

Technical Memorandum #2 – Future Conditions

To: Dan Farnsworth
Transportation Planner
Fargo-Moorhead Metro Council of Governments

From: Rick Gunderson, PE
Josh Hinds PE, PTOE
Houston Engineering, Inc.

Subject: Cass County Road 18 Extension Study

Date: November 7, 2018

Project: FM Metro COG Project Number 2018-005

SCOPE OF MEMORANDUM

The Cass County Highway Department, in coordination with both the Normanna and Pleasant Township officials, made a request to the Fargo-Moorhead Metro Council of Governments (Metro COG) to study the potential extension of Cass County Roadway 18 (CR 18) along 52nd Street SE. The study area for this project includes 52nd Street SE in Cass County from Cass County Roadway 17 (CR 17) west to Cass County Roadway 15 (CR 15) in both the Normanna and Pleasant Townships within Cass County, North Dakota. The study area for the project is shown in Figure 1. This memorandum (the memo) will include information on the future conditions of 52nd Street SE in the project area and the surrounding communities. Additional memoranda will be completed as the project progresses including information on alternatives analysis, purpose and need, and public participation to provide information to Cass County and the townships in making decisions related to extending CR 18.

This memo will contain information from the Cass County Comprehensive and Transportation Plan, Kindred School District demographics update, and other documents to determine the expected growth of the communities in the project's study area. The memo will provide information that will be used to determine such things as impacts due to flood events, forecasted traffic volumes, and planned future improvements to roadway infrastructure so that the information may be used in future phases of this project to complete the analysis of alternatives and the purpose and need for the project.

