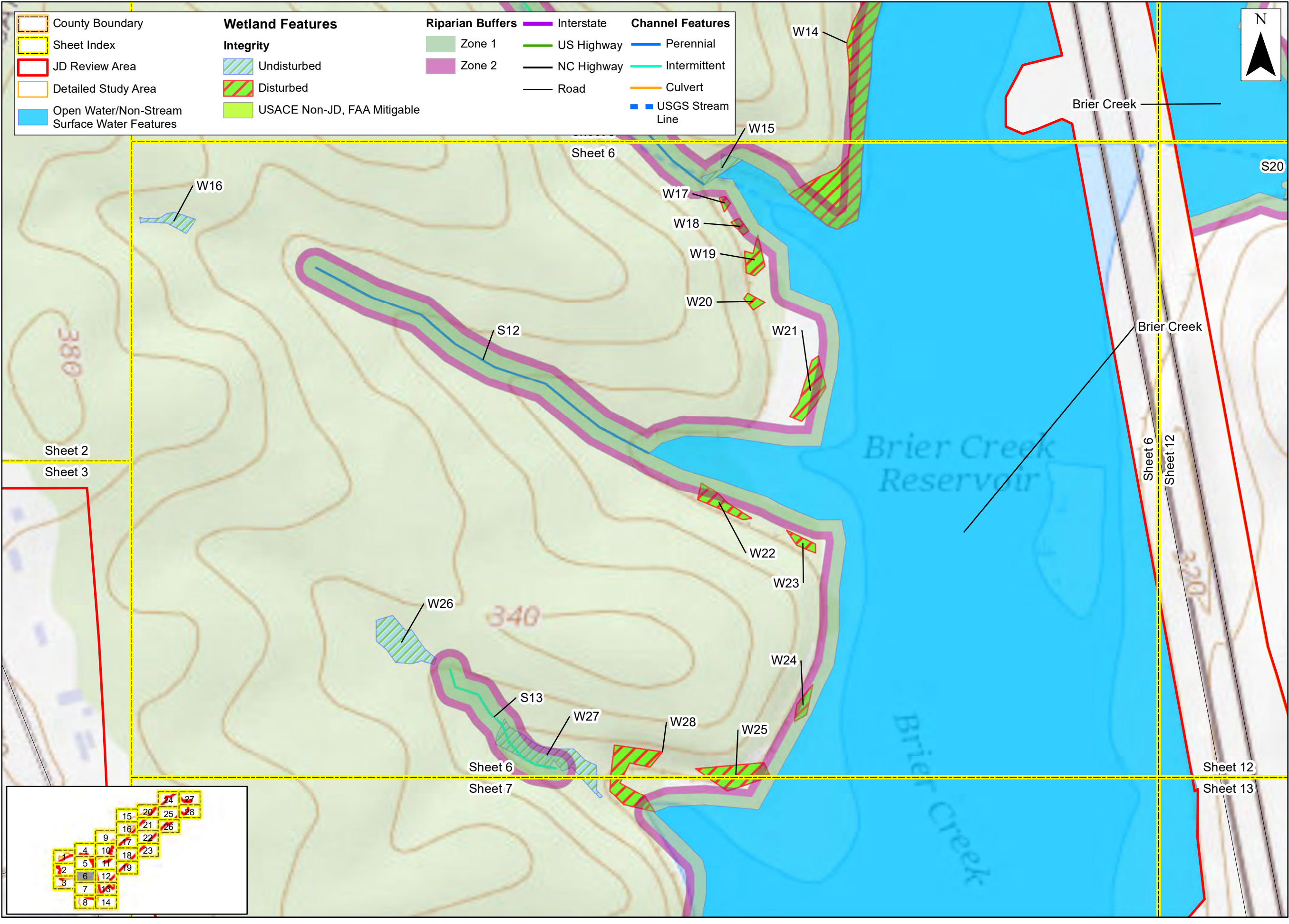
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Interstate

US Highway

NC Highway

Road

Channel Features

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Culvert

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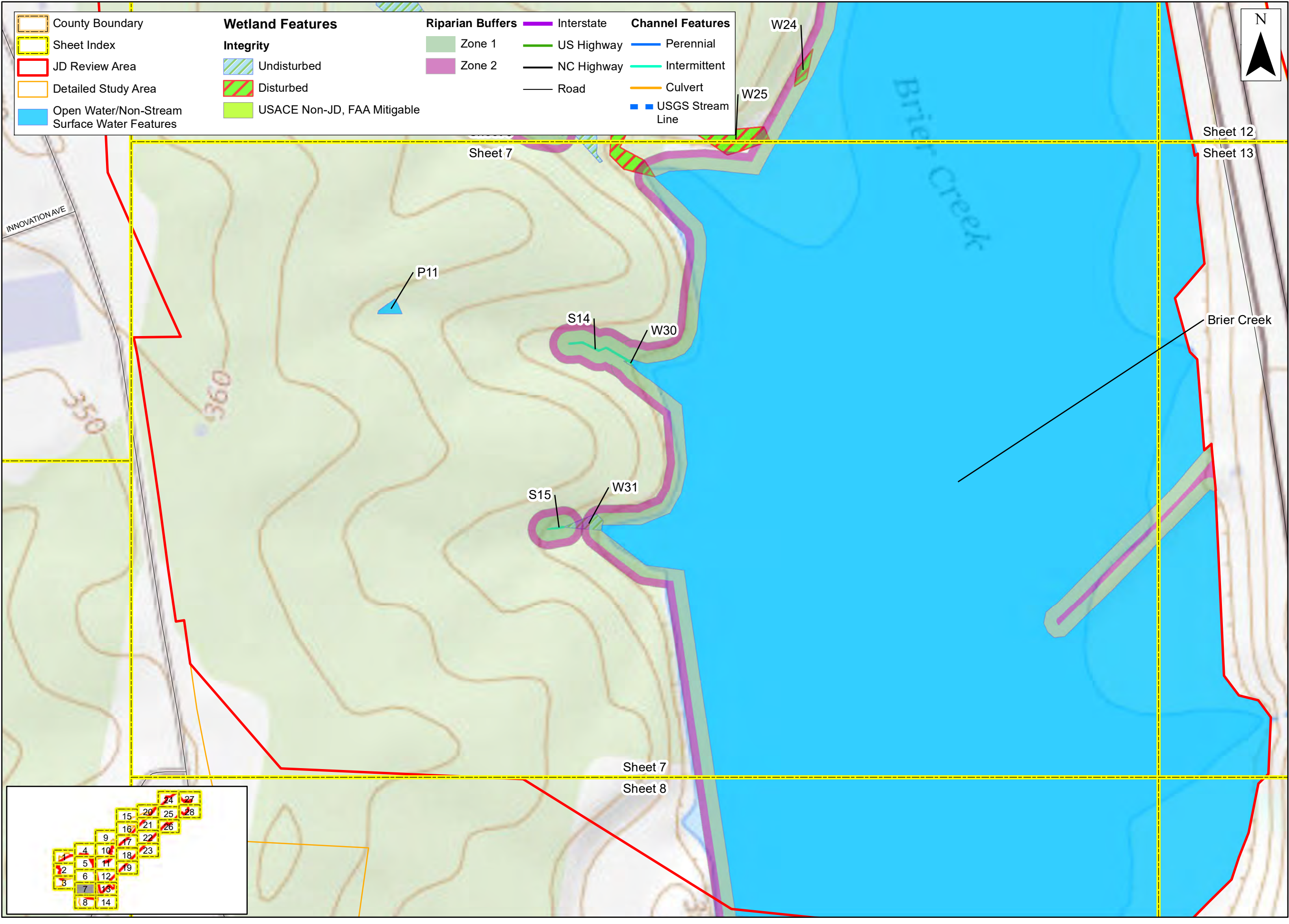
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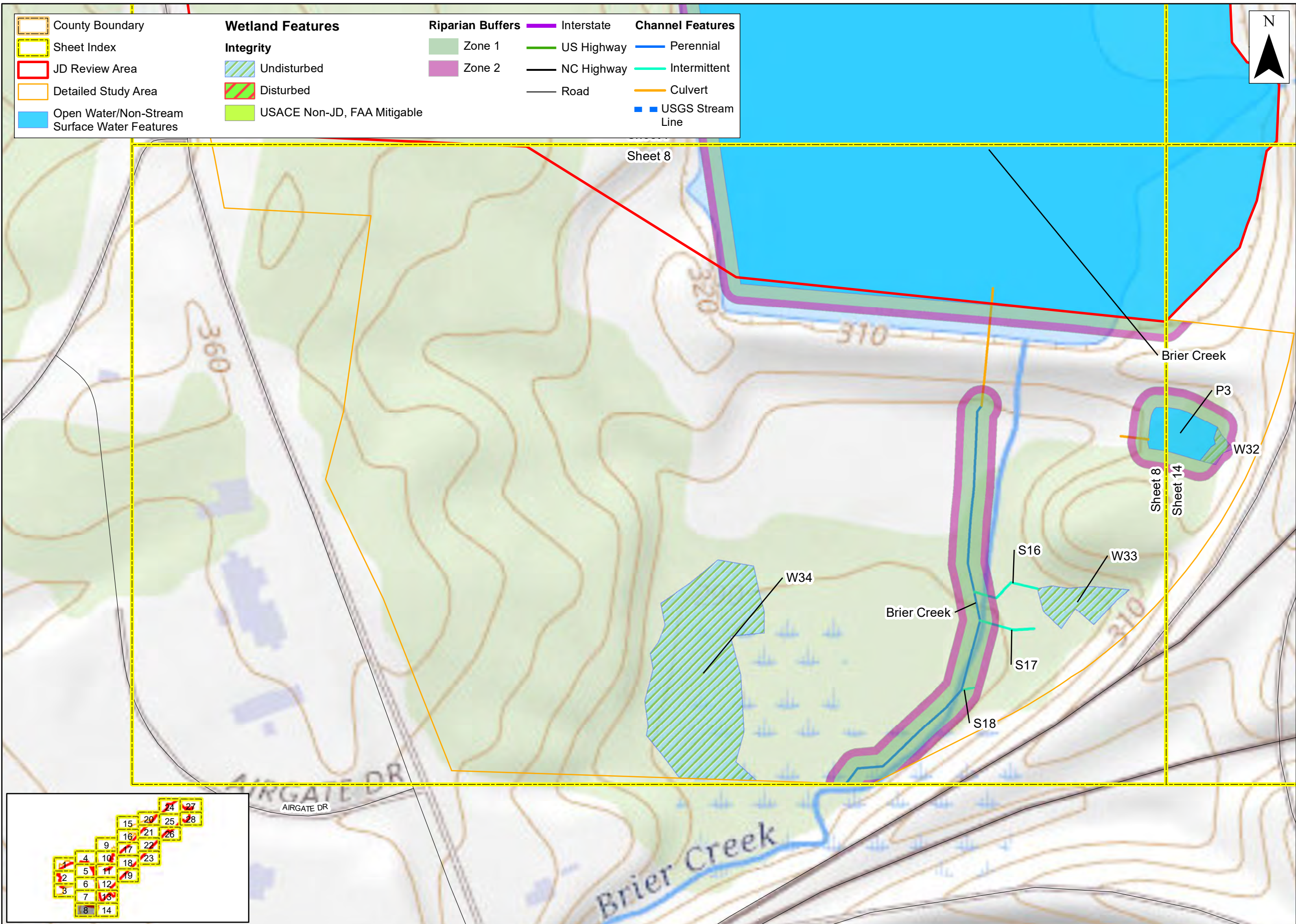
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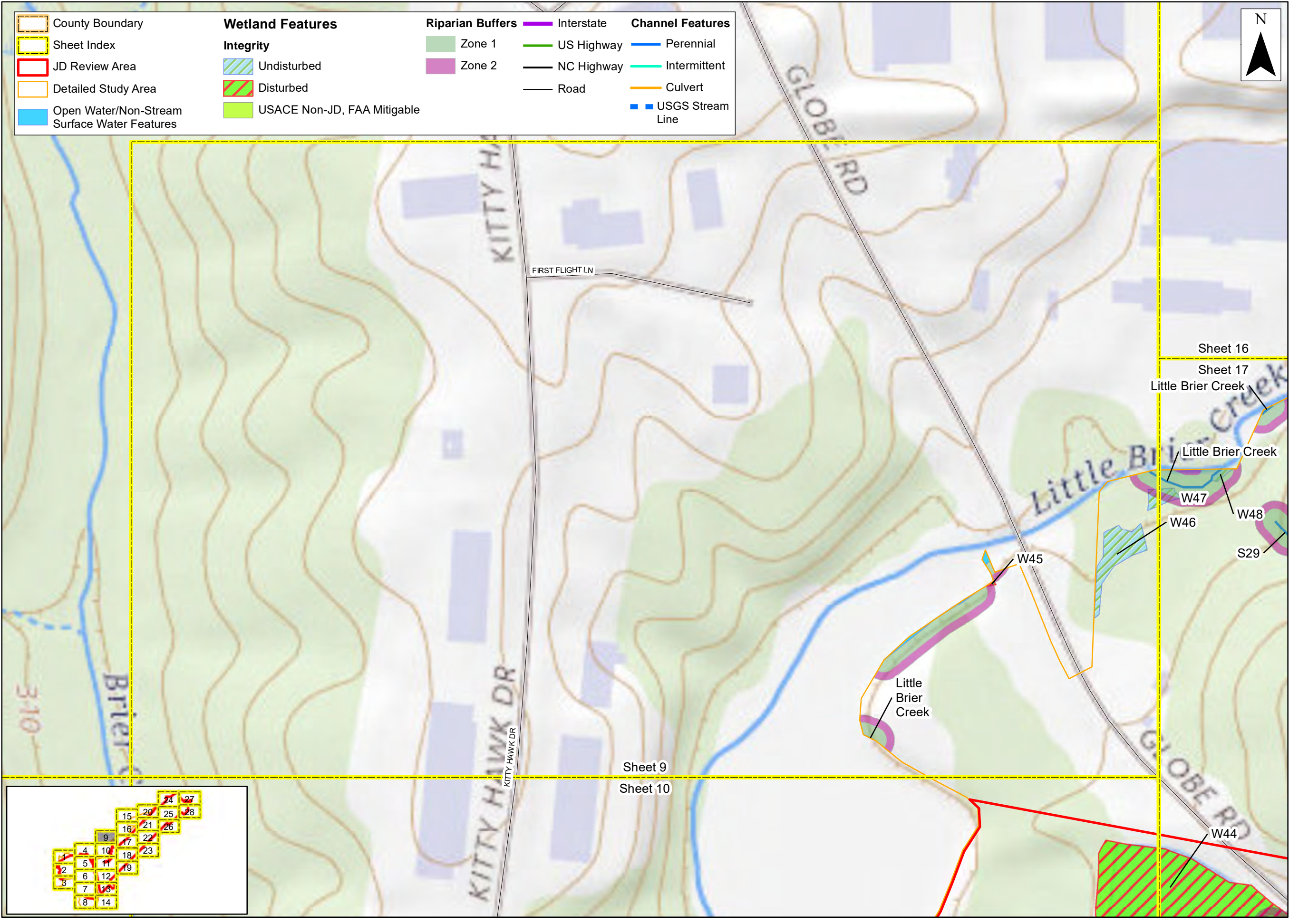
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County Boundary

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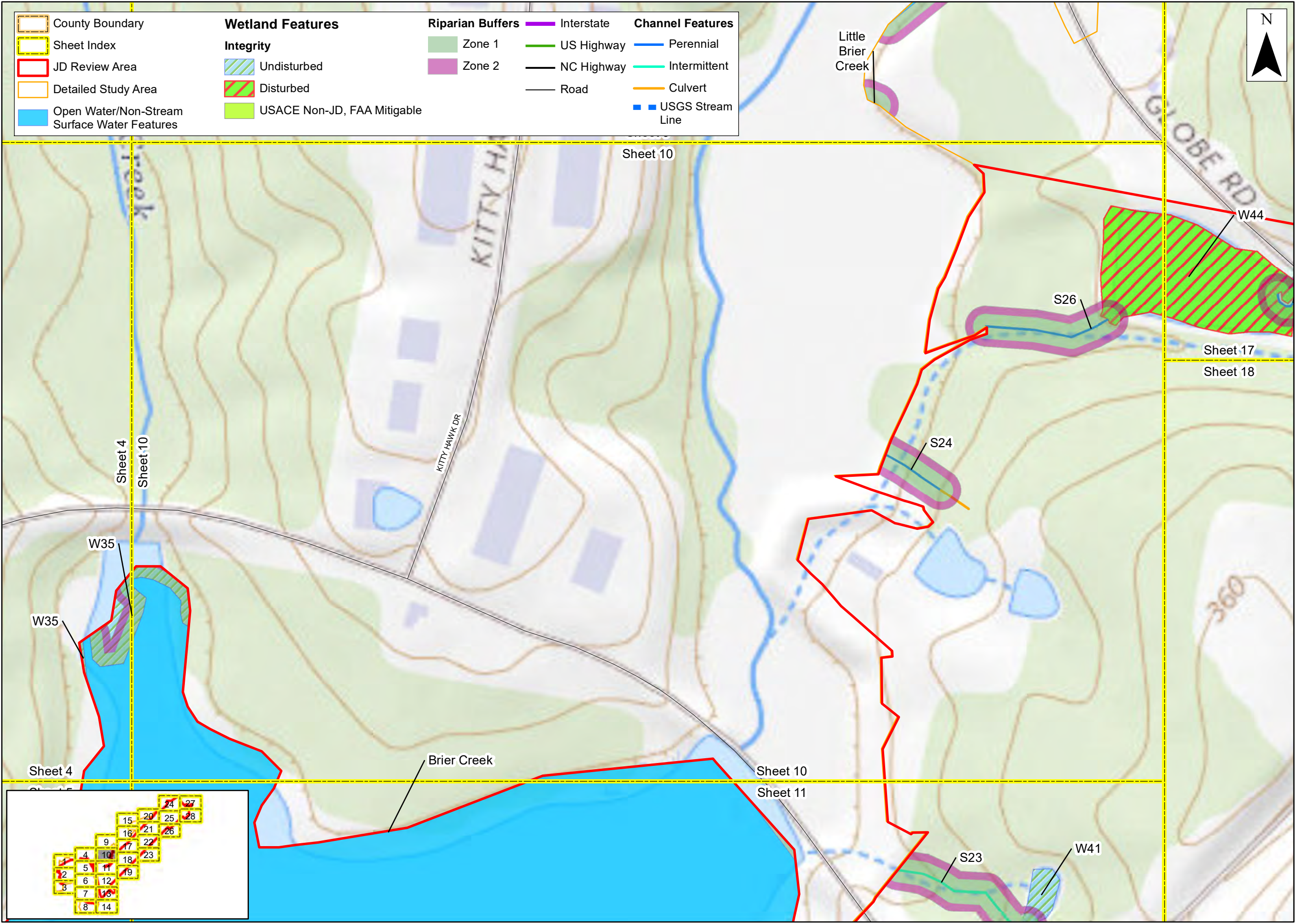
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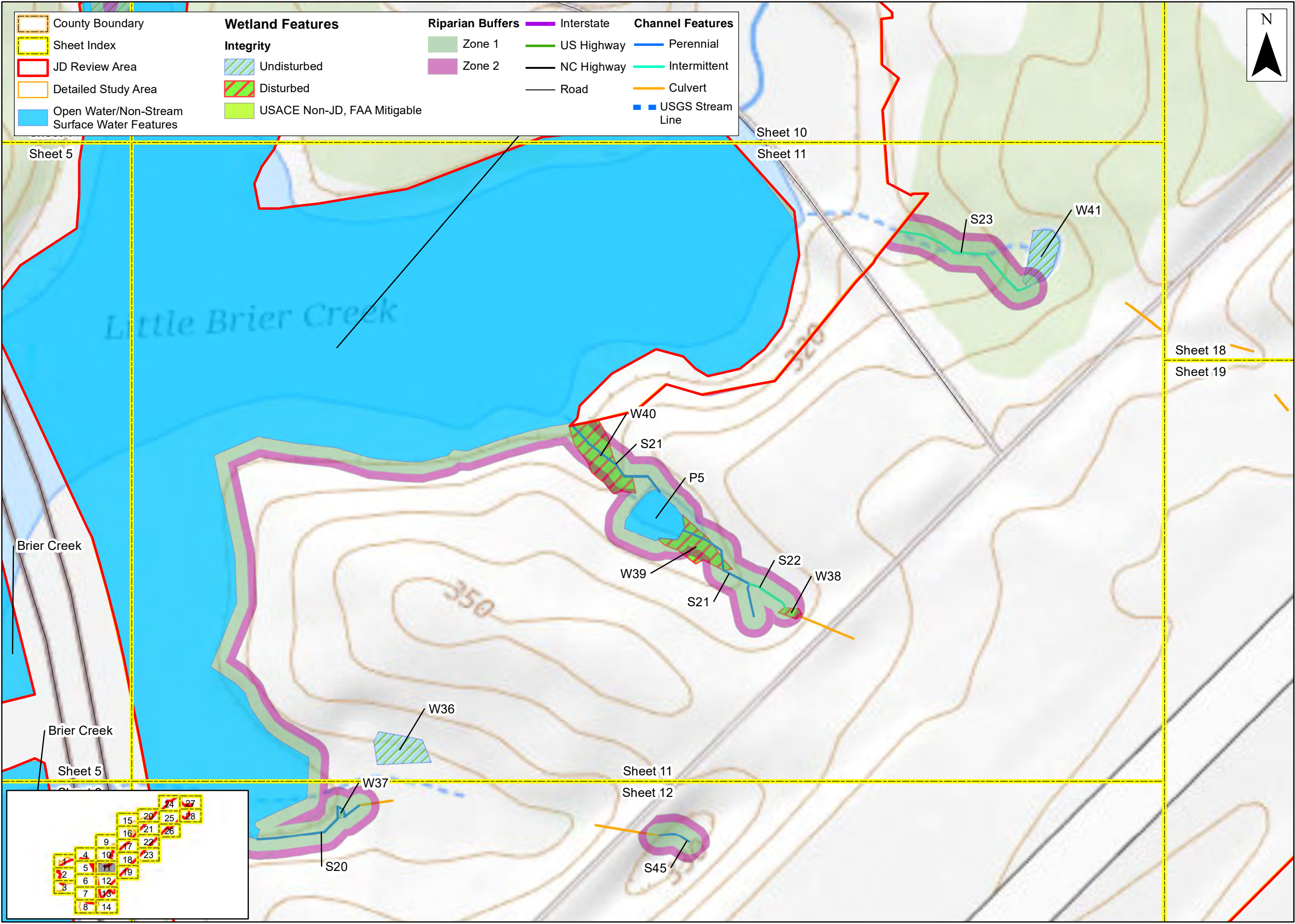
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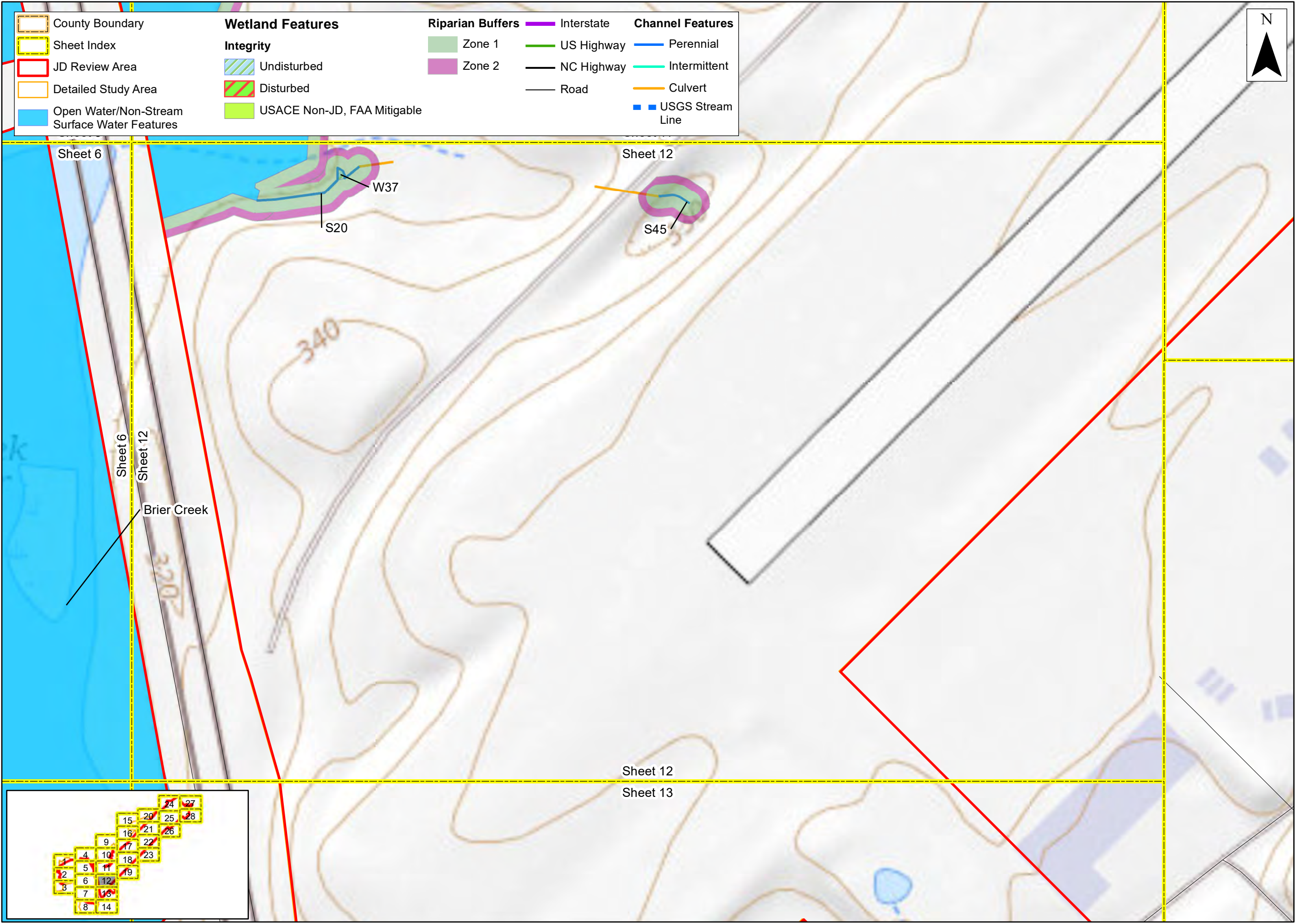
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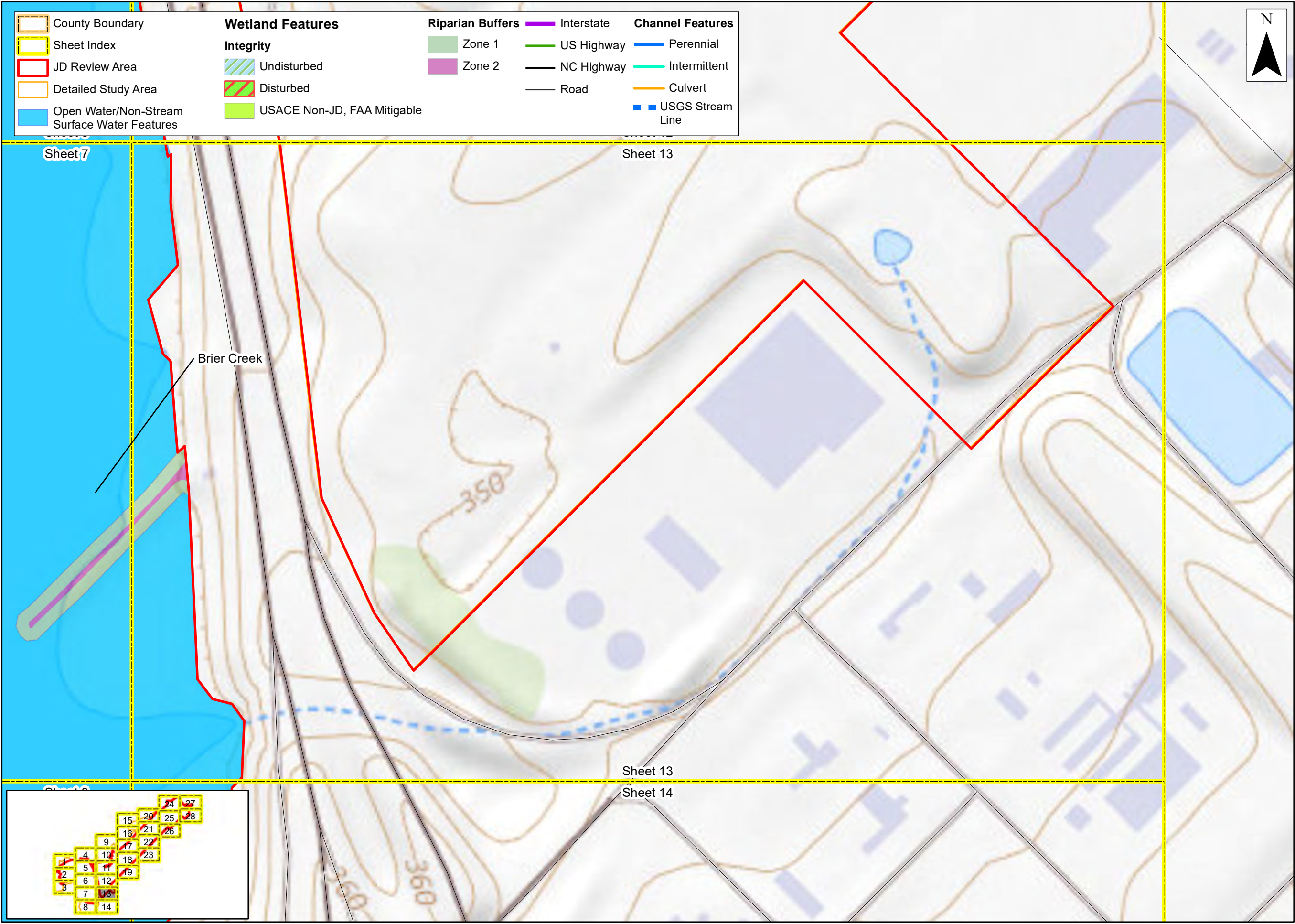
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Sheet 12



County Boundary	Wetland Features	Riparian Buffers	Interstate	Channel Features
Sheet Index	Integrity	Zone 1	US Highway	Perennial
JD Review Area	Undisturbed	Zone 2	NC Highway	Intermittent
Detailed Study Area	Disturbed	Road	Culvert	USGS Stream Line
Open Water/Non-Stream Surface Water Features	USACE Non-JD, FAA Mitigable			



