



MEMORANDUM

**Highway
Department**

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TO: Cass County Commission

FROM: Jason Benson, County Engineer *JMB*

DATE: November 30, 2020

SUBJECT: Consent Agenda topic for December 7th, 2020 Commission Meeting: Adoption of the 2021-2025 Comprehensive Highway Plan

In an effort to increase efficiency and maintain a high level of transparency, the Cass County Comprehensive Highway Plan has been developed.

The Comprehensive Highway Plan acts as a document that more efficiently displays our highway and bridge data and serves as a 5 year Capital Improvement Plan (CIP). This plan is anticipated to be revisited annually. Included in the plan is a discussion of land use, highway safety, maintenance, and construction. A large amount of data is used for preparing the plan, but rather than displaying this data, maps are used to display what is most pertinent in an effort to make the plan more user-friendly and easier to update.

The Comprehensive Highway Plan was presented in draft form to the Cass County Road Advisory Committee at the July meeting.

SUGGESTED MOTION:

Adopt the 2021-2025 Comprehensive Highway Plan as an illustrative plan that provides future guidance for project planning and for this plan to be reviewed and updated annually.

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CASS COUNTY COMPREHENSIVE HIGHWAY PLAN



2021-2025

Cass County Highway Department
Cass County, North Dakota

This document was prepared pursuant to NDCC 11-31-03(2) and is intended to be used for internal planning purposes. Data used herein is deemed to be accurate, however, is not all-encompassing. Maps within are graphical displays of conditions at the time of preparation and are not to be used as a substitute for an accurate field survey.

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Plan Purpose

Cass County operates and maintains a highway system, which in conjunction with local, regional, and state systems, helps to serve the transportation needs of its residents and businesses. The Cass County Comprehensive Highway Plan provides the framework for development of the long-range highway and bridge planning guidance for 2021-2025. The Plan describes system principals and standards, evaluates the existing County transportation system, identifies future system needs, develops a maintenance plan, identifies funding sources, and outlines strategies to implement the Plan. The Plan provides the framework for decisions regarding the roadway and bridge infrastructure improvements necessary to develop a safe and efficient highway system.

Note on plan priorities and funding uncertainties: Cass County has received an additional transportation funding from the ND Legislature over the last 10 years. This funding has been greatly appreciated, but because of the unreliable nature of the funding, this Plan sets priorities for how to best spend those funds if they become available. Over the 2013-2014 and 2015-2016 biennium received one-time funding from the Legislature. However, due to state revenue reductions, Cass County did not receive any additional funding for the 2017-2018 biennium. The 2019 Legislature pass the “Operation Prairie Dog” infrastructure bill which was projected to add approximately \$7 Million to the county per biennium starting in 2019-2020 to be available in July 2021. At this time, it is expected that no funding will be available due to reduced oil prices and activity. Therefore, this plan assumes no “Prairie Dog” funding will be available until 2023. We will continue to be proactive in identifying future projects and will be prepared if state revenues increase and “Prairie Dog” funding becomes available.

Plan Updates and Proponent for Changes in this Plan

The Cass County Engineer is the chief proponent for updates to the Cass County Comprehensive Highway Plan. Working in conjunction with the Deputy Cass County Engineer and County Planner, updates will be approved through the Road Advisory Committee and the Cass County Commission.

The five-year plan will serve as a living document that will be updated annually to maintain a long-range focus while allowing for flexibility due to changes in construction costs, revenues, flooding, and other considerations. The plan will be reviewed and updated in June of each year. The updated plan will be forwarded to the Road Advisory Committee for approval during the July rotational meeting. The plan will then be sent to the County Commission for final approval after budget approval. The plan will provide the future project costs and will serve as the basis for the Highway Department’s annual highway and bridge budget line items.

Vision and Mission

Vision - To be recognized as a premiere county road program in the Northern Plains states.

Mission - To provide and maintain an efficient, safe, environmentally sensitive, and cost effective county road system that effectively meets the citizen's needs for personal mobility and the movement of freight consistent with the importance of the economy.

Commitment - We are committed to community service and providing quality, low cost project construction, engineering, and administration. Through public involvement, working with landowners, townships, and the travelling public, we strive to deliver effective highway and bridge maintenance, rehabilitation, and new construction. Safety is paramount in everything we do. Whether plowing snow, maintaining traffic signs, graveling rural roads, or building a new bridge, the safety of our employees and the travelling public always comes first. Our commitment has been validated in the awards received by the Cass County Highway Department to including:

- NDDOT's inaugural Vision Zero Safety Program Award in 2019
- National Association of Counties Achievement Award for Cass County's Highway Recycling and Reconstruction Program to reconstruct County Highways at a cheaper, more environmentally friendly method, all while providing a high-quality road for the travelling public. Between 2017 and 2020 this program saved Cass County nearly \$12 million.

Goals

Cass County's transportation goals are interdependent, mutually supportive, and apply to our transportation system's infrastructure and services. Our goals are nested with both the NDDOT and FM Metro COG transportation priorities.

1. Safe and secure transportation.
2. Sustainable and reliable mobility through planning and maintenance.
3. Communication and cooperation with landowners, townships, cities, NDDOT, and other stakeholders.
4. Transportation supports economic growth with consideration of environmental, cultural, and social impacts.
5. Cost effective construction with diversified and sufficient funding.

Summary

The 2021-2025 Cass County Comprehensive Highway Plan was prepared to assist staff and decision makers in planning for maintenance and capital improvements to the County Highway System. The plan addresses both funding and project planning, so resources are used carefully to ensure the highest return to taxpayers. The Cass County highway system consists of 635 miles of roadway covering more than 1,768 square miles and 564 bridges of which 231 span 20 feet in length or greater.

Safe, efficient, and responsive transportation infrastructure is necessary to the incidents of commerce, public safety, recreation, and education. The 2018 Cass County Comprehensive and Transportation Plan

describe Cass County's commitment to transportation and can be found at:

<https://www.casscountynd.gov/our-county/planning/cass-county-comprehensive-and-transportation-plan/comprehensive-plan-current-documents>. The 2018 Cass County Comprehensive and

Transportation Plan focuses on the Guiding Principles of "Regionalism, Resilience, and Livability". It also emphasizes the need to "Manage the County Highway System and collaborating with federal, state, and local officials to provide and maintain appropriate transportation systems."

This plan has been developed through compiling data from multiple sources including:

- North Dakota Department of Transportation (NDDOT)
- Fargo-Moorhead Metropolitan Council of Governments (FM Metro COG)
- Pavement Testing and Traffic Counts from Consultant Engineers
- Cass County Highway Department
- Cass County Planning Department
- Cass County GIS Department
- Cass County Tax Equalization Office

The Highway Department is continuing to develop its inventory of data including an analysis of structures under 20 feet in length, inventory of signage on County Highways, geo-locating culverts and approaches on County Highways, inventory of ditch grades of all County Highways, and continued development of characteristics of each road segment. Collecting this data will further improve the County's asset management program.

Further, the plan works in concert with various regional plans and corridor studies. Staff works closely with FM Metro COG, NDDOT, and other entities of the County in planning and programming new projects. The Metropolitan Long-Range Transportation Plan guides development of the transportation system in the Fargo-Moorhead metropolitan area. Along with this larger plan, FM Metro COG has completed several complimentary studies that offer guidance to programming.

The development of a Regionally Significant Transportation Infrastructure in the Traffic Operations Incident Management Strategy identifies the importance of moving traffic quickly in times of disaster. Some County Highways have been identified in this strategic plan and are noted as new projects and are programmed. FM Metro COG, through the Metro Bike/Ped Committee, also creates a Bicycle and Pedestrian Master Plan every five years which helps identify needs in the system for accommodating alternate modes of traffic. Along with these plans, specific corridor studies in the metro area assist Cass County Highway anticipate or respond to necessary improvements to the system.

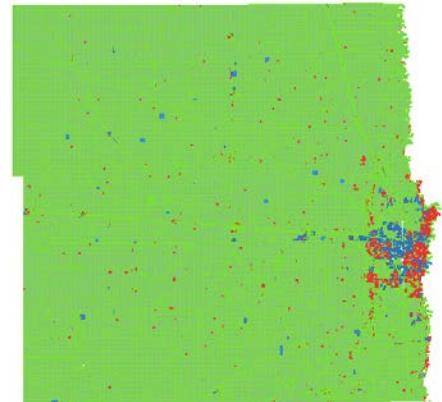


Existing and Future Land Use

The Fargo Moorhead metropolitan area has seen tremendous growth in recent years. The economic prosperity of the metro area has contributed to the growth in the surrounding communities. According to the 1990 Census, Cass County population was 102,874, grew to 123,138 in 2000, and increased 21.6% to 149,778 in 2010. The most recent Census data from 2010 to 2015 shows Cass County growing to 168,930, an increase of 12.8%. With significant growth in commercial and residential building permits, Cass County can expect continued growth. In addition to utilizing Census data to project growth, Cass County participates with the FM Metro COG in researching demographic trends as part of its long range transportation planning and modeling. It is anticipated that by the year 2030 population in Cass County could grow to over 200,000. Table 1 illustrates population in the County’s largest cities.

<i>Table 1 - Population - US Census</i>				
City	1990 Census	2000 Census	2010 Census	2018 Census Estimated
Fargo	75,111	90,559	105,549	125,838
West Fargo	12,287	14,940	25,830	39,078
Horace	662	915	2,430	No Estimate
Casselton	1,602	1,855	2,329	No Estimate
Mapleton	682	606	762	No Estimate
Harwood	590	607	718	No Estimate
Kindred	569	614	692	No Estimate

Despite the growth and importance of the metro area, the County remains primarily agricultural. Ninety-Five percent of the approximately 1.13 million acres of land in Cass County are used for agricultural purposes. Map 1 illustrates this by showing agricultural land uses in green, commercial in blue, and residential in red. It becomes evident that the County’s land use is predominately agricultural.



Map 1: Existing Land Use

Further, the County has committed to promote development only in areas that can adequately accommodate it. The 2018 Cass County Comprehensive and Transportation Plan describe Cass County’s commitment to achieve orderly development that maintains Cass County’s rural heritage. The plan can be found at: <https://www.casscountynd.gov/our-county/planning/cass-county-comprehensive-and-transportation-plan/comprehensive-plan-current-documents>.

Highway Safety

Cass County and its agents have committed to maintaining the safest network of roads possible. The planning process considers road safety by implementing the most effective practices available. Commitment to educating the public, roadway safety improvements, sign maintenance and improved signing, routine road maintenance, and operational safety are all components of each project. Cass County is a member of the NDDOT Vision Zero partnership and was awarded the NDDOT's inaugural Vision Zero Safety Program Award in 2019.



Cass County uses the systemic approach to highway safety. All new construction and maintenance overlays include the use of edge line rumble strip installation to separate the roadway from the shoulder while leaving on-off gaps for bicycle safety. This method can help reduce accidents that occur from running off the road (roadway departures). Nearly all asphalt County Highways have rumble strips, with the only remaining roads without rumble strips being those with a projected paving project within the next few years and our older concrete roads. Intersection improvements and safety enhancements are implemented where collisions have historically happened or where collisions may be likely. Using a systemic approach, improvements such as flashing signals and stop signs, rumble strips, and improved signage have proven successful in past projects. Striping is performed annually on all paved County Highways.

These systemic safety improvements have reduced crashes over the last 12 years when comparing the six years before the safety improvements and the six years after. From 2008-2013 the County total crashes were 447 and between 2014 and 2019 the average went down to 324. This represents a decrease of 27% between the two six-year periods before and after the implementation of these systemic safety improvements.

Highway Access Ordinance #2007-1 was developed to reduce the amount of access points on County Highways for more efficient and safe operation. With design speeds on County Highways at 55 mph and the reduction of accesses to one per ¼ mile, a County Highway can operate with less interruption and more predictable intersections. In addition, the Ordinance regulates the design of the approach by increasing the slope of the approach to reduce severity in off road crashes.

Cass County uses crash data provided by the NDDOT in planning and implementing safety enhancements. When significant crashes occur on Cass County Highways, a general reconnaissance is performed by the County Engineer or Highway Superintendent to assess the road condition and variables that may be present.

Signs and Traffic Control Devices

Cass County utilizes the 2009 Edition of the Manual on Uniform Traffic Control Devices (MUTCD) from the US Department of Transportation, Federal Highway Administration. The MUTCD is the standard for traffic control devices and has been adopted by the NDDOT. Cass County maintains an inventory of their signs indicating condition and location in a geo-database.

Local Road Safety Plan

In 2014 the NDDOT sponsored a statewide Local Road Safety Plan (LRSP) for counties. The purpose of this plan was to develop the following:

1. Establish safety emphasis areas
2. High priority safety strategies
3. Identify at-risk locations
4. Develop safety investment options
5. Identify high priority safety projects, both proactive and reactive
6. Position local agencies to compete for safety funds
7. Foster safety culture among local stakeholders

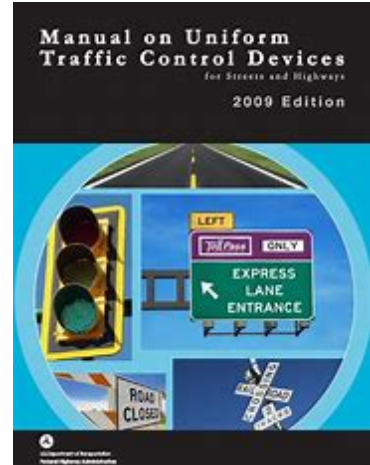
One of the critical issues identified was the higher crash rate on rural paved roads. While gravel roads make up approximately 93% of North Dakota's 97,600 miles of rural local road system, approximately half of the severe crashes are on the paved roads that make up 7% of the rural system.

The LRSP therefore focused on the Cass County paved road network and a Risk Rating Criteria was developed for the paved roads based on: Density of Road Departure Crashes; Traffic Volume; Curve (Critical Radius) Density; Access Density; and Road Edge Risk Assessment.

To develop a comprehensive LRSP, a public workshop was held with an emphasis on the 4 E's: Engineering, Enforcement, Education, and Emergency Medical Services. Through group discussion and review of crash data, participants worked to address severe crashes on the County roadways. Critical emphasis areas discussed were: Unbelted Vehicle Occupants; Lane Departure Crashes; Alcohol Related Crashes; Excessive Speed or Aggressive Driving; Intersection Crashes; and Crashes Involving Drivers Under Age 21.

Crash data from 2008 to 2012 was used for the countywide crash analysis. For Cass County, there were not enough crashes to be statistically reliable; therefore, decisions were based on the crashes for all cities, statewide data, or national research. The safety emphasis areas for Cass County are consistent with the state's emphasis areas. This process revealed where crashes were overrepresented based on a comparison to statewide averages or where a large enough number of crashes represented an opportunity to substantially reduce crashes. As a result, the following safety emphasis areas were identified as priorities for safety investments:

- Driver Behavior – Young drivers, aggressive drivers, alcohol-related, and unbelted vehicle occupants
- Highways – Lane departure and intersection crashes.



Cass County Severe Crashes by Safety Emphasis Areas (2008 to 2012)

Safety Emphasis Areas	Statewide (% of Total)	2008 to 2012 Severe Crashes					
		Cass County		State Roads		Local System	
		%	#	%	#	%	#
Total Severe Crashes	2,231	243		82		161	
Involving Drivers Under Age 21	22%	25%	60	18%	15	28%	45
Involving Drivers Over Age 64	13%	11%	26	15%	12	9%	14
Excessive Speed or Aggressive Driving	26%	23%	57	33%	27	19%	30
Alcohol-Related	30%	23%	55	26%	21	21%	34
Distracted, Asleep, or Fatigued Drivers	9%	9%	23	10%	8	9%	15
Unbelted Vehicle Occupants	48%	37%	91	40%	33	36%	58
Pedestrian Crashes	5%	12%	29	7%	6	14%	23
Bicycle Crashes	2%	7%	18	6%	5	8%	13
Motorcycle Crashes	12%	13%	31	7%	6	16%	25
Heavy Vehicle Crashes	15%	10%	25	18%	15	6%	10
Train-Vehicle Collisions	1%	0%	0	0%	0	6%	10
Lane-Departure (Run-Off-the-Road and Head-On) Crashes	47%	29%	71	41%	34	23%	37
<i>Head-On</i>	7%	6%	14	9%	7	4%	7
<i>Run-off-the-Road Crashes</i>	40%	23%	57	33%	27	19%	30
Intersection Crashes	23%	30%	74	9%	7	42%	67
Work Zone Crashes	2%	2%	5	2%	2	2%	3
Deer Collisions	1%	0%	0	0%	0	0%	0
Adverse (Winter) Weather Related	16%	25%	61	38%	31	19%	30
Note: Severe crashes are those crashes that result in at least one fatality or incapacitating injury.							

Cass County is doing quite well regarding roadway safety. This is due to Cass County’s existing safety strategies including rumble strips, pavement markings, pavement safety edges, and improved signing. Another factor is the low number of curves in our roadways as this reduces the number of roadway departures and other safety issues experienced in other counties in our region with winding roads. Our biggest safety issue involves our intersections. Because of adequate signing and lower traffic volumes, many of our intersections are safe and do not require any improvements. However, several of our intersections along ND 18, ND 38, and ND 46, as well as some intersections of two County Highways could be improved. Overall, the biggest safety recommendation includes evaluating streetlights, signage, pavement markings, and dynamic warning signs. We have worked with the NDDOT to determine the best safety options at the intersections of state highways. For these critical intersections, safety funding was used for intersection destination lighting and School Zone signs. Local funding was used to replace the remaining School Zone signs and flashing lights so that all rural school locations on the Cass County Highway system have been replaced since 2017. Finally, local funding was also used to install red LED flashing beacons on the top of stop signs located at critical road intersections to alert drivers of these stop conditions.

At this time projects have been completed or developed for Destination Lighting, Radial T Intersection Improvement at Cass 5/10, chevron signing on curves, rumble strips/stripes, and flashing red beacons on stop signs at critical intersections.