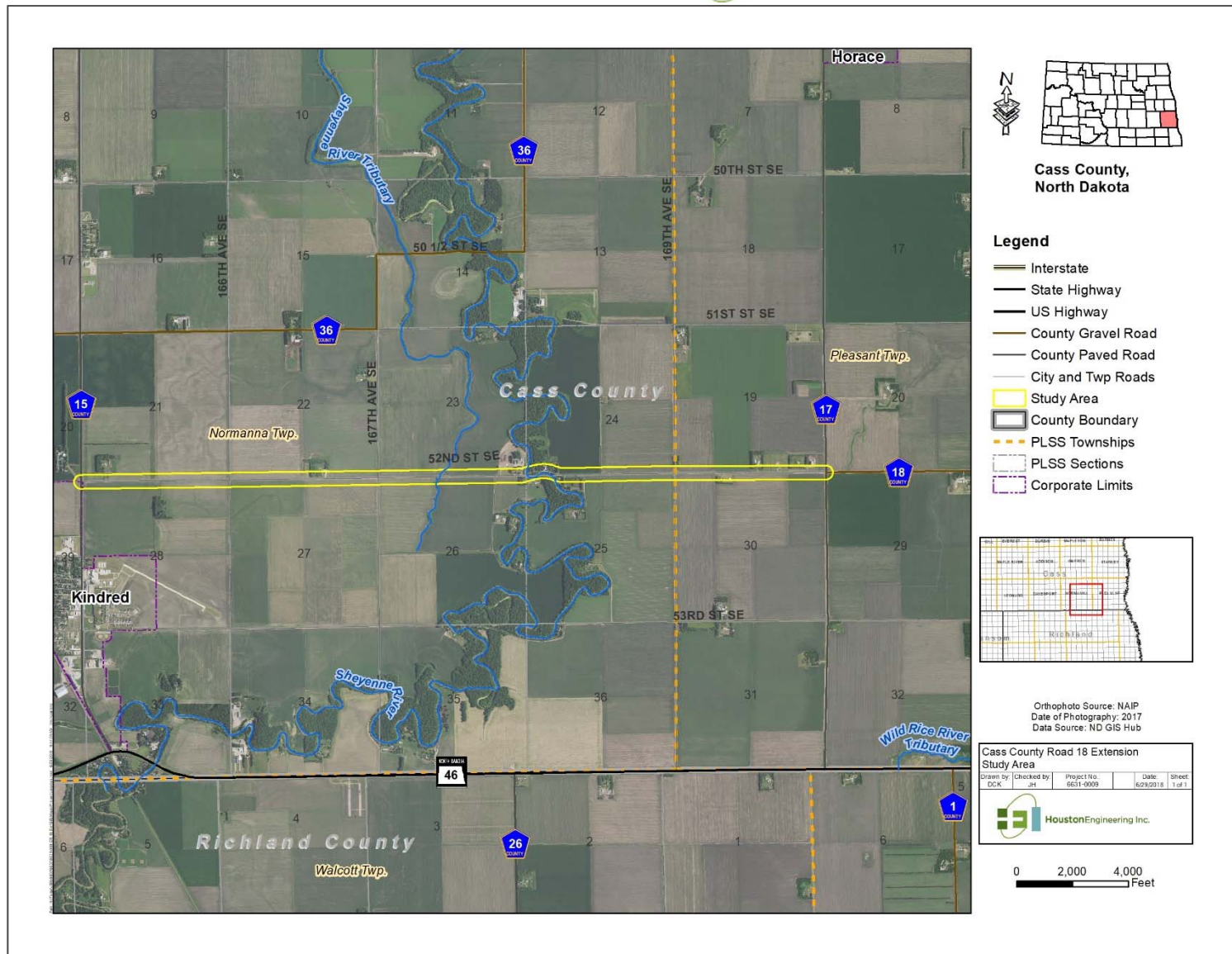


Figure 1. Study Area

FUTURE LAND USE

CASS COUNTY

The *Cass County Comprehensive and Transportation Plan* (the Comprehensive and Transportation Plan) was recently updated in May of 2018. The Comprehensive and Transportation Plan contained information on Cass County's future population and community growth out to the year 2045. Several important items for this memo such as household information, school growth, and the expansion of cities' developed areas were referenced from the Comprehensive and Transportation Plan. The Comprehensive and Transportation Plan will be referenced throughout the document with information included in several of the upcoming sections.

Future Population

The Comprehensive and Transportation Plan provided the population forecasts for several jurisdictions in Cass County. Provided in Table 1 are the historical and future populations for Cass County at-large, the City of Horace, and the City of Kindred. As shown in Table 1, both Cass County and Horace are expected to have significant population growth. The growth for the City of Horace is most likely due to the expansion from the urban areas of Fargo and West Fargo in to the jurisdiction of the City of Horace. The City of Kindred is expected to have limited growth in the future years and reach a population of around 800 people in 2025 and remain at that population through the year 2045.

Jurisdiction	1990	2000	2010	2015	2020	2025	2030	2035	2040	2045
Cass County	102,874	123,138	149,778	168,930	189,900	206,620	221,350	233,940	244,460	251,940
Horace	662	915	2,430	2,620	5,070	8,190	8,940	9,500	9,820	10,040
Kindred	569	614	692	728	773	798	805	799	802	797

Table 1. Future Populations

Household

Included in the Comprehensive and Transportation Plan were historical and future household numbers for Cass County and the Cities of Horace and Kindred. The historic and future household values are shown in Table 2. Similar to the population growth trends in Table 1, Cass County and the City of Horace are expected to see significant growth with the number of households while the City of Kindred will see limited growth through the forecasted period.

Jurisdiction	1990	2000	2010	2015	2020	2025	2030	2035	2040	2045
Cass County	42,407	53,790	63,899	70,480	78,160	83,820	89,280	95,520	96,750	99,960
Horace	216	311	810	840	1,730	2,710	2,980	3,190	3,360	3,520
Kindred	246	267	267	270	280	280	280	290	300	300

Table 2. Future Households

According to the Comprehensive and Transportation Plan, the average household size for an owner-occupied residence is 2.65 people and 1.89 people for a renter-occupied residence. The information provided for households also included age ranges for the householders. It is expected that a younger householder in the 25 to 44-year-old range to have a higher likelihood of having school-aged children currently or in the near future. Based on a map provided in the Comprehensive and Transportation Plan that is based on the year 2010

census data, both the Cities of Kindred and Oxbow's median age is in the 25 to 44-year-old category. It is also important to note that one in four households in Cass County have children.

Land Acreage Development and Growth

In order for a city to grow, land and utility services must be available. The Comprehensive and Transportation Plan categorized four different types of communities in Cass County; Metropolitan Cities, Urban Residential Communities, Rural Center, and Rural Residential Clusters. The City of Kindred was classified as a Rural Growth Center and the City of Oxbow was classified as a Rural Residential Cluster. The difference between a Rural Center and a Rural Residential Cluster is that the Center has resources, such as available land, potential utility expansion, and other similar items, that will allow for future growth where as the Cluster has limited potential for future growth.

CITY OF KINDRED

The City of Kindred currently has available lots for single family residential in the Newport Ridge development. According to the City, this is the only new development that is formally planned in the City. The Newport Ridge development is located just south of the airport and when completed will have approximately 69 developable lots. The development is currently 25 percent occupied with mostly single-family residential homes of which some feature access to the airport taxiway. Based on anticipated future growth for the City, it is expected that if additional residential lots are needed they will be developed near the new high school on the north side of the City.