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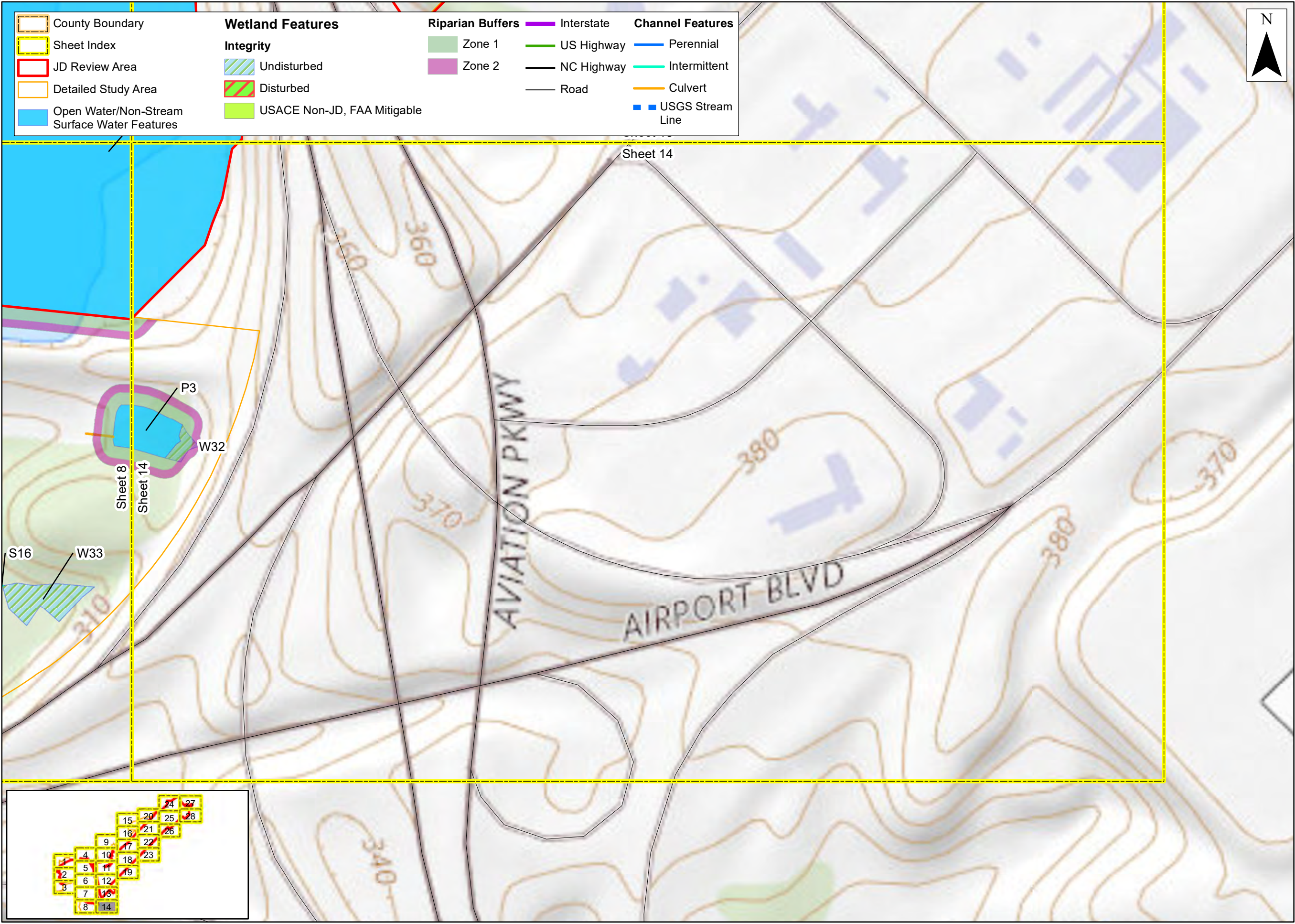
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County Boundary	Wetland Features	Riparian Buffers	Interstate	Channel Features
Sheet Index	Integrity	Zone 1	US Highway	Perennial
JD Review Area	Undisturbed	Zone 2	NC Highway	Intermittent
Detailed Study Area	Disturbed	Road	Culvert	USGS Stream Line
Open Water/Non-Stream Surface Water Features	USACE Non-JD, FAA Mitigable			



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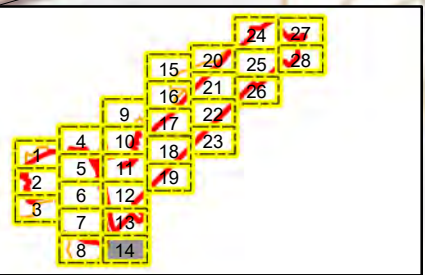
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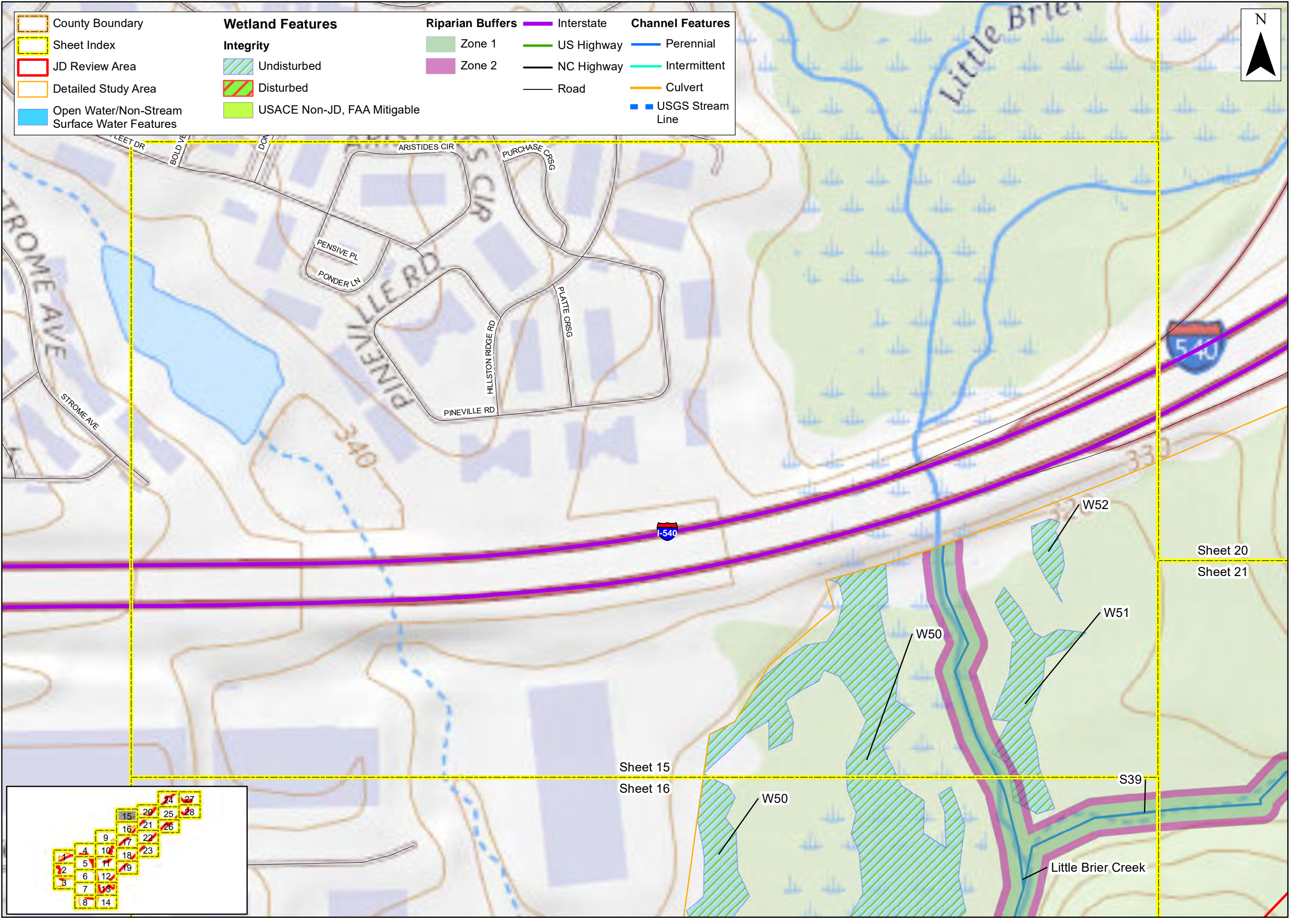
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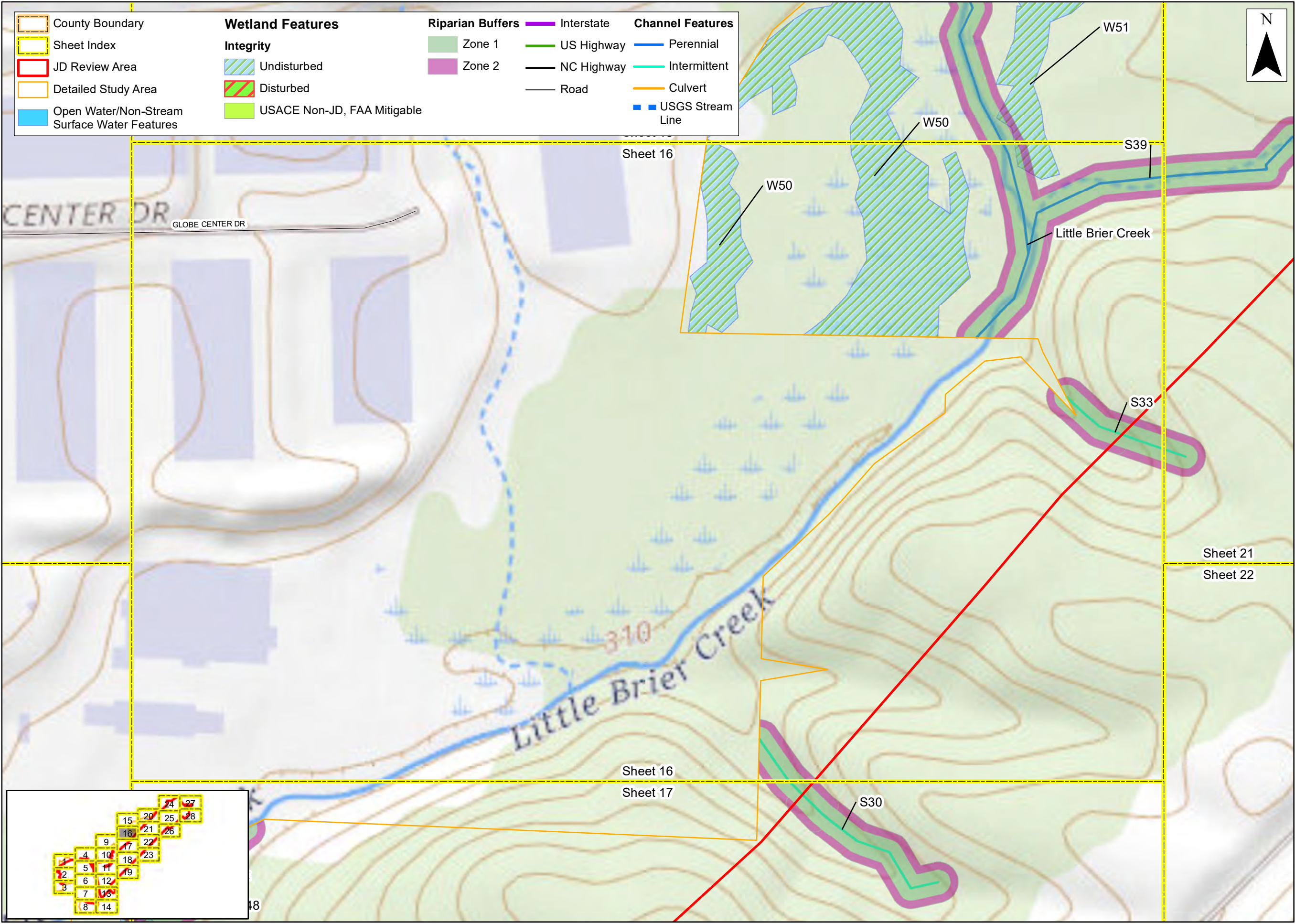
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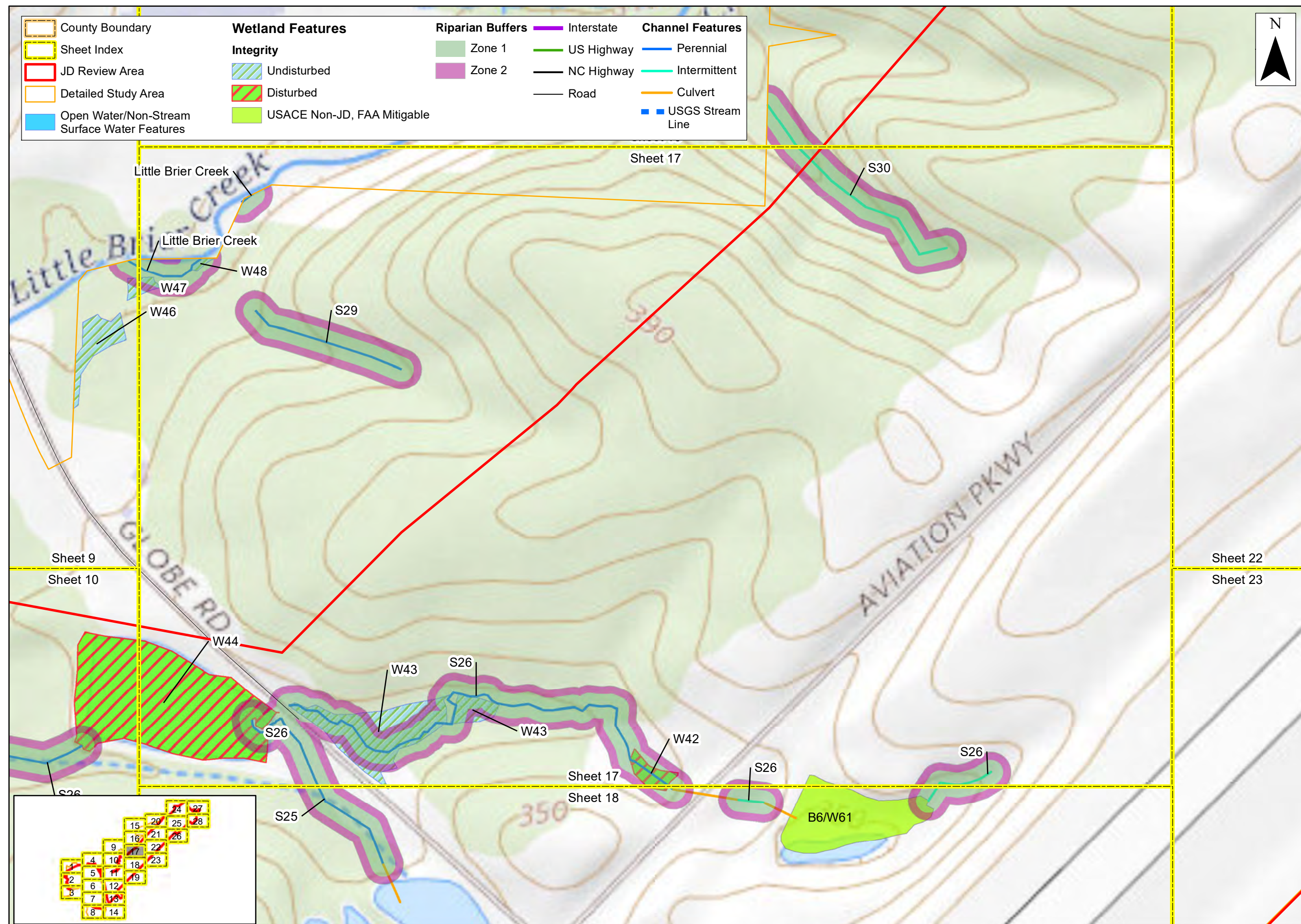
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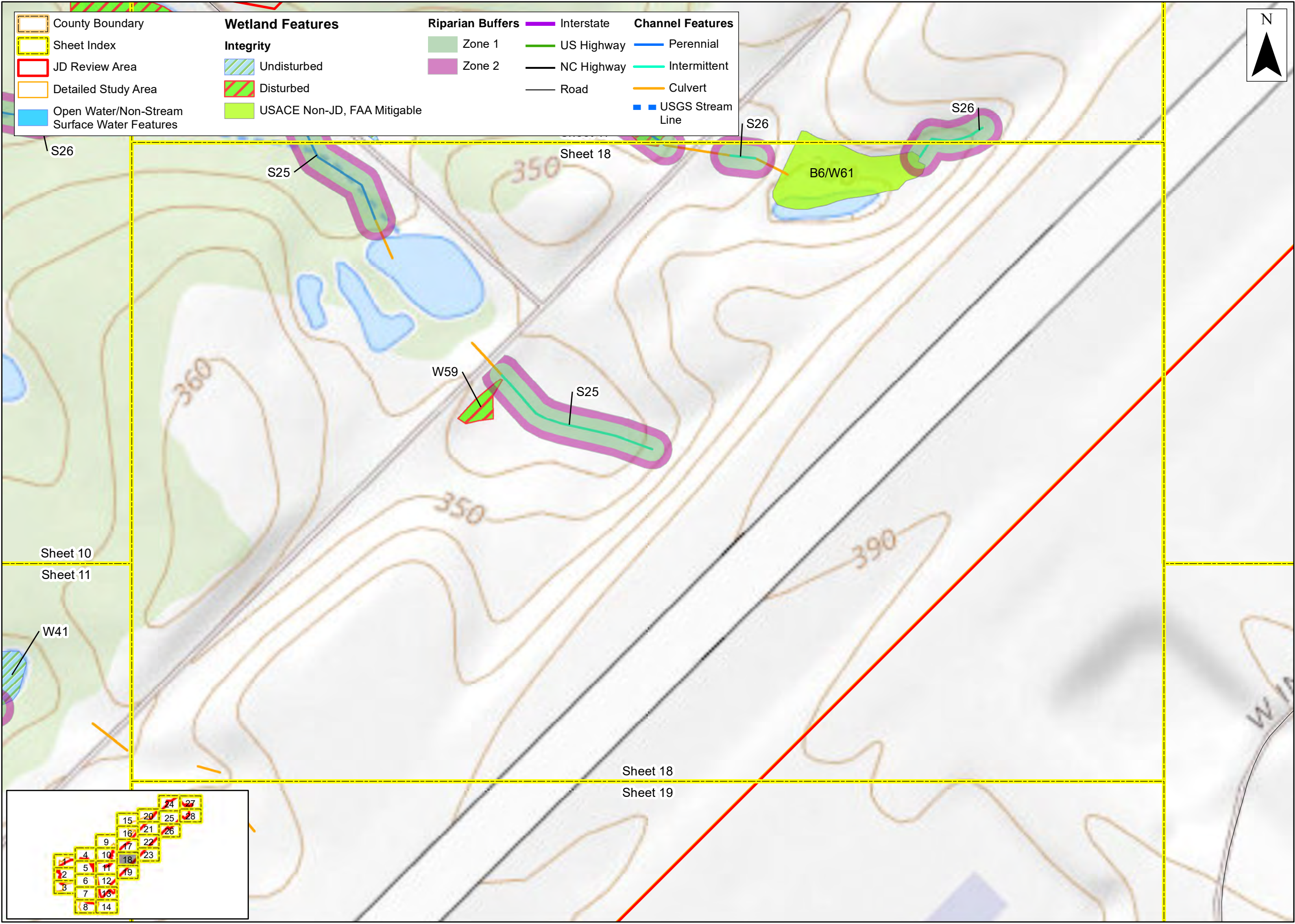
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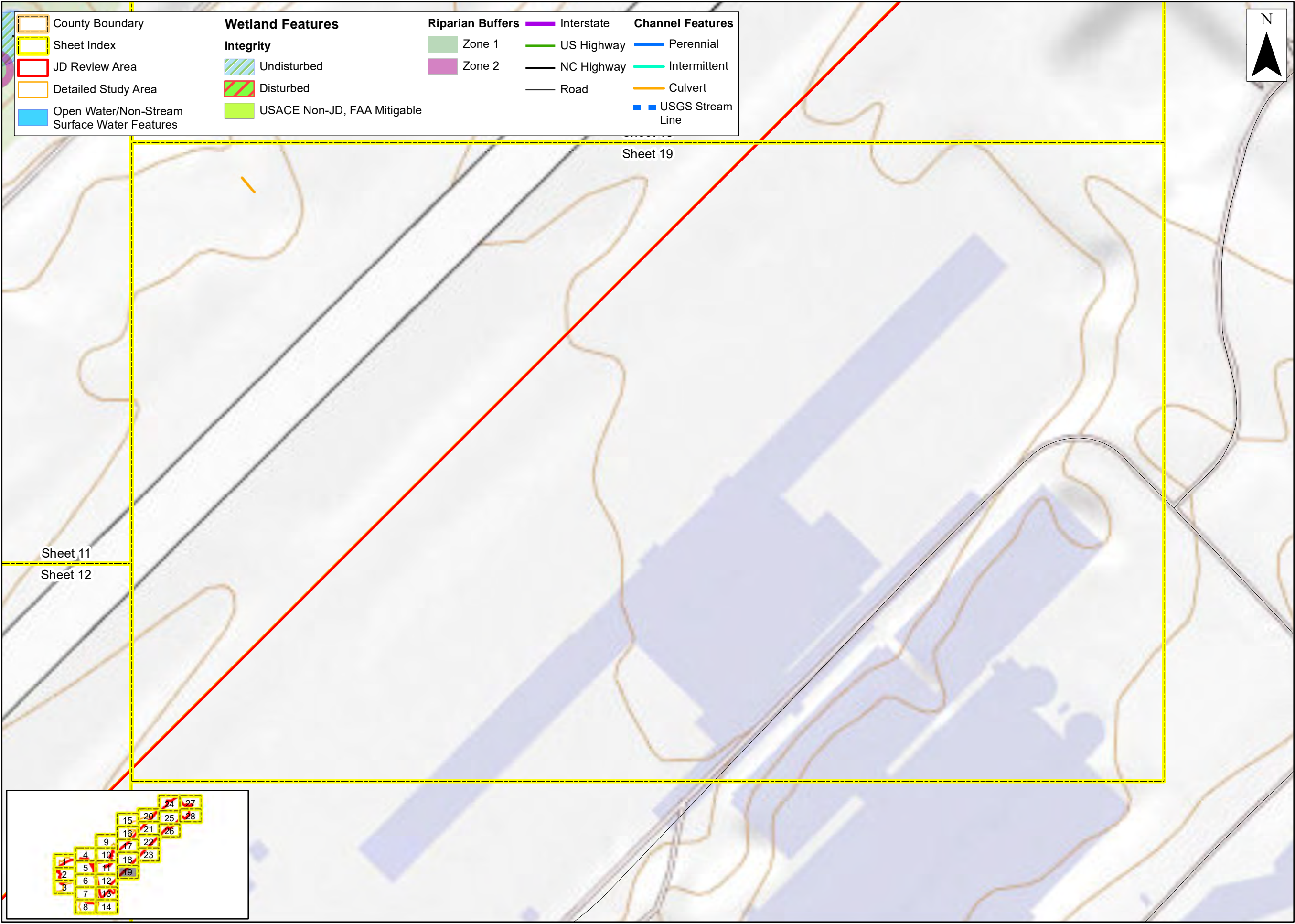
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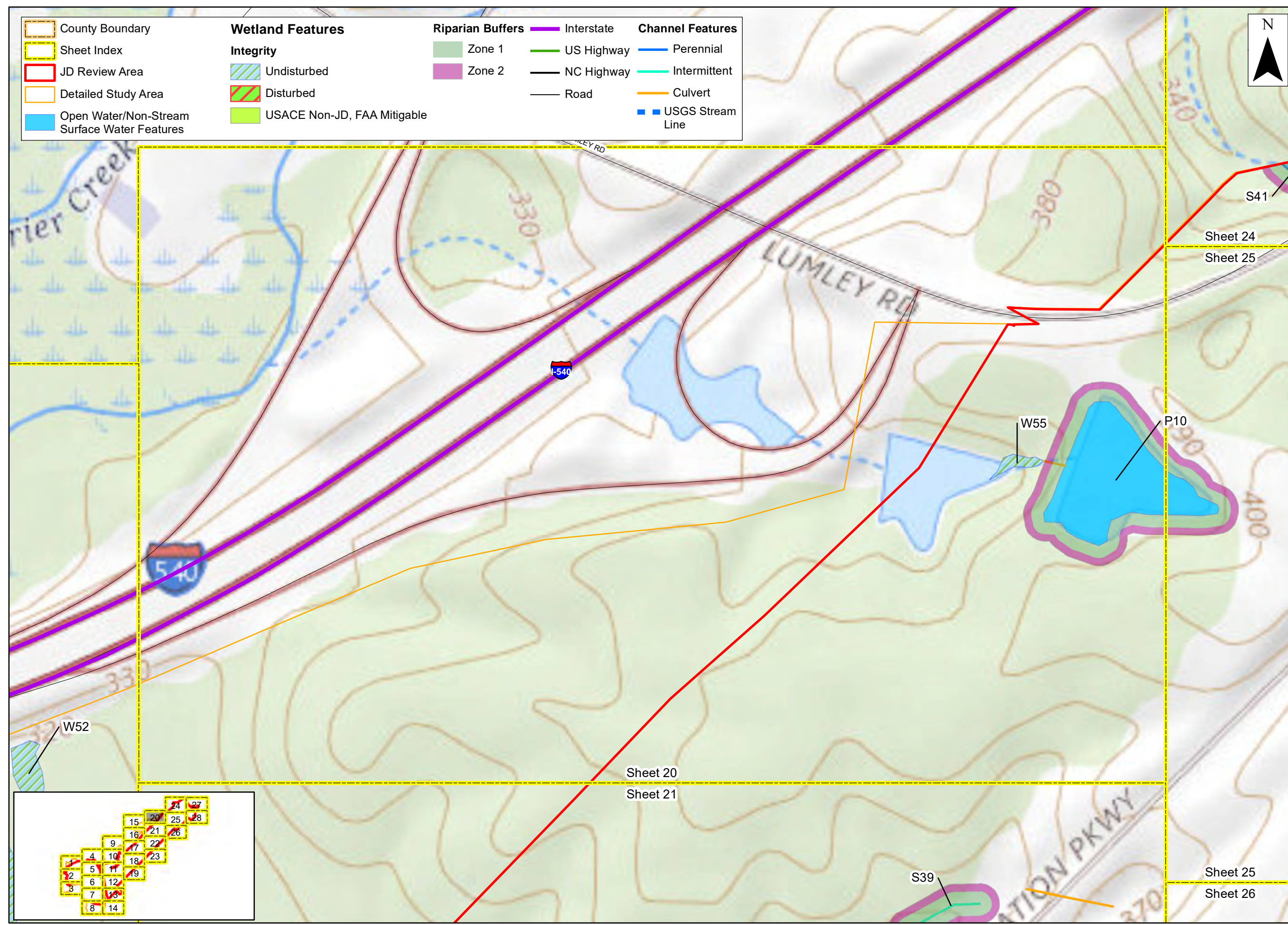
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County Boundary	Wetland Features	Riparian Buffers	Interstate	Channel Features
Sheet Index	Integrity	Zone 1	US Highway	Perennial
JD Review Area	Undisturbed	Zone 2	NC Highway	Intermittent
Detailed Study Area	Disturbed	Road	Culvert	USGS Stream Line
Open Water/Non-Stream Surface Water Features	USACE Non-JD, FAA Mitigable			