In 2011 edge-line rubble strips were installed on nearly all the counties paved highways. It is difficult to determine if this was a factor in the reduction of crashes since that time. But it is encouraging to see the decrease of 27% between the two six-year periods before and after the implementation of these systemic safety improvements. See Appendix 18 that summarizes all types of crashes from 2006 to 2019 on the Cass County Highway network.

Permitting

Related to safety and maintenance, the County relies on various permitting procedures to uphold the mission of the Department. Significant permits include:

1. Over Dimension Vehicles Permits: Ordinance #2005-2 regulates over dimension vehicles to ensure the safe practices and avoidance of damage to County Highways. Similarly, the County annually enacts Spring Load Restrictions to avoid damage to the road surface and subgrade during the wet months of spring.
2. Utility Permits: The County also permits use of its right of way for utilities which includes provisions to ensure safe operation during construction activities on or near the roadway.
3. Ditch Cleaning/Drainage Permits: There is also a permitting process for ditch cleaning to better inventory what is being done and to ensure that the water resource district is adequately notified.
4. Access Permits: The County actively permits any new access to County Highways through the Highway Access Ordinance #2007-1.
5. Subdivision Platting: The County Planning Office administers the Subdivision Ordinance which regulates growth in the County and efficiently accommodates for new roads and land use changes that may affect the County Highway System. The County Engineer reviews all new developments and assists in advising the Planning Commission.

Valuation of Highway and Bridge Assets

Cass County has invested a significant amount of funding in developing and maintaining its transportation network. Since 2000 we have spent over \$252 million in projects and maintenance on both our highways and bridges.

The current average cost to completely rebuild a paved highway is \$1.5 million. To rebuild our 311 miles of paved highway to a width of 32 feet would cost over \$467 million.

With 564 structures, our bridges and large box culverts also have a significant asset value. Of the 231 major structures (20 feet in length or greater), the average structure length is 100 feet with an average width of 28 feet. Replacement values for these 231 structures, at a cost of \$205 per square foot would be approximately \$133 million.

When factoring the additional cost to replace the 333 minor structures, the total replacement cost of our highway and bridge infrastructure is nearly 700 million. While no local government can bear the replacement cost of this large amount of infrastructure, it emphasizes the importance of funding and sustaining an effective maintenance program. An organized and well-planned maintenance and replacement program will keep replacement costs down, efficiently spend the County’s resources, extend the life of our infrastructure, and ensure the long-term viability of our highway system.

Funding Maintenance and Construction

The County relies upon a combination of the 23-cent state fuel tax, state motor vehicle license fees, federal road and bridge funds, local property tax, and when available, one-time state funding. Other items such as permit fees make up a very small portion of the budget. Cass County also continually pursues grant funding opportunities as they become available.

Influencing the cost of construction is the significant rise in the ND Construction Cost Index. From 2001 to 2018, ND’s overall Construction Cost Index increased annually an average of 7.7%. Rebuilding just one mile of road can cost up to \$1.5 million. Considering this reality, it is important to maintain a road maintenance policy to reduce the need for reconstruction.

North Dakota DOT Construction Cost Index - 2018

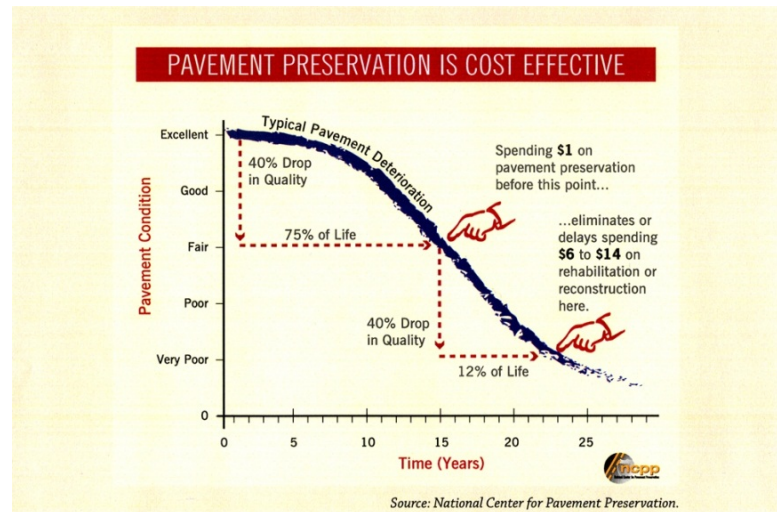


While Construction Costs have increased annually an average of 7.7% since 2001, Cass County’s Highway Distribution Tax Funding (without One Time Funding) has only increased 7%. North Dakota has a state tax that currently collects 23 cents per gallon of gasoline. This tax was last increased in 2005.

Federal funding comes from the federal gas tax of 18.4 cents, last increased in 1993. In 2000, Cass County received \$1.25 million in Federal Aid Highway Funds. With the changes from federal Fixing America’s Surface Transportation Act (FAST Act), we now receive less than \$900k in Federal Aid Highway Funds, which equates to a 25% decrease. Since 2000 we have continued to receive between \$400 to

\$700k in Federal Aid Bridge Funds every year. Federal Aid as a percentage of the County's total revenues has continued to decrease. In 2000, Federal Aid made up 21% of Cass County's revenues. From 2000-2005 Federal Aid averaged 19% of our total funding and from 2006-2012 it averaged 13% of our total funding. Now Federal Aid only makes up 8% of our County revenues. While our costs have increased 18% annually since 2000, our Federal Aid has decreased. Over that same time, local and state funding increased from \$7.4 million to \$15.3 million. If it were not for the growth in local and state funding, we would not be able to maintain our existing highway and bridge network. Federal Aid has become a very small component of our overall revenues and can no longer be counted on to fund major projects.

Regarding our asphalt highways, they generally require a maintenance overlay every 15-20 years. Current costs of a typical asphalt overlay in Cass County can range from \$200,000-\$450,000 per mile, depending on road width and thickness of the asphalt overlay, with the most frequent 36' wide, 2.5" thick overlay being approximately \$300,000 per mile. Under the desired maintenance schedule an overlay would occur every 17½ years. Given



the current inventory in Cass County we could schedule approximately 17 miles of asphalt overlay per year. Using the rate of \$300,000 per mile we can estimate a cost of \$5.1 million per year. If pavements are not overlaid with a new asphalt surface before they deteriorate, they will require full reconstruction.

Table 2 shows the estimated revenue for the Cass County Highway Department over the planning years. These estimates use revenue inflation rates of 1.5% for Federal Funding, 3% for State Funding, and 4% for Local Funding. These inflation rates were developed by Metro COG. In addition, the Operation Cost inflation rate use was 4%. The Highway Distribution Tax totals are an estimate based on past funding. Estimated annual Federal Aid Highway funding is \$900,000. The chart also includes the additional Federal Aid Funding for Bridge projects. Federal Aid Bridge funding is based on need as the NDDOT has \$5 million allocated statewide for county bridges (Cass County competes for these funds based on other county needs throughout the state).

Revenue Description	2021	2022	2023	2024	2025
Property Tax	\$9,000,000	\$9,180,000	\$9,363,600	\$9,550,872	\$9,741,889
Highway Distribution Tax and Additional State Funding	\$7,000,000	\$8,364,000	\$8,531,280	\$8,701,906	\$8,875,944
Prairie Dog Funding Bill		\$3,500,000	\$3,500,000	\$3,500,000	\$3,500,000
Other - Grants	\$1,200,000	\$0	\$0	\$0	\$0
Total Revenues	\$18,041,622	\$21,044,000	\$21,394,880	\$21,752,778	\$22,117,833
Federal Aid Highway Funding	\$1,000,000	\$1,020,000	\$1,040,400	\$1,061,208	\$1,082,432
Federal Aid Bridge Funding	\$1,200,000	\$1,224,000	\$1,248,480	\$1,273,450	\$1,298,919
Total Revenues & Federal Aid	\$20,241,622	\$23,288,000	\$23,683,760	\$24,087,435	\$24,499,184
Total Operating Cost (not including Road/Bridge Projects)	\$6,000,000	\$6,240,000	\$6,489,600	\$6,749,184	\$7,019,151
Total Available for Road/Bridge Projects	\$14,241,622	\$17,048,000	\$17,194,160	\$17,338,251	\$17,480,033

Long Range Funding Estimates

In 2018-2019, Metro COG updated its Long-Range Transportation Plan – Metro 2045 (<http://www.fmmetrocog.org/projects-rfps/long-range-transportation-plan>). This plan contains Short-Range, Mid-Range, and Long-Range revenue estimates. These estimates also use revenue inflation rates of 1.5% for Federal Funding, 3% for State Funding, 4% for Local Funding, and an Operation Cost inflation rate of 4%. Table 3 uses the Metro 2040 revenue estimates. These estimates use standard Highway Distribution Tax funding and do not include additional one-time State funding. With the continued support of one-time funding from the ND Legislature, Cass County could have an additional \$7 million per biennium and more than \$105 million over the next 30 years. When looking out to 2045, additional one-time state funding only keeps up with maintaining our highway system. Continued funding based on the 2021 “Prairie Dog Fund” rate will allow us to annually overlay 18 miles, reconstruct 3.5 miles, replace 3-4 bridges, and complete seven miles of gravel road construction.

Revenue Description	Short-Range 2021-2028	Mid-Range 2029-2038	Long-Range 2039-2048	Total
Property Tax	\$77,246,721	\$115,464,090	\$140,750,081	\$333,460,893
Highway Distribution Tax	\$69,180,346	\$105,200,615	\$128,238,963	\$302,619,925
Prairie Dog Funding Bill	\$24,500,000	\$35,000,000	\$35,000,000	\$94,500,000
Other - Grants	\$1,200,000	\$0	\$0	\$1,200,000
Total Revenues	\$172,968,690	\$255,664,705	\$303,989,044	\$732,622,439
Federal Aid Highway Funding	\$8,582,969	\$12,829,343	\$15,638,898	\$37,051,210
Federal Aid Bridge Funding	\$10,299,563	\$15,395,212	\$18,766,678	\$44,461,452
Total Revenues & Federal Aid	\$191,851,222	\$283,889,261	\$338,394,620	\$814,135,102
Total Operating Cost (not including Road/Bridge Projects)	\$55,285,358	\$98,587,120	\$145,933,021	\$299,805,498
Total Available for Road/Bridge Projects	\$136,565,864	\$185,302,141	\$192,461,599	\$514,329,604

Cass County Highways: Design Standards for New or Reconstruction of Existing Facilities

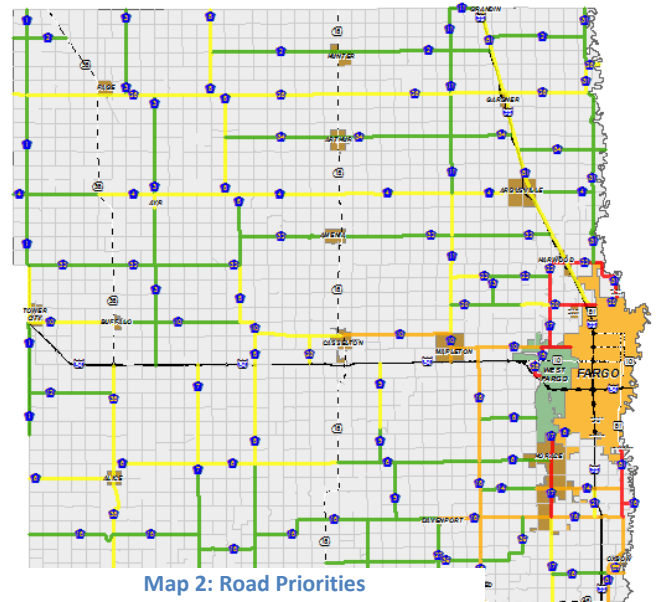
The typical section of a County Highway is rural in nature with two lanes, either paved or gravel surface. Different modes of travel and location of roadways to population centers, agricultural points of traffic, or schools sometimes require different needs. Further drainage needs may vary from roadway to roadway. Table 4 summarizes the Design Standards for New or Reconstruction of Existing Cass County Highways.

Table 4 - Minimum Design Standards for New or Reconstruction of Existing Infrastructure							
Typical Section	Design Speed	Right of Way	Road Width	Turn Lanes	Min. Section Thickness	Access Controls	Bike/Ped Facilities
Two-Lane Township Gravel Section	55 mph	66 feet	28 ft	no	4" Gravel	1/4 mile spacing	N/A
Two-Lane Rural Gravel Section	55 mph	200 feet	28 ft	no	6" Gravel	1/4 mile spacing	N/A
Two-Lane Rural Paved Section	55 mph	200 feet	32 ft	no	12" Base + HBP	1/4 mile spacing	4 ft paved shoulder
Two-Lane Village Paved Section	25 mph	200 feet	32 ft	no	12" Base + HBP	Varies	4 ft paved shoulder
Two-Lane City Paved Section	25 mph	200 feet	36 ft	no	12" Base + HBP	Varies	6 ft paved shoulder
Two-Lane Metro Paved Section	40-55 mph	200 feet	36 ft	no	12" Base + HBP	1/4 mile spacing	6 ft paved shoulder
Three-Lane Metro Paved Section	40-55 mph	200 feet	50 ft	1/4 mile spacing	12" Base + HBP	1/4 mile spacing	6 ft paved shoulder and separated path

*Note: 4:1 minimum inslope, 3:1 minimum backslope, 0.05% ditch grade, 24" minimum culvert, 8' minimum ditch bottom width on all rural highway sections; minimum HS-25 design load, 5 year storm design on all bridges.

Cass County has prioritized roads to assist in such issues as maintenance, striping, and snow removal.

Priorities are used to determine which roads are plowed first and the schedule for which maintenance or construction projects will be completed. Priorities are developed by the County Engineer by considering average daily traffic volumes, pavement condition, as well as important points of need such as schools, cities, and commerce. Map 2 displays these priorities; red is priority 1, orange is priority 2, yellow is priority 3, and green is priority 4.



Cass County Highways: Current Status of Paved Highways

Cass County currently maintains 310 miles of paved highways along the rural portions of the county. These highways vary in age and building materials (See Appendix 5 for pavement age) and will deteriorate at varying rates due to these factors. To determine their condition, county roads are inspected every 5 years by an independent testing consultant using a “Falling Weight Deflectometer” and given a PCI (Pavement Condition Index) rating from the results of this test. These results are used by county engineers to help shape decisions for future roadway maintenance/rebuilding. The most recent PCI survey was completed in 2017 and results are shown in Appendix 3 (next PCI testing will be in 2022). Cass County’s goal is to have an overall PCI of 90. Additionally, seal coats are applied to asphalt highways one year after paving or overlaying has been completed to increase the life of the pavement to 15-20 years. Our overall goal is to complete another chip seal around years 8-14 if needed to extend the life of the existing pavement before another overlay is necessary. A map showing the most recent seal coat for each highway is shown in Appendix 6.

Cass County Highways: Current Status of Gravel Highways

Cass County currently maintains 324 miles of gravel highways within the rural portions of the county. These highways vary in age, and some have been widened for future paving. Currently, the roads are maintained with weekly or bi-weekly grading depending on usage. Additionally, a budget for road repairs is prepared every year and additional gravel is added to roads requiring repairs with the allotted funds on a priority system of damage and usage. A more uniform plan for gravel roads has been adopted for the future, where a general standard of 28’ road tops with a 4% crown grade will be used for future gravel grading and reshaping projects. In addition to these dimensional standards, areas with weak subgrade are retrofitted with drain tile to remove excess moisture from the subgrade or cement reinforcement sections to increase the structural capacity of the road top. Gravel roads that have become widened or flatter over time from traffic will also be reshaped. Reshaping returns the roadway back to its designed width and crown. As gravel costs and traffic increase, gravel stabilization, dust control, and subgrade stabilization are becoming more important. Over the next several years we anticipate adding more miles of stabilized gravel and more miles of roads with dust control. This will help bridge the gap between gravel roads with 100 ADT or less and paved roads with more than 400 ADT. Our gravel roads with 100-400 ADT have a need for more enhanced gravel treatments, stabilization, and dust control to adequately manage the roadway conditions as traffic increases.

Bridge Maintenance and Construction

Cass County maintains 564 structures of which 231 span 20 feet in length or greater. Inevitably these bridges will deteriorate over time. Maintenance, reconstruction, replacement, and removal needs to and does occur. The NDDOT conducts bi-annual inspections of all structures greater than 20 feet in length giving County officials an accurate inventory of existing bridge conditions. This inventory is used to conduct` planning for the most effective projects on bridges most in need. The inventory also includes structures that have been identified by inspectors with a “Code 3” status meaning that immediate attention is required. In Cass County the average age of a bridge is 40 years old. Of the 564 structures, about 25% were built before 1960. Designed to the standards of their time, many of these



bridges have reached the end of their design life or cannot handle the truck traffic of today. Of our 231 bridges spanning over 20 feet, and 333 bridges spanning under 20 feet, we have 12 that are structurally deficient, 2 fracture critical and 6 that are functionally obsolete. If we assumed a 70-year lifespan for our structures, we need to replace at least seven per year. Since such many bridges are now over 50 years old, over the next twenty years we will have a higher number of bridge replacements, further straining our finances.

Cass County Bridges: Current Status of 20 foot or Longer Bridges on County Highways

Appendix 7 shows bridges of 20 feet or longer on County Highways. On average, these bridges are in fair condition. In the fall of 2019, Georgetown bridge across the Red River near Georgetown, MN required it to be posted. The NDDOT inspects all 20 foot or longer bridges on a 2-year cycle and rates each on a 0-100 scale. When this sufficiency rating falls below 50, the bridge is eligible for Federal funding. Currently, there are no bridges on County Highways that are below 50, however, there are 1 bridge in the 50-59.9 range. These would be potential sites for replacement soon as their rating falls below 50 or due to width and load restrictions.

Cass County Bridges: Current Status of 20 foot or Longer Bridges on Township Roads

Appendix 8 shows bridges of 20 feet or longer on township highways. These structures vary in condition from poor and in need of replacement to very good. There are 7 bridges with a sufficiency rating below 50. Four of these have a Code 3 rating which requires priority attention. These bridges are replaced or repaired on a priority basis with input from the township officials.