CITY OF OXBOW

The City of Oxbow is expected to be surrounded in a ring dike due to the impacts of the Fargo-Moorhead Diversion project. The City has prepared zoning plans and locations for single family residential development in anticipation for a ring dike. The zoning plan shows future development being completely within the area protected by the dike. It is expected that the City of Oxbow will not grow beyond the area enclosed by the ring dike and the only future growth will be what is included in the full-build plans of the City. The City currently is at approximately 75 to 85 percent of all single-family lots being developed with approximately 20 to 25 residential lots still available for single-family development.

KINDRED PUBLIC SCHOOL DISTRICT

The Kindred Public School District completed a demographic study that provides information on the population of cities in the school district and the number of students from those cities and other rural areas throughout the district. The school district has a projected 2018-2019 school population (Kindergarten through 12th Grade) of 758 students. The student population is aggregated into the following three categories for 2018 and 2019 school year:

K through 6 th Grade Total Enrollment	419 students (Average of 60 per class)
7 th and 8 th Grade Total Enrollment	126 students (Average of 63 per class)
9 th through 12 th Grade Total Enrollment	213 students (Average of 54 per class)

The demographic study also provides the number of students from each city that attended during the 2017-2018 school year. The total number of students from the Oxbow-Bakke area was 86 or 11.4 percent of the total school enrollment. The nine-year trend for enrollment from the Oxbow-Bakke area has decreased about 33 percent or about 3 percent per year. Based on information obtained from developers and realtors in the Oxbow

area, several of the householders that have recently moved to Oxbow are in the 25- to 44-year old age range that typically will have children currently attend or attend school in the future. This may change the trend of enrollment for the Kindred School District from the Oxbow area. The student location numbers and trends are included in the traffic forecasts for this memo.

FUTURE IMPACTS OF DIVERSION

FLOODING IMPACTS

The study area for this project is not located within the protected area of the Fargo-Moorhead Diversion and is typically referred to as being on the “wet” side of the diversion. The flooding impacts with the diversion for 10-year, 20-year, and 100-year storm events are shown in Figure 2. The roadway elevations shown in Figure 2 are based on the existing roadway elevations and will be considered with proposed roadway profile elevations in the Alternative Analysis phase of this project. As shown in Figure 2, 52nd Street SE holds back water that drains from the south to the north and creates flooding in area fields to the south of 52nd Street. The historic impacts to the roadway due to significant flooding events is shown in Figure 3. The information for Figure 3 was provided by Cass County based on their records and was verified by modeling information that was available from previous Cass County flooding projects. The information included in Figures 2 and 3 will provide a base for any analysis included in the Alternative Analysis phase.

IMPACTS TO AREA ROADWAYS

Reviewing the most recent information available for the Fargo-Moorhead Diversion, 52nd Street SE in the study area will not be impacted by the construction of the diversion. The roadways in the area of this project that will be impacted are all to the north and east of the study area. County Road 18 east of Interstate 29 will be raised to allow access to Oxbow once the ring dike has been constructed.

FUTURE AREA ROADWAY IMPROVEMENTS

The current Cass County Transportation Plan was reviewed to determine if any area roadway, bridge, and drainage structure improvements are planned in the next five years. According to the Transportation Plan, no roadway, bridge, or drainage structure improvements are planned in the area. As previously mentioned, there will be some roadway improvements due to the construction of the Fargo-Moorhead Diversion. The North Dakota Department of Transportation (NDDOT) Statewide Transportation Improvement Program (STIP) document for 2018 to 2021 was reviewed and no significant construction project will take place on North Dakota 46.