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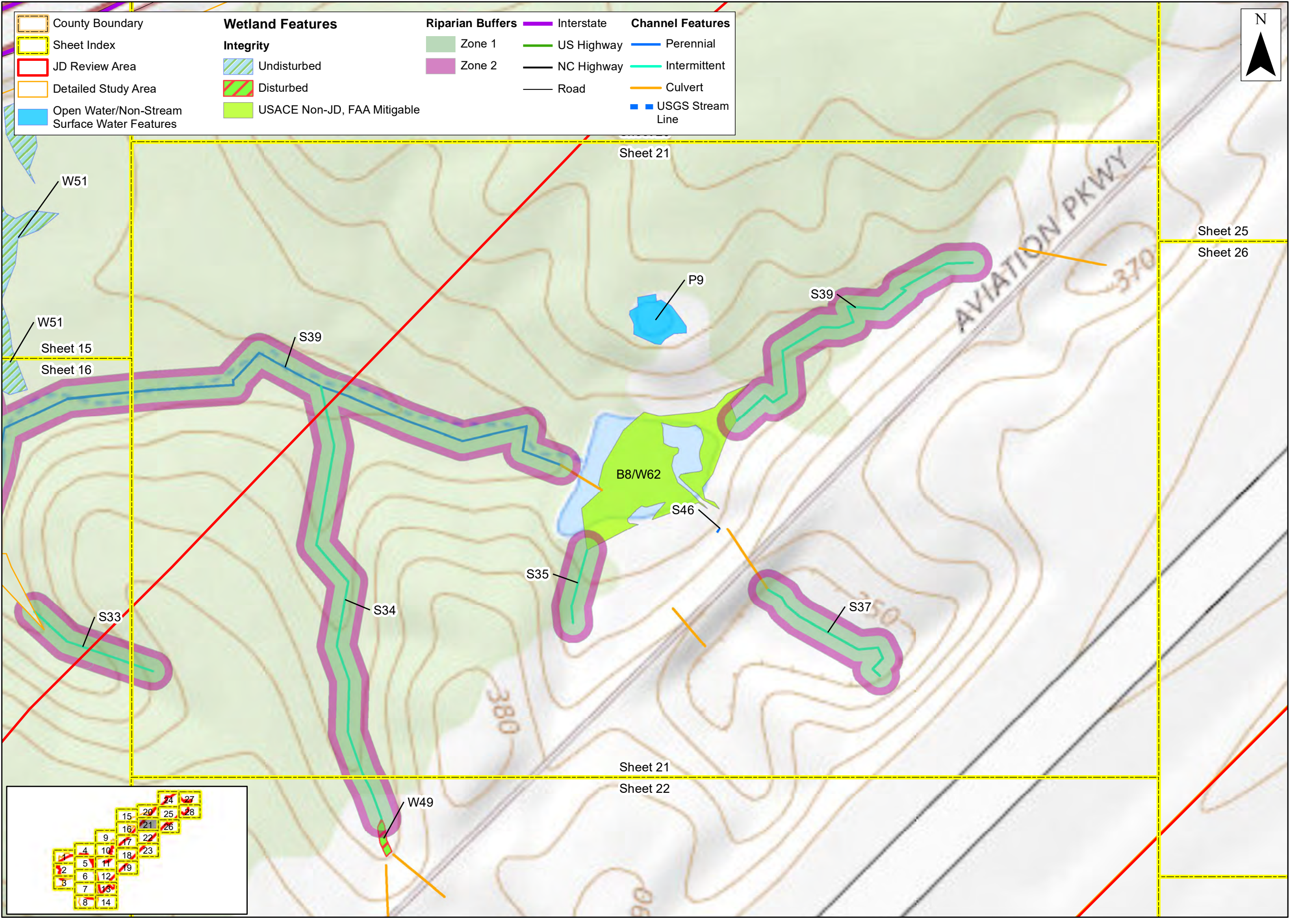
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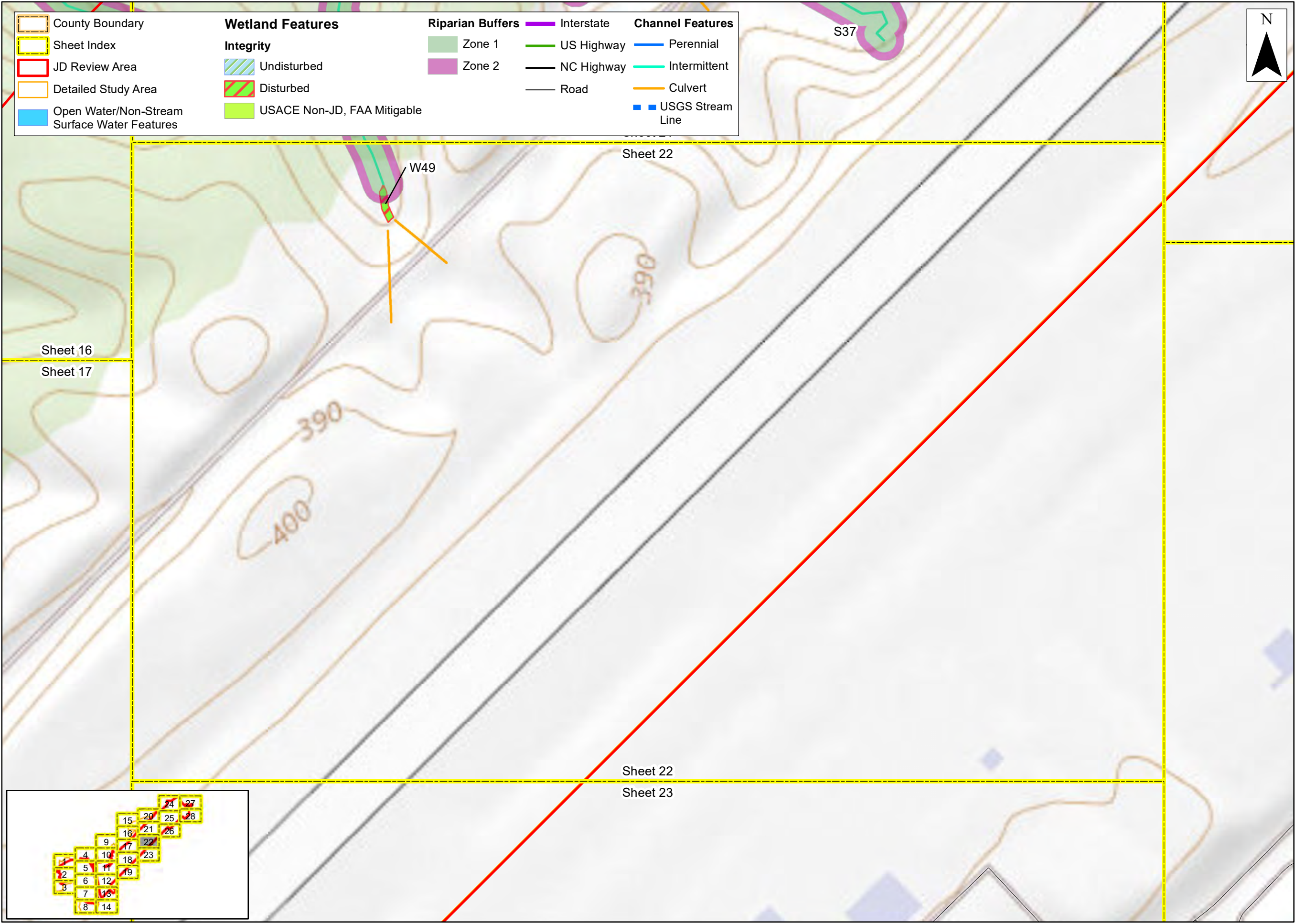
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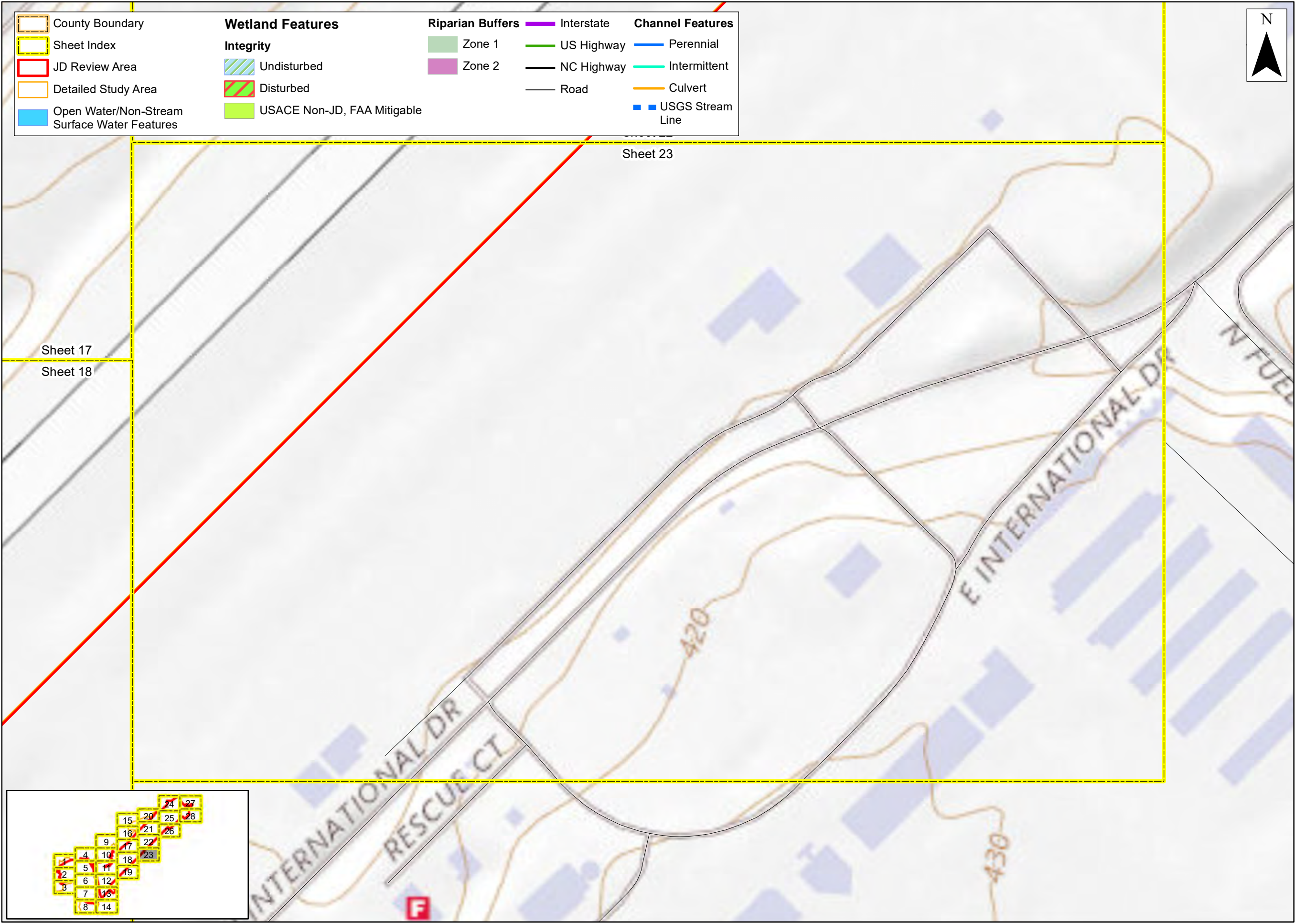
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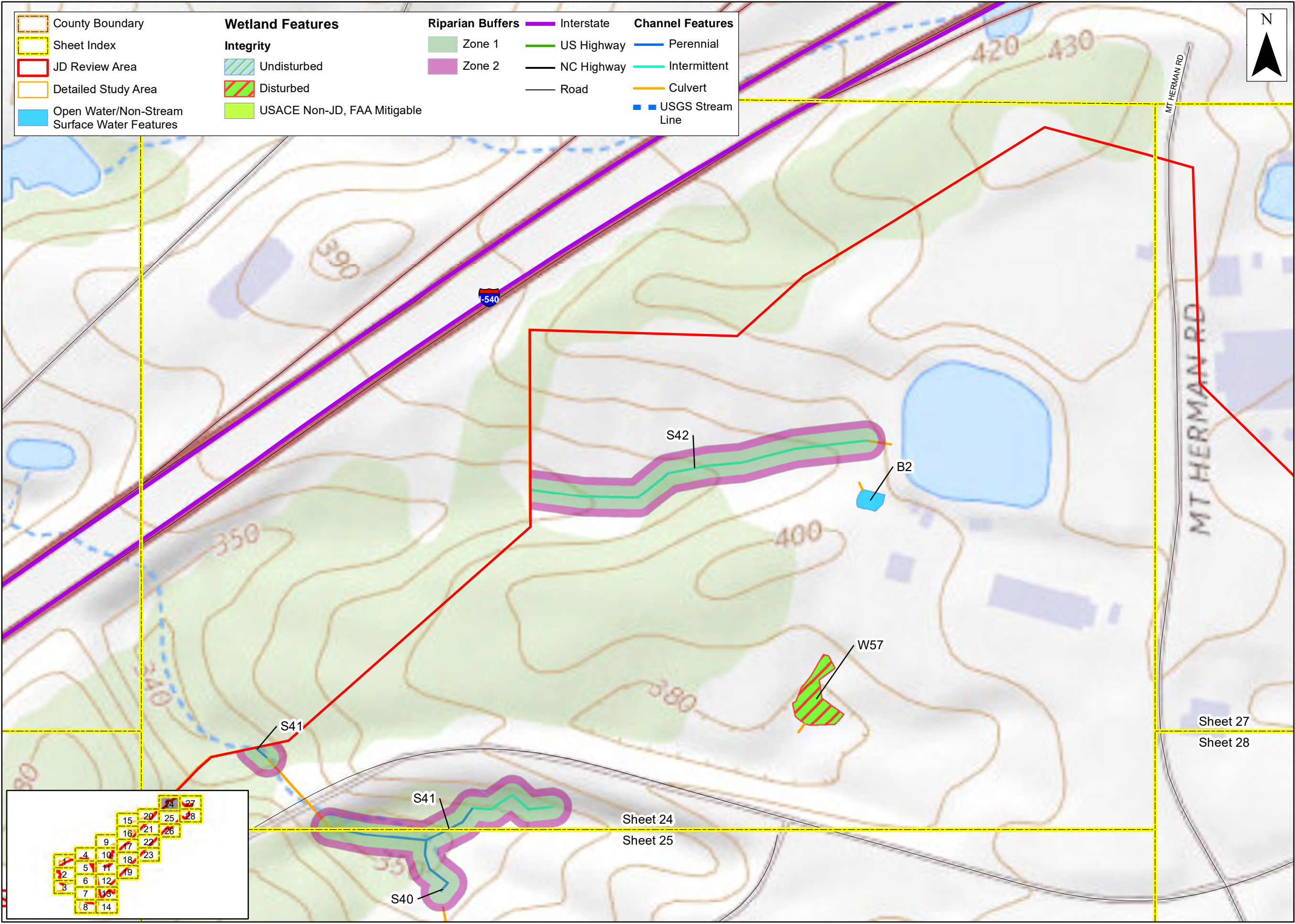
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County Boundary	Wetland Features	Riparian Buffers	Interstate	Channel Features
Sheet Index	Integrity	Zone 1	US Highway	Perennial
JD Review Area	Undisturbed	Zone 2	NC Highway	Intermittent
Detailed Study Area	Disturbed	Road	Culvert	USGS Stream Line
Open Water/Non-Stream Surface Water Features	USACE Non-JD, FAA Mitigable			



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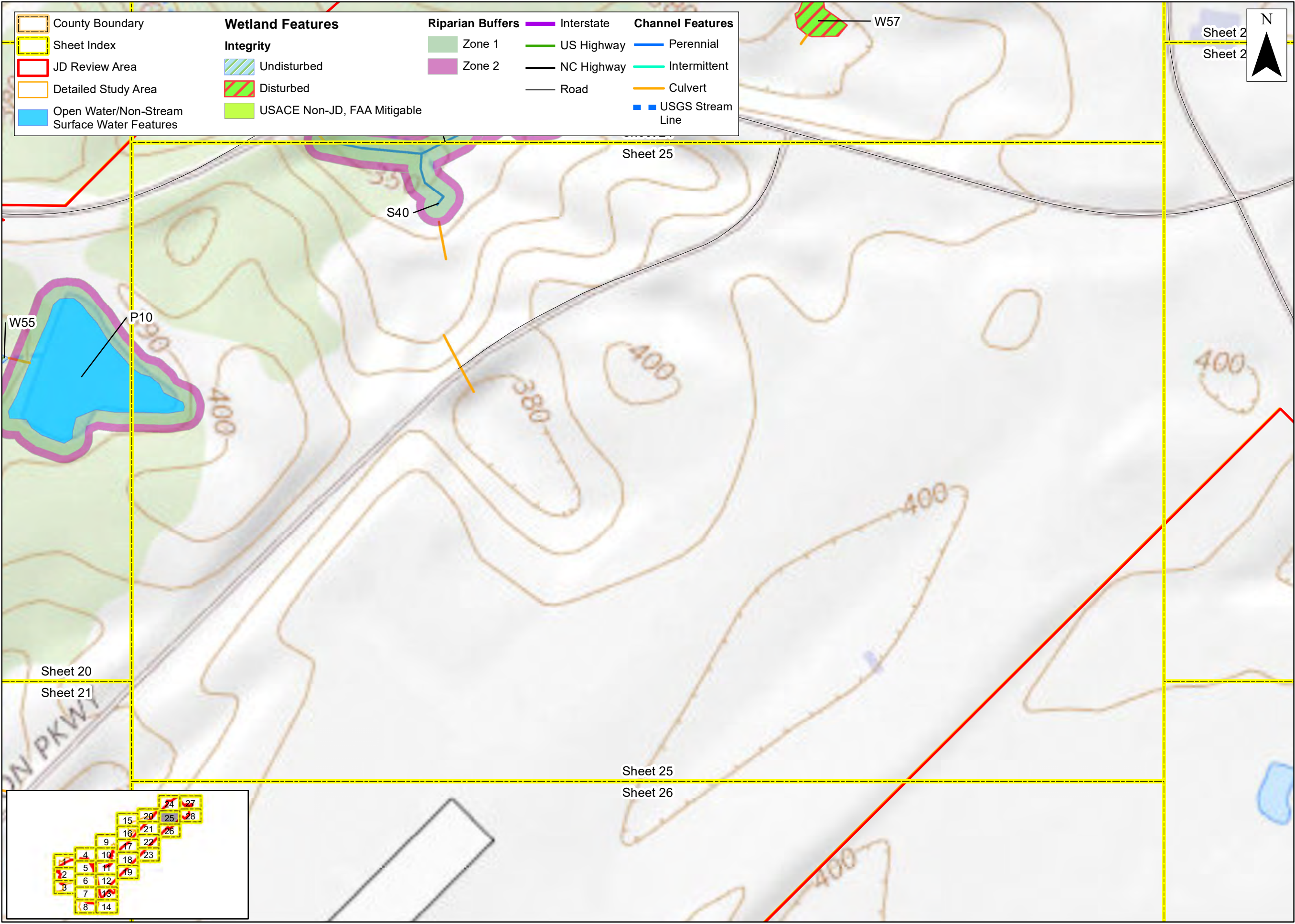
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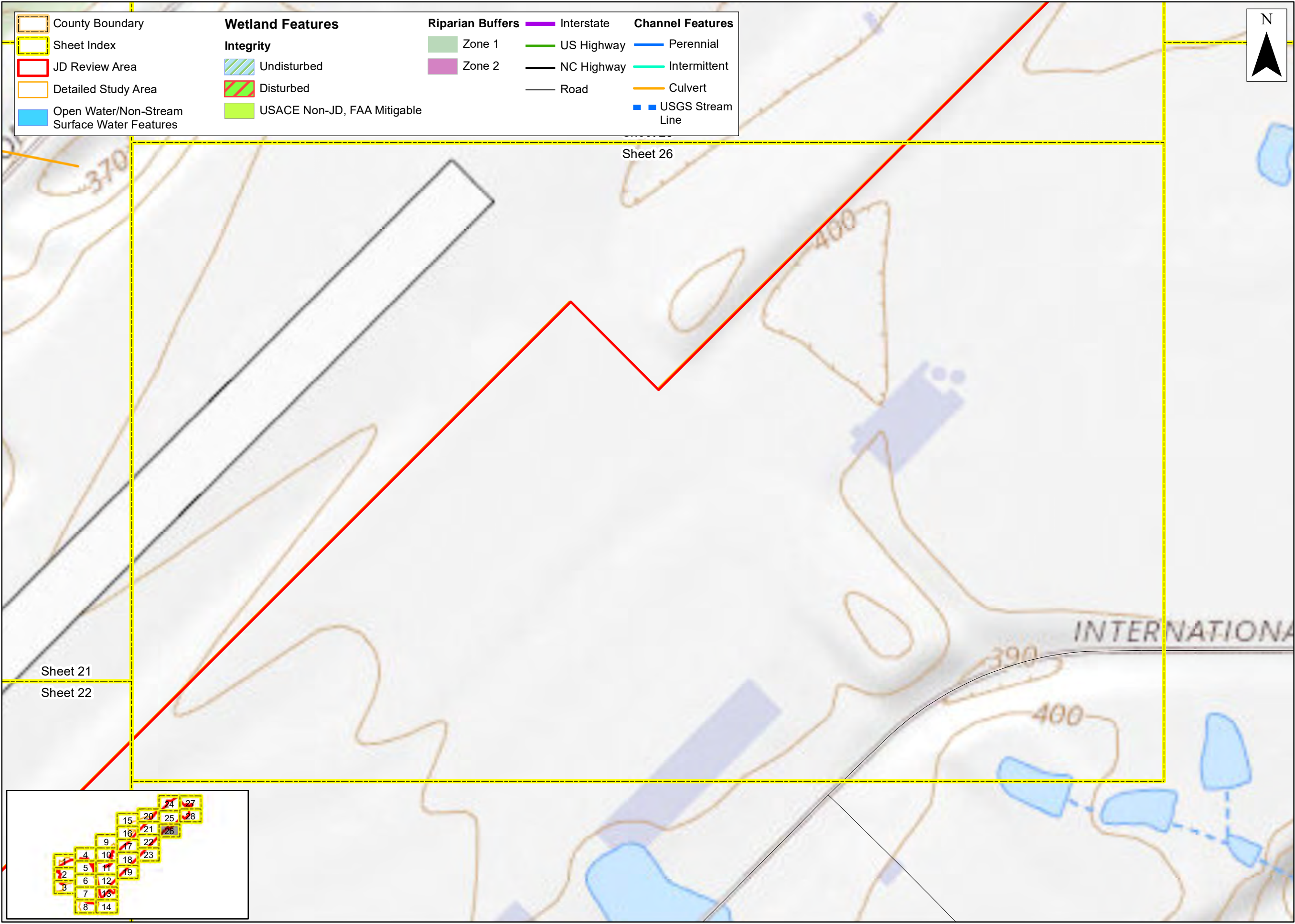
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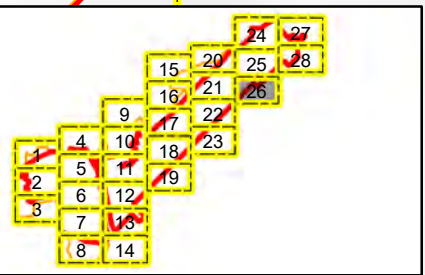


County Boundary	Wetland Features	Riparian Buffers	Interstate	Channel Features
Sheet Index	Integrity	Zone 1	US Highway	Perennial
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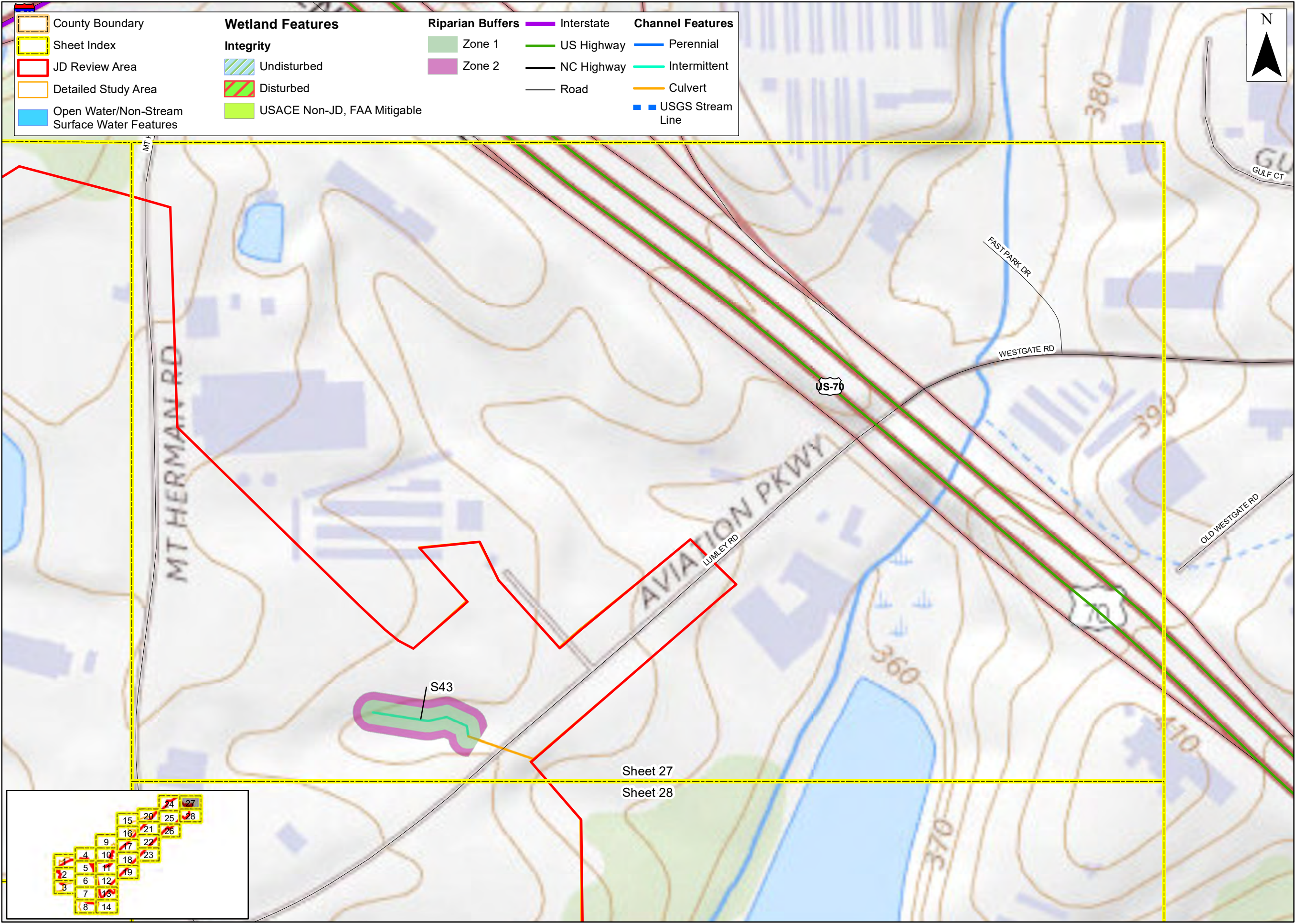
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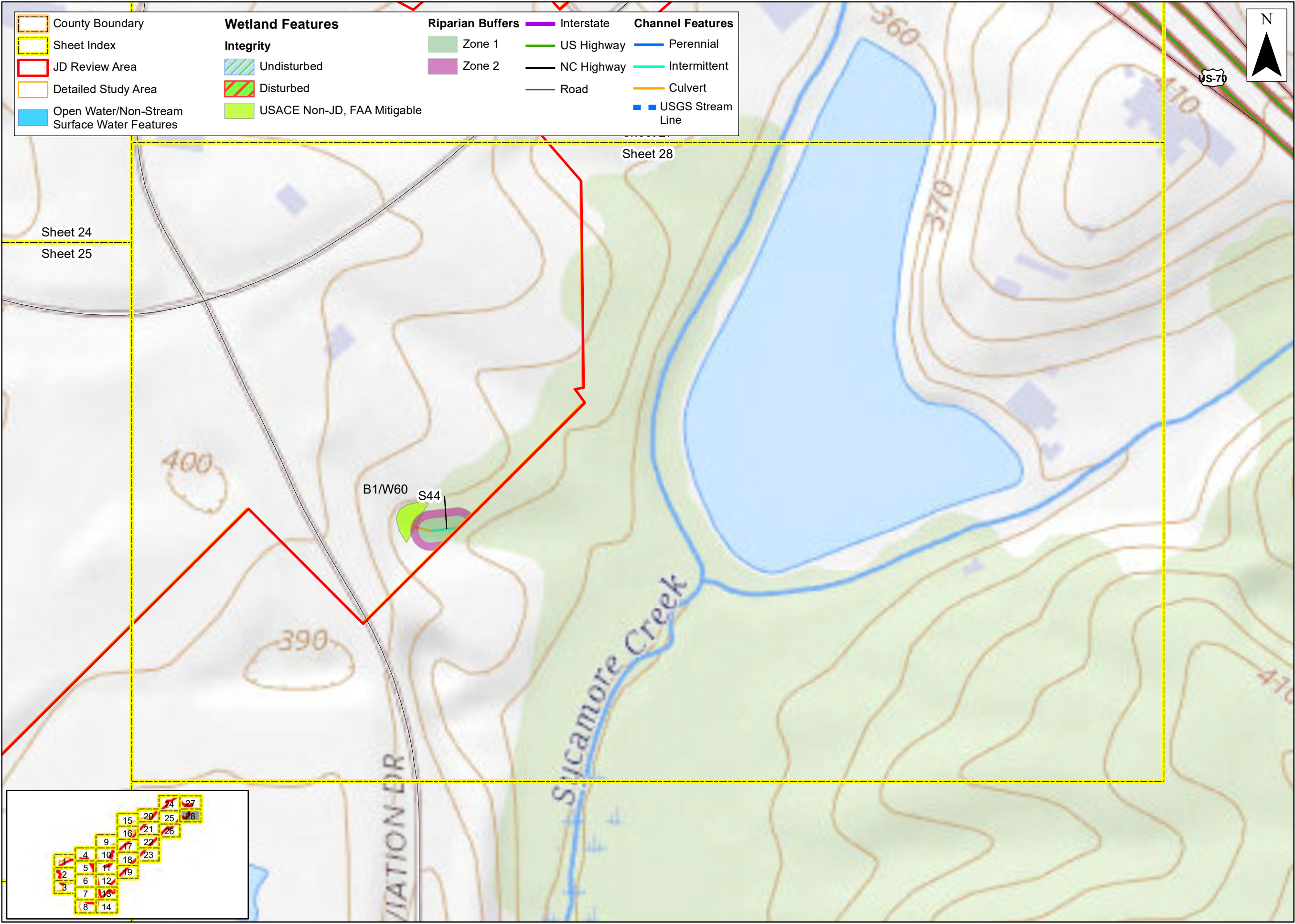
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County Boundary

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Wetland Features

Undisturbed

Disturbed

USACE Non-JD, FAA Mitigable

FEMA Zone, Subtype

AE,

AE, FLOODWAY

Interstate

US Highway

NC Highway

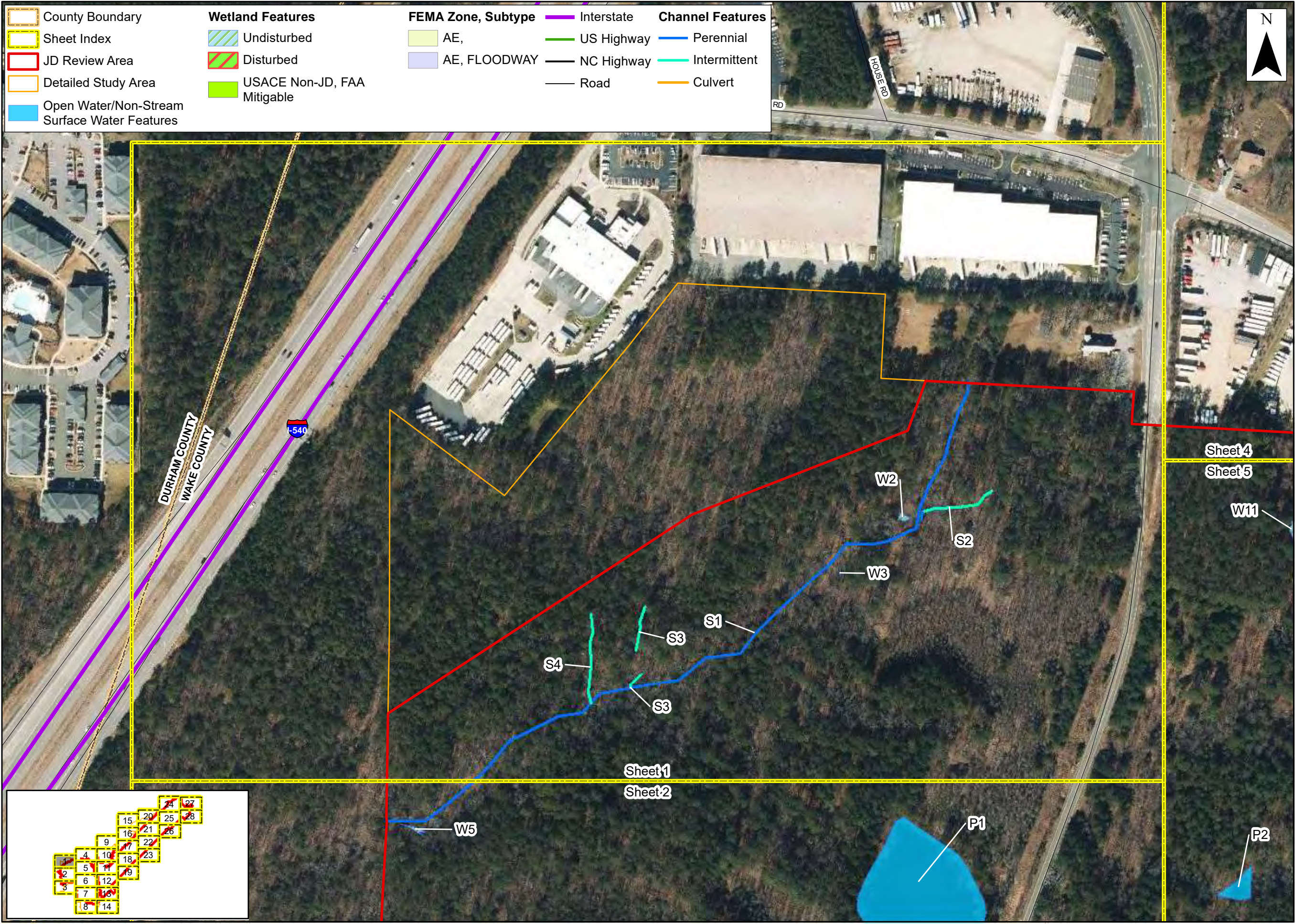
Road

Channel Features

Perennial

Intermittent

Culvert



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**Wake County,
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 JD Review Area
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 Open Water/Non-Stream Surface Water Features