Cass County Bridges: Current Status of Bridges less than 20 feet in Length

There are many minor structures that are less than 20 feet in length. The NDDOT no longer inspects these bridges. The Cass County Highway Department has developed a 5-year rotation for inspecting these structures.

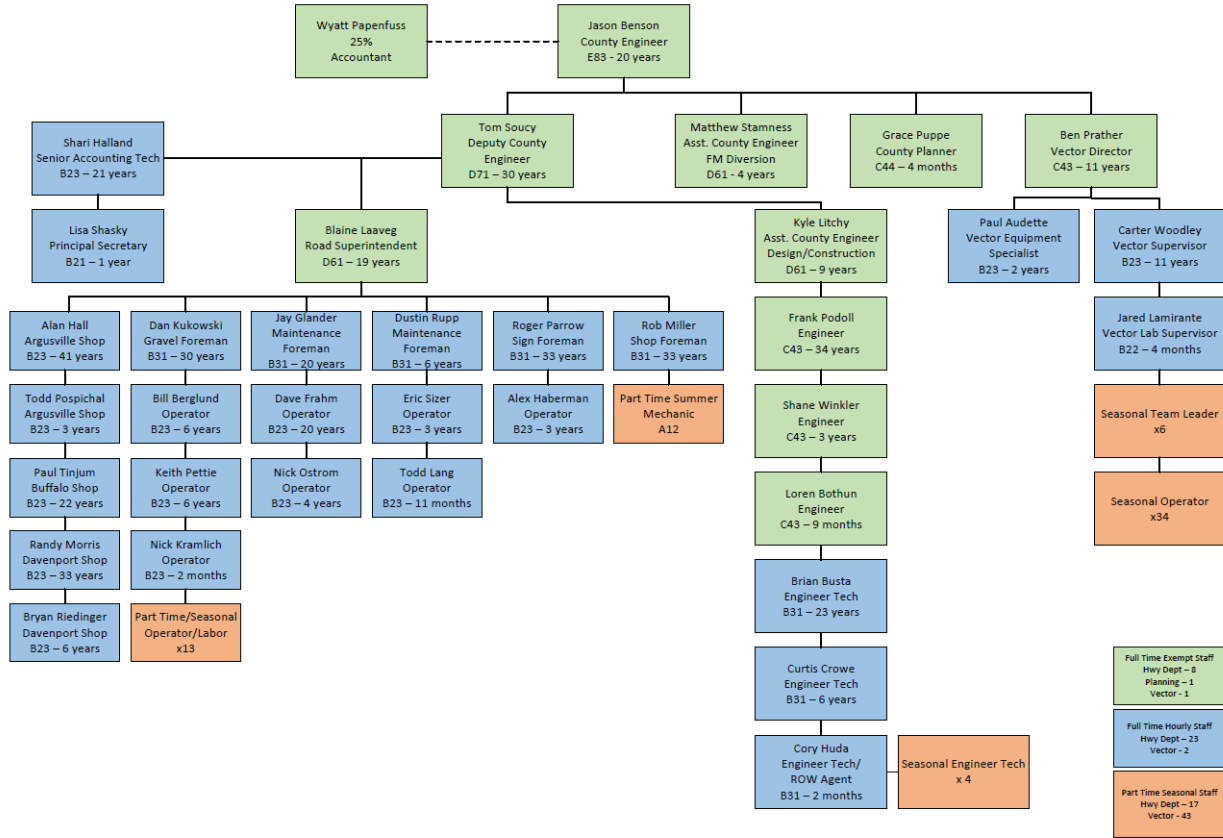
Cass County: Future Staffing - Heavy Equipment - Facilities Needs

Staffing

- **Current Staffing:** The Highway Department made up of 35 full time administrative, operations, and engineering staff. The County Engineer also supervises the County Planning and the County Vector Control Departments totaling four full time employees. The Highway Department currently has the County Engineer, a Deputy County Engineer, an Assistant County Engineer (FM Diversion), Assistant County Engineer (Design and Construction), a Road Superintendent, and two office administration staff. Under the Assistant County Engineer (Design and Construction) are six full time engineering staff and under the Road Superintendent are 18 full time operations staff. Then Highway Department also hires between 16-20 part time engineering and operations staff during the summer. The Vector Control Department has 4 full time employees and hires around 40-42 part time summer employees. Below is the current organizational chart.

- **Proposed Future Staffing over the Next Five Years:** The Highway Department looks to add one new staff position over the next five years. In addition to handling increases in workload, this one new position would help transition for potential retirements and changes.
 - A mechanic to work under our current Maintenance Foreman. This new staff member would be replacing a six-month part-time employee. The person would also add flexibility during the winter months for both equipment maintenance and assisting with snow plowing.

CASS COUNTY HIGHWAY DEPARTMENT ORGANIZATIONAL CHART
(as of 07-01-20)



Heavy Equipment:

- Current Equipment:
The motorgraders, Trucks, Pickups, Loaders, Backhoes, Tractors and Trailers are replaced on a as needed to keep the fleet in working order.
- Five Year Projected Equipment Purchases:

	2021	2022	2023	2024	2025
Unit	Unit	Unit	Unit	5 CY Wheel Loader	Mack Truck
Shop P/U (1)	Tandem Trucks (2)	Shop P/U (2)	Shop P/U (4)	3 Disc Mowers	
Engr. P/U (3)	2.5 CY Loader	Ag Tractors	Toolcat	Shop P/U (3)	
Flatbed replace 42		Lowboy Trailer		Engr. P/U (2)	
Kenworth Truck		Equipment Trailer			
Forklift					
Dump Box for 60					
Snow Pusher for Loader					
Sign Truck					
Equipment and years listed are subject to change.					

Highway Department Facilities:

- Current Facilities:
 - West Fargo Shop was built in 1969.
 - Office addition was built in 1970.
 - The roof was upgraded in 2018.
 - The main office was remodeled in 1997.
 - The Davenport rural shop was built in 1982.
 - The Argusville and Buffalo rural shops were built in 1988.
 - The service hoist main shop was removed, and a pit was installed for service work in 1998.
 - An asphalt curb and gutter parking lot for employees/visitors and fuel pumps are also moved to their current location in 2001.
 - The Vector/Weed Storage building was built in 2002/2003.
 - Sand/Salt Storage building was built in 2003.
 - The Vector addition was added to the west side of the office section in 2005. This year the vector chemical building was also constructed.
 - Concrete Paving East of the Main Shop was built in 2007.
 - East Storage Building was built in 2012
 - Concrete Paving West of the Main Shop was built in 2013.
 - Concrete Paving South of the Main Shop was built in 2014.
 - Concrete Paving west of the East storage building to the main entrance roadway. The wash bay drains, and old paint room concrete floor was replaced. The heated storage area of the main shop floor drains and concrete near the overhead shop doors was all built in 2015.
 - The asphalt curb and gutter Employee and Visitor parking lot was expanded to the north in 2017 and the remaining portion of the parking lot was overlaid with new asphalt in 2020.

- Five Year Projected Facilities Remodel, Changes, or New Additions:
 - 2020-2021 we are acquiring a new property and building a new facility for our Davenport Shop. Once completed, the old shop will be sold.

Strategic Long Range 2045 Goals

Now through the year 2045, Cass County will continue to aggressively design, build, and maintain our future highway network. Below are the goals listed by decade:

2021 to 2035

- Reconstruct or regrade all paved County highways with inslopes less than 4:1 to a standard slope of 4:1 or flatter and a 32-foot-wide paved surface.
- Construct a continuous paved highway running east-west across the County south of Interstate 94.
- Repair, replace, or remove all bridges/structures identified with a sufficiency rating less than 50 within two years of its last inspection.

2036 to 2045

- Implement a plan to regrade or reshape all gravel roads within the last 30 years to ensure we maintain a proper 28-foot-wide surface, maintain 4:1 inslopes, and maintain ditch drainage and culverts.

2021-2025 Paved Highway Improvement Plan

There are numerous factors that can be and are used to make decisions regarding improvements and maintenance on the County Highway System. Many variables go into prioritizing future projects such as average daily traffic as obtained from the NDDOT and/or the FM Metro COG, PCI ratings, asphalt thickness, last year paved, last year sealed, population within the proximity, and points of commerce or increased traffic. These variables are taken into consideration when scheduling the most efficient construction schedules in upcoming years. Table 5 illustrates the proposed highway projects for the next five years that are a result of these components.

Table 5 - Proposed Highway Improvements					
Hwy	Project Location	Type of Project	Funding Source (Local/Fed Aid)	Year to be Completed *	Project Cost
10	Casselton - 15th St to Hwy 11	Bituminous Surfacing	Local	2021	\$2,800,000
New 6	Hwy 17 to 45th St. & 45th St to 64th Ave S	Grading	Local	2021	\$2,200,000
5 & 10	Hwy 5 & Hwy 10 Radial Tee Intersection & Shldr. Impr.	Grading & Surfacing	Federal	2021	\$3,200,000
				TOTAL =	\$8,200,000
New 6	Hwy 17 to 45th St. & 45th St to 64th Ave S	Bituminous Surfacing	Local	2022	\$1,200,000
9	Hwy 10 to I94	Subgrade Repair	Local	2022	\$360,000
9	I94 to Durbin	Grading & Surfacing	Local	2022	\$2,800,000
32	State Hwy 18 West through Amenia	Grading & Surfacing	Local	2022	\$1,000,000
34	State Hwy 18 East through Arthur	Grading & Surfacing	Local	2022	\$600,000
34	Arthur to Hwy 11	Subgrade Repair	Local	2022	\$1,540,000
81	76th Ave S to State Hwy 46	Culvert Lining	Local	2022	\$1,000,000
				TOTAL =	\$8,500,000
5	Trail Co. Line to Hwy 26	Mill and Overlay	Local	2023	\$1,200,000
5	Hwy 26 to Hwy 34	Mill and Overlay	Local	2023	\$600,000
6	C17 Roundabout E 1,800'	Grading & Surfacing	Local	2023	\$500,000
10	State Hwy 38 through Buffalo 1 Mile East	Grading & Surfacing	Local	2023	\$1,800,000
11	Hwy 4 to Hwy 22	Mill and Overlay	Federal	2023	\$1,500,000
16	I29 to Hwy 81	Mill and Overlay	Local	2023	\$300,000
16	Hwy 81 to Red River Bridge	Mill and Overlay	Local	2023	\$150,000
17	Hwy 17 & 64th Ave S - Roundabout	Grading & Surfacing	Local	2023	\$2,000,000
18	I29 to Red River Bridge	Mill and Overlay	Local	2023	\$300,000
21	Hwy 14 to Hwy 16	Mill and Overlay	Local	2023	\$450,000
25	Hwy 81 to 0.4 Miles S. through Hickson	Mill and Overlay	Local	2023	\$60,000
34	Hwy 11 to I29	Subgrade Repair	Local	2023	\$820,000
81	Hwy 16 W to ST Hwy 46	Mill and Overlay	Local	2023	\$2,000,000
				TOTAL =	\$11,680,000
6	Sheyenne Diversion to Hwy 17	Mill and Overlay	Local	2024	\$225,000
14	Sheyenne River to I29	Mill and Overlay	Local	2024	\$1,000,000
16	State Hwy 18 to Davenport	Subgrade Repair & Bituminous Surfacing	Local	2024	\$5,000,000
17	52nd Ave S Roundabout to Horace & Horace to Hwy 16	Mill and Overlay	Local	2024	\$1,800,000
26	Hwy 5 North to State Hwy 18	Mill and Overlay	Federal	2024	\$2,200,000
34	State Hwy 18 to 1 Mile East of C5	Subgrade Repair	Local	2024	\$1,400,000
				TOTAL =	\$11,625,000
1	Hwy 4 to Hwy 26	Subgrade Repair	Local	2025	\$1,400,000
5	Wheatland to I94	Grading & Surfacing	Local	2025	\$1,700,000
6	Barnes Co Line to Hwy 38	Grading & Surfacing	Local	2025	\$5,000,000
26	Barnes Co. Line to ST Hwy 38	Mill and Overlay	Local	2025	\$1,100,000
26	State Hwy 18 to I29	Mill and Overlay	Federal	2025	\$2,900,000
81	Hwy 20 to Hwy 32	Grading & Surfacing	Local	2025	\$5,130,000
				TOTAL =	\$17,230,000

* Note: Years to be completed are illustrative and subject to change and approved annually and/or as necessary by the Road Advisory Committee.

2021-2025 Gravel Road Improvement Plan

Many factors are used to make decisions regarding improvements and maintenance of our gravel road system. Routine maintenance, motor grader operations, and annual gravelling programs are sufficient in maintaining a consistent, high quality gravel road. However, there are times where excessive moisture, poor drainage, soft subgrade, and other issues must be addressed. In addition, there are times when major reshaping or regrading of gravel roads must occur.

Cass County is proactively working to reduce soft roadbeds through drain tile and subgrade repair/cement stabilization. In addition, Cass County will address significant soft spots and subgrade issues through near term drain tile and subgrade repair projects. Long term work will be done to reshape gravel roads that have become widened or flattened over time from traffic, and up to 15 miles of gravel road will be reshaped annually. This reshaping will save money over time by reducing the width of the roadway back to County design standards, which in turn reduces the overall gravel required to resurface the roadway.

Over the last 10 years Cass County has implemented a plan to stabilize and improve gravel road performance. This has been through completing road reconstruction, cement treated subgrade, and gravel stabilization with dust control. This has helped improve many roads, but additional work is needed on our gravel roads to replace culverts, regrade ditches, and improve the roadway. If additional funding becomes available it would be ideal to allocate a significant portion to improving the roadway, culverts, and ditches of our gravel roads.

Table 6 illustrates the proposed gravel highway improvements.

Table 6 - Proposed Gravel Highway Improvements						
Hwy	Project Location	Length (Miles)	Type of Project	Year to be Completed	Funding Source (Local/Fed Aid)	Project Cost
	TO BE DETERMINED			2021	Local	\$0
New 9 & 34	I94 to C10 & State 18 to C11	9.5	Subgrade Repair	2022	Local	\$1,900,000
34	C11 to I29	4.1	Subgrade Repair	2023	Local	\$820,000
34	State Hwy 18 to 1 Mile East of C5	7.0	Subgrade Repair	2024	Local	\$1,400,000
1	C4 to C26	7.0	Subgrade Repair	2025	Local	\$1,400,000
11	C26 to Traill Co Line	6.0	Subgrade Repair	2026	Local	\$1,200,000
3	C26 to Traill Co Line	6.0	Subgrade Repair	2027	Local	\$1,200,000
32	State Hwy 38 to C1	5.9	Subgrade Repair	2028	Local	\$1,180,000
16	State Hwy 38 to Barnes County Line	6.5	Subgrade Repair	2029	Local	\$1,300,000

2021-2025 Bridge Improvement Plan

The County utilizes bi-annual inspection reports provided by the NDDOT to identify necessary improvements to County and township structures. Funding is allocated annually to account for these necessary improvements. In addition to these improvements the County includes, in the construction schedule, necessary flood repairs which combine local and federal funds. There are approximately 40 bridges currently slated for improvements with additional funding set aside for replacing minor structures. Table 7 illustrates the proposed bridge improvements for 2021-2025.