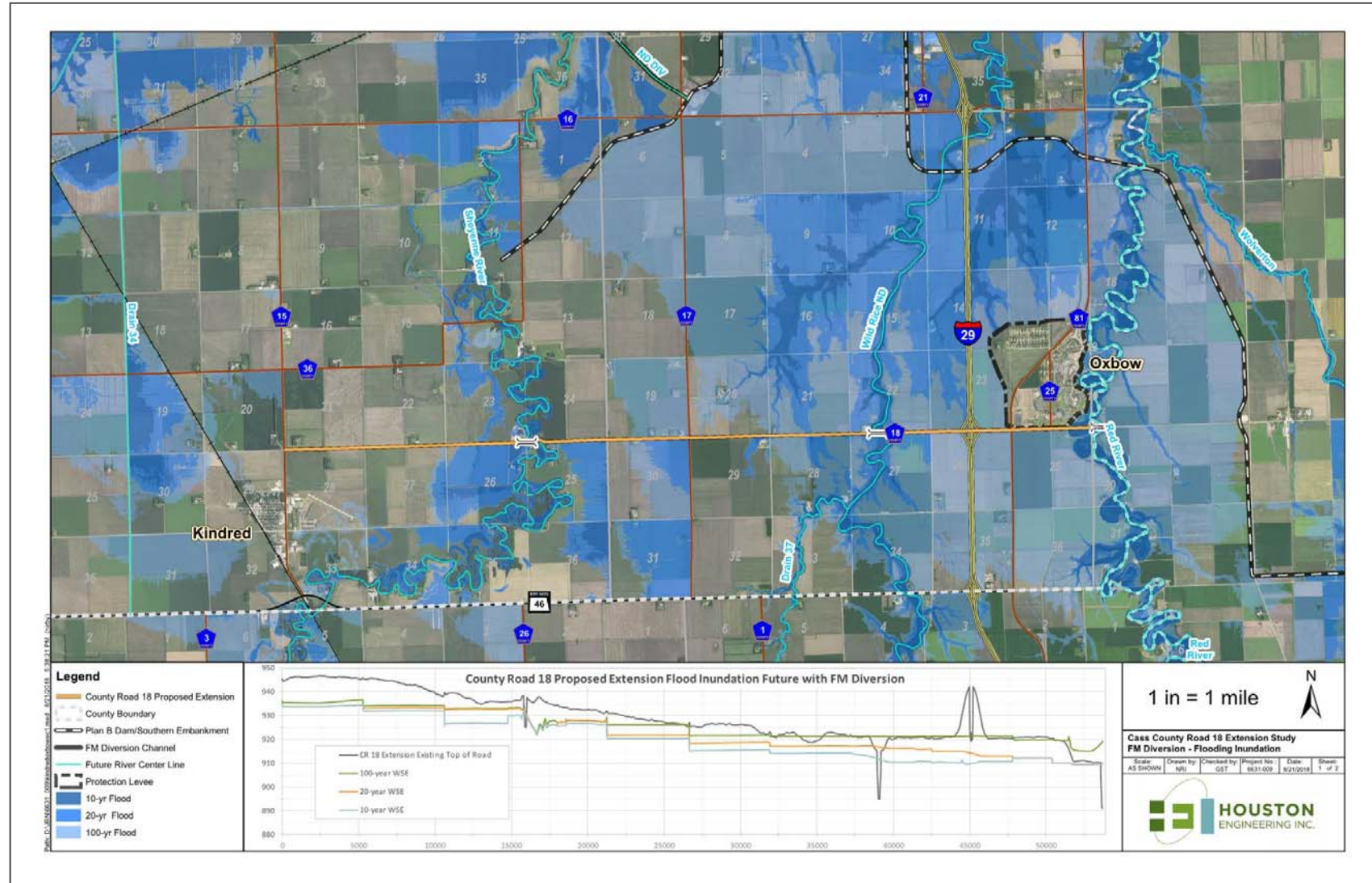


Figure 2. 10-year, 20-year, and 100-year Flood Events

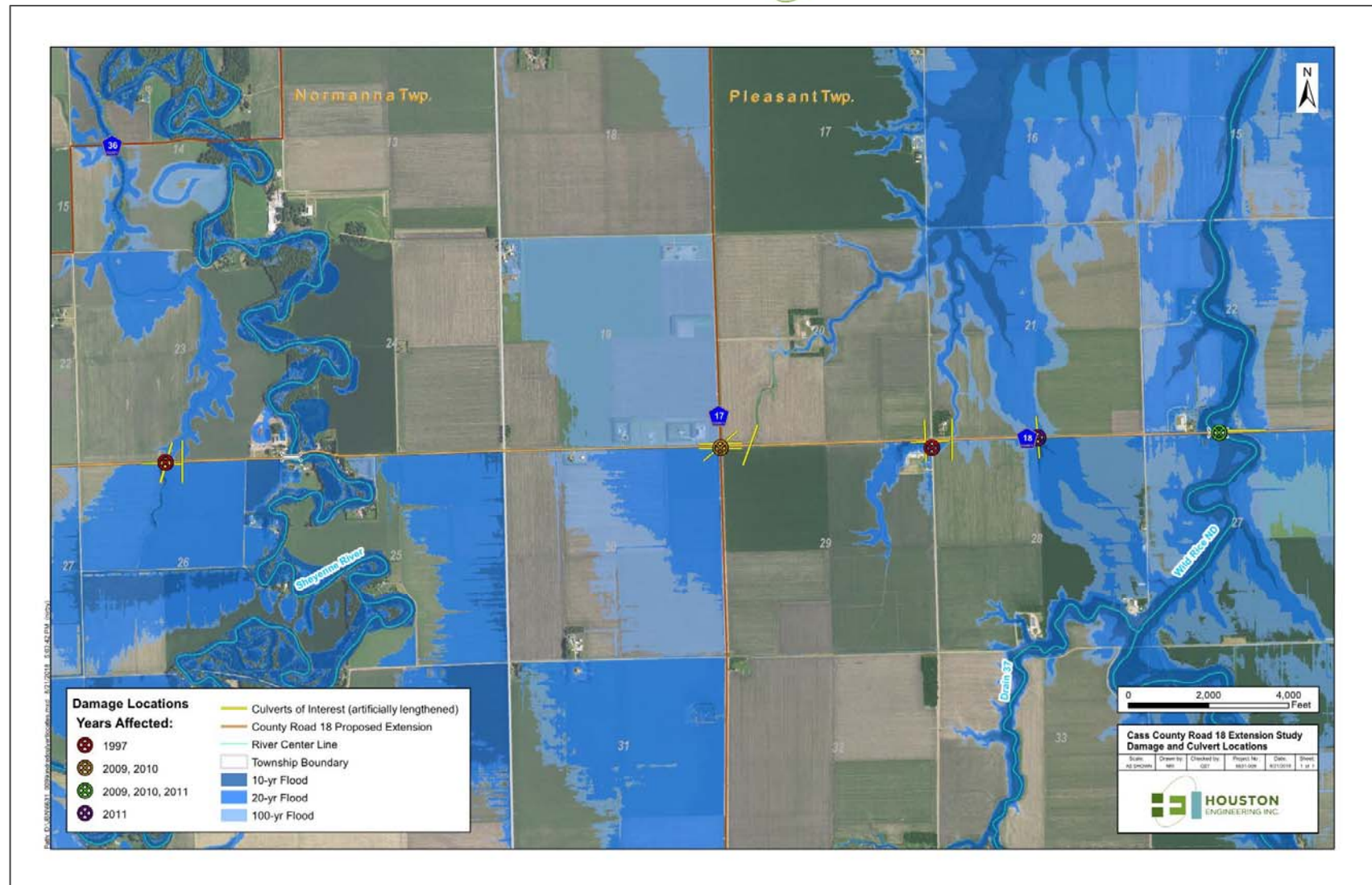


Figure 3. Historic Flood Damage Areas

FORECASTED TRAFFIC VOLUMES

METHODOLOGY

The location of 52nd Street SE is rural with farms and residents typically located every one to two miles along the roadway. The City of Kindred is within one mile of the far west end of the roadway. No other cities or proposed developments are located near the roadway. Traditional trip generation and traffic forecasting relies on known existing and future development within analysis zones to determine the trips that will be generated by the development. Once the number of trips is known, the trips are assigned to roadways serving the analysis zone. With the rural location of this roadway and very limited development planned for the future, the traditional methodology for forecasting traffic volumes was adjusted to determine the traffic forecasts for this roadway. A step-based methodology is provided below with further explanation following:

- Step 1. Determine existing base traffic volumes along area roadways and at the CR18 and North Dakota 46 (ND46) Interchanges
- Step 2. Determine existing traffic patterns and directional distribution
- Step 3. Determine traffic growth rates based on historic traffic data
- Step 4. Review Cities of Oxbow and Kindred land use information for future traffic volume growth
- Step 5. Determine future traffic roadway assignment based on travel times for each alternative
- Step 6. Review and balance traffic forecasts, as needed.

The 52nd Street SE corridor is located such that the only sizable trip generators in the area, Cities of Kindred and Oxbow, are able to serve as a cordon boundary along with Interstate 29, ND 46, and the north City Limits of Kindred. Several NDDOT traffic count sites are located at the ramps and cross road of the interchanges and along Cass County Road 15 and ND 46. The traffic volumes at the boundary points allow for accurately determining where traffic using 52nd Street SE is