Wetland Features

 Undisturbed
 Disturbed
 USACE Non-JD, FAA Mitigable

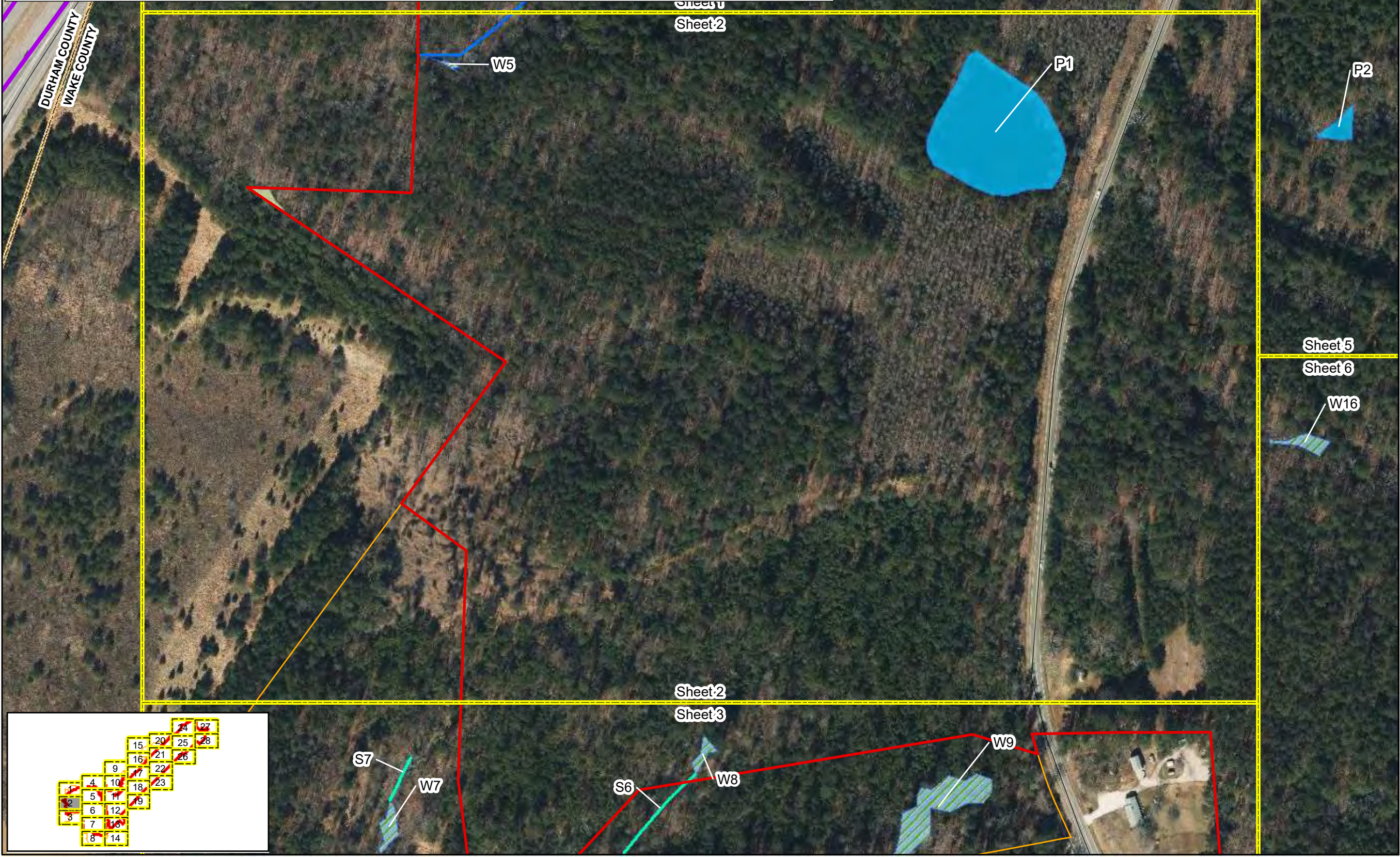
FEMA Zone, Subtype

 AE,
 AE, FLOODWAY

Interstate
 US Highway
 NC Highway
 Road

Channel Features

 Perennial
 Intermittent
 Culvert



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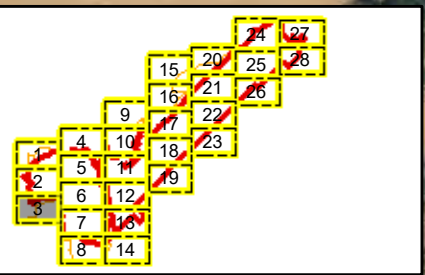
Figure

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Sheet 2



County Boundary Sheet	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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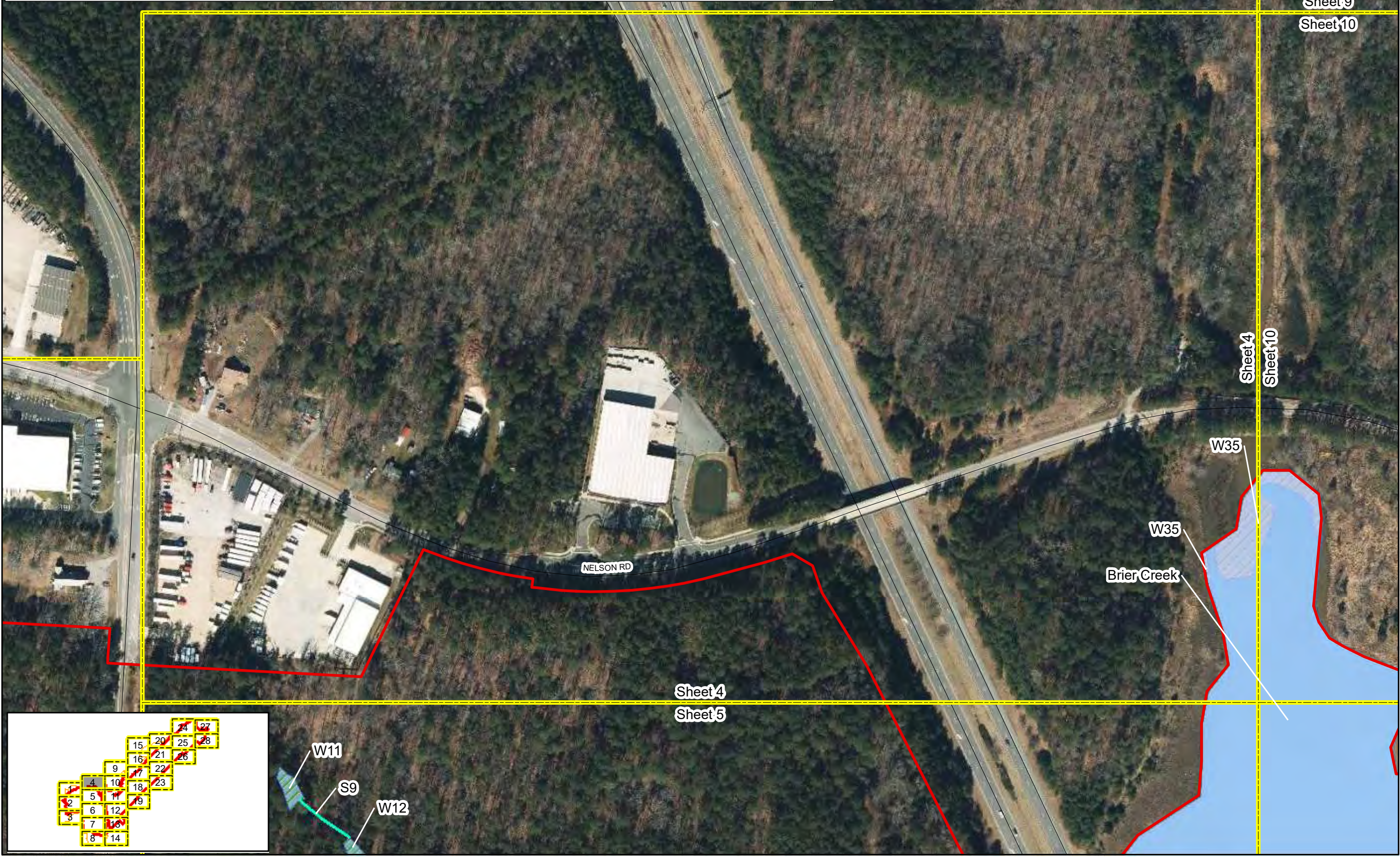
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County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Sheet Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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
















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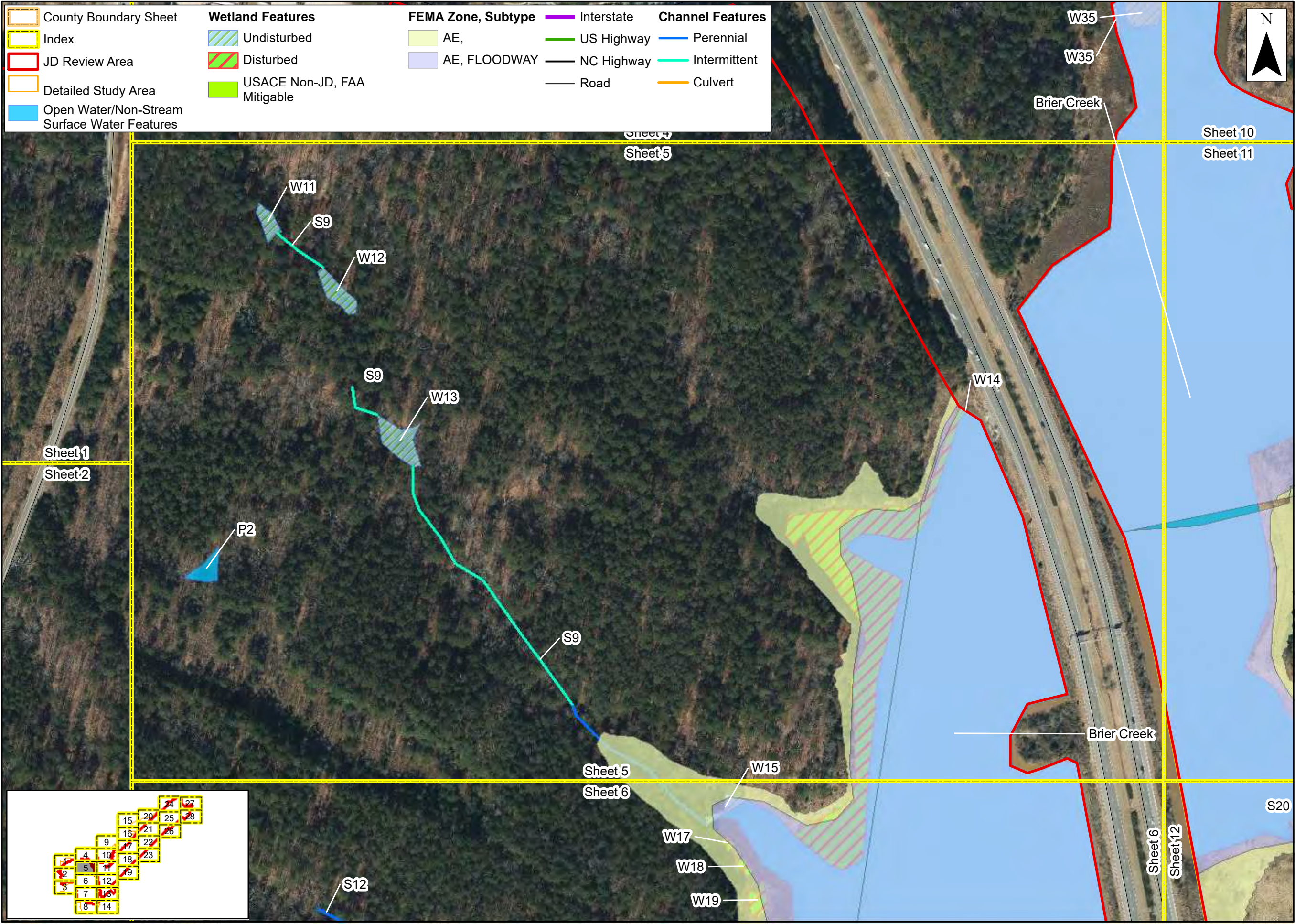
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Sheet 4

 County Boundary Sheet	Wetland Features	FEMA Zone, Subtype	 Interstate	Channel Features
 Index	 Undisturbed	 AE,	 US Highway	 Perennial
 JD Review Area	 Disturbed	 AE, FLOODWAY	 NC Highway	 Intermittent
 Detailed Study Area	 USACE Non-JD, FAA Mitigable		 Road	 Culvert
 Open Water/Non-Stream Surface Water Features				



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Date: November 2022

Scale: 0 100 200 Ft

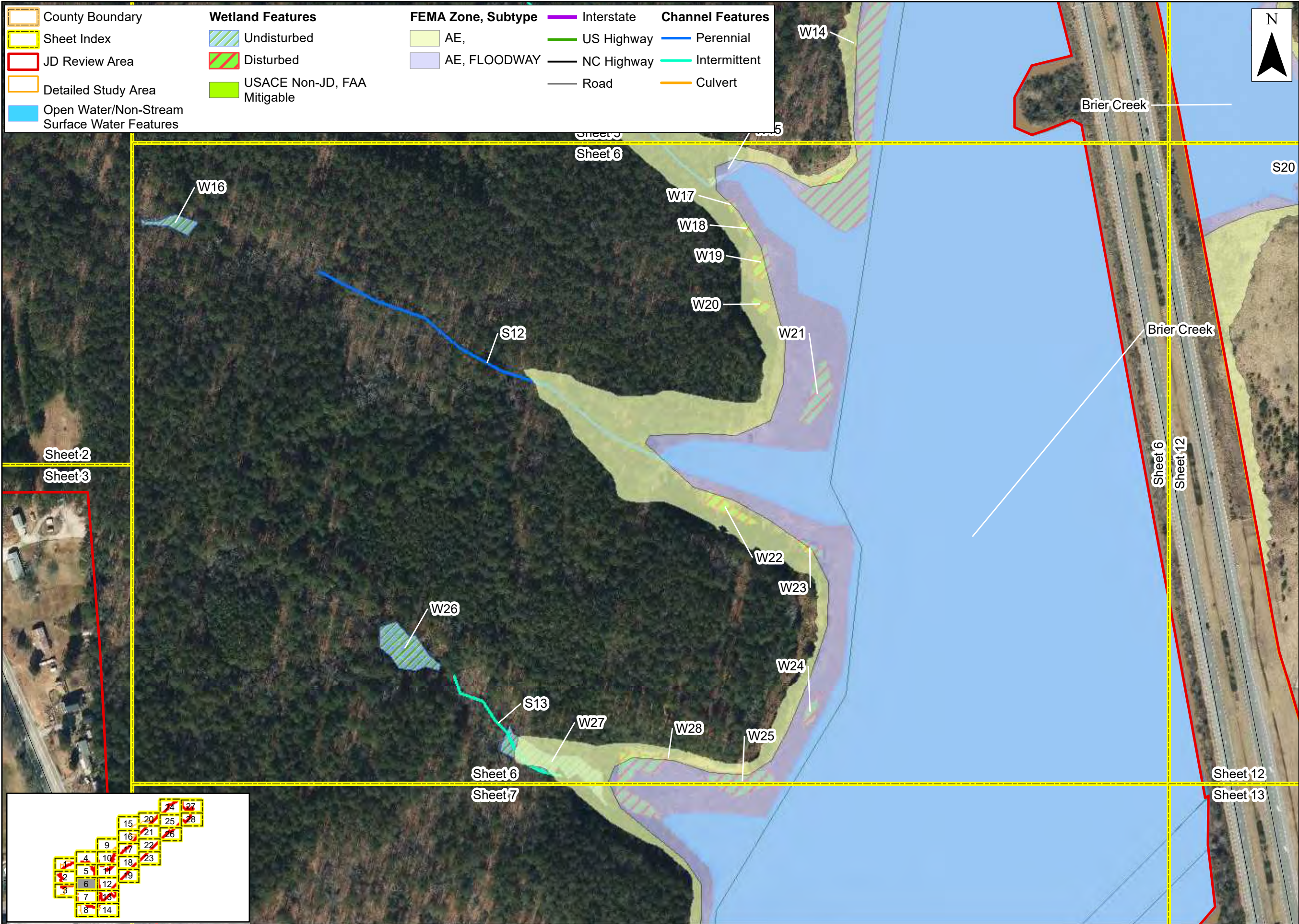
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Figure

8

Sheet 5



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





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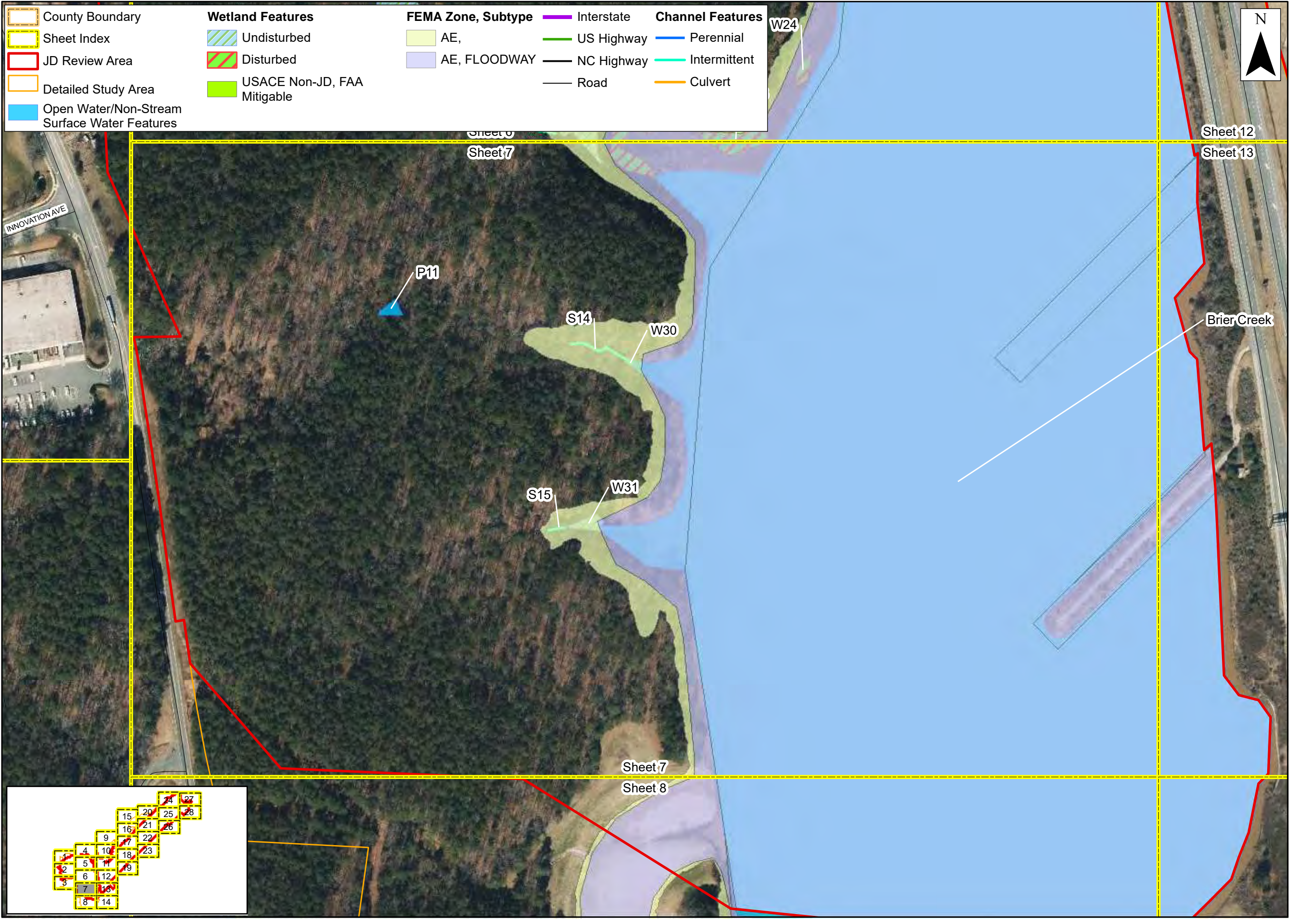
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5L/23R
Replacement**

**Federal
Environmental
Assessment**

**FEMA
Floodplains**

**Wake County,
North Carolina**

 County Boundary	Wetland Features	FEMA Zone, Subtype	 Interstate	Channel Features
 Sheet Index	 Undisturbed	 AE,	 US Highway	 Perennial
 JD Review Area	 Disturbed	 AE, FLOODWAY	 NC Highway	 Intermittent
 Detailed Study Area	 USACE Non-JD, FAA Mitigable		 Road	 Culvert
 Open Water/Non-Stream Surface Water Features				



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Replacement**

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Assessment**

**FEMA
Floodplains**

**Wake County,
North Carolina**

Date: November 2022

Scale: 0 100 200 Ft

Job No.: 19-018

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Figure

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Sheet 7

County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Sheet Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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Assessment**

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North Carolina**

Date: November 2022

Scale: 0 100 200 Ft

Job No.: 19-018

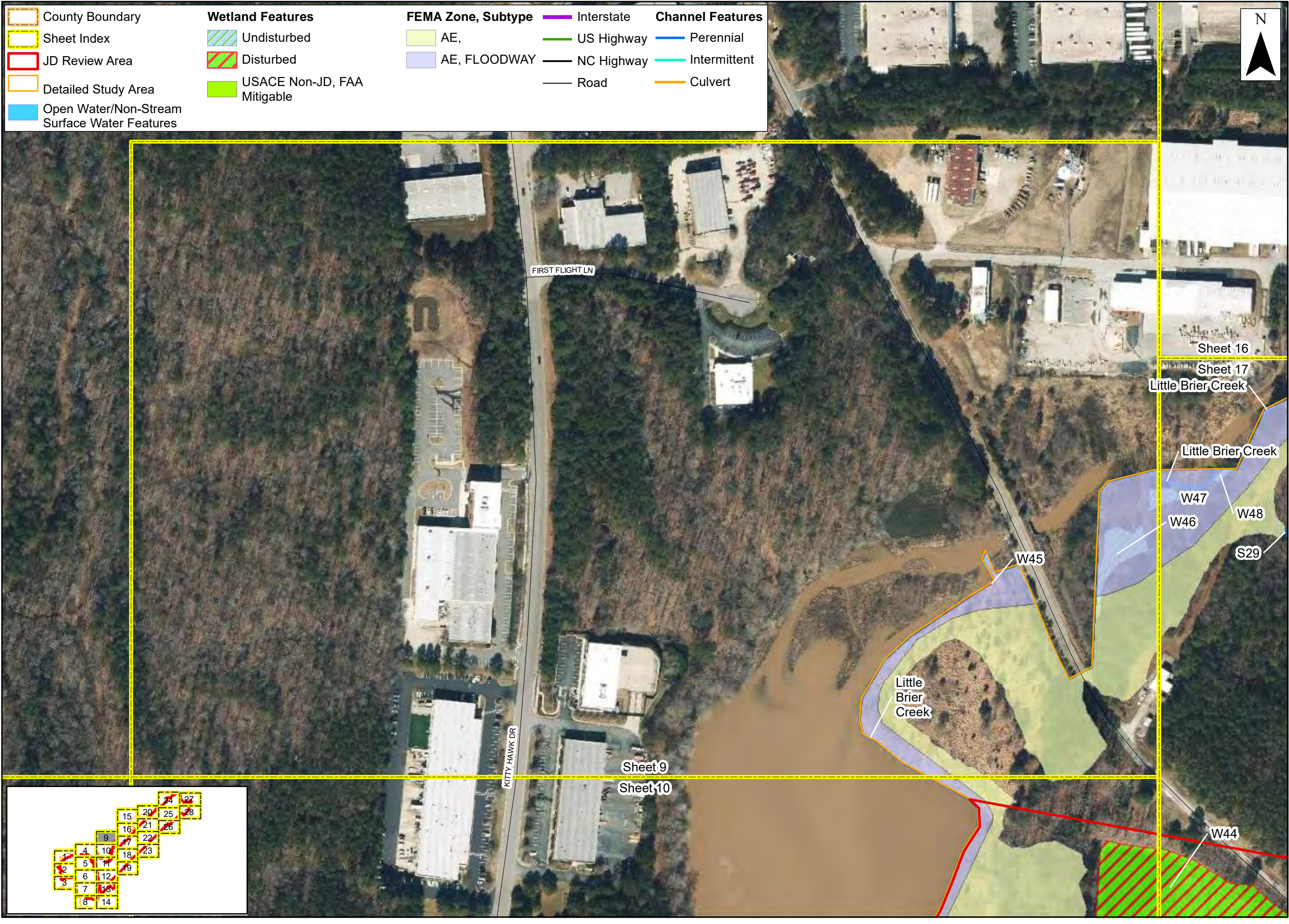
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Figure

8

Sheet 8

County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
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JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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North Carolina**

Date: November 2022

Scale: 0 100 200 Ft

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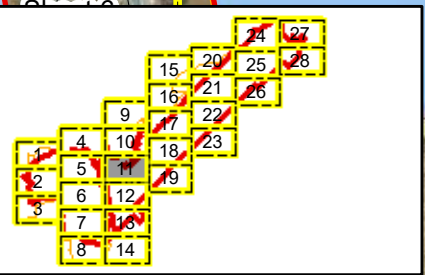
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8

Sheet 9



County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
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JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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North Carolina**

Date: November 2022

Scale: 0 100 200 Ft

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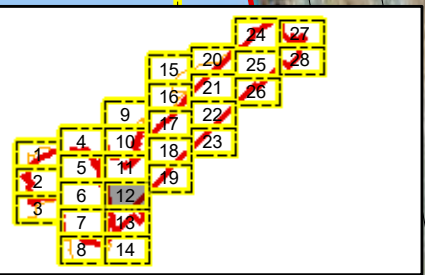
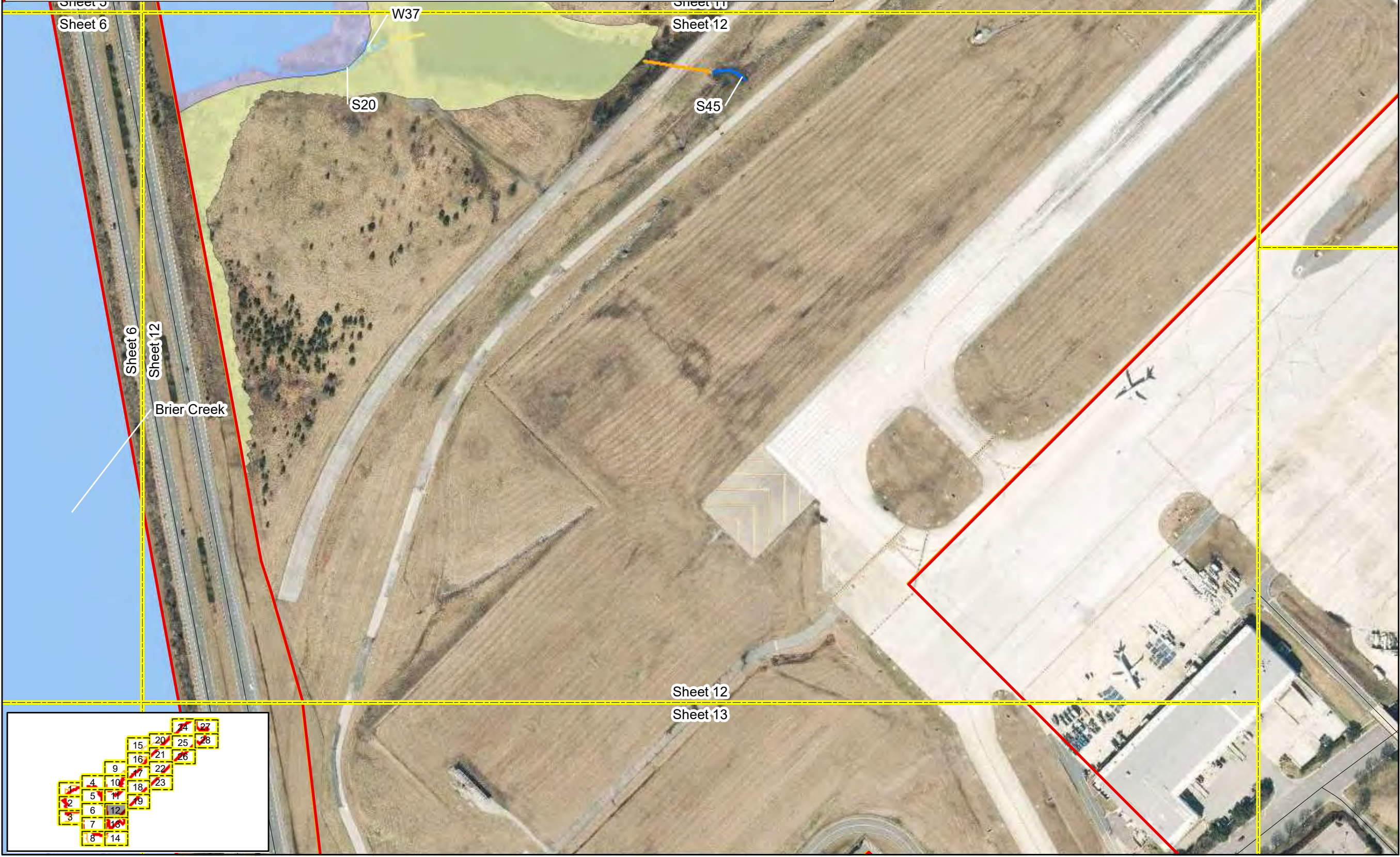
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Figure

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Sheet 11

County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
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JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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Scale: 0 100 200 Ft