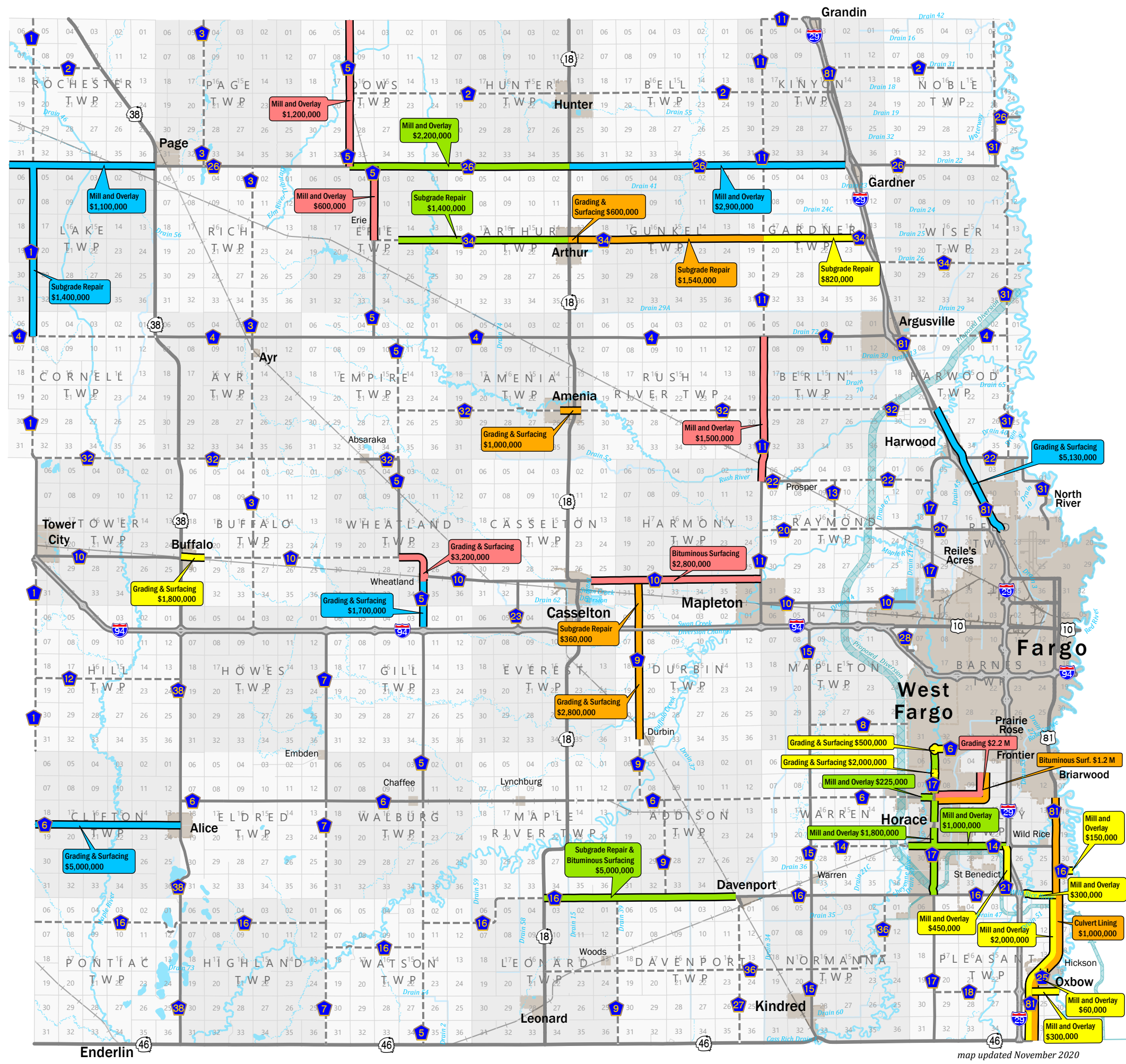
Table 7 - Proposed Bridge Improvements

HWY	TWP	LOCATION	PROJECT TYPE	FUNDING	STRUCTURE TYPE	YEAR	TOTAL
	Noble	15/16 Noble - North Cass WRD Drain 18	Box Culvert	Local	Major	2021	\$100,000
26	Kinoyon	C26 - 35-36 Kinoyon Twp - Dr 22	Box Culvert	Local	Major	2021	\$55,000
2	Noble	C2 - 16/17 Noble Twp - Drain 31	Box Culvert	Local	Major	2021	\$100,000
	Noble	27/34 Noble - North Cass WRD Drain 32	Box Culvert	Local	Major	2021	\$135,000
	Raymond	25-26 Raymond Twp - Drain 14	Box Culvert	Local	Major	2021	\$150,000
							COUNTY FORCES STRUCTURES = \$540,000
	Harwood	31-32 Harwood Twp - Lower Branch of the Rush River	Box Culvert	Local	Major	2021	\$120,000
	Raymond & Berlin	2 Raymond - 36 Berlin Twps - Lower Branch of the Rush River	Box Culvert	Local	Major	2021	\$120,000
	Stanley	13/24 Stanley Township - Wild Rice River	Bridge Removal	Local	Major	2021	\$100,000
	Everest & Durbin	36 Everest/31 Durbin - Buffalo Creek	Box Culvert	Local	Major	2021	\$100,000
	Everest & Maple River	36 Everest - 1 Maple River - Tributary of Buffalo Creek	Box Culvert	Local	Major	2021	\$80,000
3	Durbin	C9 - 17/18 Durbin Township - Tributary of Swan Creek	Box Culvert	Local	Major	2021	\$200,000
	Durbin	18/19 Durbin Twp - Tributary of Swan Creek	Box Culvert	Local	Major	2021	\$175,000
	Clifton	27/34 Clifton - Maple River	Bridge Replacement	Local	Major	2021	\$900,000
	Maple River	28/29 Maple River Twp - Maple River	Low Water Crossing	Federal	Major	2021	\$1,500,000
							CONTRACTED STRUCTURES = \$3,295,000
							TOTAL STRUCTURES = \$3,835,000
	Normanna	30/31 Normanna Twp - Dr 34	Box Culvert	Local	Minor	2022	\$45,000
	Gardner	3/10 Gardner - North Cass WRD - Drain 23	Box Culvert	Local	Major	2022	\$75,000
	Hunter	33/34 Hunter Twp - Elm River Trib.	Box Culvert	Local	Minor	2022	\$125,000
	Gardner & Wiser	25 Gardner/30 Wiser Twp - Dr 26	Box Culvert	Local	Minor	2022	\$50,000
	Kinoyon	25/26 Kinoyon Township - Drain 19	Box Culvert	Local	Minor	2022	\$50,000
							COUNTY FORCES STRUCTURES = \$345,000
	Clifton	10/15 Clifton Township on Maple River	Box Culvert	Local	Minor	2022	\$150,000
	Clifton	3/10 Clifton Township on Maple River	Box Culvert	Local	Minor	2022	\$300,000
5	Gill	C5 - 34/35 Gill Twp	Culvert Replacement	Local	Minor	2022	\$80,000
	Addison & Maple River	18-19 Addison / 13-24 Maple River - Maple River	Bridge Replacement	Federal	Major	2022	\$1,800,000
							CONTRACTED STRUCTURES = \$2,330,000
							TOTAL STRUCTURES = \$2,675,000
	Everest	11/12 Everest Township - Wheatland Channel	Box Culvert	Local	Minor	2023	\$90,000
	Tower	34/35 Tower Township on Maple River	Box Culvert	Local	Major	2023	\$125,000
	Empire	4/5 Empire Township on Tributary of the Rush River	Box Culvert	Local	Minor	2023	\$50,000
16	Pontiac	5/8 Pontiac Twp - Tributary of the Maple River	Box Culvert	Local	Minor	2023	\$75,000
	Pontiac	5/6 Pontiac Twp - Tributary of the Maple River	Box Culvert	Local	Minor	2023	\$75,000
	Pontiac/Clifton	6 Pontiac & 31 Clifton Twps - Tributary of the Maple River	Box Culvert	Local	Minor	2023	\$75,000
							COUNTY FORCES STRUCTURES = \$430,000
6	Stanley	C6 - 6 Stanley/32 Barnes Twps - Sheyenne River	Bridge Replacement	Local	Major	2023	\$1,000,000
17	Stanley	C17 - 5/6 Stanley Twp - Sheyenne River	Box Culvert	Local	Major	2023	\$1,800,000
							CONTRACTED STRUCTURES = \$2,800,000
							TOTAL STRUCTURES = \$3,230,000
	Kinoyon/Noble	36 Kinoyon/31 Noble - Dr 32 - North	Box Culvert	Local	Major	2024	\$50,000
	Howes	25-26 Howes Twp	Box Culvert	Local	Minor	2024	\$50,000
	Kinoyon	35/36 Kinoyon Twp - Dr 32	Box Culvert	Local	Minor	2024	\$60,000
	Wheatland	11-12 N Wheatland Twp	Box Culvert	Local	Major	2024	\$90,000
	Wheatland	11-12 S Wheatland Twp	Box Culvert	Local	Major	2024	\$90,000
	Wheatland	13-14 Wheatland Twp	Box Culvert	Local	Major	2024	\$90,000
							COUNTY FORCES STRUCTURES = \$430,000
32	Amenia	C32 - 22/27 Amenia Twp - Rush River	Bridge Replacement	Local	Major	2024	\$900,000
15	Mapleton	C15 - 8/9 Mapleton Township on Drain 14	Bridge Replacement	Local	Major	2024	\$1,000,000
	Everest & Durbin	1 Everest/6 Durbin Townships - Swan Creek	Box Culvert	Local	Major	2024	\$300,000
							CONTRACTED STRUCTURES = \$2,200,000
							TOTAL STRUCTURES = \$2,630,000
	Noble	33/34 Noble - Dr 32 - North	Box Culvert	Local	Major	2025	\$50,000
	Rush River	32/33 Rush River - Rush River	Structure Replacement	Local	Major	2025	\$500,000
	Bell	19/20 Bell - S. Branch of Elm River	Box Culvert	Local	Major	2025	\$150,000
	Wheatland	30-31 Wheatland Twp - Buffalo Creek Trib.	Box Culvert	Local	Major	2025	\$50,000
	Kinoyon/Noble	25 Kinoyon/30 Noble Township - Drain 19	Box Culvert	Local	Minor	2025	\$50,000
							COUNTY FORCES STRUCTURES = \$800,000
34	Wiser	C34 - Georgetown Red River Bridge	Bridge Replacement	Local	Major	2025	\$600,000
							CONTRACTED STRUCTURES = \$600,000
							TOTAL STRUCTURES = \$1,400,000
							5 YEAR COUNTY FORCES STRUCTURES = \$2,605,000
							5 YEAR CONTRACTED STRUCTURE TOTAL = \$11,225,000
							5 YEAR STRUCTURE TOTAL = \$13,830,000

2021-2025 Revenues vs Project Costs

Table 8 illustrates the revenue stream and estimated costs of the 2021-2025 Plan. Appendix 2 and 3 illustrate the proposed capital improvements over the 2021-2025 period.

<i>Table 8 - Revenue vs. Project Costs</i>					
Revenue Description	2021	2022	2023	2024	2025
Property Tax	\$9,000,000	\$9,180,000	\$9,363,600	\$9,550,872	\$9,741,889
Highway Distribution Tax	\$7,000,000	\$8,364,000	\$8,531,280	\$8,701,906	\$8,875,944
Prairie Dog Funding Bill	\$0	\$3,500,000	\$3,500,000	\$3,500,000	\$3,500,000
Other	\$1,200,000	\$0	\$0	\$0	\$0
Total Revenues	\$18,041,622	\$21,044,000	\$21,394,880	\$21,752,778	\$22,117,833
Federal Aid Highway Funding	\$1,000,000	\$1,020,000	\$1,040,400	\$1,061,208	\$1,082,432
Federal Aid Bridge Funding	\$1,200,000	\$1,224,000	\$1,248,480	\$1,273,450	\$1,298,919
Total Revenues & Federal Aid	\$20,241,622	\$23,288,000	\$23,683,760	\$24,087,435	\$24,499,184
Total Operating Cost (not including Road/Bridge Projects)	\$6,000,000	\$6,060,000	\$6,120,600	\$6,181,806	\$6,243,624
Total Available for Road/Bridge Projects	\$14,241,622	\$17,228,000	\$17,563,160	\$17,905,629	\$18,255,560
Total Paved Highway Project Costs	\$8,200,000	\$6,600,000	\$10,860,000	\$10,225,000	\$15,930,000
County Bridge Project Costs	\$3,835,000	\$2,675,000	\$3,200,000	\$2,610,000	\$1,400,000
Chipseal, Crackseal, Striping, Reshaping, Subgrade Repair & Drantile	\$500,000	\$2,835,072	\$1,589,045	\$3,009,504	\$2,200,000
Total Project Costs	\$12,535,000	\$12,110,072	\$15,649,045	\$15,844,504	\$19,530,000
Differences (Revenues-Costs)	\$1,706,622	\$5,117,928	\$1,914,115	\$2,061,125	-\$1,274,440



Appendix 1

2021 - 2025

5 Year Capital Improvement Plan

Proposed Highway Projects

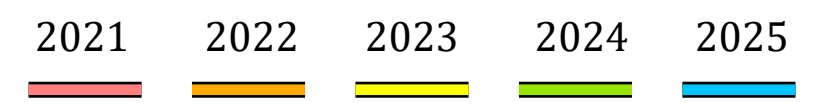


TABLE 5 - PROPOSED HIGHWAY IMPROVEMENTS

HWY	LOCATION	PROJECT TYPE	FUNDING	YEAR	COST
10	Casselton - 15th St to Hwy 11	Bituminous Surfacing	Local	2021	\$2,800,000
New 6	Hwy 17 to 45th St. & 45th St to 64th Ave S	Grading	Local	2021	\$2,200,000
5 & 10	Hwy 5 & Hwy 10 Radial Tee Intersection & Shldr. Impr.	Grading & Surfacing	Federal	2021	\$3,200,000
11	Hwy 4 to Hwy 22	Mill and Overlay	Federal	2021	\$1,500,000
5	Trail Co. Line to Hwy 26	Mill and Overlay	Local	2021	\$1,200,000
5	Hwy 26 to Hwy 34	Mill and Overlay	Local	2021	\$600,000
New 6	Hwy 17 to 45th St. & 45th St to 64th Ave S	Bituminous Surfacing	Local	2022	\$1,200,000
9	Hwy 10 to I94	Subgrade Repair	Local	2022	\$360,000
9	I94 to Durbin	Grading & Surfacing	Local	2022	\$2,800,000
32	State Hwy 18 West through Amenia	Grading & Surfacing	Local	2022	\$1,000,000
34	State Hwy 18 East through Arthur	Grading & Surfacing	Local	2022	\$600,000
34	Arthur to Hwy 11	Subgrade Repair	Local	2022	\$1,540,000
81	76th Ave S to State Hwy 46	Culvert Lining	Local	2022	\$1,000,000
6	C17 Roundabout E 1,800'	Grading & Surfacing	Local	2023	\$500,000
10	State Hwy 38 through Buffalo 1 Mile East	Grading & Surfacing	Local	2023	\$1,800,000
16	I29 to Hwy 81	Mill and Overlay	Local	2023	\$300,000
16	Hwy 81 to Red River Bridge	Mill and Overlay	Local	2023	\$150,000
17	Hwy 17 & 64th Ave S - Roundabout	Grading & Surfacing	Local	2023	\$2,000,000
18	I29 to Red River Bridge	Mill and Overlay	Local	2023	\$300,000
21	Hwy 14 to Hwy 16	Mill and Overlay	Local	2023	\$450,000
25	Hwy 81 to 0.4 Miles S. through Hickson	Mill and Overlay	Local	2023	\$60,000
34	Hwy 11 to I29	Subgrade Repair	Local	2023	\$820,000
81	Hwy 16 W to ST Hwy 46	Mill and Overlay	Local	2023	\$2,000,000
6	Sheyenne Diversion to Hwy 17	Mill and Overlay	Local	2024	\$225,000
14	Sheyenne River to I29	Mill and Overlay	Local	2024	\$1,000,000
16	State Hwy 18 to Davenport	Subgrade Repair & Bituminous Surf.	Local	2024	\$5,000,000
17	S2nd Ave S Roundabout to Horace & Horace to Hwy 16	Mill and Overlay	Local	2024	\$1,800,000
26	Hwy 5 North to State Hwy 18	Mill and Overlay	Federal	2024	\$2,200,000
34	State Hwy 18 to 1 Mile East of C5	Subgrade Repair	Local	2024	\$1,400,000
1	Hwy 4 to Hwy 26	Subgrade Repair	Local	2025	\$1,400,000
5	Wheatland to I94	Grading & Surfacing	Local	2025	\$1,700,000
6	Barnes Co Line to Hwy 38	Grading & Surfacing	Local	2025	\$5,000,000
26	Barnes Co. Line to ST Hwy 38	Mill and Overlay	Local	2025	\$1,100,000
26	State Hwy 18 to I29	Mill and Overlay	Federal	2025	\$2,900,000
81	Hwy 20 to Hwy 32	Grading & Surfacing	Local	2025	\$5,130,000

Note: Years to be completed are illustrative and subject to change and approved annually and/or as necessary by the Road Advisory Committee.

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Appendix 2

**2021 - 2025
5 Year Capital Improvement Plan
Proposed Structure Projects**

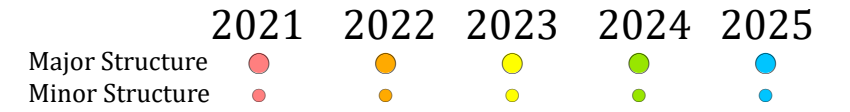


TABLE 7 - PROPOSED BRIDGE IMPROVEMENTS

HWY	LOCATION	PROJECT TYPE	FUNDING	STRUCTURE TYPE	YEAR	COST
	15/16 Noble - North Cass WRD Drain 18	Box Culvert	Local	Major	2021	\$100,000
26	C26 - 35-36 Kinyon Twp - Dr 22	Box Culvert	Local	Major	2021	\$55,000
2	C2 - 16/17 Noble Twp - Drain 31	Box Culvert	Local	Major	2021	\$100,000
	27/34 Noble - North Cass WRD Drain 32	Box Culvert	Local	Major	2021	\$135,000
	25-26 Raymond Twp - Drain 14	Box Culvert	Local	Major	2021	\$150,000
	31-32 Harwood Twp - Lower Branch of the Rush River	Box Culvert	Local	Major	2021	\$120,000
	2 Raymond - 36 Berlin Twps - Lower Branch of the Rush River	Box Culvert	Local	Major	2021	\$120,000
	13/24 Stanley Township - Wild Rice River	Bridge Removal	Local	Major	2021	\$100,000
	36 Everest/31 Durbin - Buffalo Creek	Box Culvert	Local	Major	2021	\$100,000
	36 Everest - 1 Maple River - Tributary of Buffalo Creek	Box Culvert	Local	Major	2021	\$80,000
9	C9 - 17/18 Durbin Township - Tributary of Swan Creek	Box Culvert	Local	Major	2021	\$200,000
	18/19 Durbin Twp -Tributary of Swan Creek	Box Culvert	Local	Major	2021	\$175,000
	27/34 Clifton - Maple River	Bridge Replacement	Local	Major	2021	\$900,000
	28/29 Maple River Twp - Maple River	Low Water Crossing	Federal	Major	2021	\$1,500,000
	30/31 Normanna Twp - Dr 34	Box Culvert	Local	Minor	2022	\$45,000
	9/10 Gardner - North Cass WRD - Drain 23	Box Culvert	Local	Major	2022	\$75,000
	33/34 Hunter Twp - Elm River Trib.	Box Culvert	Local	Minor	2022	\$125,000
	25 Gardner/30 Wiser Twp - Dr 26	Box Culvert	Local	Minor	2022	\$50,000
	25/26 Kinyon Township - Drain 19	Box Culvert	Local	Minor	2022	\$50,000
	10/15 Clifton Township on Maple River	Box Culvert	Local	Minor	2022	\$150,000
	3/10 Clifton Township on Maple River	Box Culvert	Local	Minor	2022	\$300,000
5	C5 - 34/35 Gill Twp	Culvert Replacement	Local	Minor	2022	\$80,000
	18-19 Addison / 13-24 Maple River - Maple River	Bridge Replacement	Federal	Major	2022	\$1,800,000
	11/12 Everest Township - Wheatland Channel	Box Culvert	Local	Minor	2023	\$90,000
	34/35 Tower Township on Maple River	Box Culvert	Local	Major	2023	\$125,000
	4/5 Empire Township on Tributary of the Rush River	Box Culvert	Local	Minor	2023	\$50,000
16	5/8 Pontiac Twp - Tributary of the Maple River	Box Culvert	Local	Minor	2023	\$75,000
	5/6 Pontiac Twp - Tributary of the Maple River	Box Culvert	Local	Minor	2023	\$75,000
	6 Pontiac & 31 Clifton Twps - Tributary of the Maple River	Box Culvert	Local	Minor	2023	\$75,000
6	C6 - 6 Stanley/32 Barnes Twps - Sheyenne River	Bridge Replacement	Local	Major	2023	\$1,000,000
17	C17 - 5/6 Stanley Twp - Sheyenne River	Box Culvert	Local	Major	2023	\$1,800,000
	36 Kinyon/31 Noble - Dr 32 - North	Box Culvert	Local	Major	2024	\$50,000
	25-26 Howes Twp	Box Culvert	Local	Minor	2024	\$50,000
	35/36 Kinyon Twp - Dr 32	Box Culvert	Local	Minor	2024	\$60,000
	11-12 N Wheatland Twp	Box Culvert	Local	Major	2024	\$90,000
	11-12 S Wheatland Twp	Box Culvert	Local	Major	2024	\$90,000
	13-14 Wheatland Twp	Box Culvert	Local	Major	2024	\$90,000
32	C32 - 22/27 Amenia Twp - Rush River	Bridge Replacement	Local	Major	2024	\$900,000
15	C15 - 8/9 Mapleton Township on Drain 14	Bridge Replacement	Local	Major	2024	\$1,000,000
	1 Everest/6 Durbin Townships - Swan Creek	Box Culvert	Local	Major	2024	\$300,000
	33/34 Noble - Dr 32 - North	Box Culvert	Local	Major	2025	\$50,000
	32/33 Rush River - Rush River	Structure Replacement	Local	Major	2025	\$500,000
	19/20 Bell - S. Branch of Elm River	Box Culvert	Local	Major	2025	\$150,000
	30-31 Wheatland Twp - Buffalo Creek Trib.	Box Culvert	Local	Major	2025	\$50,000
	25 Kinyon/30 Noble Township - Drain 19	Box Culvert	Local	Minor	2025	\$50,000
34	C34 - Georgetown Red River Bridge	Bridge Replacement	Local	Major	2025	\$600,000