originating and ending. Steps 1, 2, and 3 of the methodology were based on North Dakota Department of Transportation (NDDOT) historic traffic data. Some of the area roadway historic annual average traffic growth rates are included in Figure 4 with 2018 traffic volumes. Once this information was determined, the existing base traffic information was complete.

The information needed for step 4 was readily available from the Cities on each the City websites or from their city engineer. The percentage of developed lots for the current year 2018 were determined for each development in the City and then the expected growth due to a full-build out of the development was determined. Both Cities have limited existing lots available with populations that are expected to grow and stabilize by 2025 so a full-build out was assumed for all forecasting. For step 5, several NDDOT traffic count sites are located on the roadways serving both cities, which allowed for basing the trip assignments off the current travel patterns for each City. The current developed households were used to determine an approximate rate of trips that were used for forecasting future traffic volumes based on the anticipated growth. Two main factors were used in determining the future traffic assignments for each alternative to be considered; travel time and roadway surface type. It is generally assumed that when travelers would be provided an opportunity to choose 52nd Street SE for travel versus an alternative route, the travel time would have to be shorter for 52nd Street SE or the condition of the roadway would have to be improved from an aggregate surface to a paved surface to attract a significant number of vehicles. The travel time between CR 18 interchange and the City of Kindred is shown in Table 3. As shown in Table 3, the I-29 and ND 46 route has a shorter travel time and is a paved surface and is expected to attract more traffic than 52nd Street SE. Once future traffic volumes are determined for each alternative, the forecasts were reviewed for balance forecasted traffic volumes.