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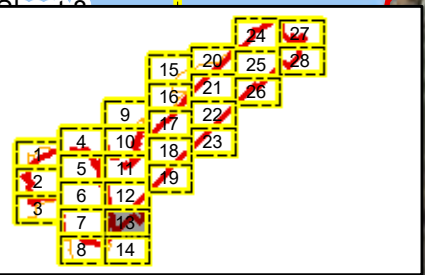
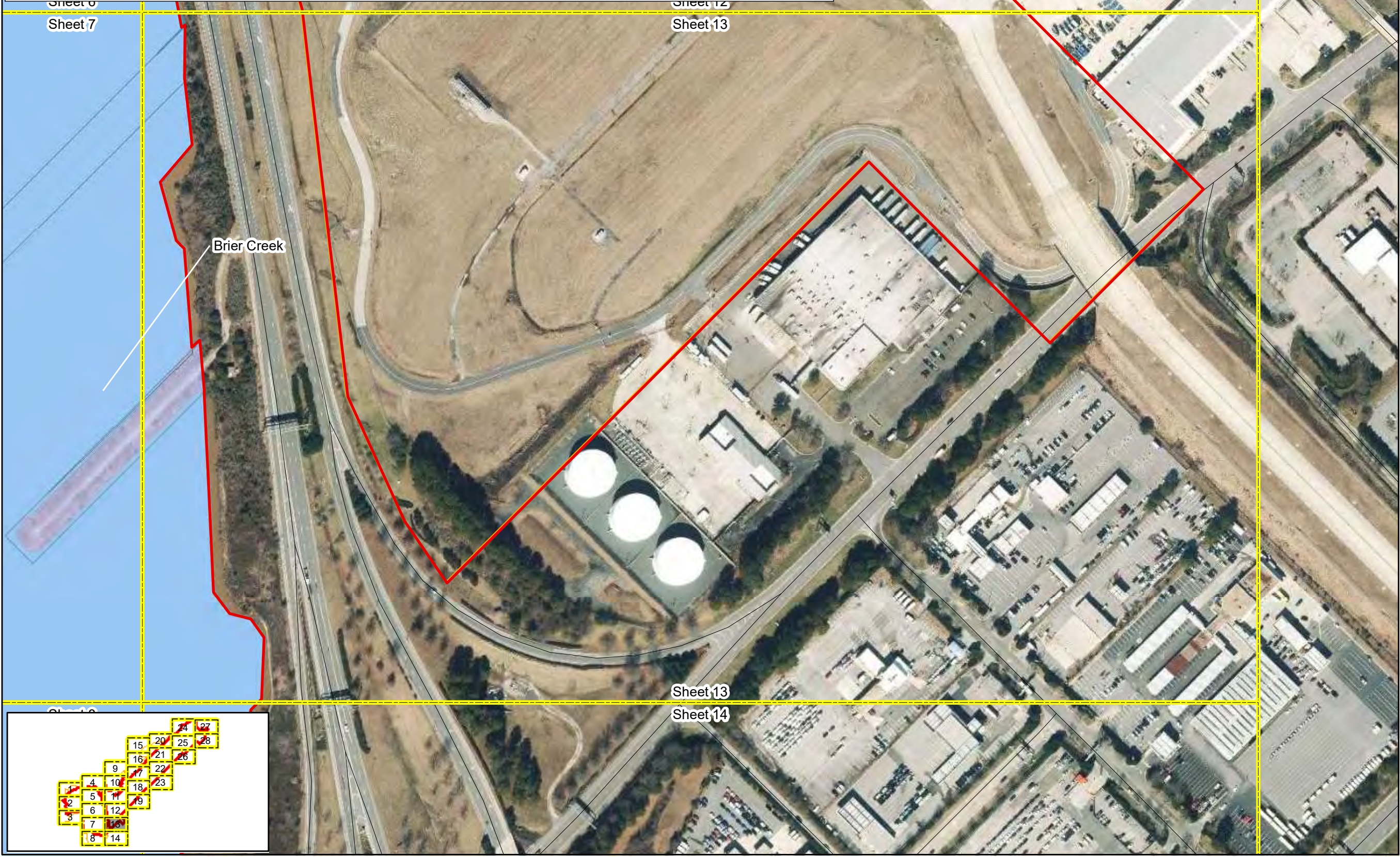
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Figure

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Sheet 12

County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Sheet Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
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
















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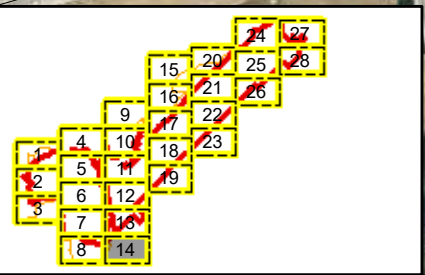
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Figure

8

Sheet 13

 County Boundary	Wetland Features	FEMA Zone, Subtype	 Interstate	Channel Features
 Sheet Index	 Undisturbed	 AE,	 US Highway	 Perennial
 JD Review Area	 Disturbed	 AE, FLOODWAY	 NC Highway	 Intermittent
 Detailed Study Area	 USACE Non-JD, FAA Mitigable		 Road	 Culvert
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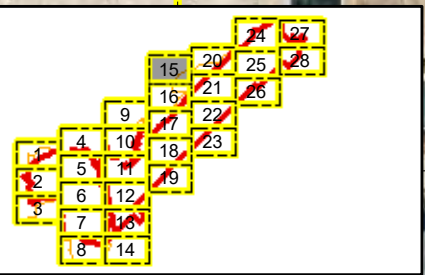
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Figure

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Sheet 14

County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Sheet Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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Figure

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Sheet 15

County Boundary

Sheet Index

JD Review Area

Detailed Study Area

Open Water/Non-Stream Surface Water Features

Wetland Features

Undisturbed

Disturbed

USACE Non-JD, FAA Mitigable

FEMA Zone, Subtype

AE,

AE, FLOODWAY

Interstate

US Highway

NC Highway

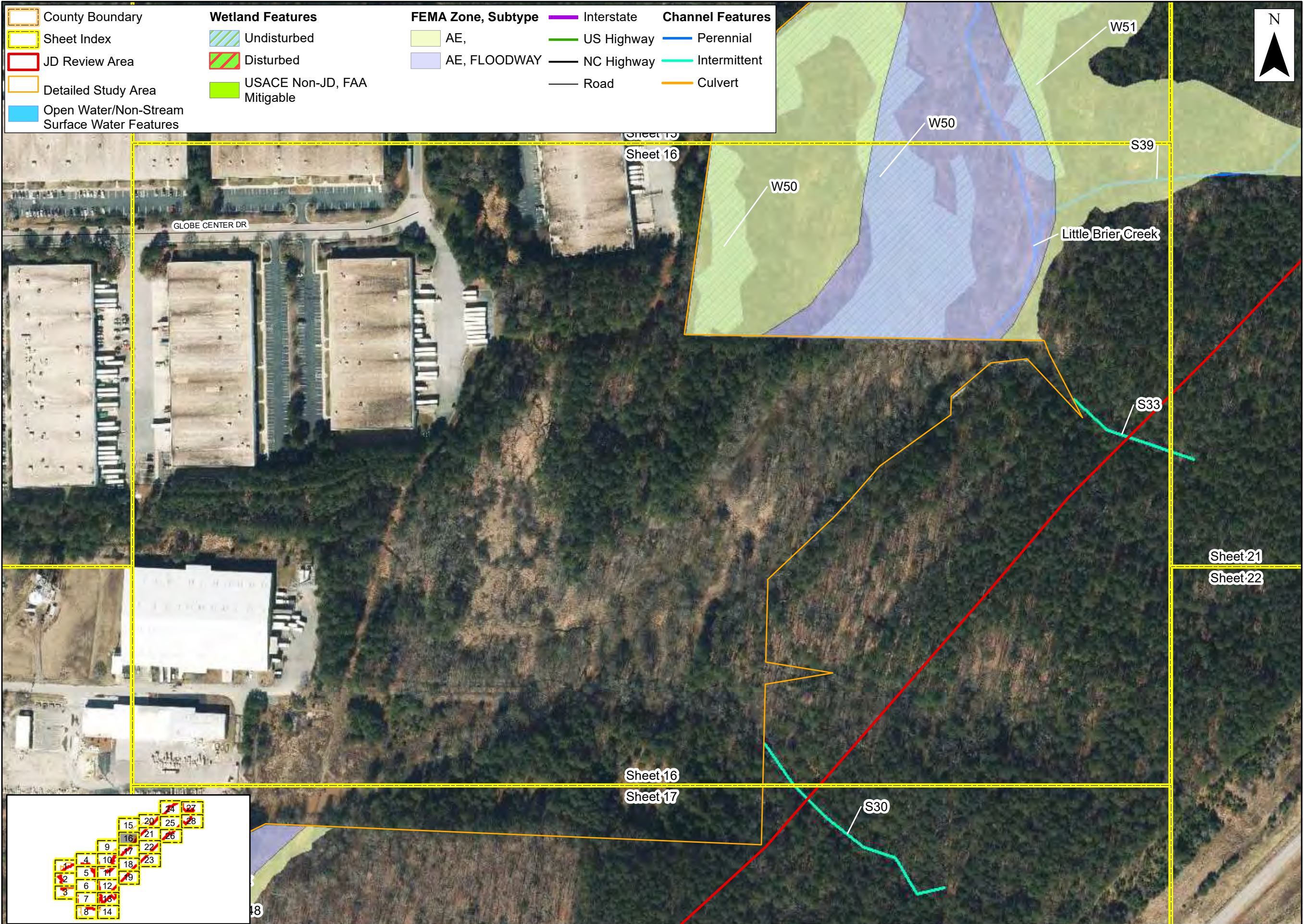
Road

Channel Features

Perennial

Intermittent

Culvert



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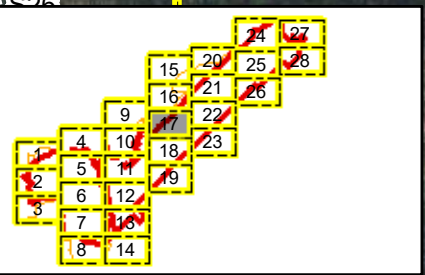
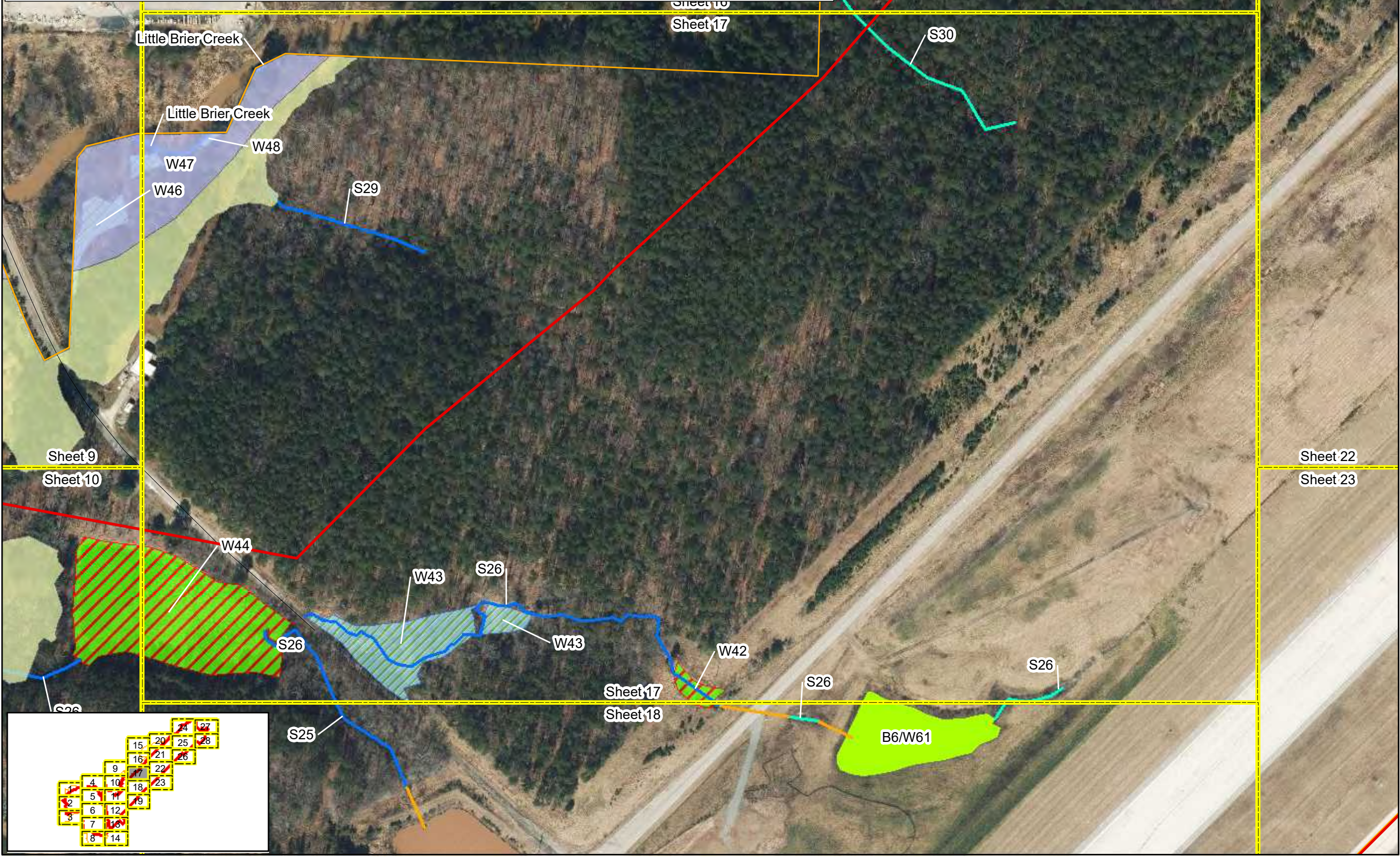
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Floodplains**

**Wake County,
North Carolina**

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Sheet 16

County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Sheet Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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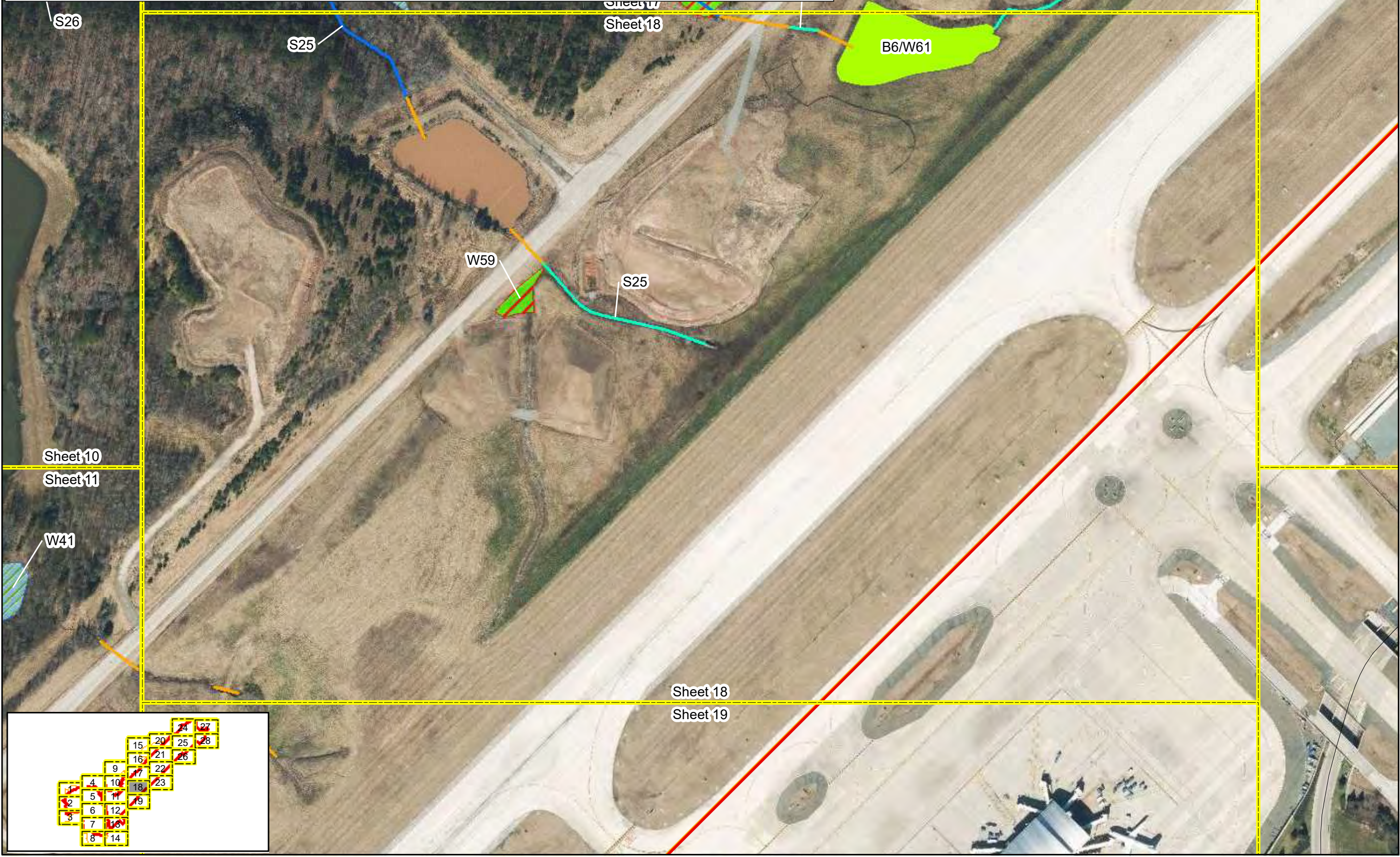
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Figure

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Sheet 17

County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Sheet Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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**Wake County,
North Carolina**

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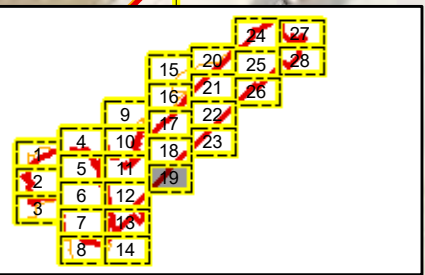
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Figure

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Sheet 18

County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
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JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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Date: November 2022

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
















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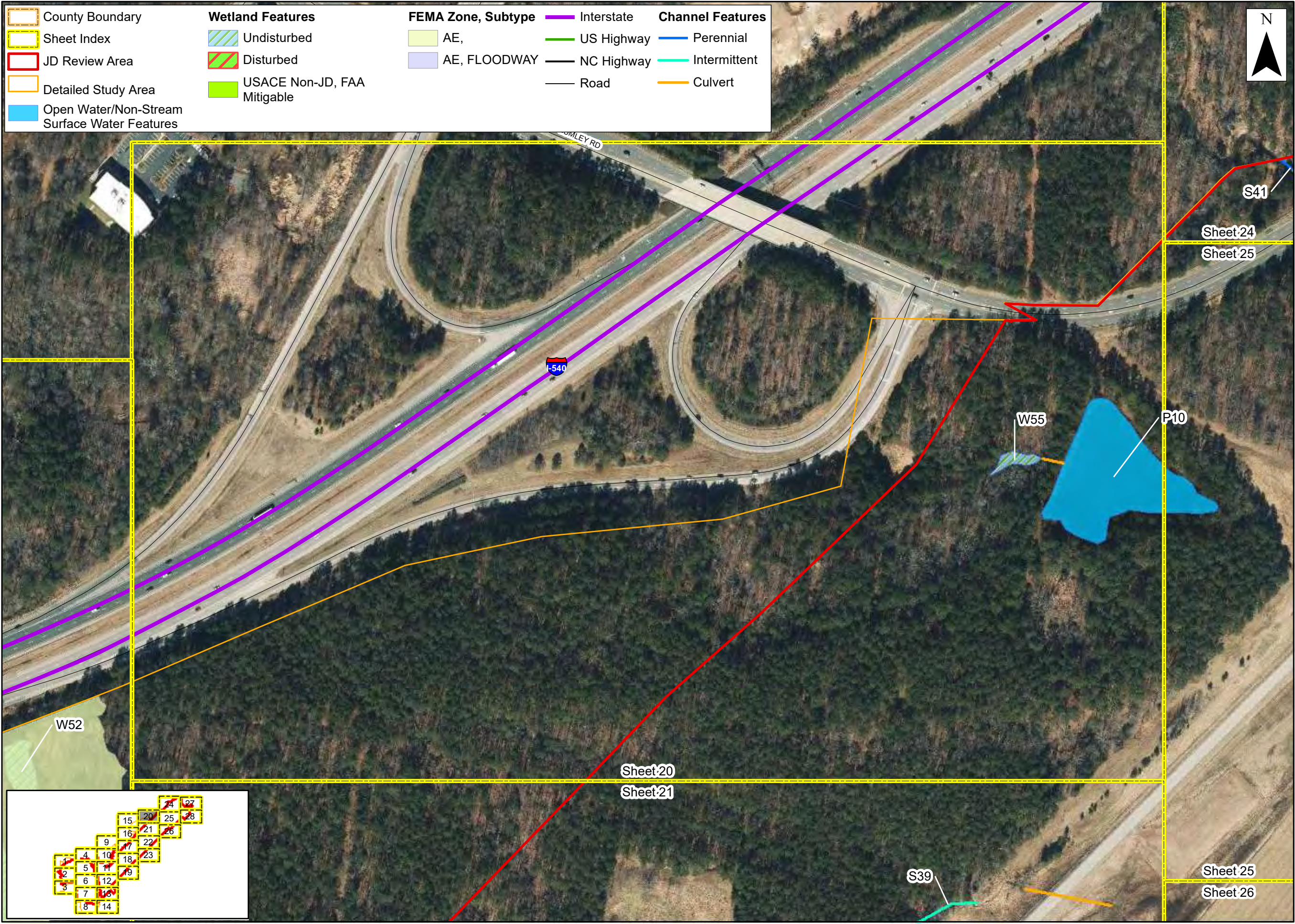
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Figure

8

Sheet 19

 County Boundary	Wetland Features	FEMA Zone, Subtype	 Interstate	Channel Features
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 JD Review Area	 Disturbed	 AE, FLOODWAY	 NC Highway	 Intermittent
 Detailed Study Area	 USACE Non-JD, FAA Mitigable		 Road	 Culvert
 Open Water/Non-Stream Surface Water Features				



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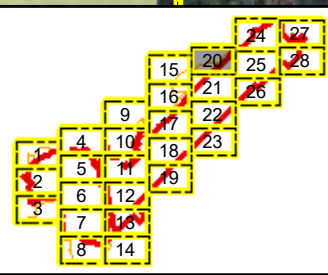
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Figure

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Sheet 20



County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Sheet Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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Wake County, North Carolina

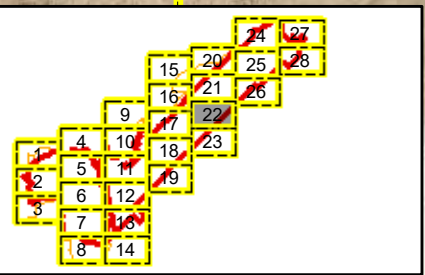
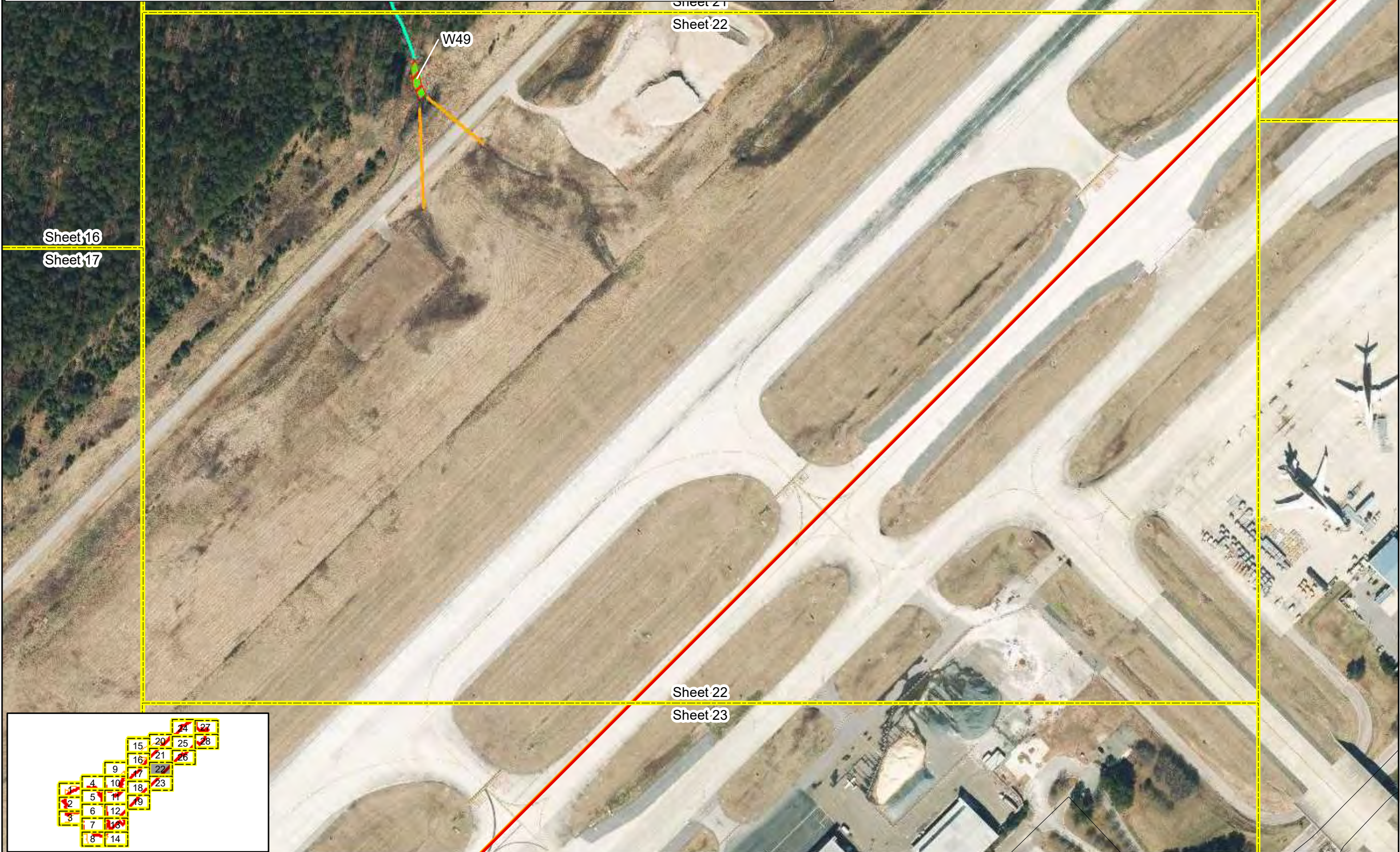
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Job No.:	19-018
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Figure

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Sheet 21

County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Sheet Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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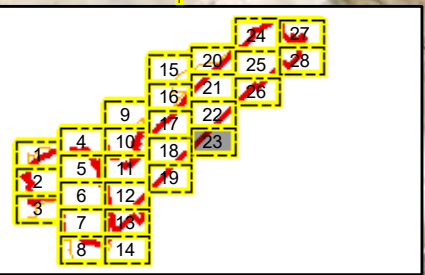
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Figure

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Sheet 22

County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Sheet Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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Sheet 23

County Boundary

Sheet Index

JD Review Area

Detailed Study Area

Open Water/Non-Stream Surface Water Features

Wetland Features

Undisturbed

Disturbed

USACE Non-JD, FAA Mitigable

FEMA Zone, Subtype

AE,

AE, FLOODWAY

Interstate

US Highway

NC Highway

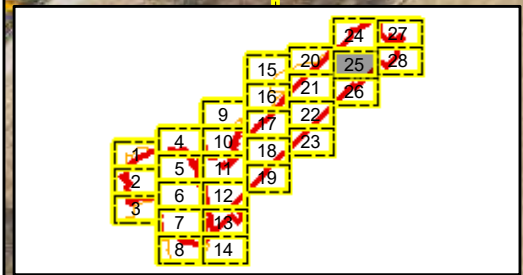
Road

Channel Features

Perennial

Intermittent

Culvert



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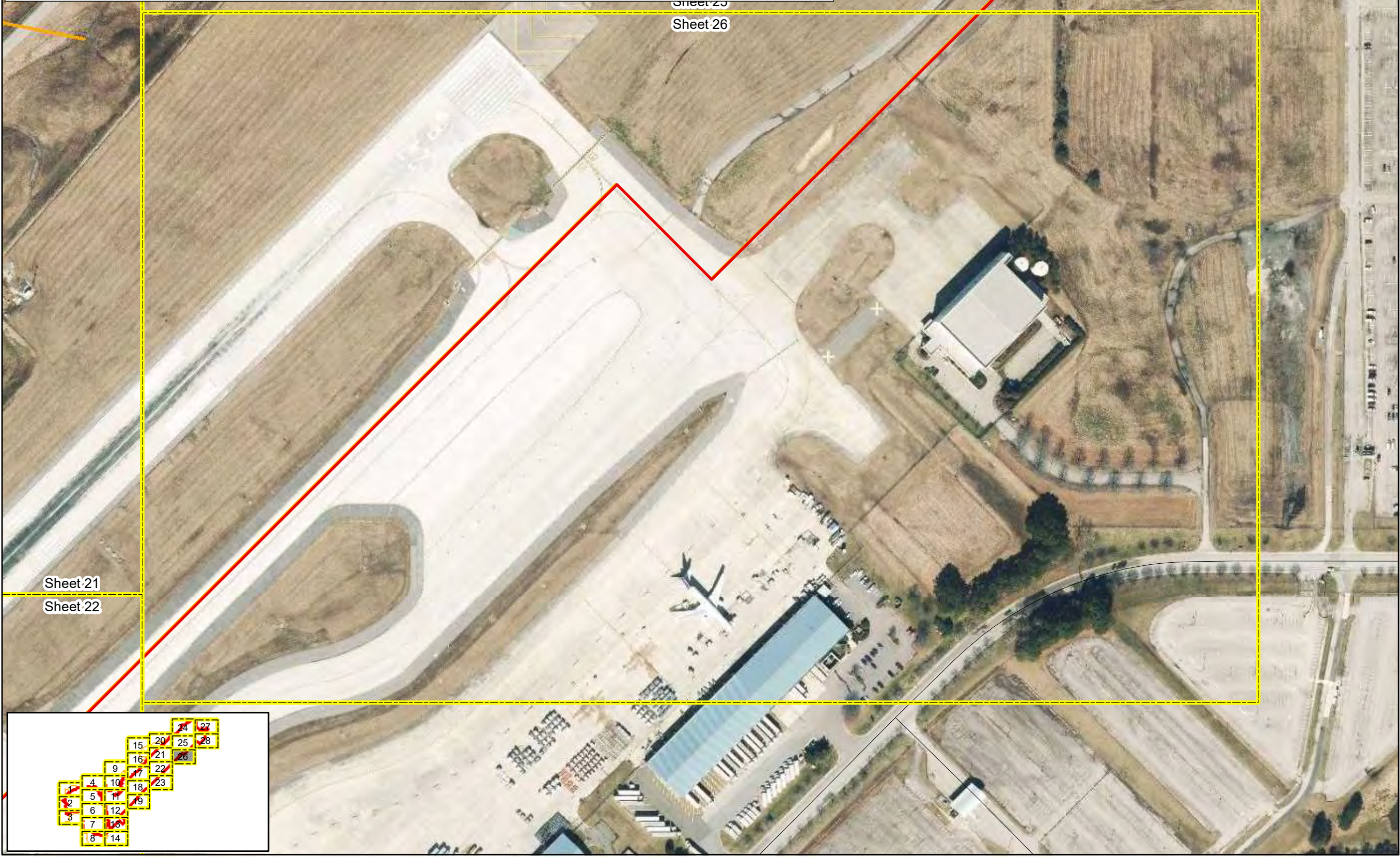
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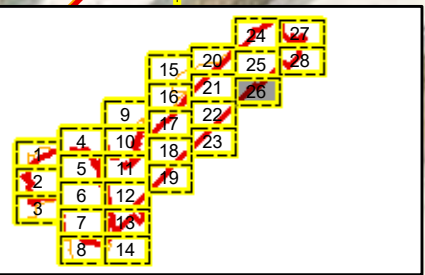
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County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Sheet Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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Sheet 25
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Sheet 26

County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Sheet Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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North Carolina**