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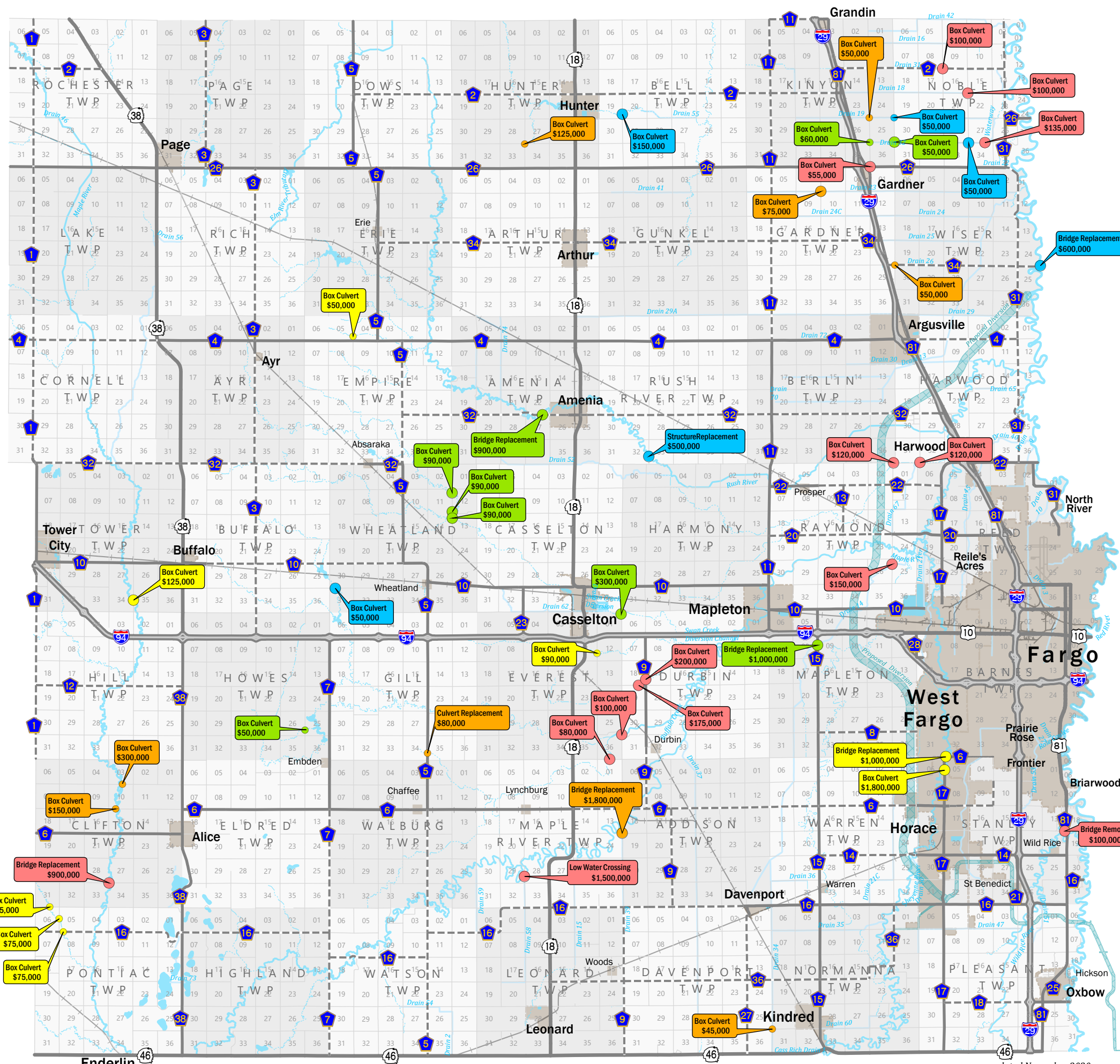
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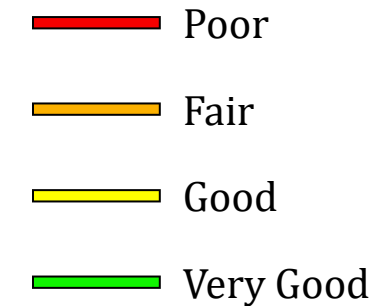
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Appendix 3

Pavement Condition Index (PCI) 2017 Testing Results



PCI	Paved Miles	% of Paved Miles
not measured/unknown	1.81	0.58%
Poor PCI 0 - 65	0	0%
Fair PCI 66 - 80	6.94	2.23%
Good PCI 81 - 90	160.65	51.72%
Very Good PCI 91 - 100	141.22	45.46%

Total Paved Miles: 310.63

Average PCI*: 90.54
*prorated per length

Pavement Evaluation completed by American Engineering Testing in 2017. The evaluation consisted of deflection testing with a Model 8002E Dynatest Falling Weight Deflectometer. Pavement surface condition assessment based on the Pavement Condition Index (PCI) method developed by the Army Corps of Engineers. The resulting data is analyzed to evaluate the structural and surface condition of the existing pavements on the tested road segments.

Roads reconstructed after 2017 have an assumed PCI value of 100.

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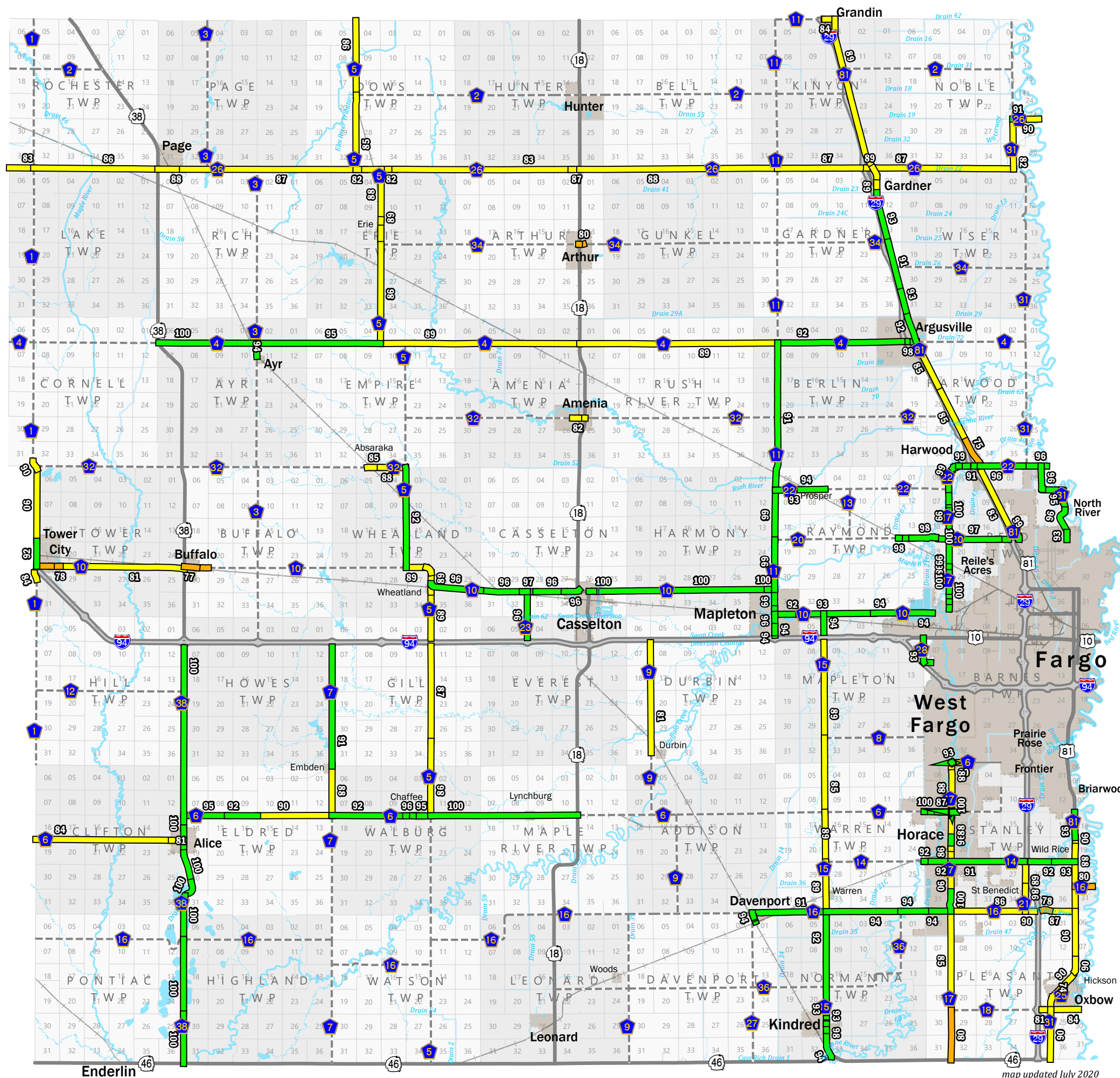
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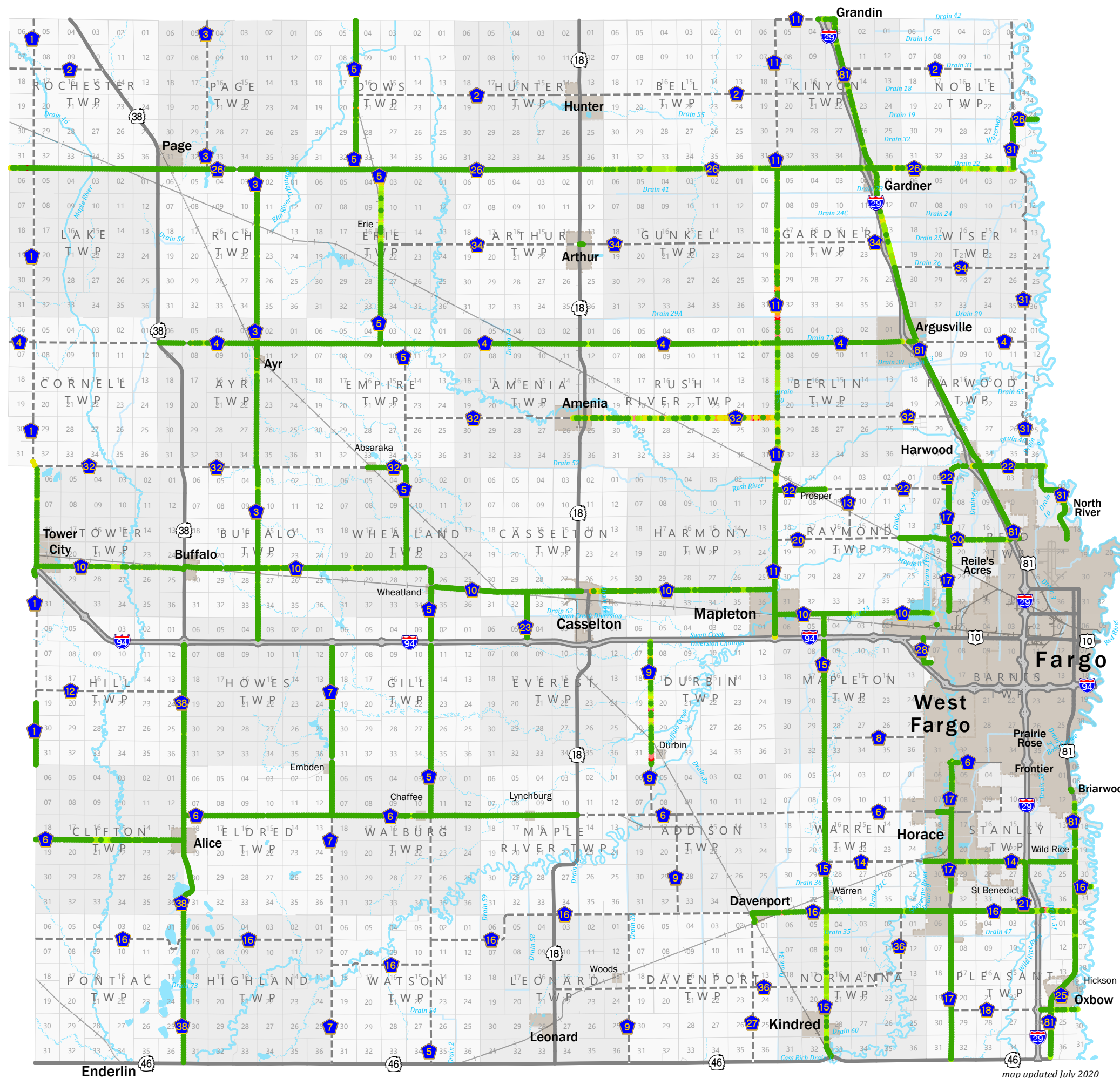
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Appendix 4

Highway Load Capacity 2017 Testing Results



Tons/Axle

- 3 (worst)
- 4
- 5
- 6
- 7
- 8
- 9
- 10 (best)

Pavement Evaluation completed by American Engineering Testing in 2017. The evaluation consisted of deflection testing with a Model 8002E Dynatest Falling Weight Deflectometer. Pavement surface condition assessment based on the Pavement Condition Index (PCI) method developed by the Army Corps of Engineers. The resulting data is analyzed to evaluate the structural and surface condition of the existing pavements on the tested road segments.