Route via	Distance (miles)	Free Flow Time (minutes)	Intersection Delay (minutes)	Total Travel Time (minutes)
52nd Street/CR 18	9.4	14.0	2.0	16.0
I-29/ND46	12.1	14.0	1.0	15.0

Table 3. Travel Time Between CR 18 Interchange and City of Kindred

ROADWAY SECTION ALTERNATIVES

For the traffic forecasting, three general alternatives were considered for the improved 52nd Street SE; No-Build (Existing) Section, Aggregate County Typical Section, Paved County Typical Section. The design criteria for the roadway alternatives was not a consideration as the roadway width, ditch foreslopes, etc. would at least meet the County's minimum criteria and not have a significant impact on travelers choosing a route. The speed limit for 52nd Street SE for each of the three alternatives was kept at 55 miles per hour with 0.5 miles at 25 miles per hour. The paved roadway surface was assumed to be attract more traffic volume due to the consistent surface (i.e. no impacts from wet weather, aggregate washboarding, etc.) for the travelling public.

- No-Build Alternative
- Aggregate Surface Alternative
- Paved Surface Alternative

TRAFFIC FORECASTS

The traffic forecasts for all three roadway alternatives was completed for the future years 2025 and 2045 based on the average of the spring and fall 2018 traffic counts. The traffic forecasts are included in Figures 5 and 6 for 52nd Street SE. It is expected that some of the additional traffic volume on 52nd Street SE would be due to vehicles using an improved roadway section from County Road 15 and 17.