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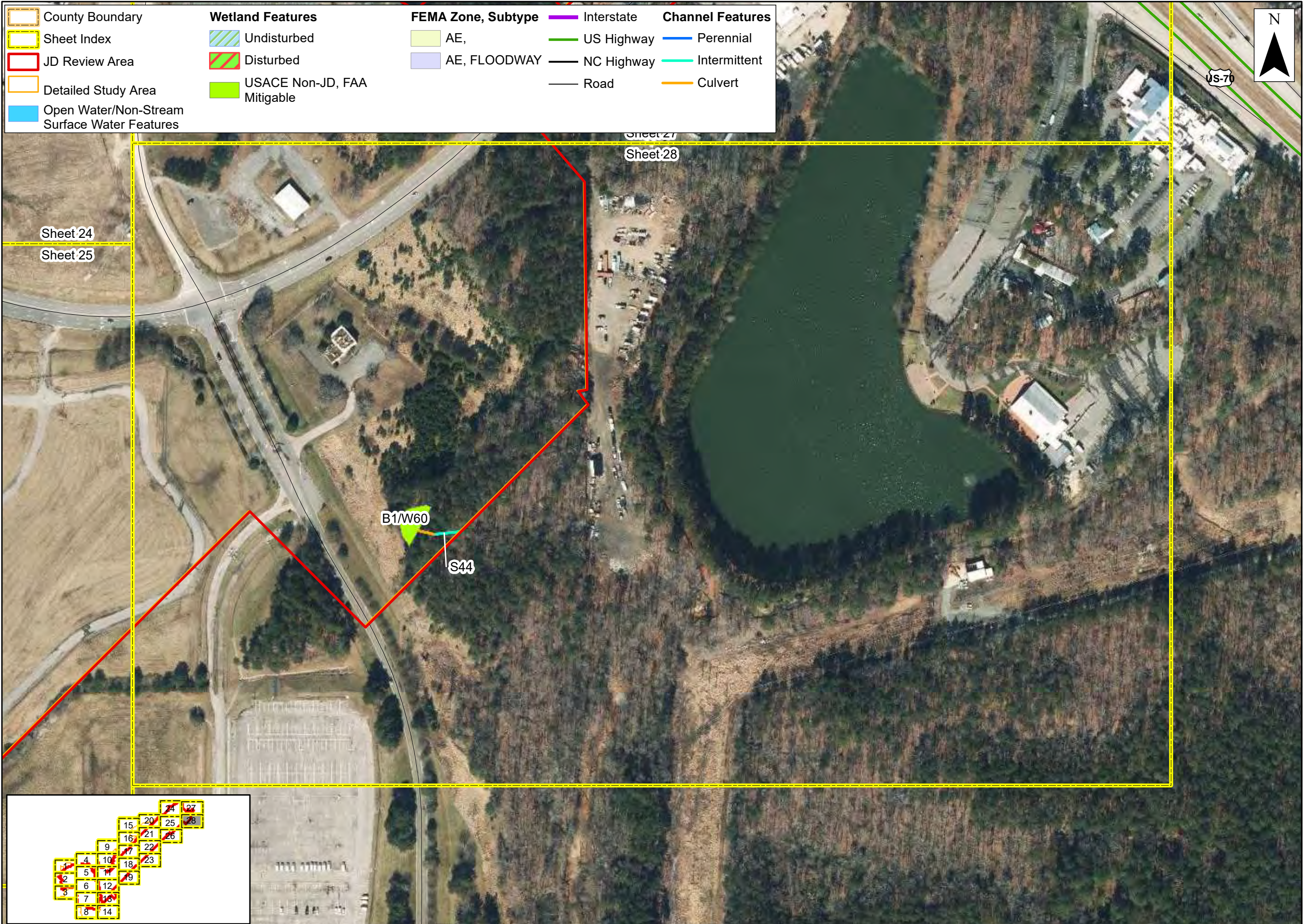
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Figure

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Sheet 27

County Boundary	Wetland Features	FEMA Zone, Subtype	Interstate	Channel Features
Sheet Index	Undisturbed	AE,	US Highway	Perennial
JD Review Area	Disturbed	AE, FLOODWAY	NC Highway	Intermittent
Detailed Study Area	USACE Non-JD, FAA Mitigable	Road	Culvert	
Open Water/Non-Stream Surface Water Features				



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Sheet 28

Appendix B Qualifications of Contributors

Investigator:	Trevor Hall
Education:	BS, Environmental Science: Ecology and Organismal Biology, University of Delaware, 2016
Experience:	Environmental Scientist, Three Oaks Engineering, July 2021-Present Jr. Environmental Scientist, NV5 Consultants and Engineers, April 2019-July 2021 Senior Fisheries Technician, North Carolina State University, October 2018-April 2019
Responsibilities:	Wetland and stream delineations
Investigator:	Nathan Howell, PWS
Education:	B.S. Fisheries, Wildlife, and Conservation Biology, North Carolina State University, 2013 M.S. Plant and Microbial Biology, North Carolina State University, 2015
Experience:	Environmental Scientist, Three Oaks Engineering, October 2015-Present
Responsibilities:	Document preparation and review, wetland and stream delineations
Investigator:	Byron Levan
Education:	B.S. Fisheries, Wildlife, and Conservation Biology; North Carolina State University, 2011 M.F.W. Fisheries, Wildlife, and Conservation Biology, North Carolina State University, 2019
Experience:	Environmental Scientist, Three Oaks Engineering, 2021-Present Junior Environmental Scientist, NV5 Global Inc. 2019-2021
Responsibilities:	Document preparation and review, wetland and stream delineations
Investigator:	James Mason, PWS
Education:	B.A. Biology, Colby College, 2000 M.S. Biology/Ecology, UNC-Charlotte, 2004
Experience:	Environmental Senior Scientist, Three Oaks Engineering, April 2018-Present
Responsibilities:	Document preparation and review, wetland and stream delineations
Investigator:	Tess Moody
Education:	B.S. in Natural Resources Management – Wildlife Biology, University of Tennessee at Martin, 2011 M.S. in Forestry, Wildlife, and Fisheries – Wildlife Health, University of Tennessee, 2013
Experience:	Wildlife Research Technician/Assistant, UT Knoxville, May 2011-September 2013 Natural History Interpretive Aide, Charleston County Parks, February 2016-September 2018 Environmental Scientist, Three Oaks Engineering, September 2018-Present
Responsibilities:	Wetland and stream delineations
Investigator:	Cary Rowells

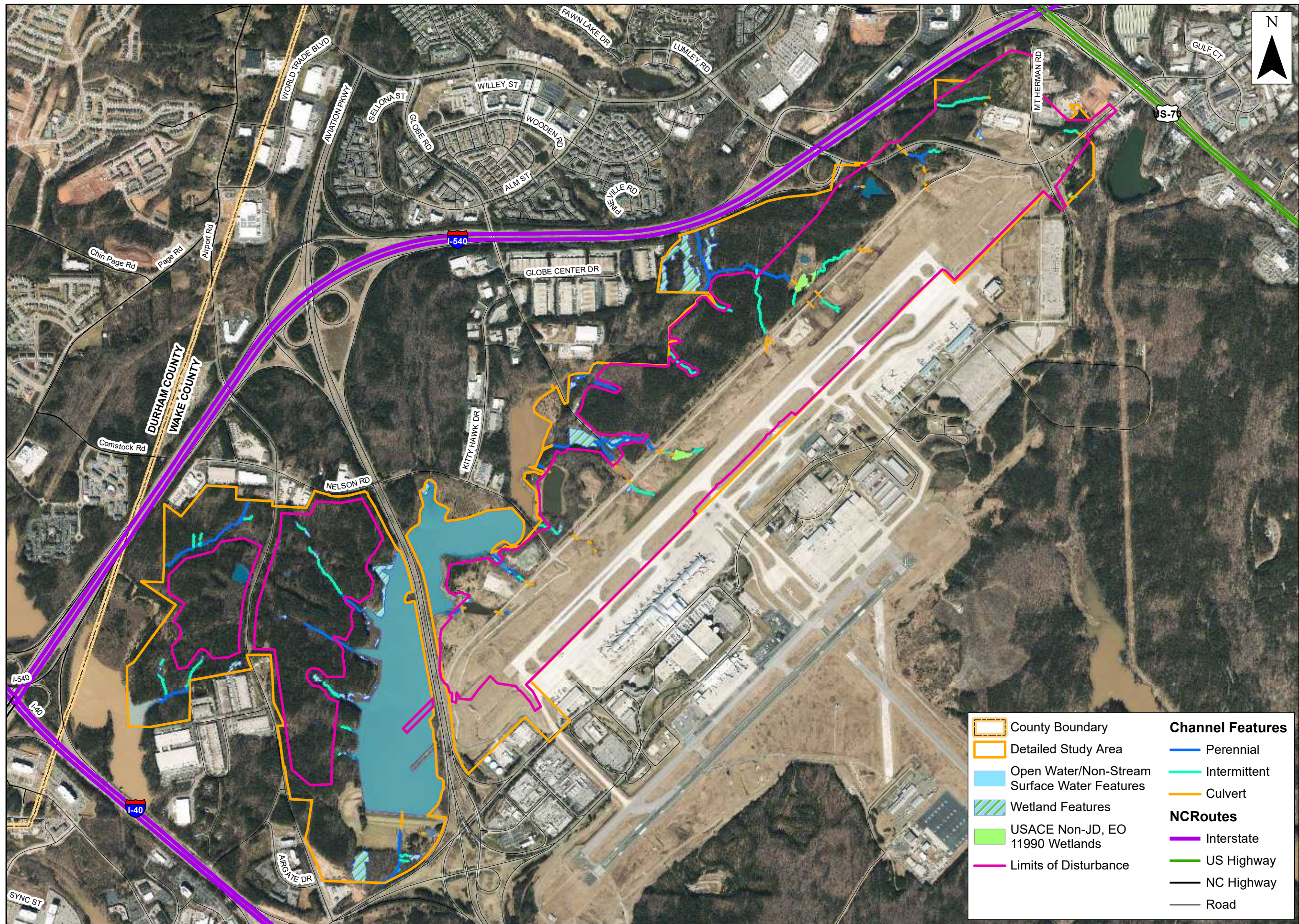


Education:	Coursework, Civil Engineering, Wake Technical Community College
Experience:	Coursework, Geology, University of North Carolina at Wilmington GIS Analyst, Three Oaks Engineering, 2015-Present GIS analyst, Michael Baker Engineering, 2002-2015 Analytical Surveys, Inc., CADD Technician/GIS Technician/GIS Project Coordinator, 1989-2002
Responsibilities:	GIS mapping, Microstation
Investigator:	Joanna Salvucci
Education:	B.S. Environmental Geoscience, Bridgewater State University, 2020
Experience:	Environmental Scientist, Three Oaks Engineering, March 2021-Present
Responsibilities:	Document preparation and review, wetland and stream delineations
Investigator:	Kate Seveck
Education:	M.S. Environmental Sciences, University of Rhode Island, 2004 B.A. Biology, Reed College, 2000
Experience:	Environmental Scientist, Three Oaks Engineering, June 2015-present Environmental Scientist, The Catena Group, November 2004-June 2015
Responsibilities:	GIS Mapping
Investigator:	Lizzy Stokes-Cawley
Education:	M.E.M. Water Resources, Duke University, 2016 B.S. Conservation Biology, St. Lawrence University, 2011
Experience:	Environmental Scientist, Three Oaks Engineering, April 2017-Present
Responsibilities:	Wetland and stream delineations
Investigator:	Elizabeth Workman-Maurer
Education:	B.S. Fisheries and Wildlife Sciences at North Carolina State University, 1996
Experience:	Senior Environmental Planner, Three Oaks Engineering, 2021-Present AECOM, Planner/Project Manager, 2016-2021 RK&K, Biologist/Planner, 2000-2016
Responsibilities:	Wetland and stream delineations



Potential Impact Map Set

In order to determine the potential impacts to wetlands, an ArcView GIS program was used to calculate potential impacts based on the limits of disturbance. The limits of disturbance identify a boundary where within this area resources are assumed to be disturbed during construction activities. The limits of disturbance are within the DSA but are smaller to only account for areas that would be impacted by construction activities or resources that have been avoided. Detailed impacted streams, wetlands, and surface water maps are being provided to the USACE as part of the 404-permit application.



- | | |
|--|-------------------------|
| County Boundary | Channel Features |
| Detailed Study Area | Perennial |
| Open Water/Non-Stream Surface Water Features | Intermittent |
| Wetland Features | Culvert |
| USACE Non-JD, EO 11990 Wetlands | NCRoutes |
| Limits of Disturbance | Interstate |
| | US Highway |
| | NC Highway |
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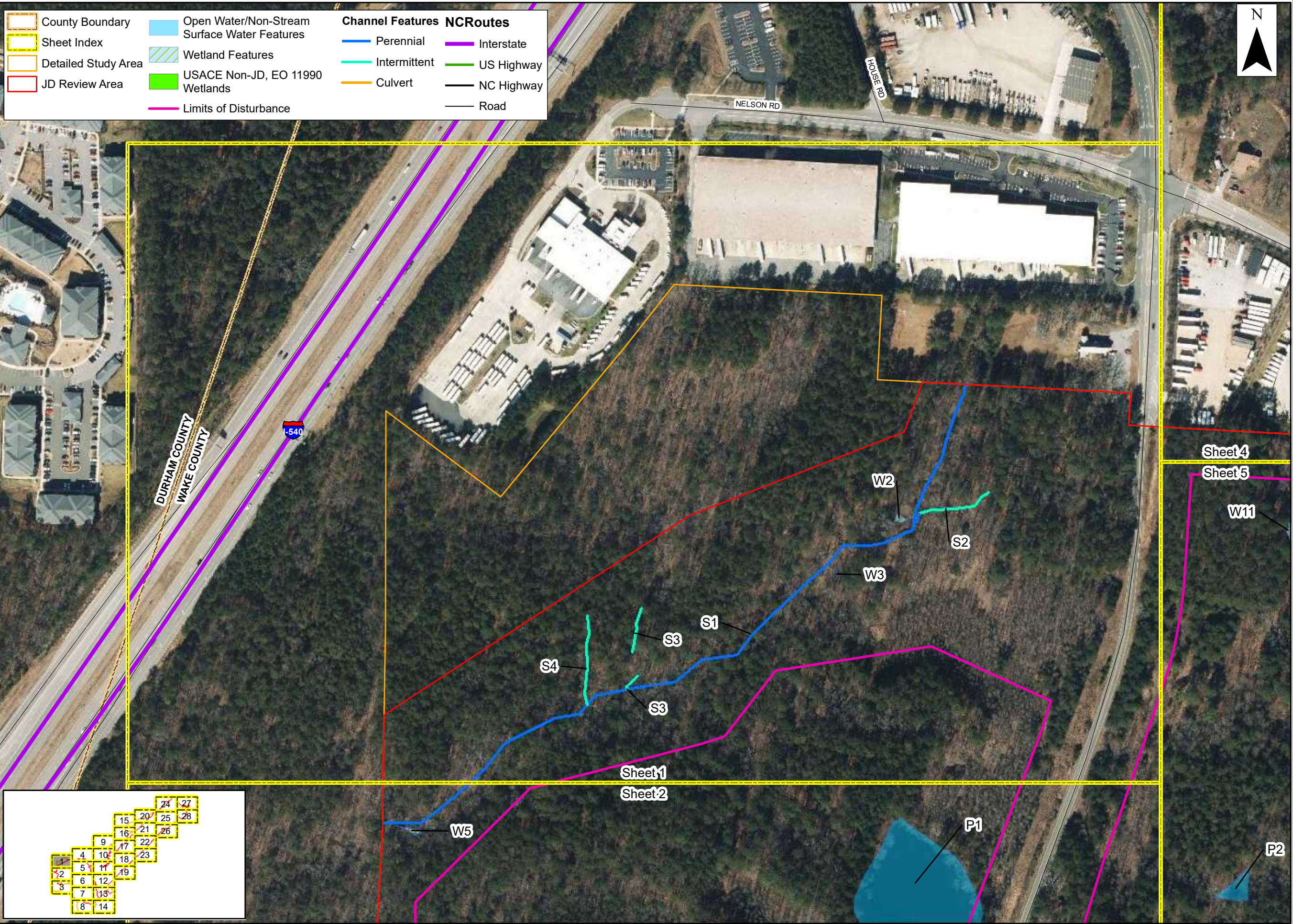
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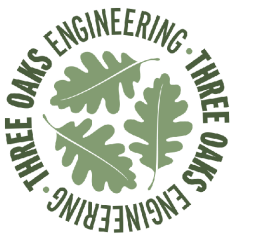
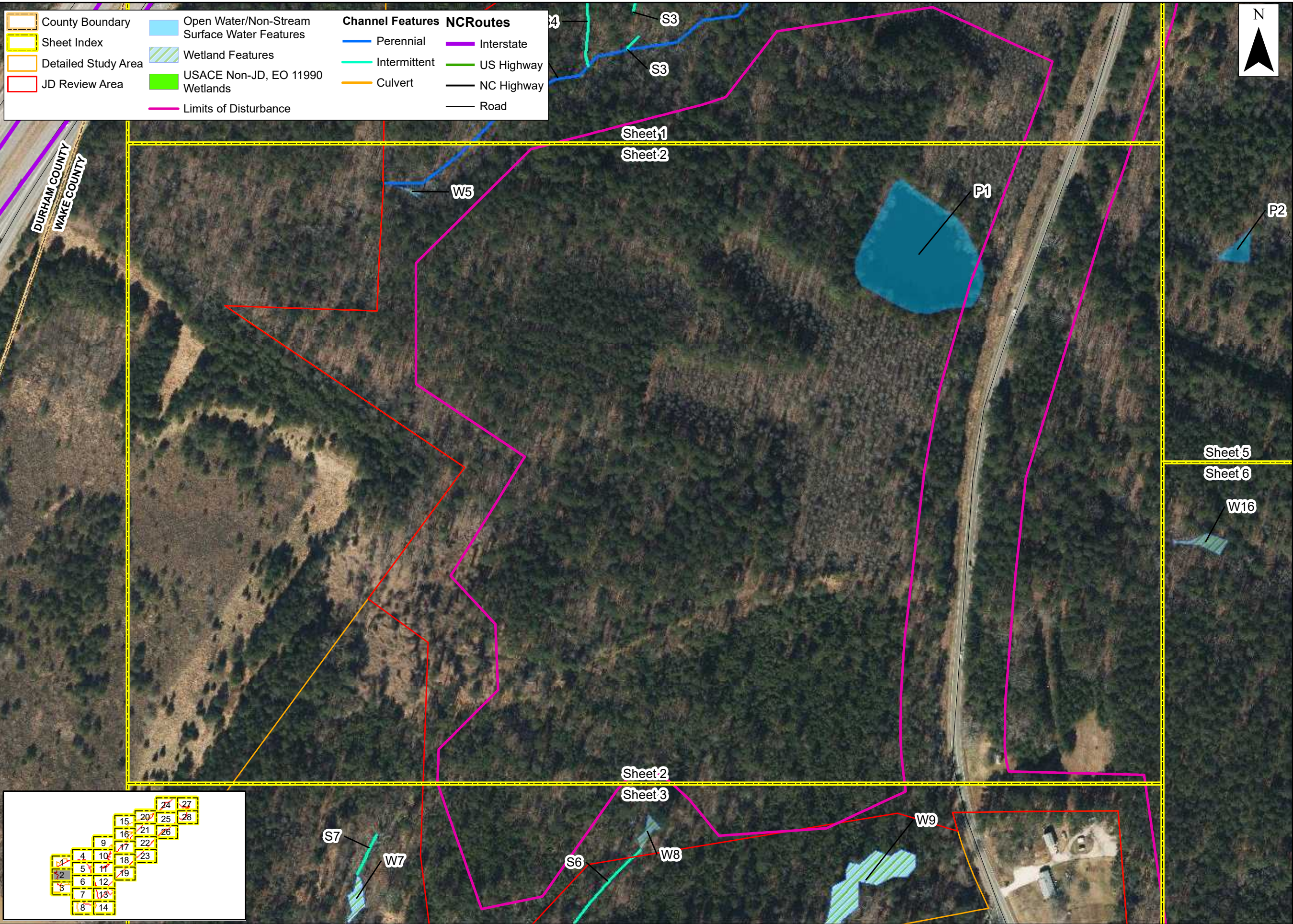
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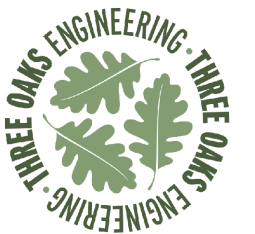
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County Boundary	Open Water/Non-Stream Surface Water Features	Channel Features	NCRoutes
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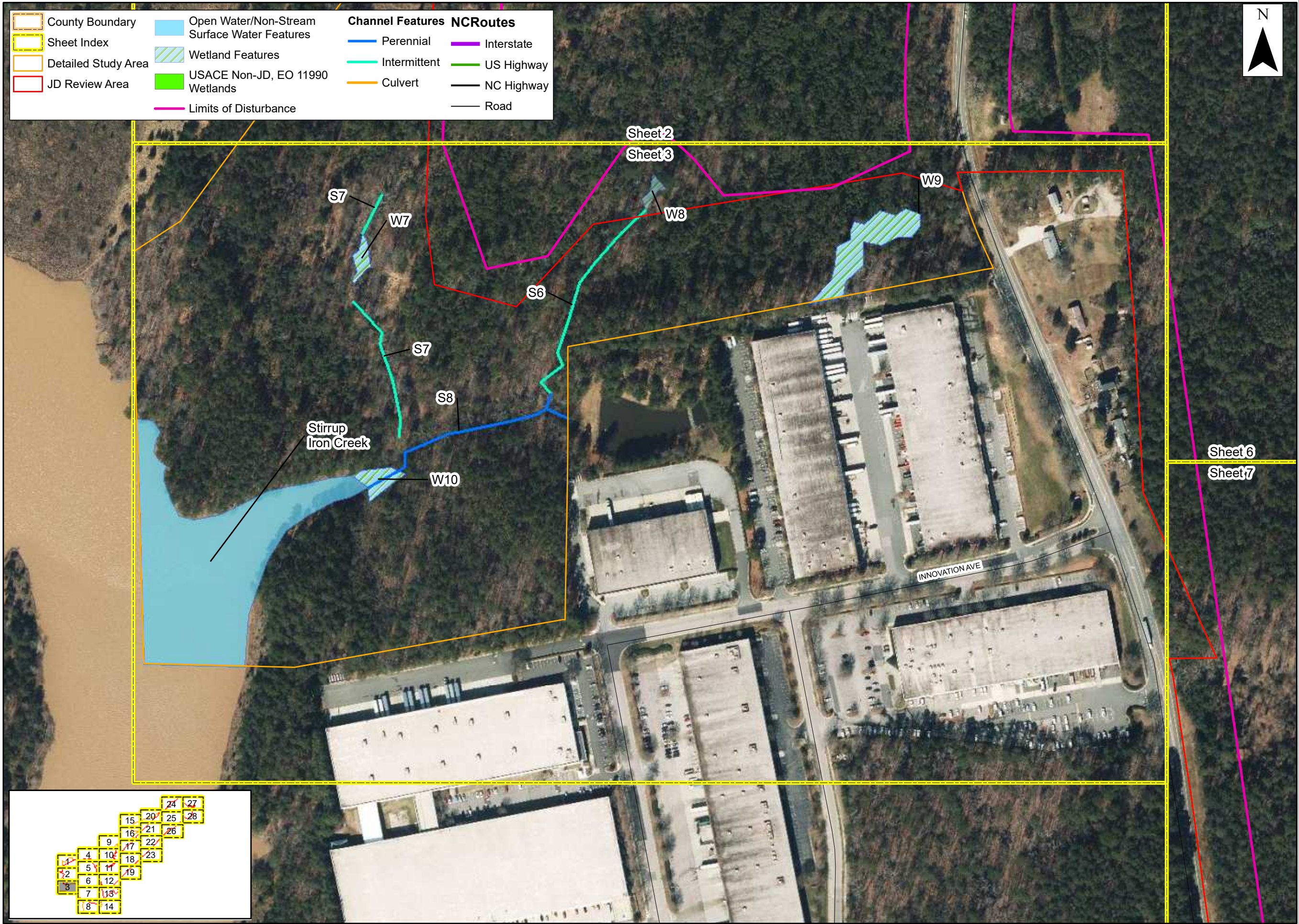
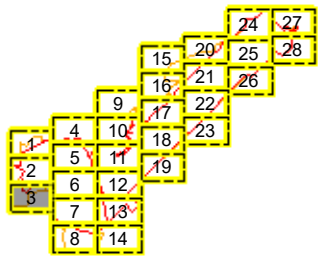
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NELSON RD

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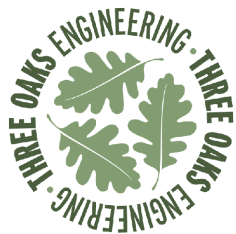
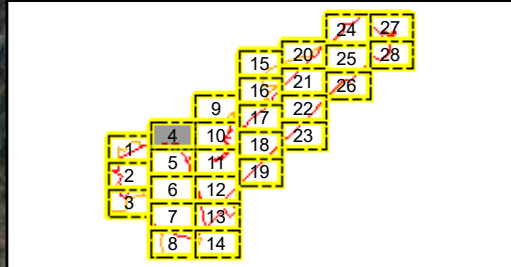
Brier Creek