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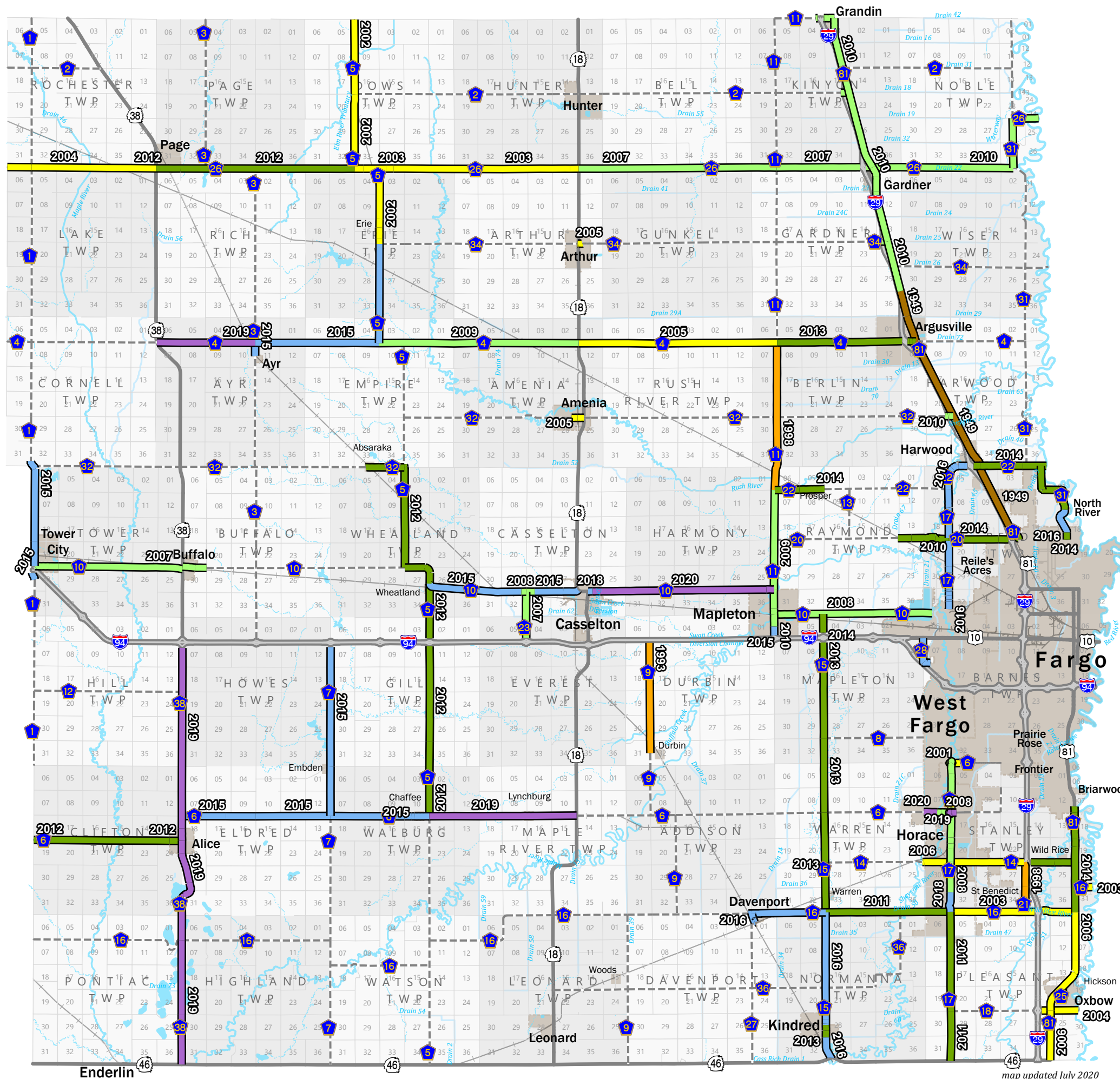
Appendix 5

Paving Projects

Year of Last Project

- 1949
- 1993 - 1999
- 2000 - 2006
- 2007 - 2010
- 2011 - 2014
- 2015 - 2018
- 2019 - 2020

Year	Miles	Average PCI per segment
1949	10.64	85.5
1993 - 1999	12.41	86.75
2000 - 2006	50.73	85.35
2007 - 2010	68.47	90.13
2011 - 2014	77.58	91.94
2015 - 2018	55.25	95.26
2019 - 2020	35.55	100



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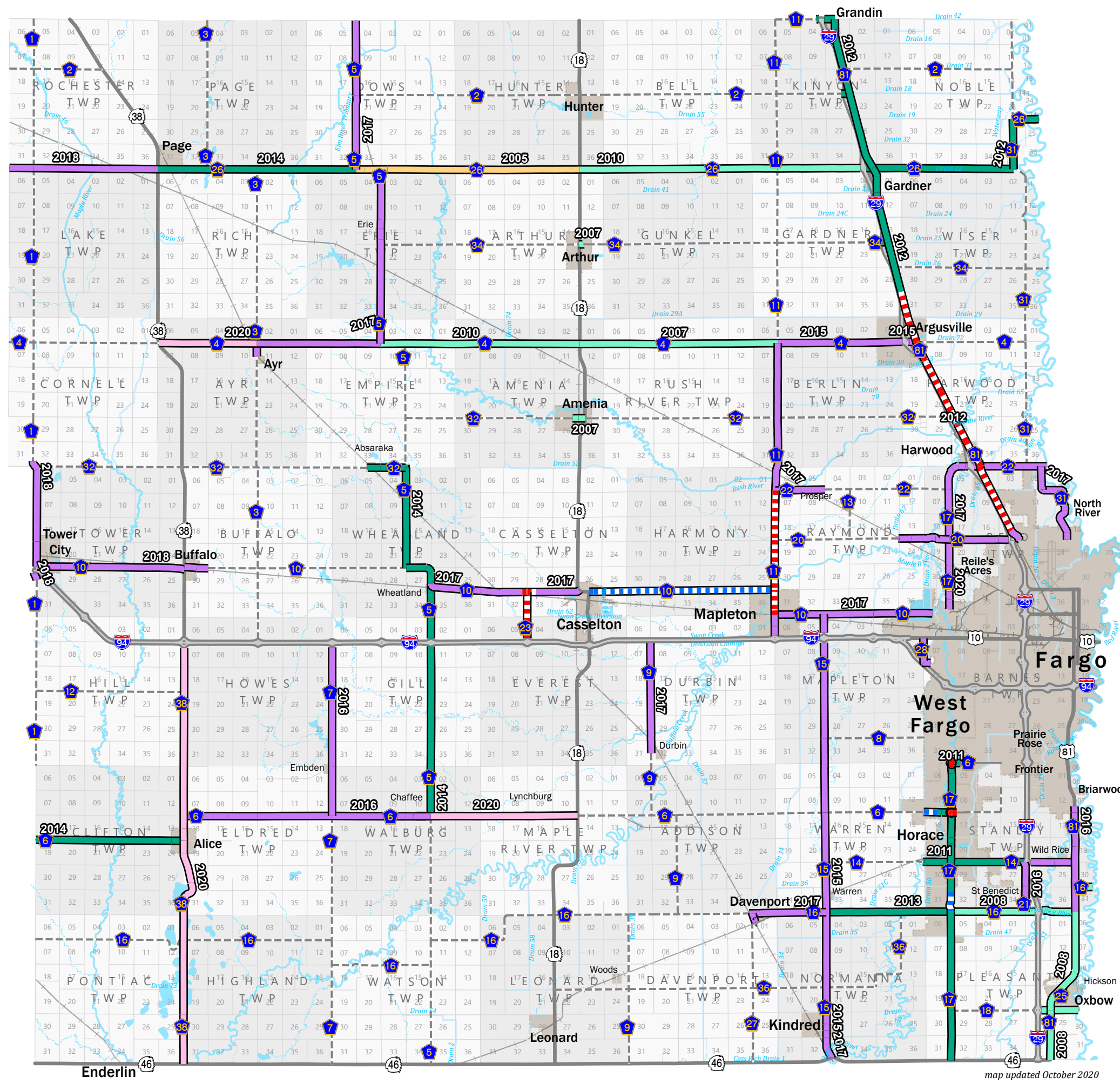
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Appendix 6

Chip Seal Projects



Year of Last Project

2005 - 2006

2007 - 2010

2011 - 2014

2015 - 2018

2019 - 2020

Asphalt - No Chip Seal

Concrete - No Chip Seal

Year	Miles	Average PCI_per segment
2005 - 2006	9.03	83.8
2007 - 2010	41.62	84.85
2011 - 2014	72.98	88.32
2015 - 2018	131.8	93.05
2019 - 2020	26.93	100
Asphalt - No Chip Seal	8.85	100
Concrete - No Chip Seal	19.43	94.96

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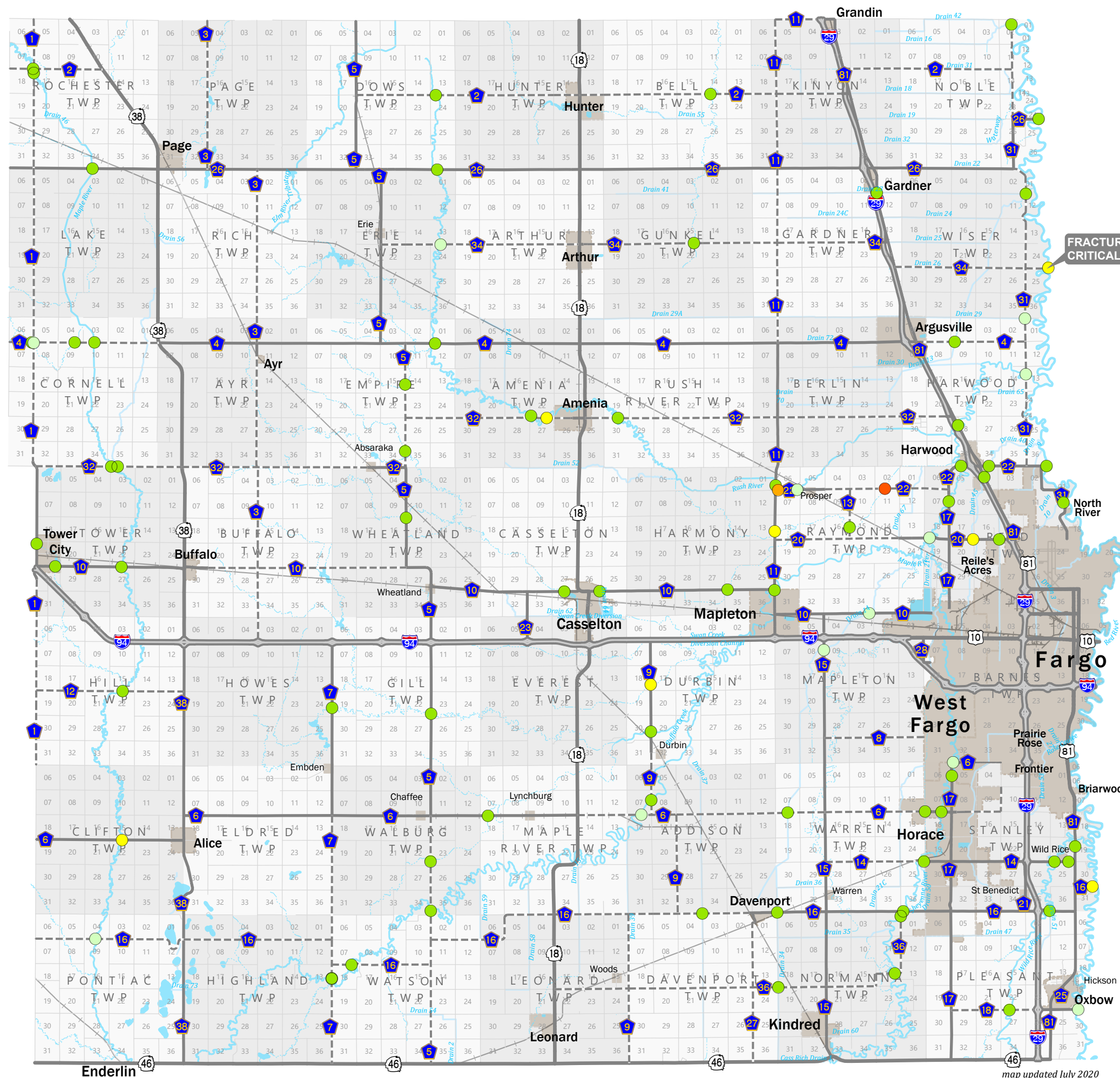
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Appendix 7

Bridges on County Roads: ND DOT 2019/2020 Bridge Inspection and Appraisal



Bridge Sufficiency Rating

- 50 - 59.9
- 60 - 69.9
- 70 - 79.9
- 80 - 89.9
- 90 - 100

Sufficiency Rating	Bridge Count
50 - 59.9	1
60 - 69.9	1
70 - 79.9	7
80 - 89.9	12
90 - 100	67

Average Rating: 93.86

Cass County Highway Department

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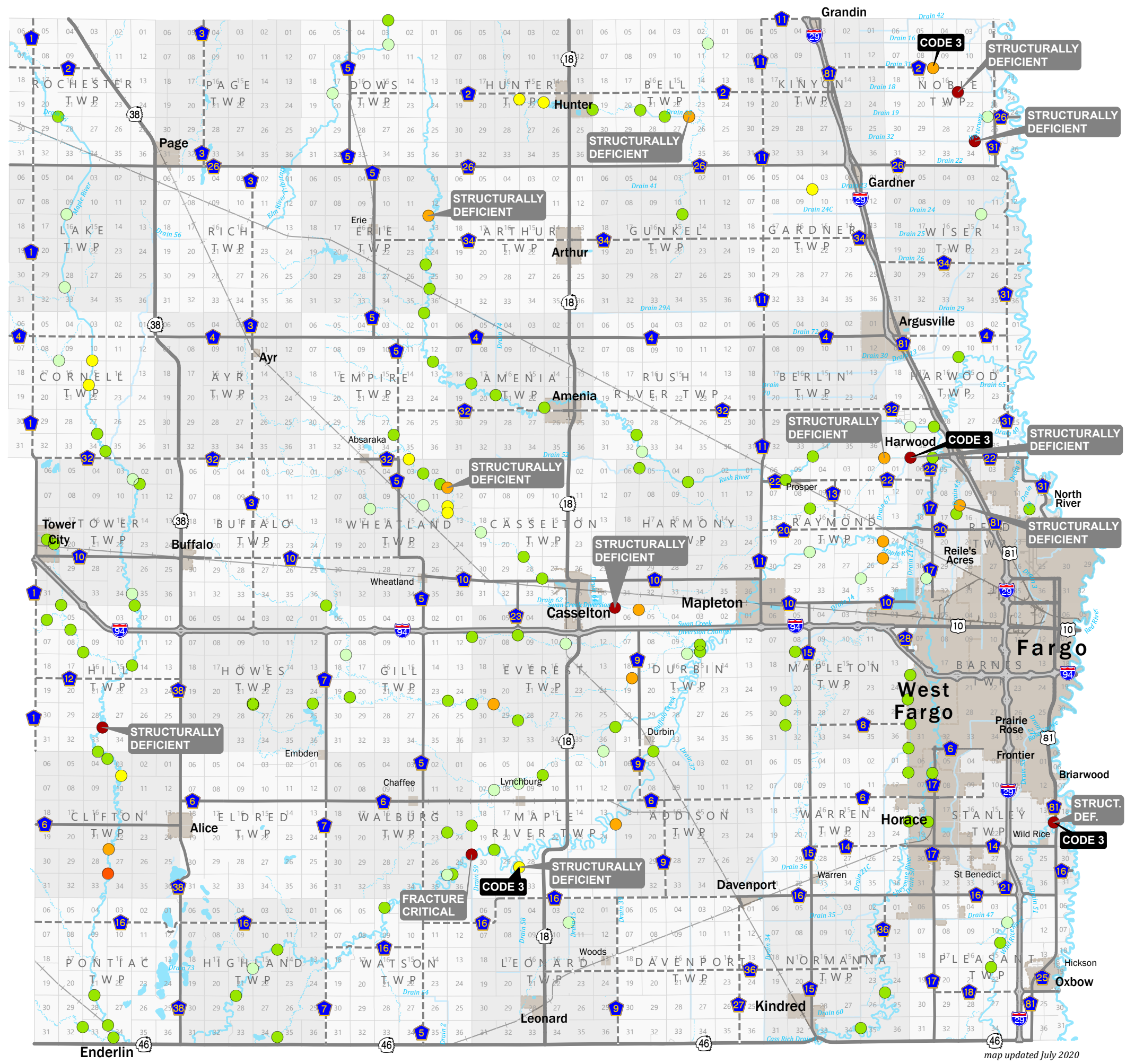
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Appendix 8

**Bridges on Township Roads:
ND DOT 2019/2020
Bridge Inspection and Appraisal**

Bridge Sufficiency Rating

- 37 - 49.9
- 50 - 59.9
- 60 - 69.9
- 70 - 79.9
- 80 - 89.9
- 90 - 100

Sufficiency Rating	Bridge Count
37 - 49.9	7
50 - 59.9	1
60 - 69.9	12
70 - 79.9	11
80 - 89.9	28
90 - 100	84

Average Rating: 87.85

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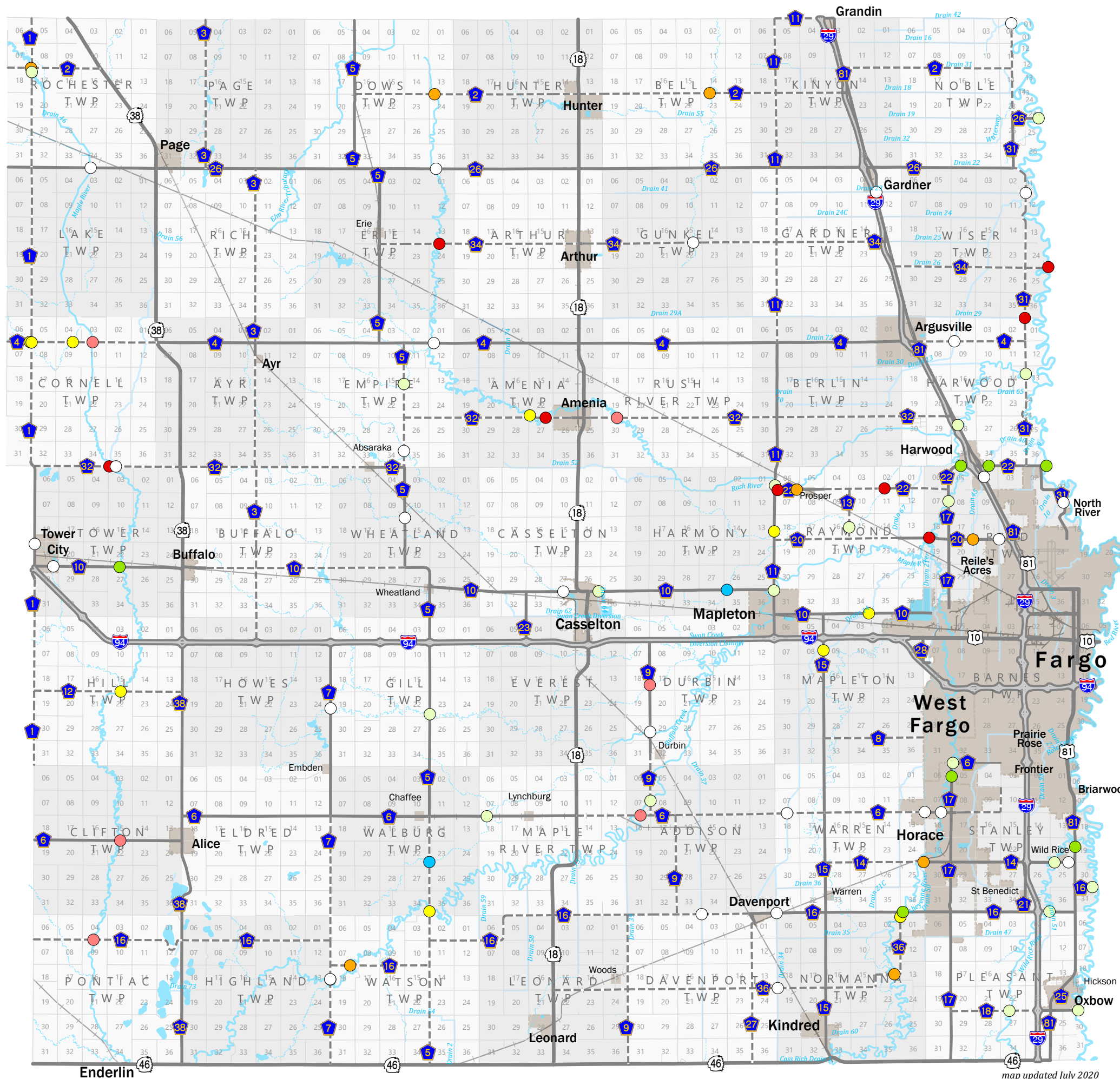
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Appendix 9