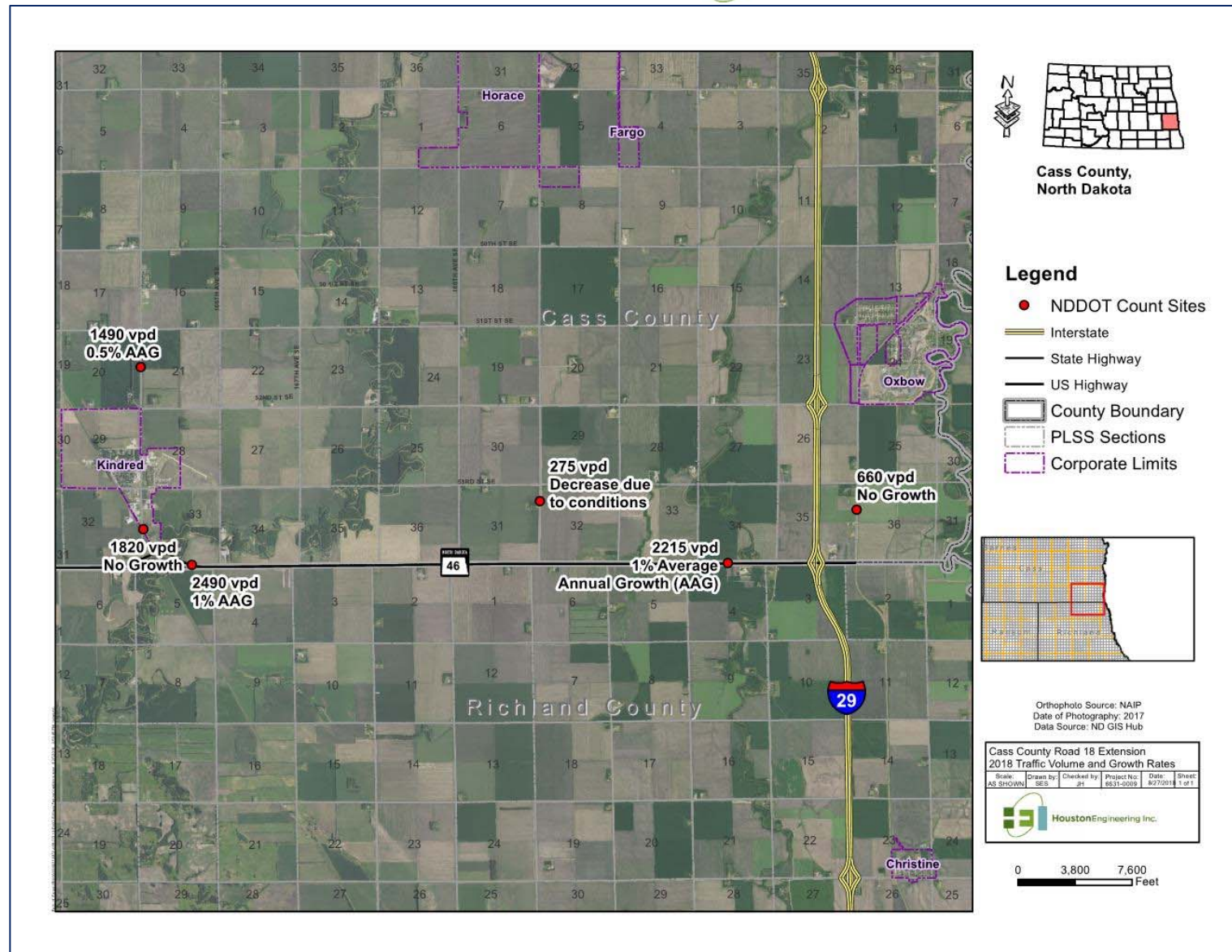


Figure 4. Historic Traffic Growth Rates

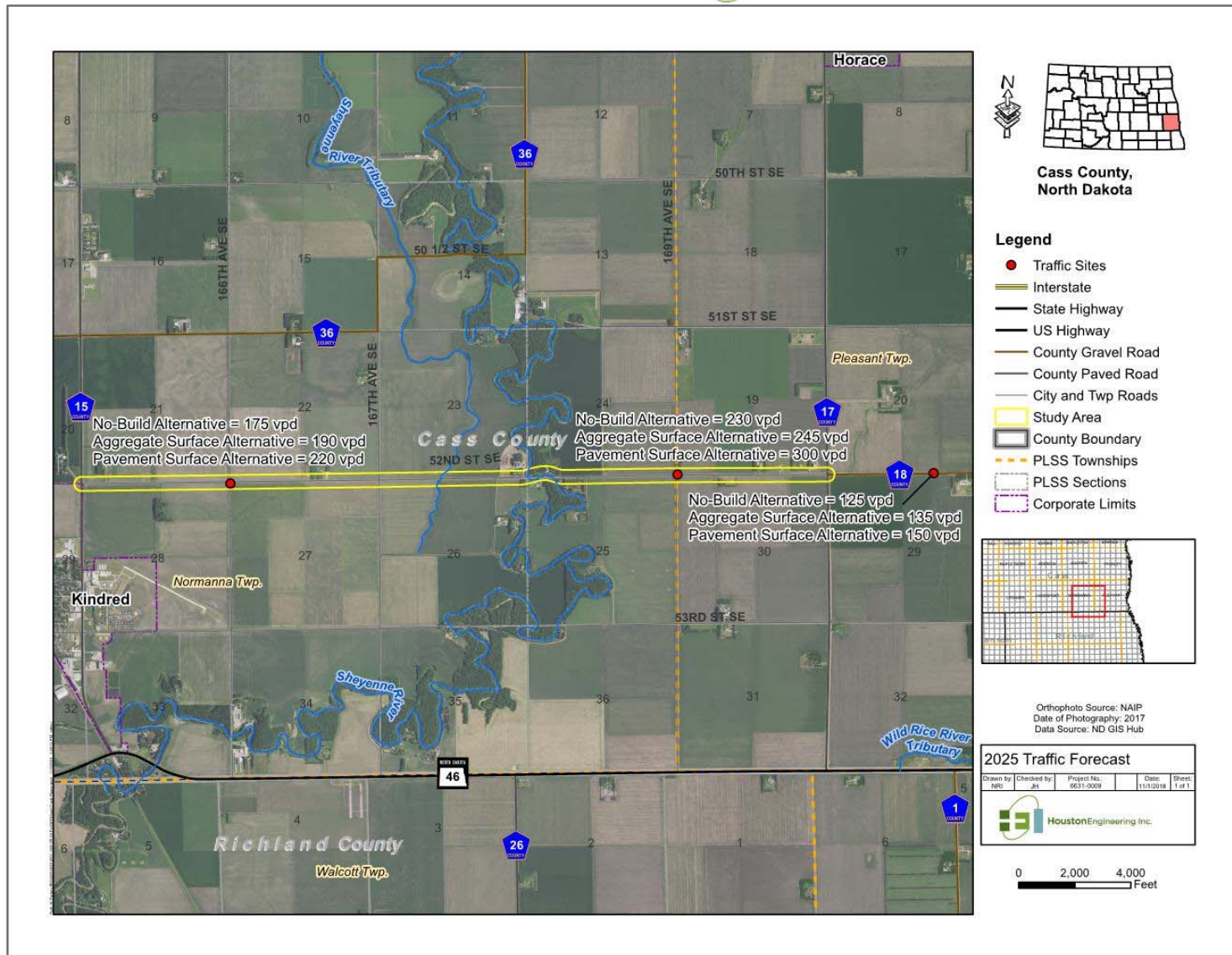


Figure 5. 2025 Traffic Forecasts

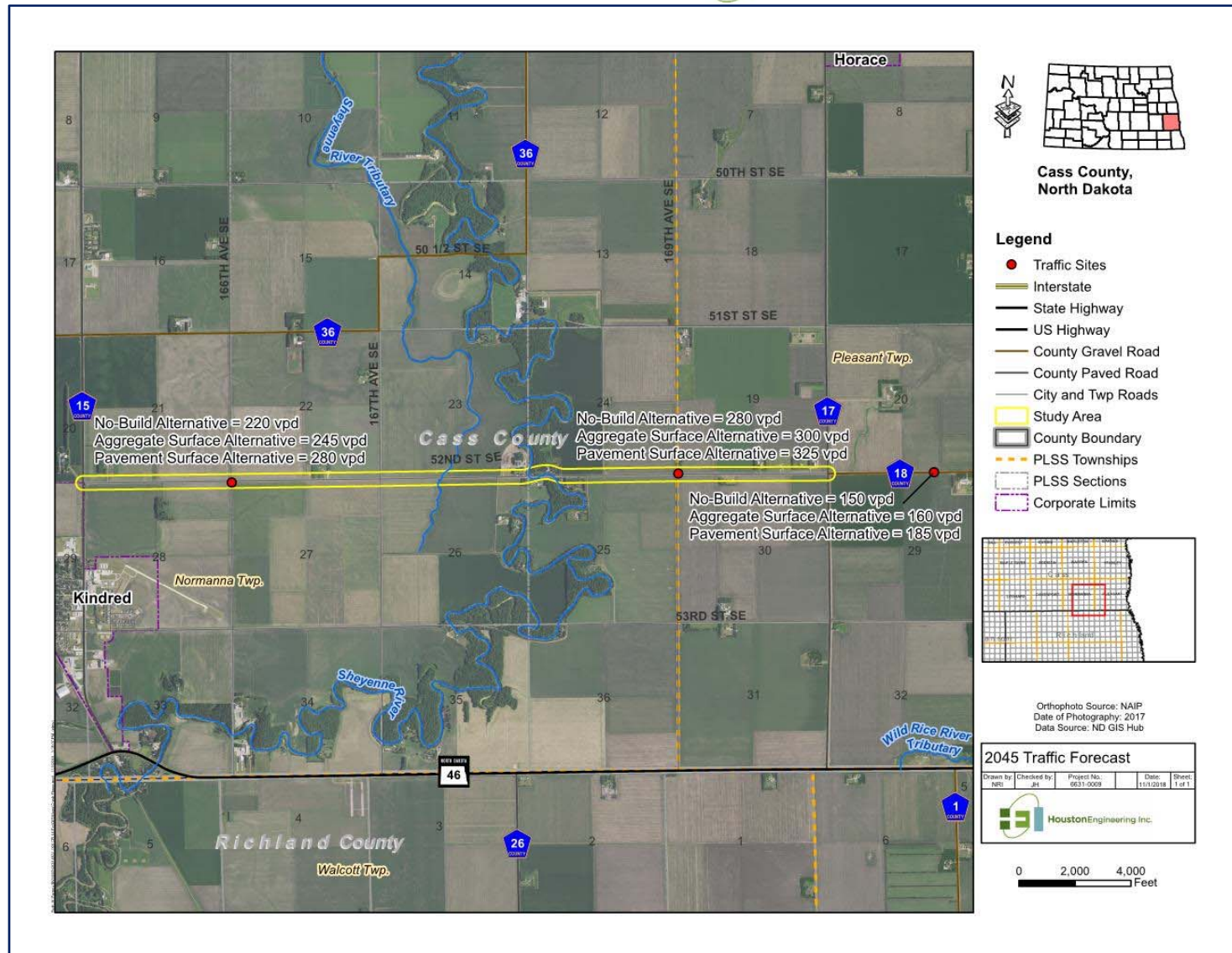


Figure 6. 2045 Traffic Forecasts

SUMMARY OF FUTURE CONDITIONS

Included in this memo was a review of the future conditions and traffic forecasts for the study area. As previously mentioned, this memo will be a part of the final report completed for this study. Additional information may be added to this memo throughout the project and be included in the final memo. The information contained in this memo will be utilized in future memos that are a part of this study.