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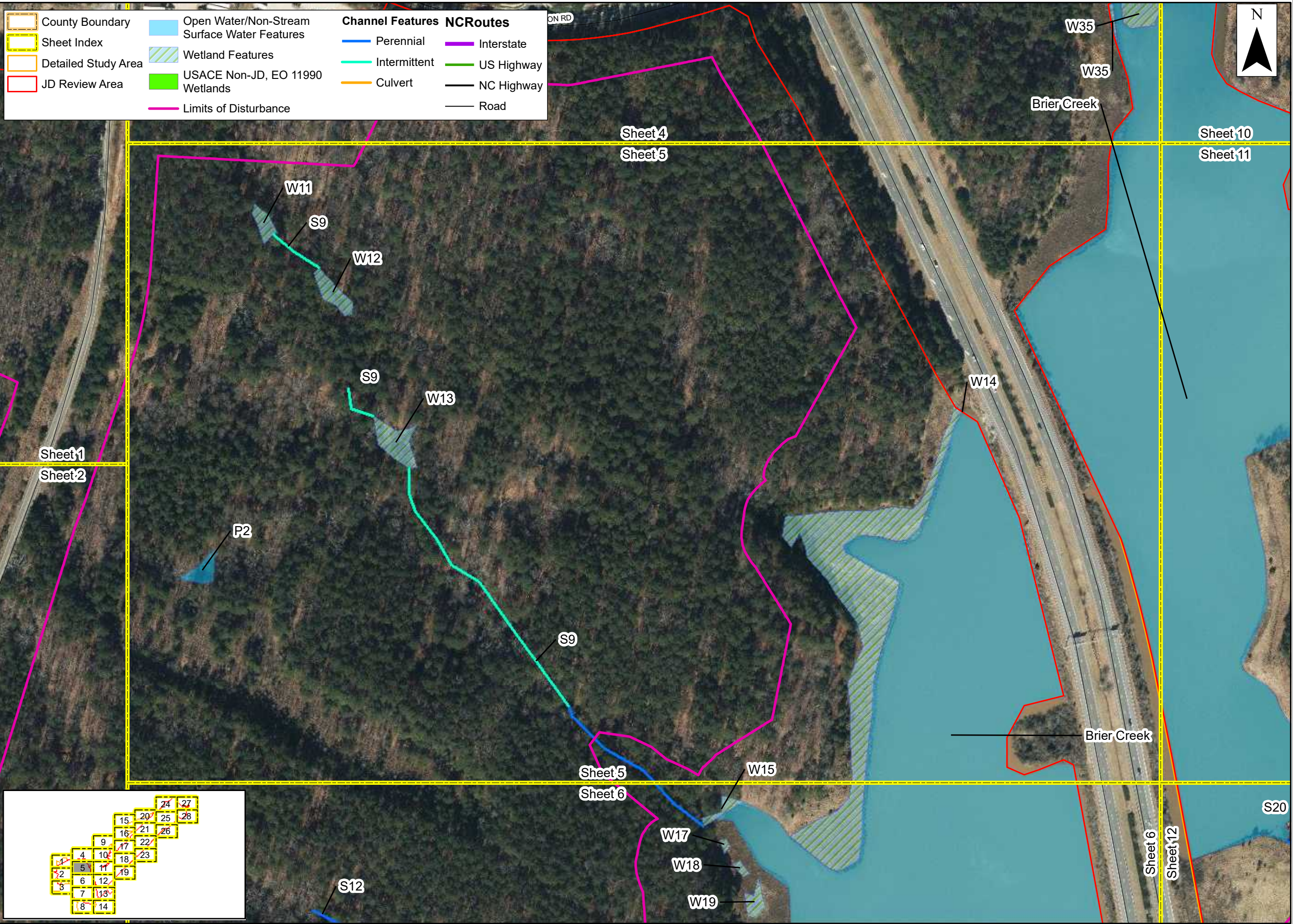
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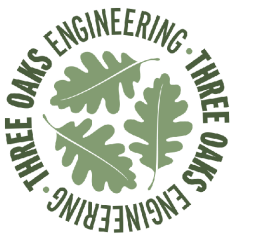
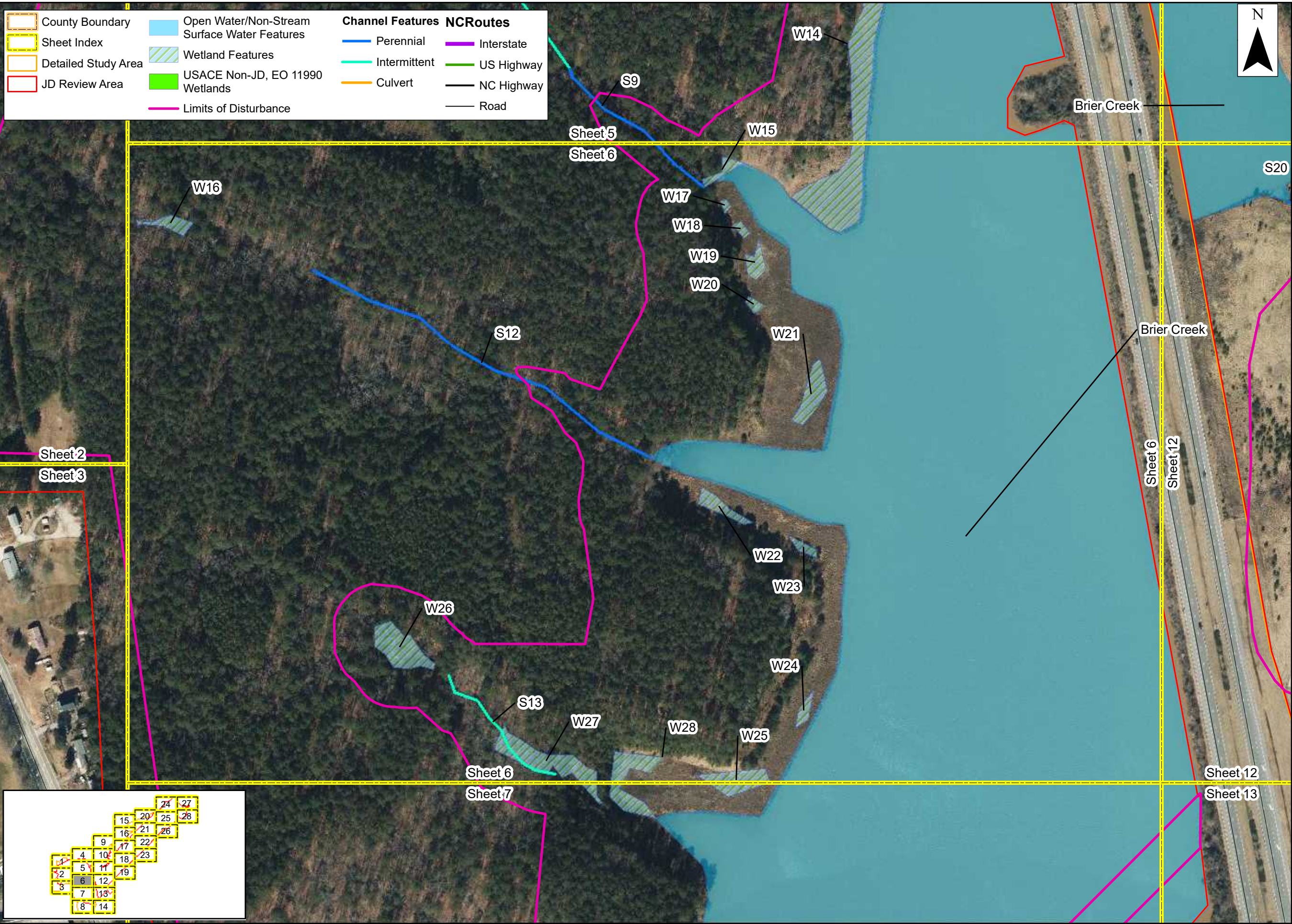
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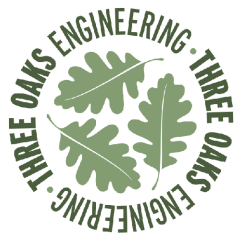
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County Boundary	Open Water/Non-Stream Surface Water Features	Channel Features	NCRoutes
Sheet Index	Wetland Features	Perennial	Interstate
Detailed Study Area	USACE Non-JD, EO 11990 Wetlands	Intermittent	US Highway
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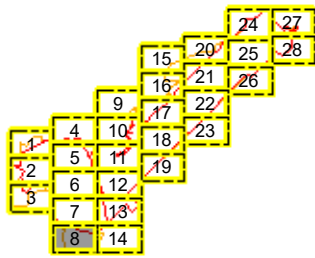
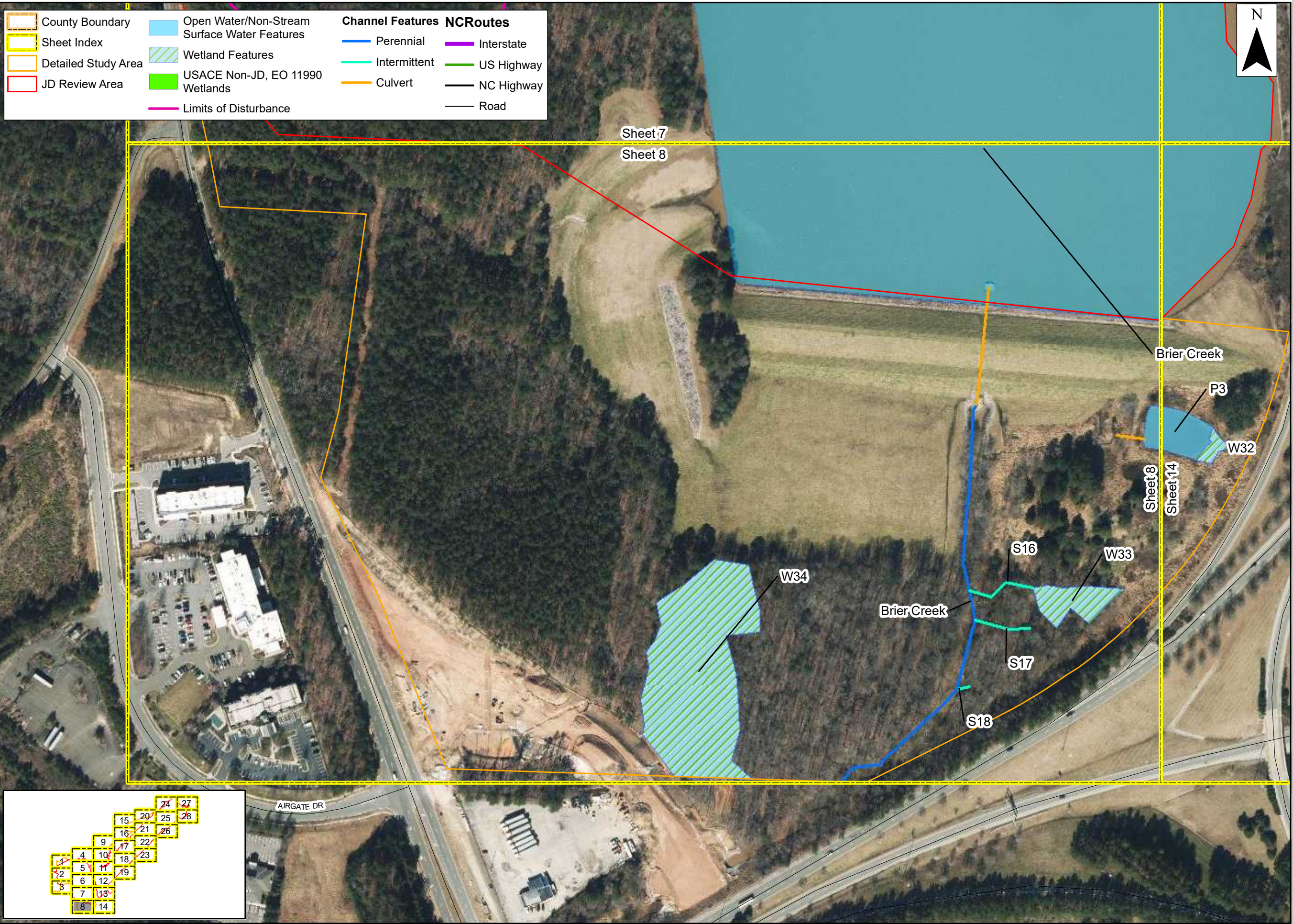
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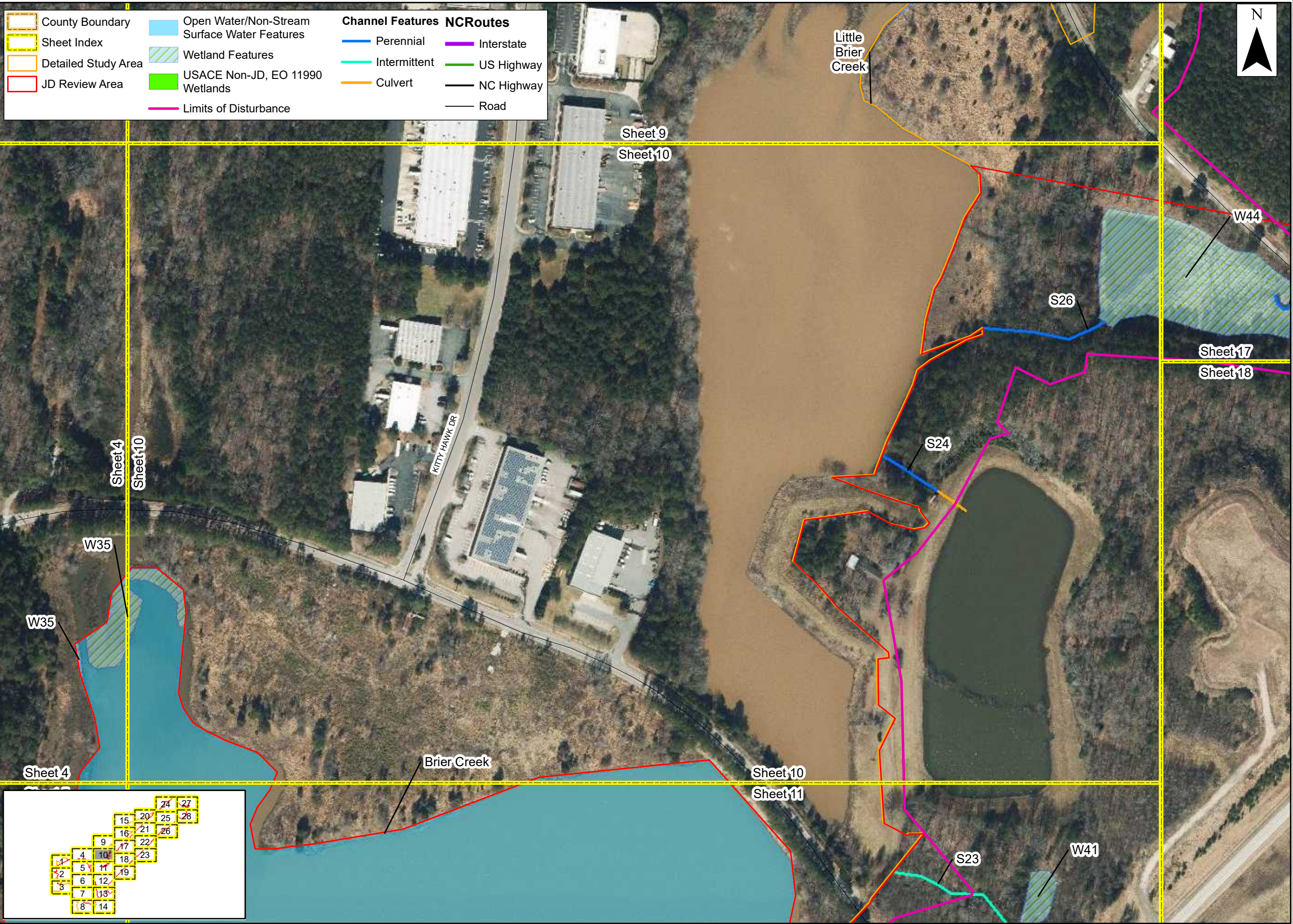
Figure

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County Boundary	Open Water/Non-Stream Surface Water Features	Channel Features	NCRoutes
Sheet Index	Wetland Features	Perennial	Interstate
Detailed Study Area	USACE Non-JD, EO 11990 Wetlands	Intermittent	US Highway
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County Boundary	Open Water/Non-Stream Surface Water Features	Channel Features	NCRoutes
Sheet Index	Wetland Features	Perennial	Interstate
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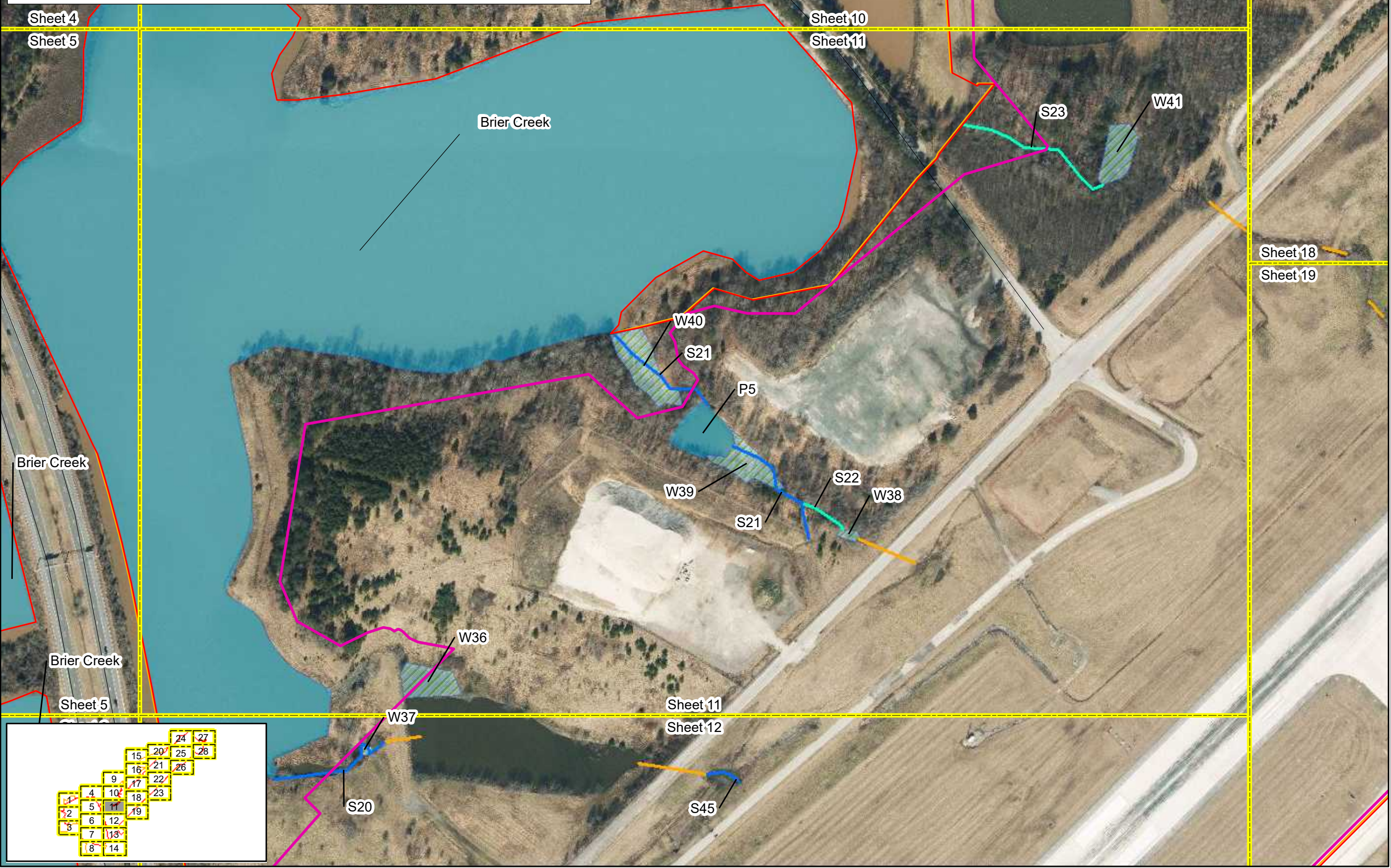
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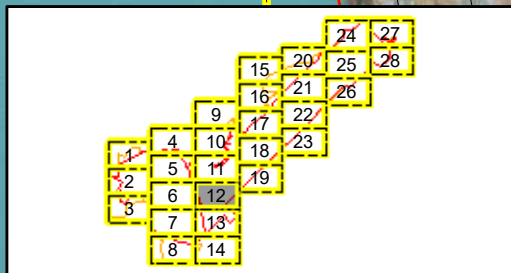
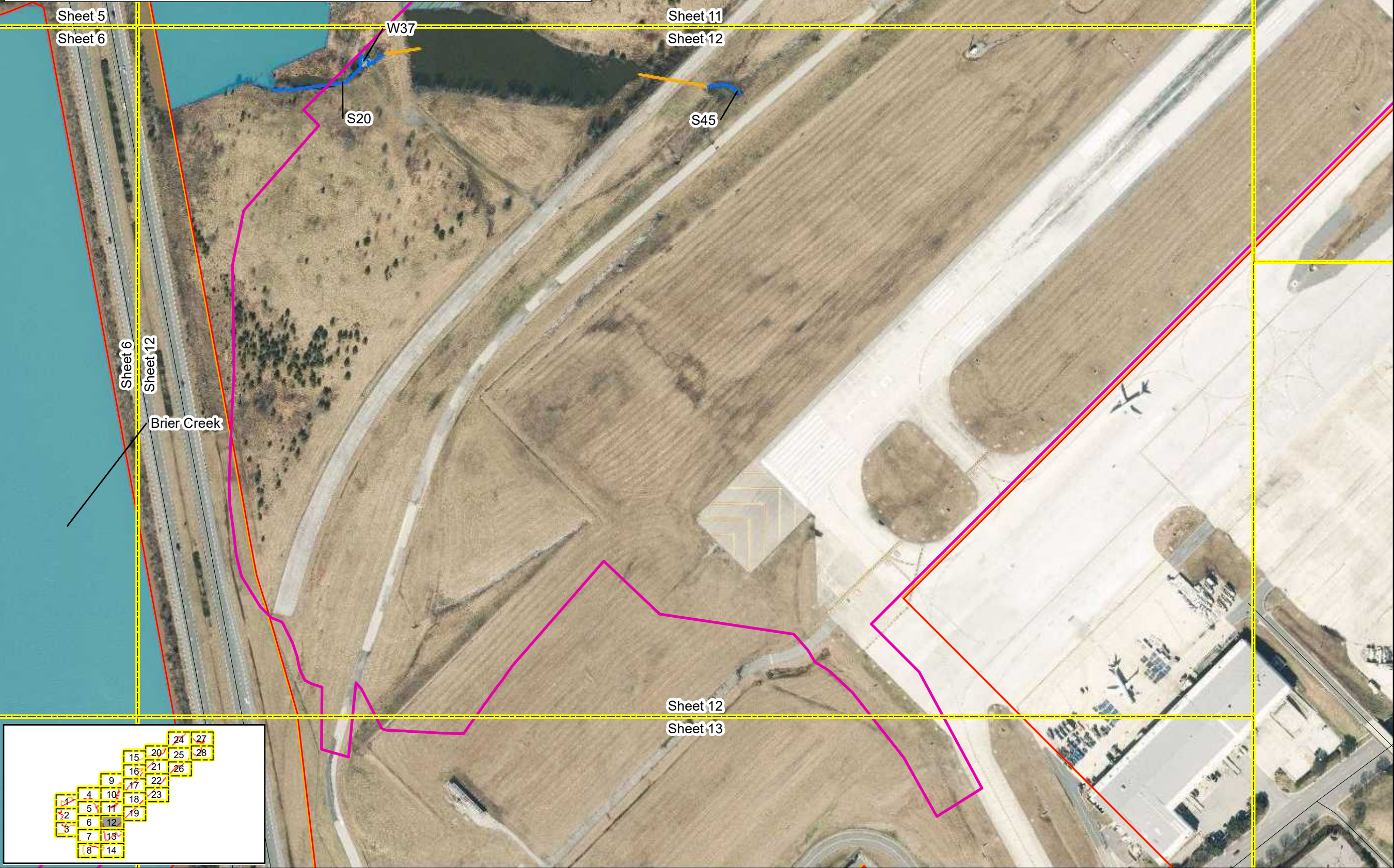
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County Boundary	Open Water/Non-Stream Surface Water Features	Channel Features	NCRoutes
Sheet Index	Wetland Features	Perennial	Interstate
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County Boundary	Open Water/Non-Stream Surface Water Features	Channel Features	NCRoutes
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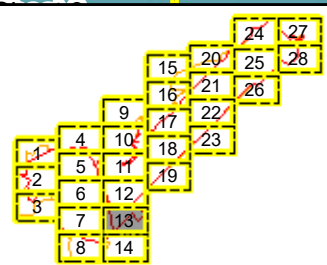
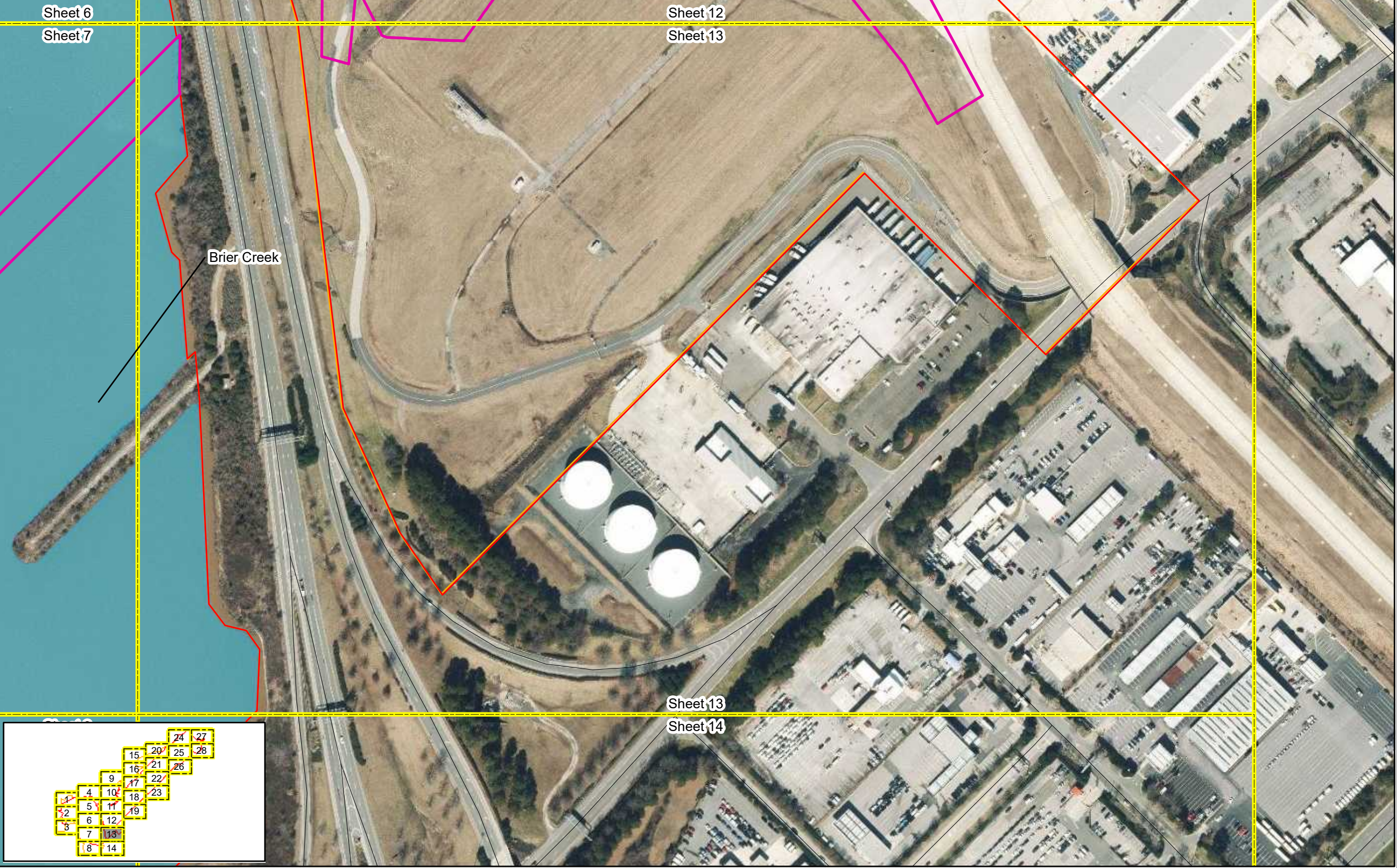
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