Bridges on County Roads: ND DOT 2019/2020 Curb to Curb Roadway Width



Structure Width

- culvert
- under 24'
- 24' - 25.9'
- 26' - 27.9'
- 28' - 29.9'
- 30' - 39.9'
- 40' - 49.9'
- 50' or more

Structure Width	Bridge Count
under 24'	8
24' - 25.9'	6
26' - 27.9'	8
28' - 29.9'	10
30' - 39.9'	19
40' - 49.9'	7
50' +	2
culvert	28

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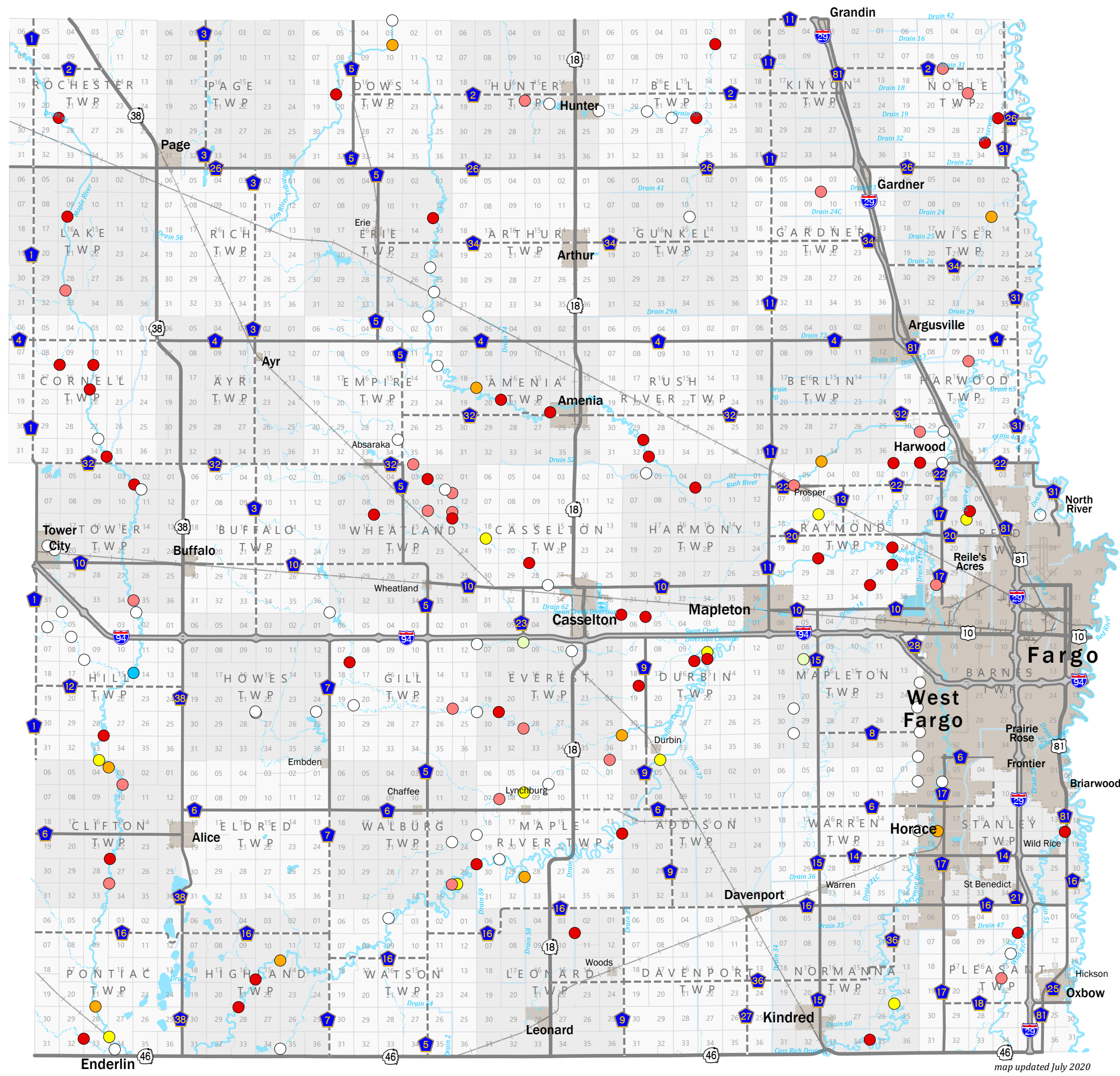
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Appendix 10
Bridges on Township Roads:
ND DOT 2019/2020
Curb to Curb Roadway Width

Structure Width

- culvert
- under 24'
- 24' - 25.9'
- 26' - 27.9'
- 28' - 29.9'
- 30' - 39.9'
- 40' - 49.9'
- 50' or more

Structure Width	Bridge Count
under 24'	47
24' - 25.9'	22
26' - 27.9'	10
28' - 29.9'	10
30' - 39.9'	2
40' - 49.9'	0
50' +	1
culvert	51

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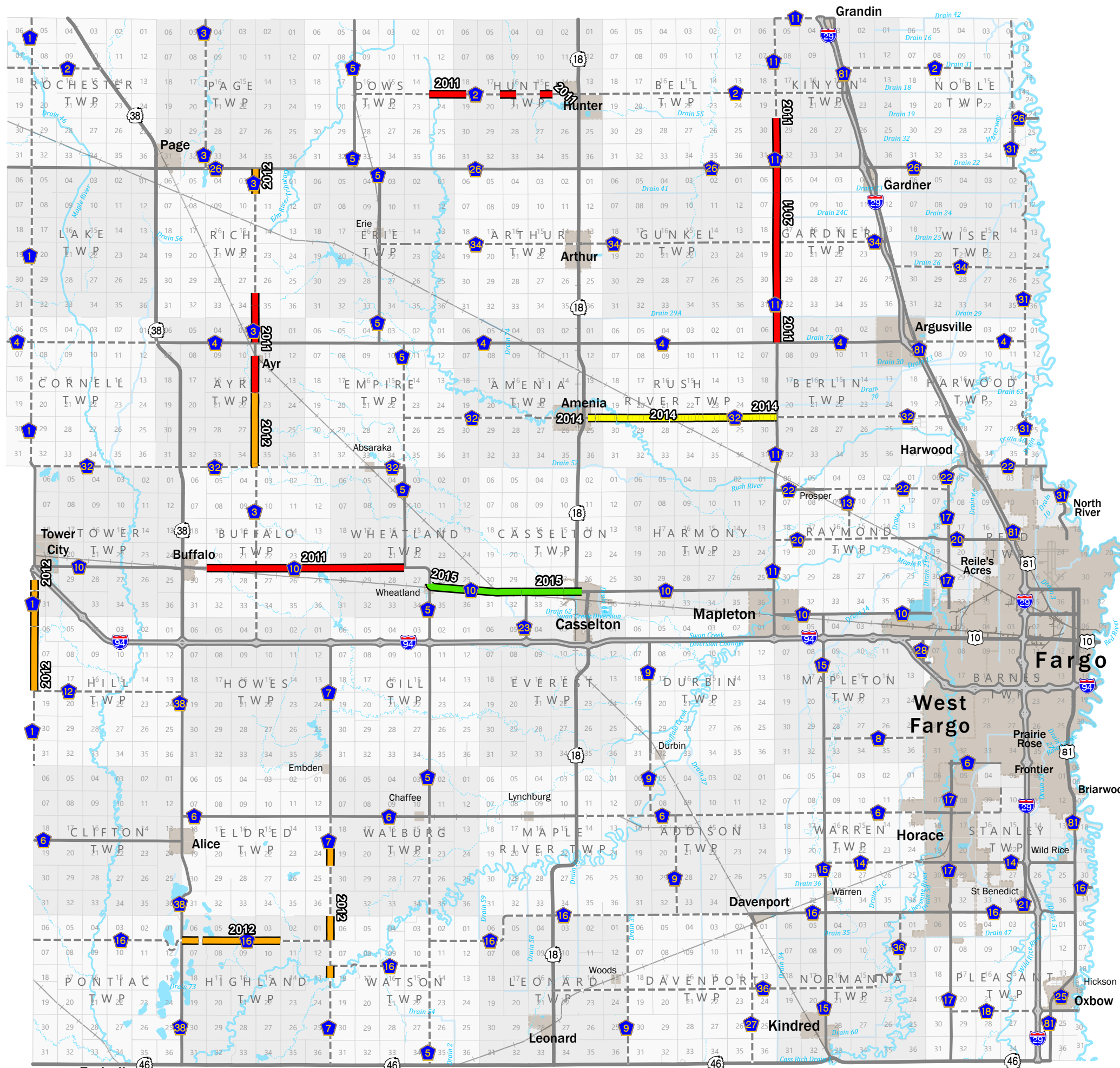
Appendix 11

Drain Tile Projects

Year of Last Project

- 2011
- 2012
- 2014
- 2015

Year	Miles
2011	23.07
2012	14.25
2014	7.45
2015	6.2
Total	50.97



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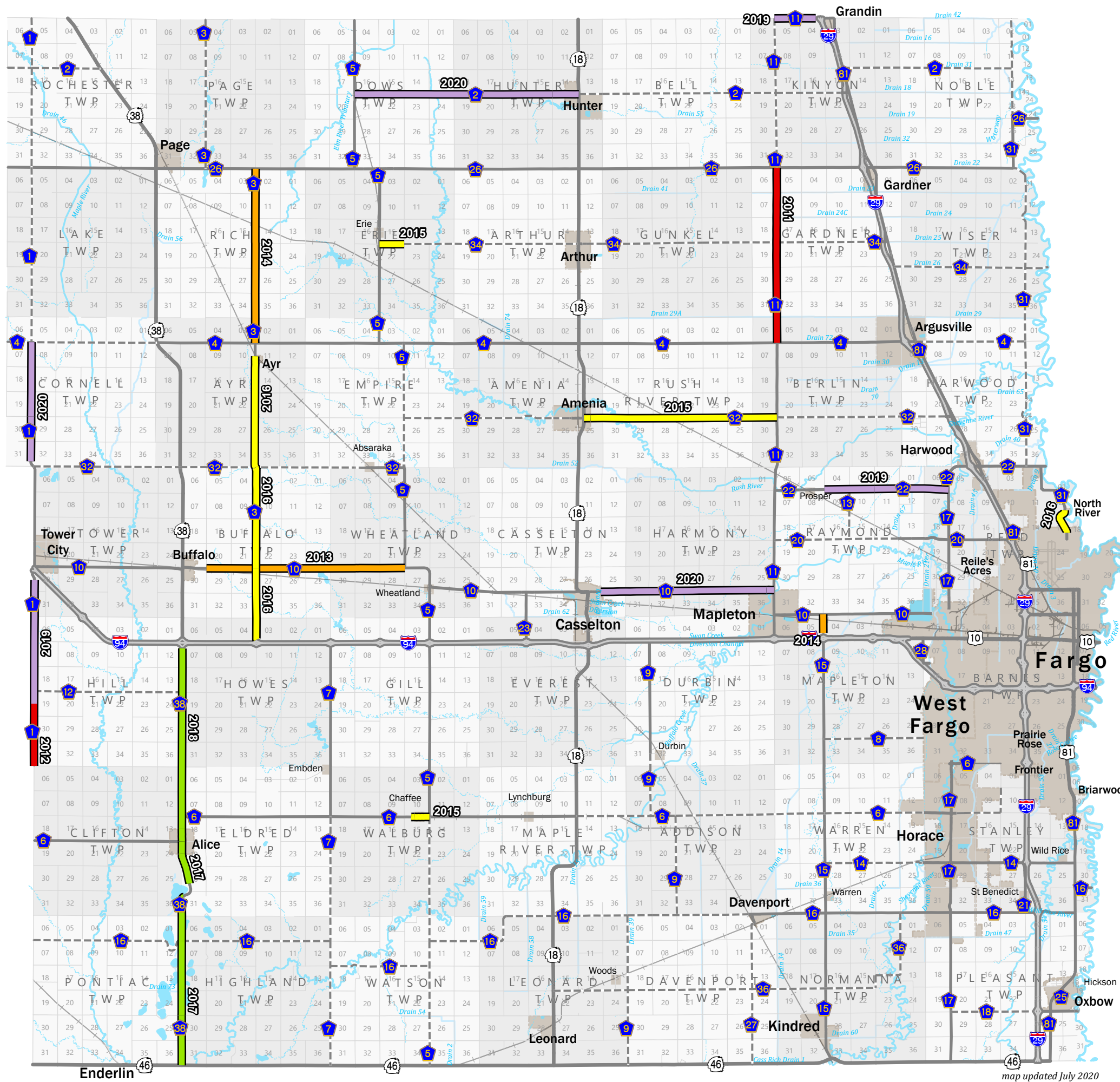
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Subgrade Repair Projects

Year of Last Project

- 2011 - 2012
- 2013 - 2014
- 2015 - 2016
- 2017 - 2018
- 2019 - 2020

Year	Gravel Miles	Paved Miles	Total Miles
2011 - 2012	9.56	0	9.56
2013 - 2014	15.01	0.75	15.76
2015 - 2016	20.19	1.8	21.99
2017 - 2018	0	16.28	16.28
2019 - 2020	25.43	6.97	32.4
Total	70.19	25.8	95.99



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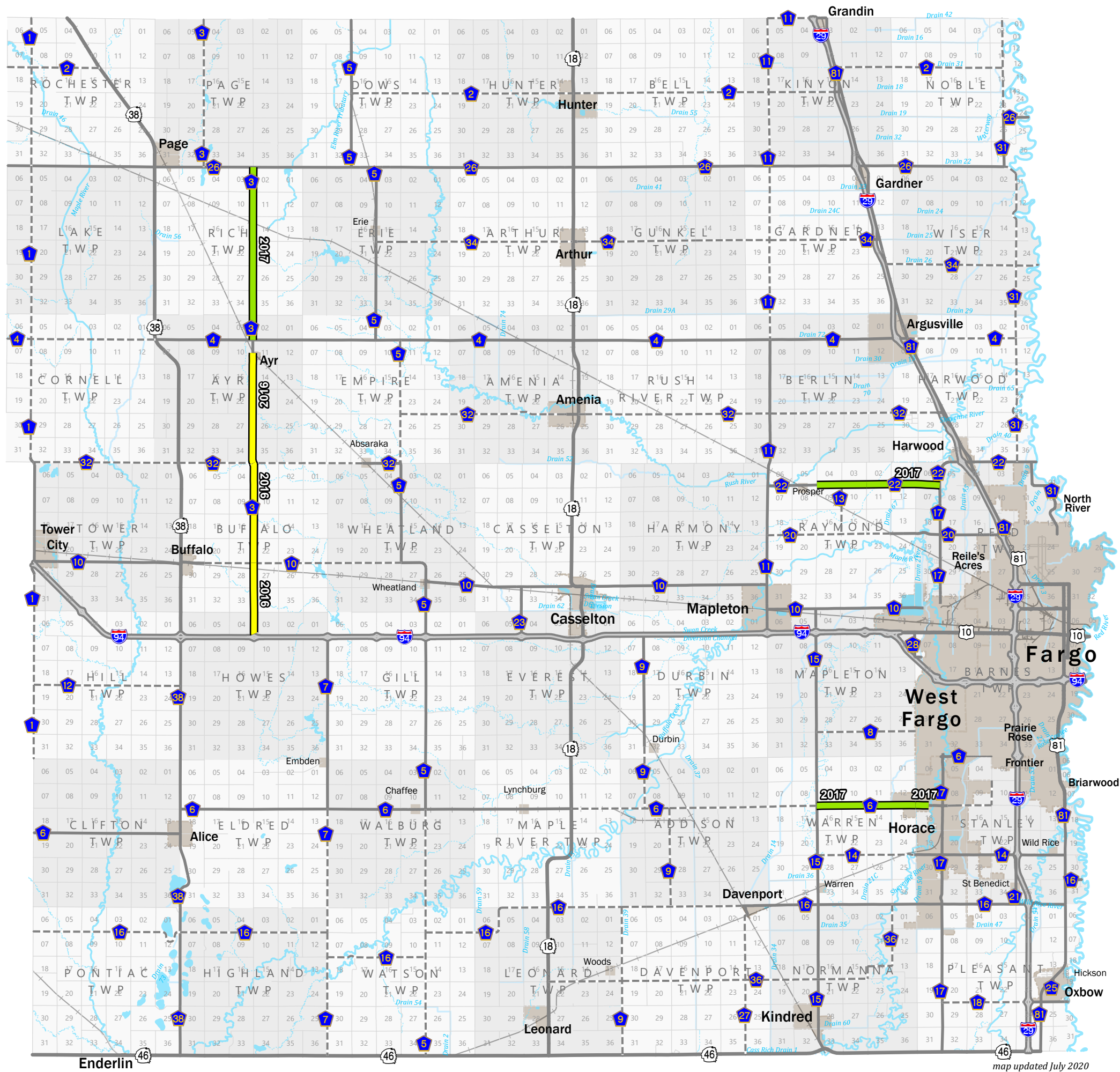
Gravel Stabilization Projects