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 County Boundary	 Open Water/Non-Stream Surface Water Features	Channel Features	NCRoutes
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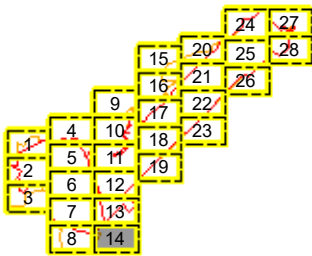
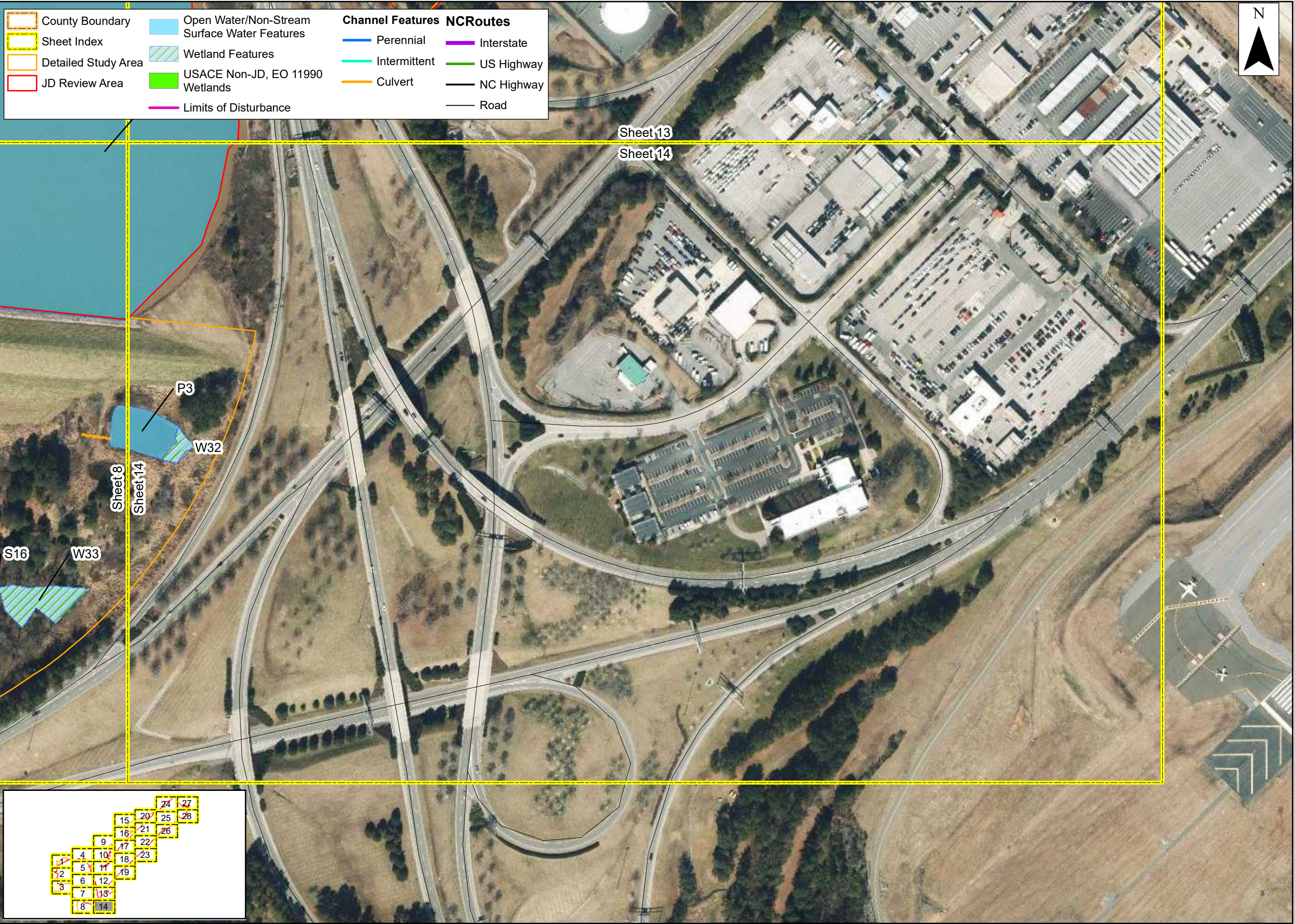
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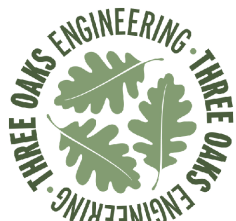
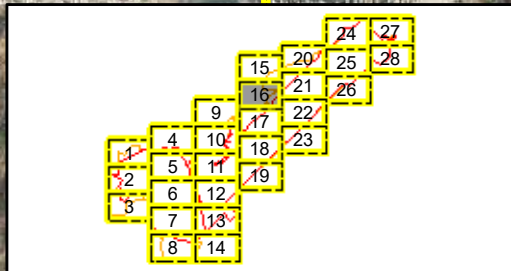
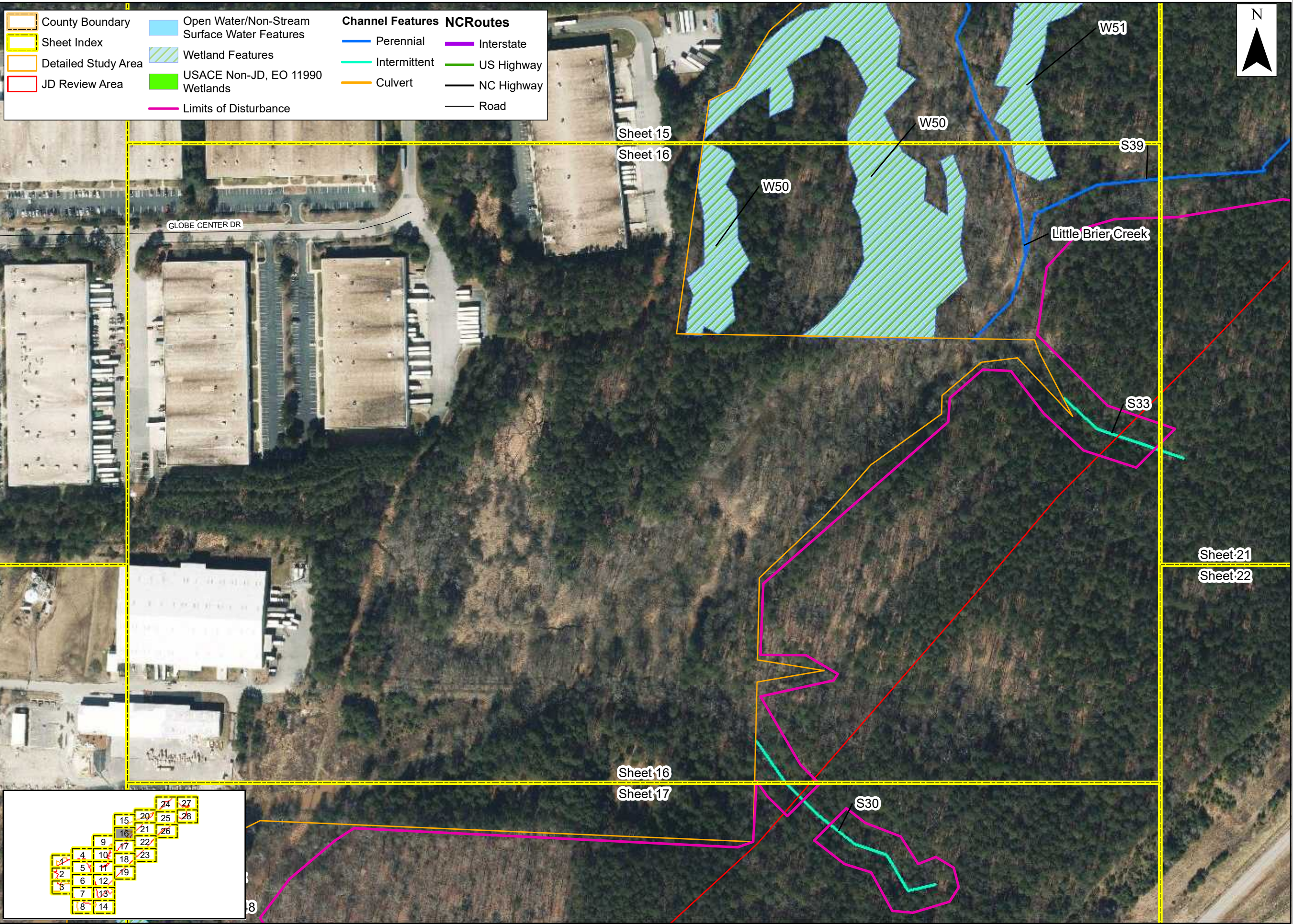
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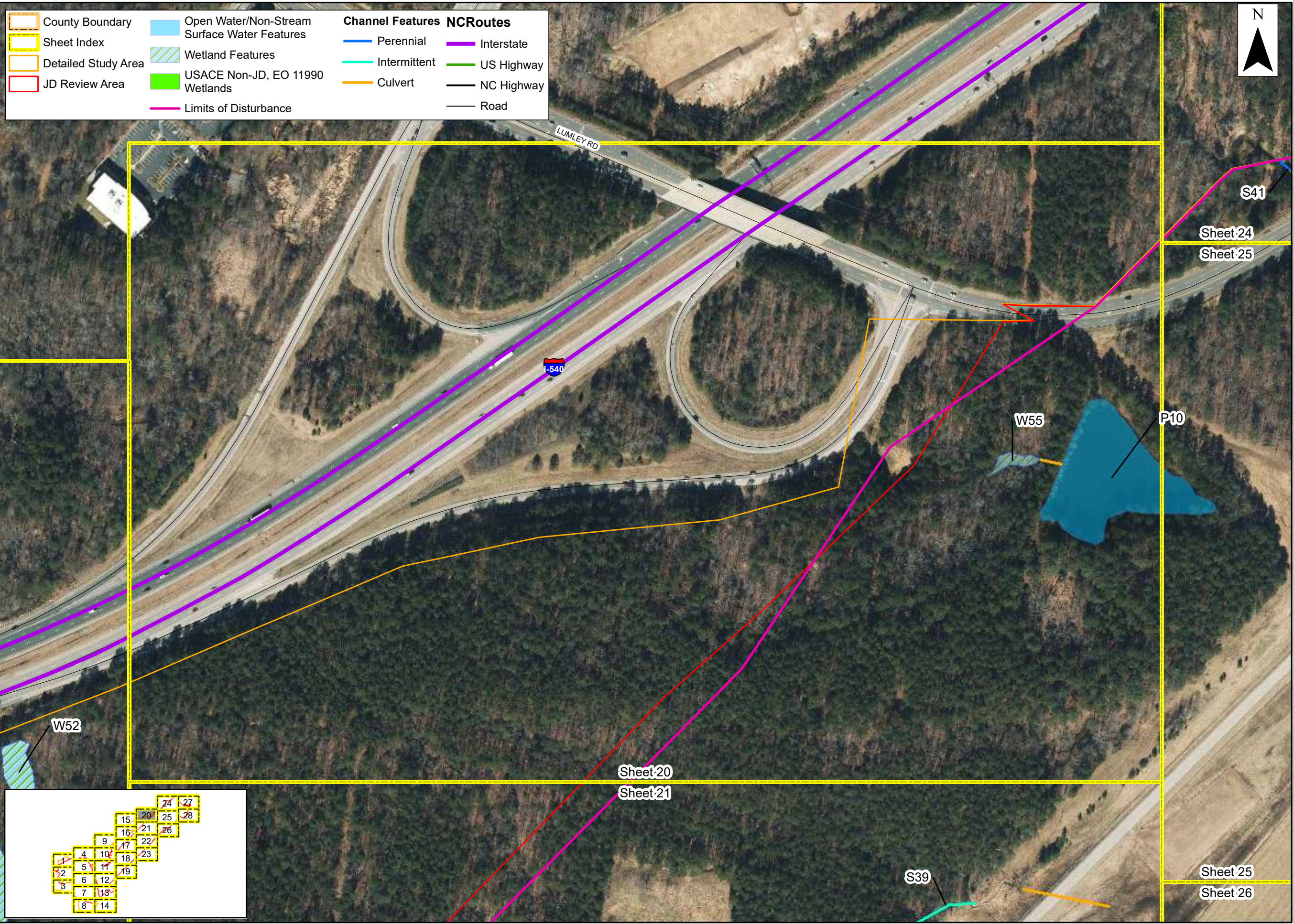
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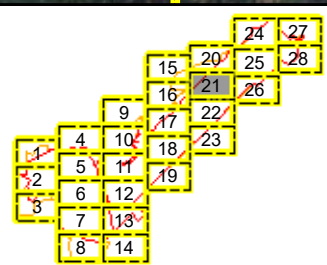
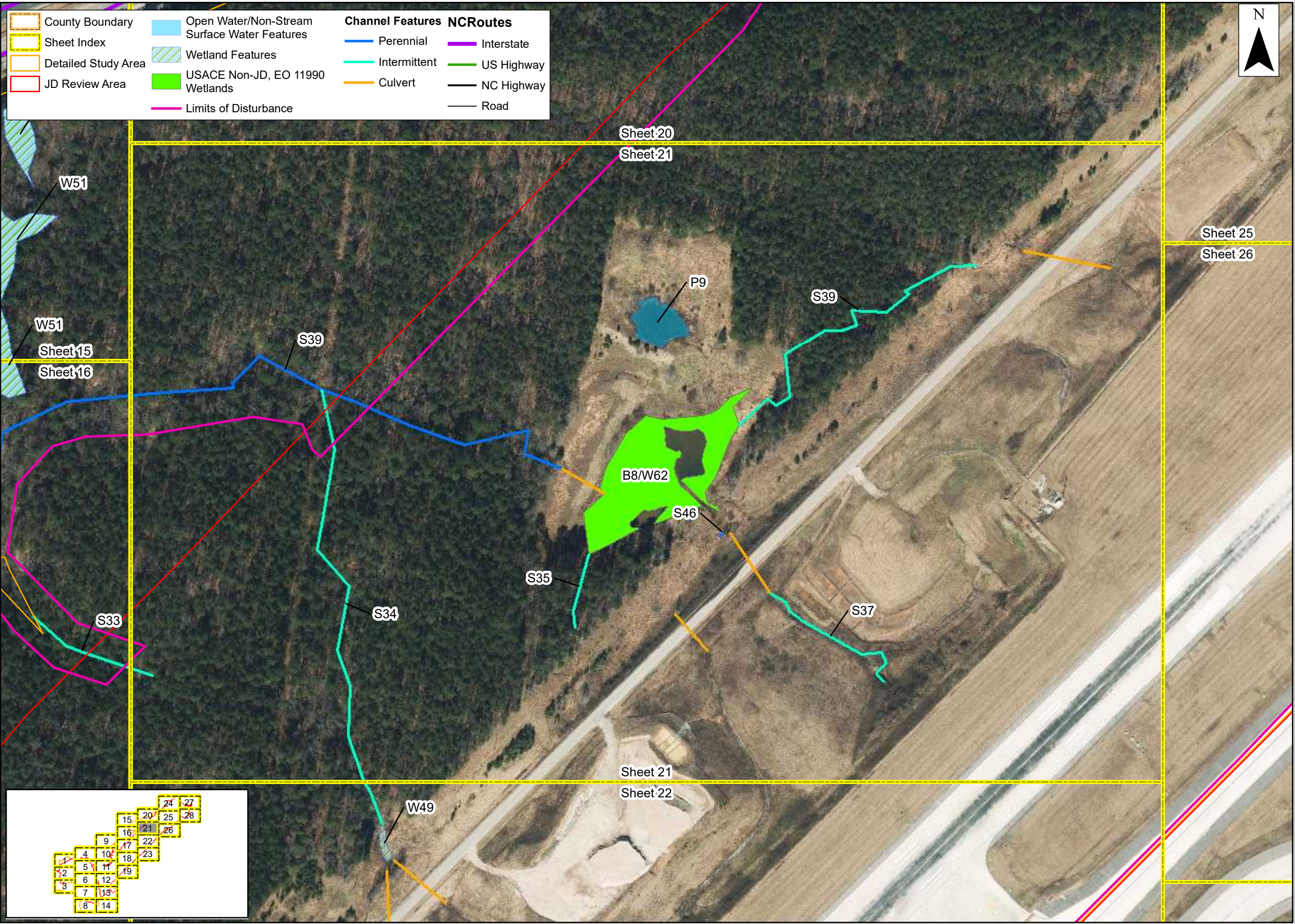
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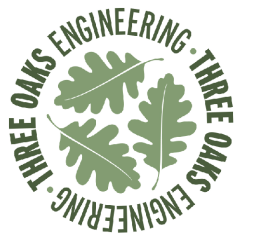
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County Boundary	Open Water/Non-Stream Surface Water Features	Channel Features	NCRoutes
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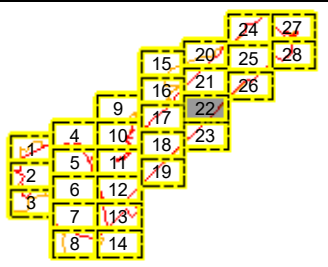
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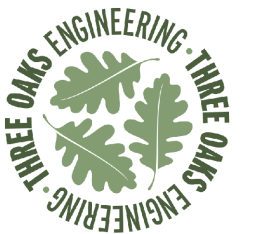
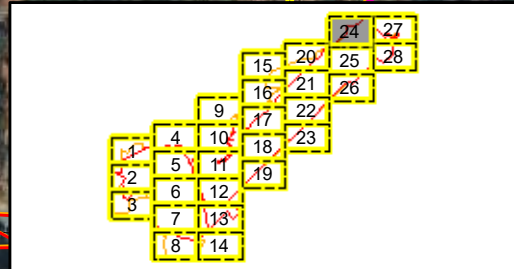
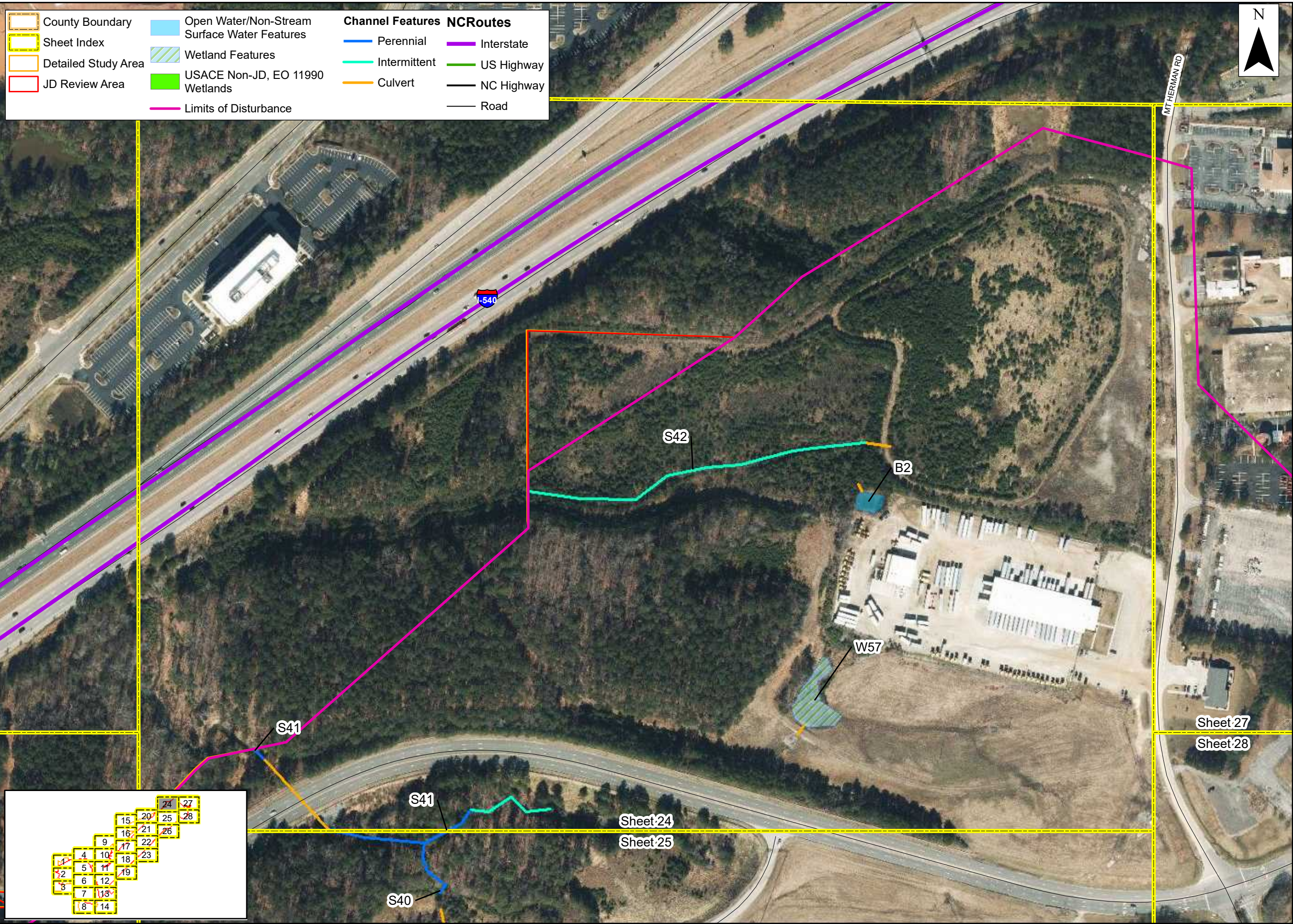
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 County Boundary	 Open Water/Non-Stream Surface Water Features	Channel Features	NCRoutes
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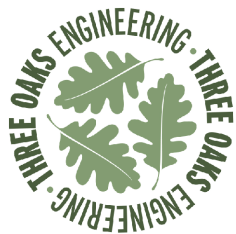
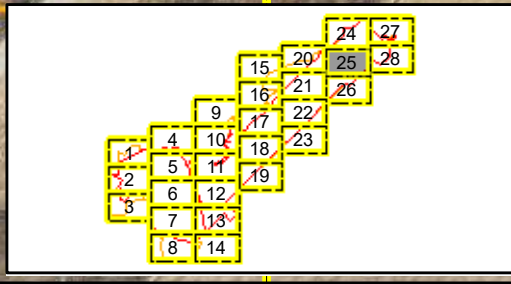
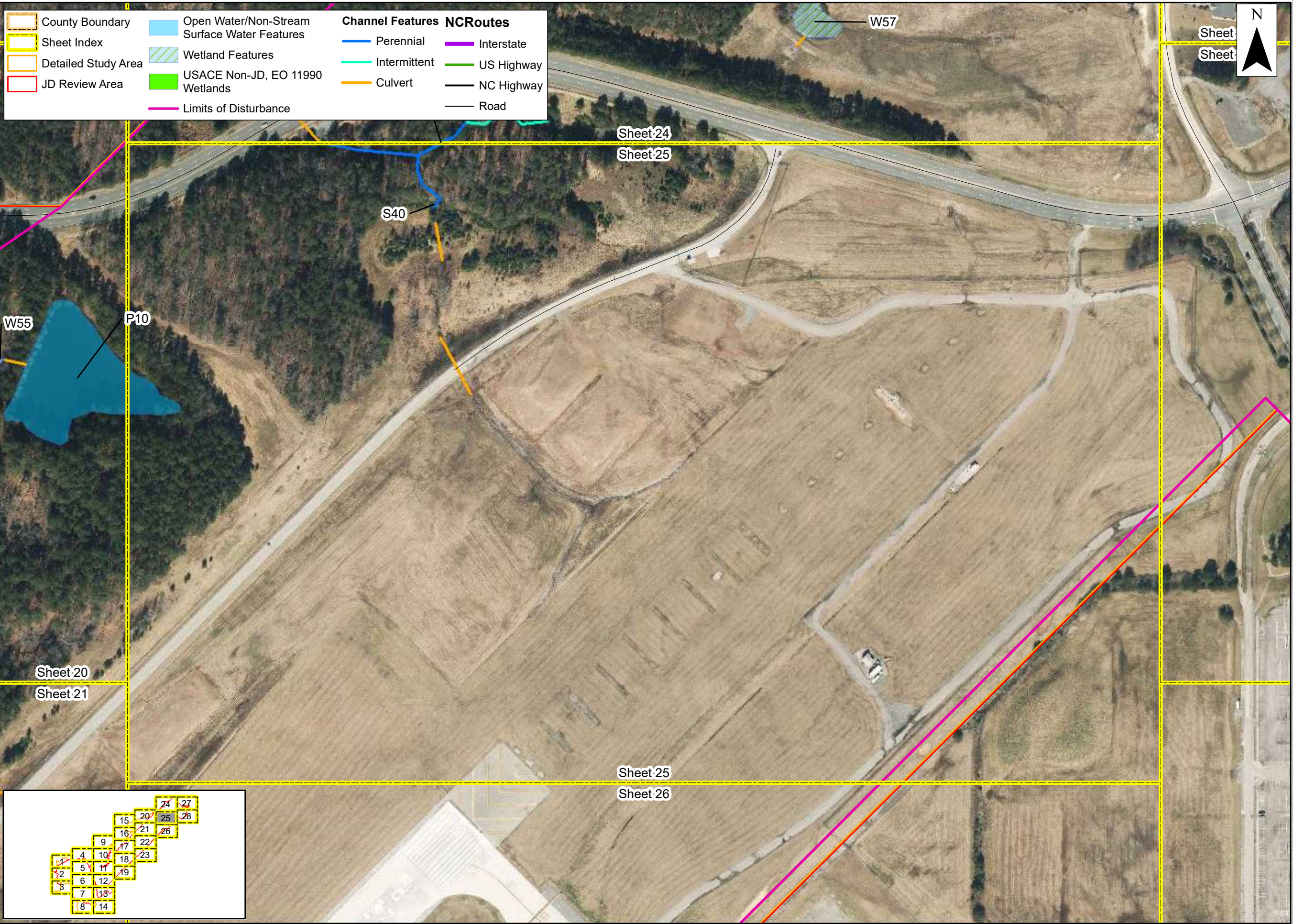
NCRoutes

Interstate

US Highway

NC Highway

Road



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**Limits of
Disturbance**

**Wake County,
North Carolina**

Date: January 2023

Scale: 0 100 200 Ft

Job No.: 19-018

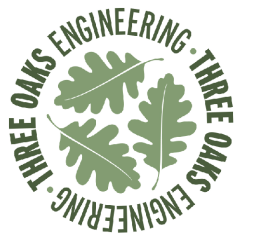
Drawn By: KEMS
Checked By: NDH

Figure

1

Sheet 25

County Boundary	Open Water/Non-Stream Surface Water Features	Channel Features	NCRoutes
Sheet Index	Wetland Features	Perennial	Interstate
Detailed Study Area	USACE Non-JD, EO 11990 Wetlands	Intermittent	US Highway
JD Review Area	Limits of Disturbance	Culvert	NC Highway
		Road	



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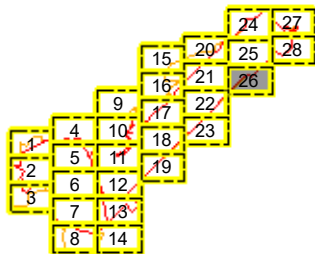
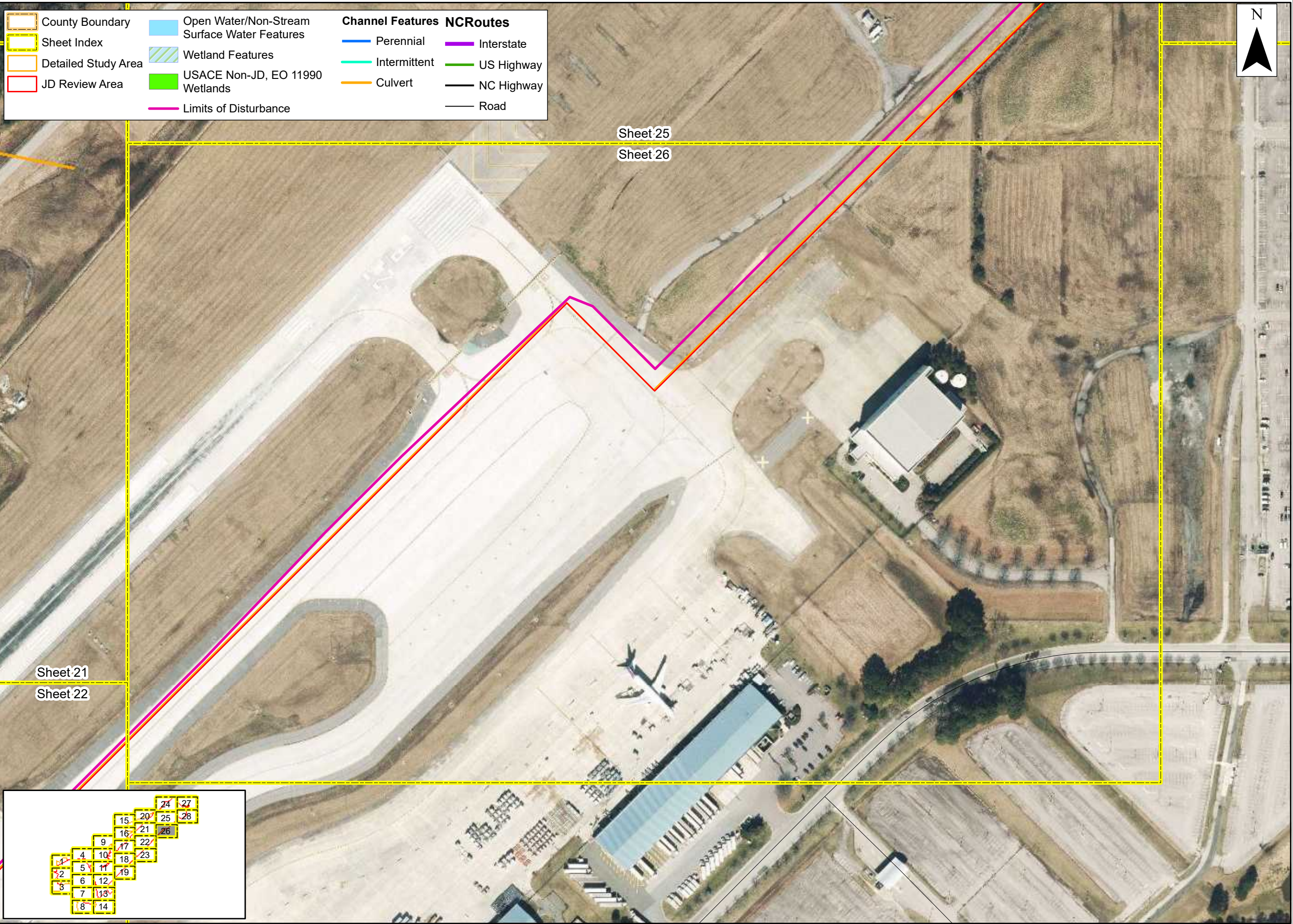
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Figure

1

Sheet 26



County Boundary

Sheet Index

Detailed Study Area

JD Review Area

Open Water/Non-Stream Surface Water Features

Wetland Features

USACE Non-JD, EO 11990 Wetlands

Limits of Disturbance

Channel Features

Perennial

Intermittent

Culvert

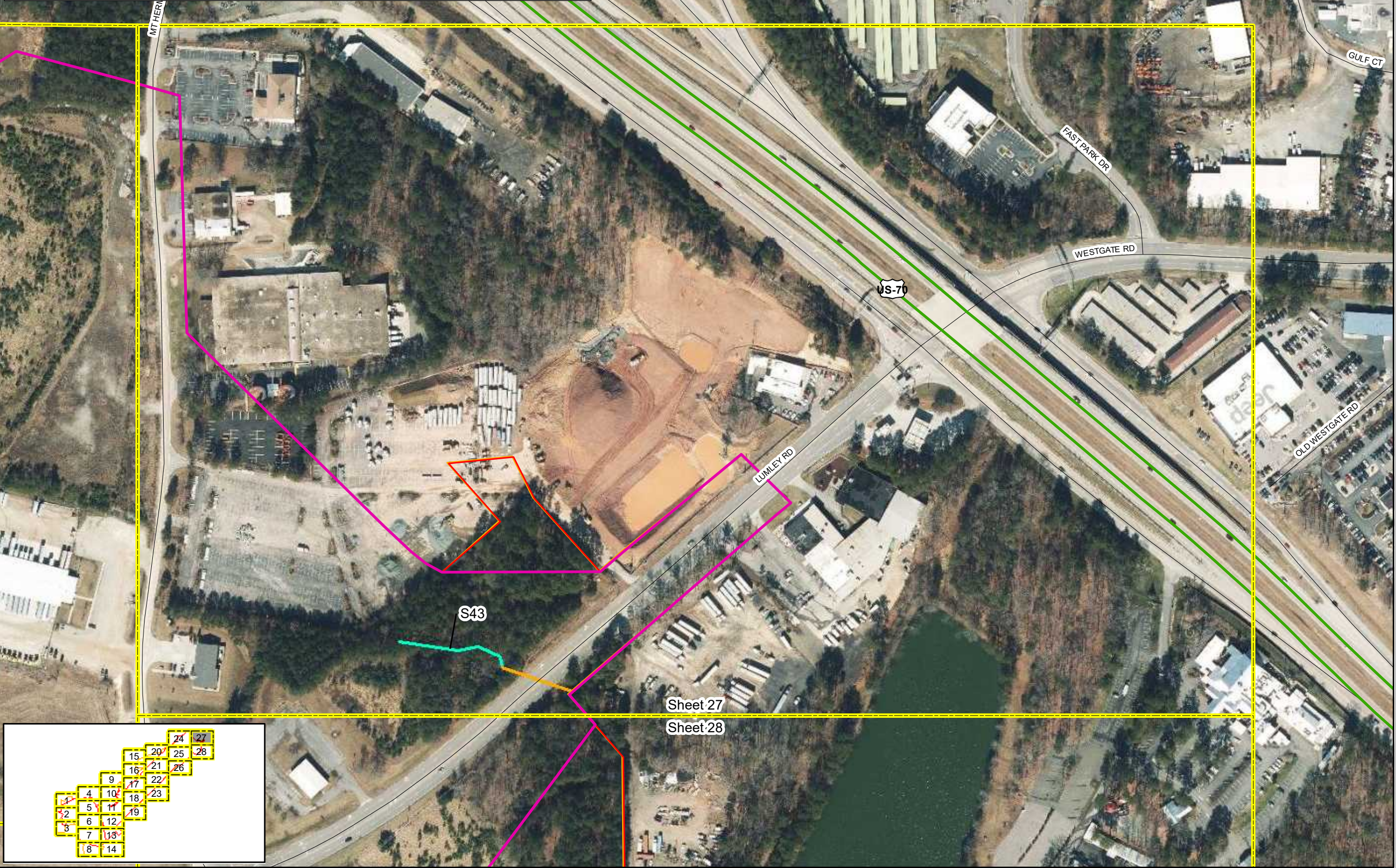
NCRoutes

Interstate

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Road



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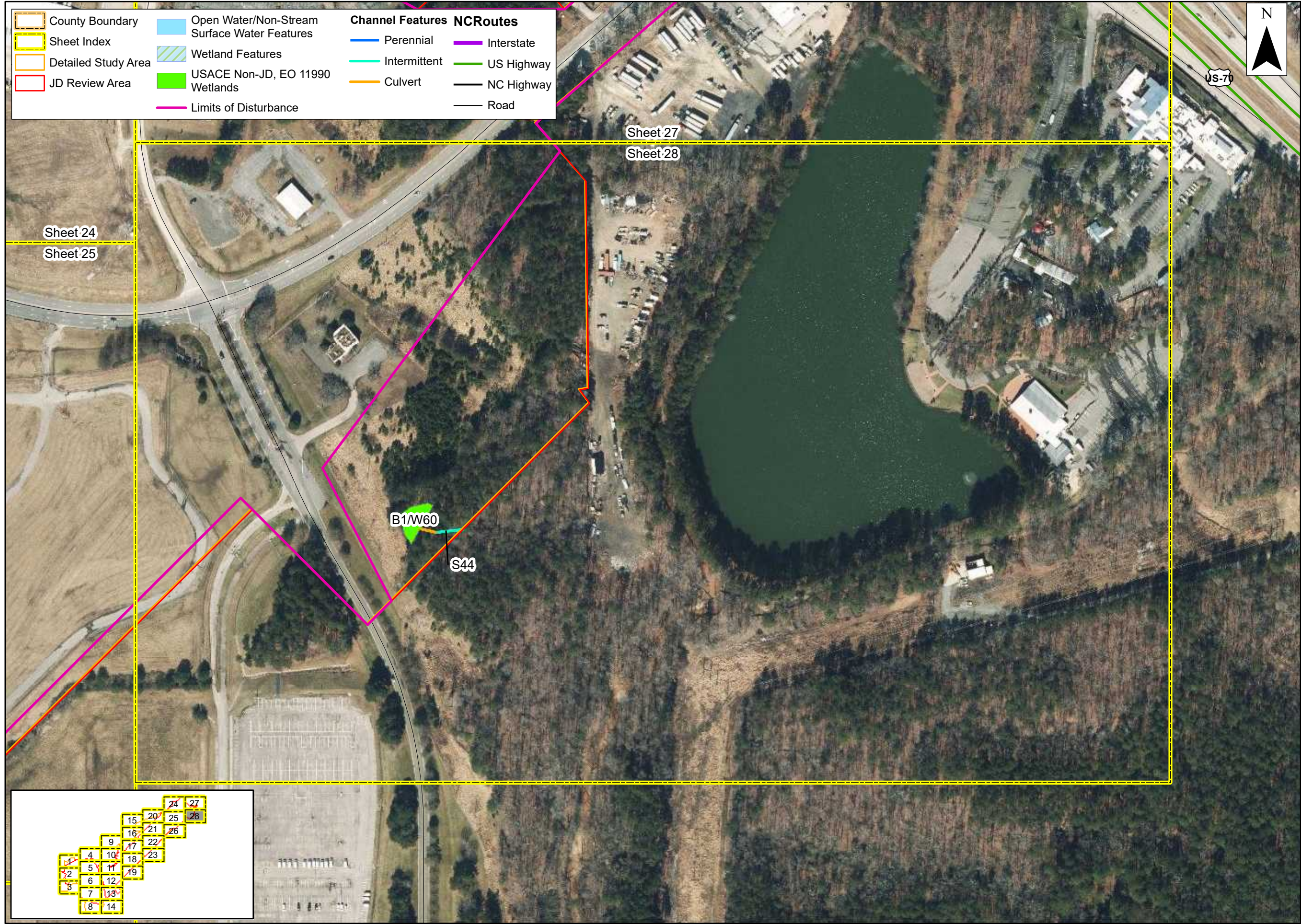
Drawn By: KEMS
Checked By: NDH

Figure

1

Sheet 27

 County Boundary	 Open Water/Non-Stream Surface Water Features	Channel Features	NCRoutes
 Sheet Index	 Wetland Features	 Perennial	 Interstate
 Detailed Study Area	 USACE Non-JD, EO 11990 Wetlands	 Intermittent	 US Highway
 JD Review Area	 Limits of Disturbance	 Culvert	 NC Highway
		 Road	



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Scale: 0 100 200 Ft

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Figure

1

Sheet 28