Year of Last Project

█ 2016

█ 2017

Year	Miles
2016	11.42
2017	16.55
Total	27.97



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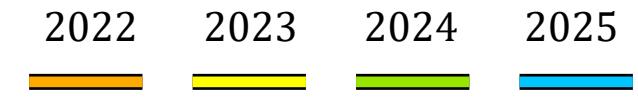
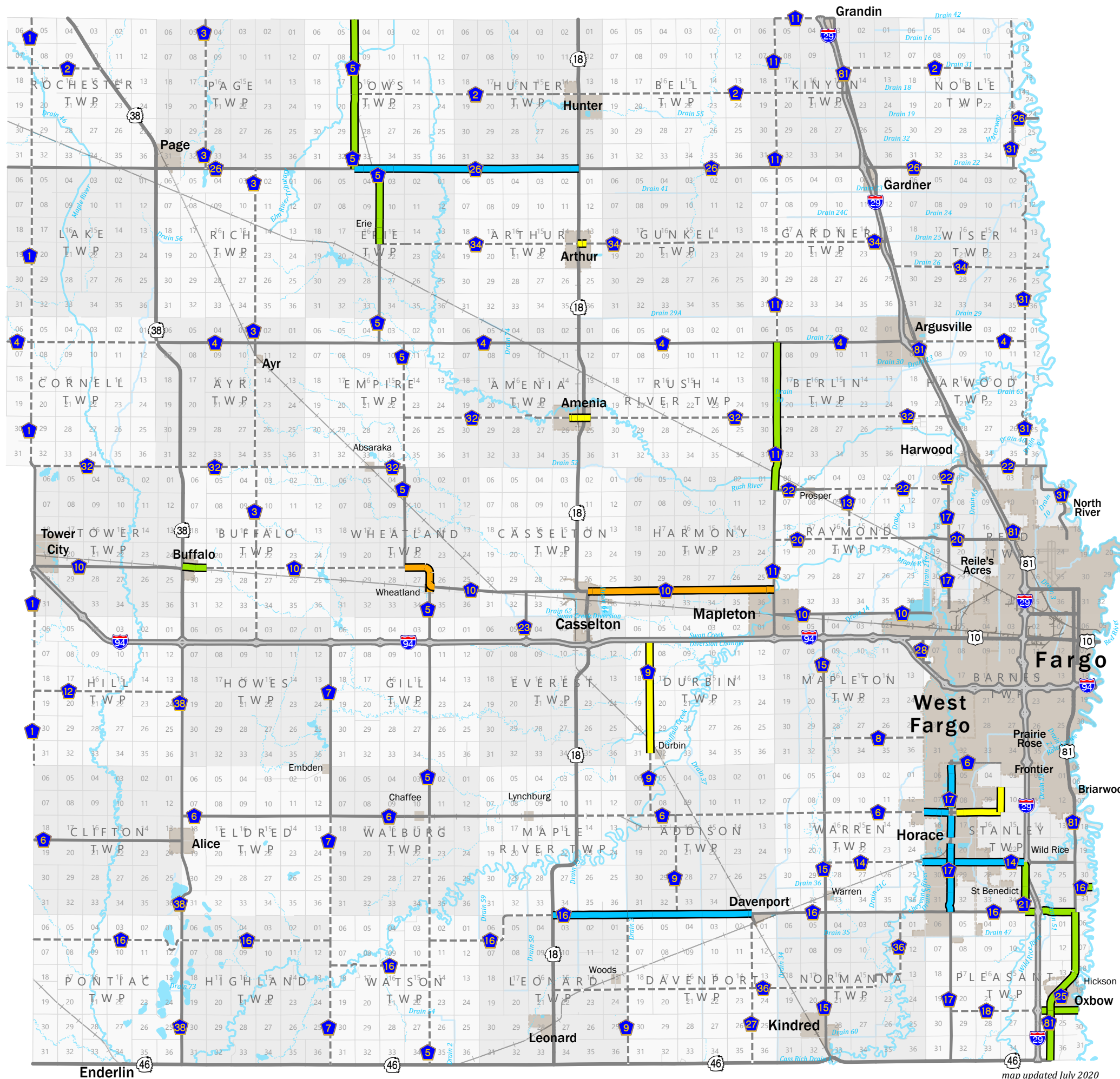


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Proposed Chip Seal Projects



Year	Miles
2022	9.65
2023	8.43
2024	28.55
2025	27.49
Total	74.12

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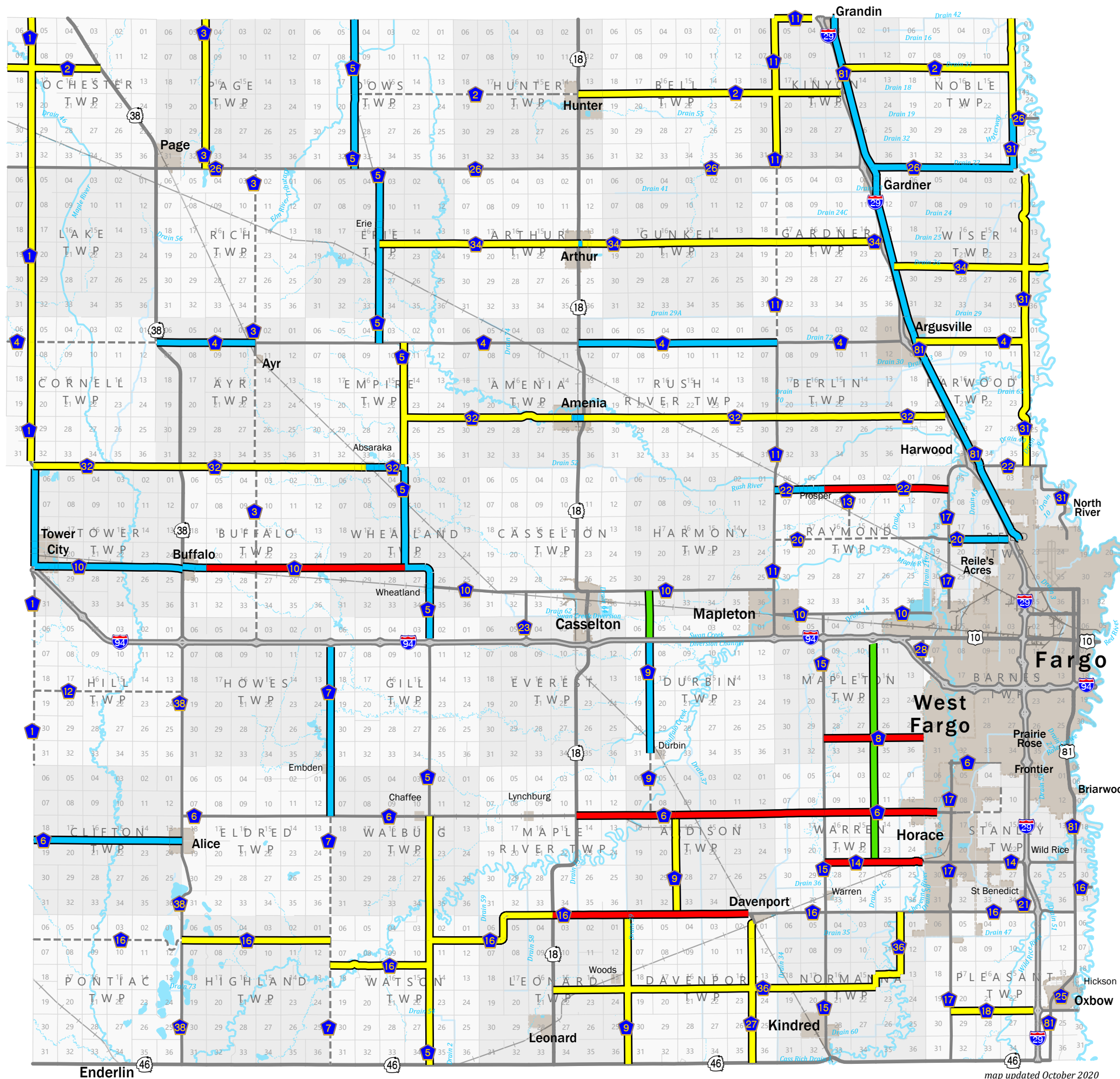
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Projected 30 Year Improvements



- Gravel - Needs Paving/Grading
- Gravel - Needs Reshaping
- Paved - Needs Widening
- Future County Highway

Type of Improvement	Miles	Cost/Mile*	Estimated Total
Gravel - Needs Paving/Grading	43.3	\$1.5 Million	\$65 Million
Gravel - Needs Reshaping	200.46	\$150,000	\$30.1 Million
Paved - Needs Widening	97.78	\$1.2 Million	\$117.3 Million
Future County Highway	10.66	\$1.5 Million	\$16 Million
Total:			\$228.4 Million

**Cost per mile figures represent today's costs and do not take into account inflation.*

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Recommended Pavement Overlay

-  1.5 - 1.75 inch Mill and Overlay
-  1.5 - 1.75 inch Overlay
-  2 inch Mill and Overlay
-  2 inch Overlay
-  2.5 - 2.75 inch Mill and Overlay
-  2.5 - 2.75 inch Overlay
-  3 inch Overlay

Recommended Pavement Overlay*	Miles
1.5 - 1.75 inch Mill and Overlay	4.64
1.5 - 1.75 inch Overlay	50.64
2 inch Mill and Overlay	2.57
2 inch Overlay	1.8
2.5 - 2.75 inch Mill and Overlay	0.98
2.5 - 2.75 inch Overlay	17.58
3 inch Overlay	1.03
Total	79.24

* Recommended pavement overlay thickness needed to achieve a 10 tons/axle road (from American Engineering 2017 testing results)

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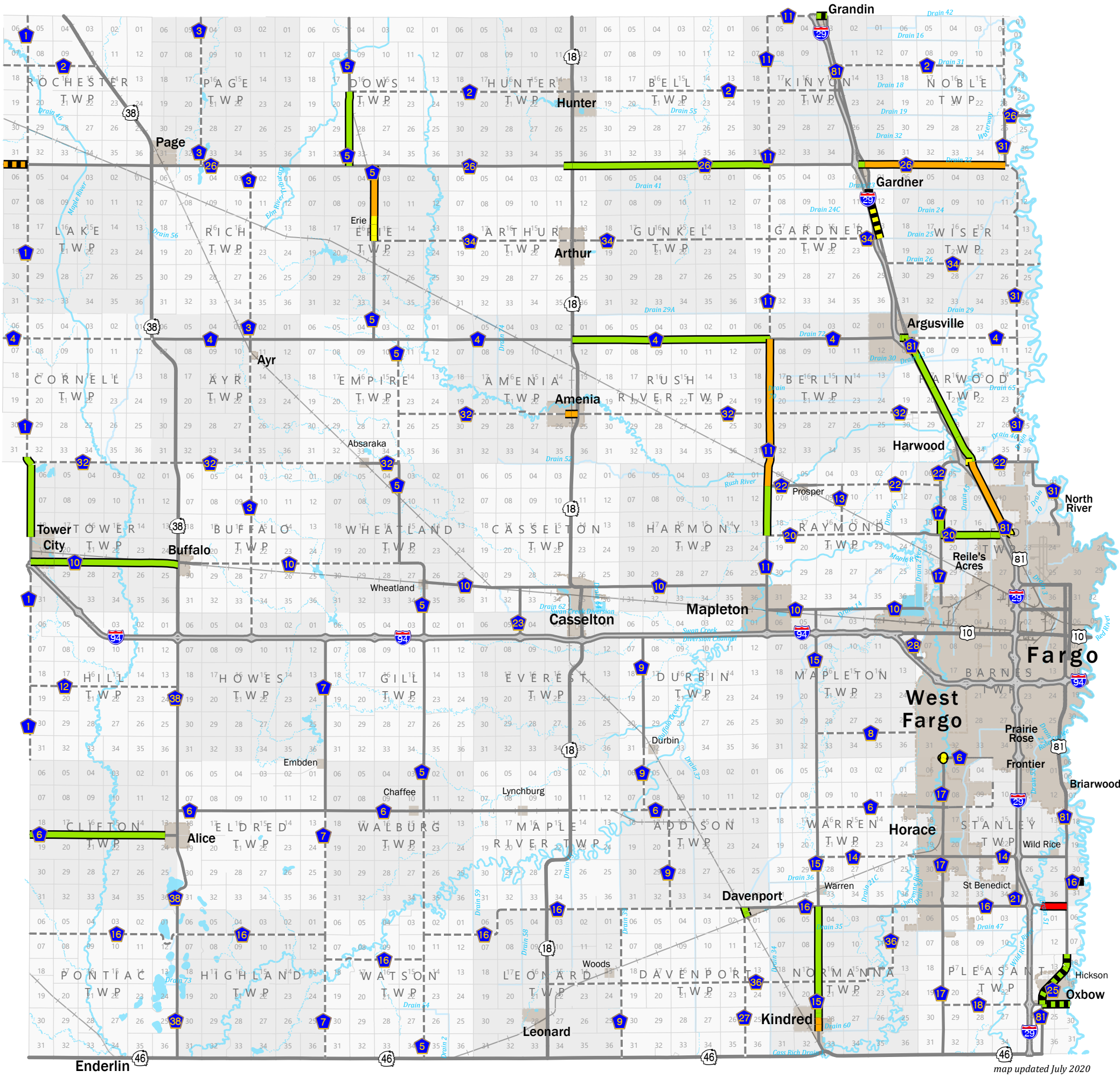
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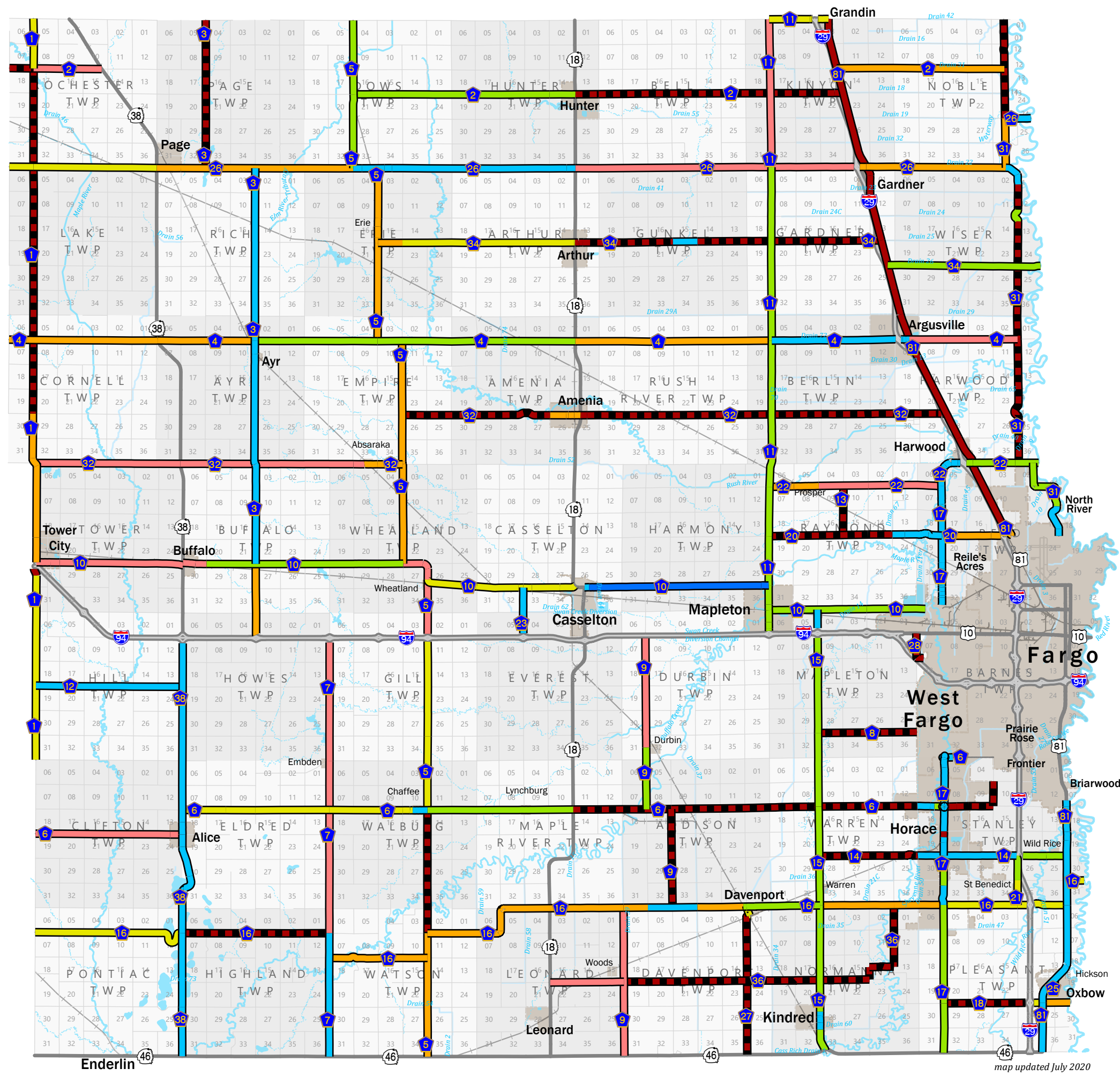
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Age of Highways and Estimated Age of Culvert Infrastructure



Year of Road Grading - Est. Age of Culverts

- unknown/TBD 65+ years old
- 1937 - 1949 71 - 83 years old
- 1950 - 1959 61 - 70 years old
- 1960 - 1969 51 - 60 years old
- 1970 - 1979 41 - 50 years old
- 1980 - 1999 21 - 40 years old
- 2000 - 2019 1 - 20 years old
- 2020 0 years old

Year of Road Grading	Miles	% of Mileage
unknown/TBD (65+ years old)	151.12	23.71%
1937 - 1949	22.04	3.46%
1950 - 1959	84.79	13.30%
1960 - 1969	102.25	16.04%
1970 - 1979	60.63	9.51%
1980 - 1999	111.61	17.51%
2000 - 2019	97.68	15.32%
2020	7.29	1.14%

The age of highways is based upon the year of road graded. In most cases, the age of culverts is equivalent to the age of highways.

Cass County Highway Department

Jason Benson
County Engineer, P.E.

Tom Soucy
Deputy County Engineer, P.E.

Blaine Laaveg
Highway Superintendent



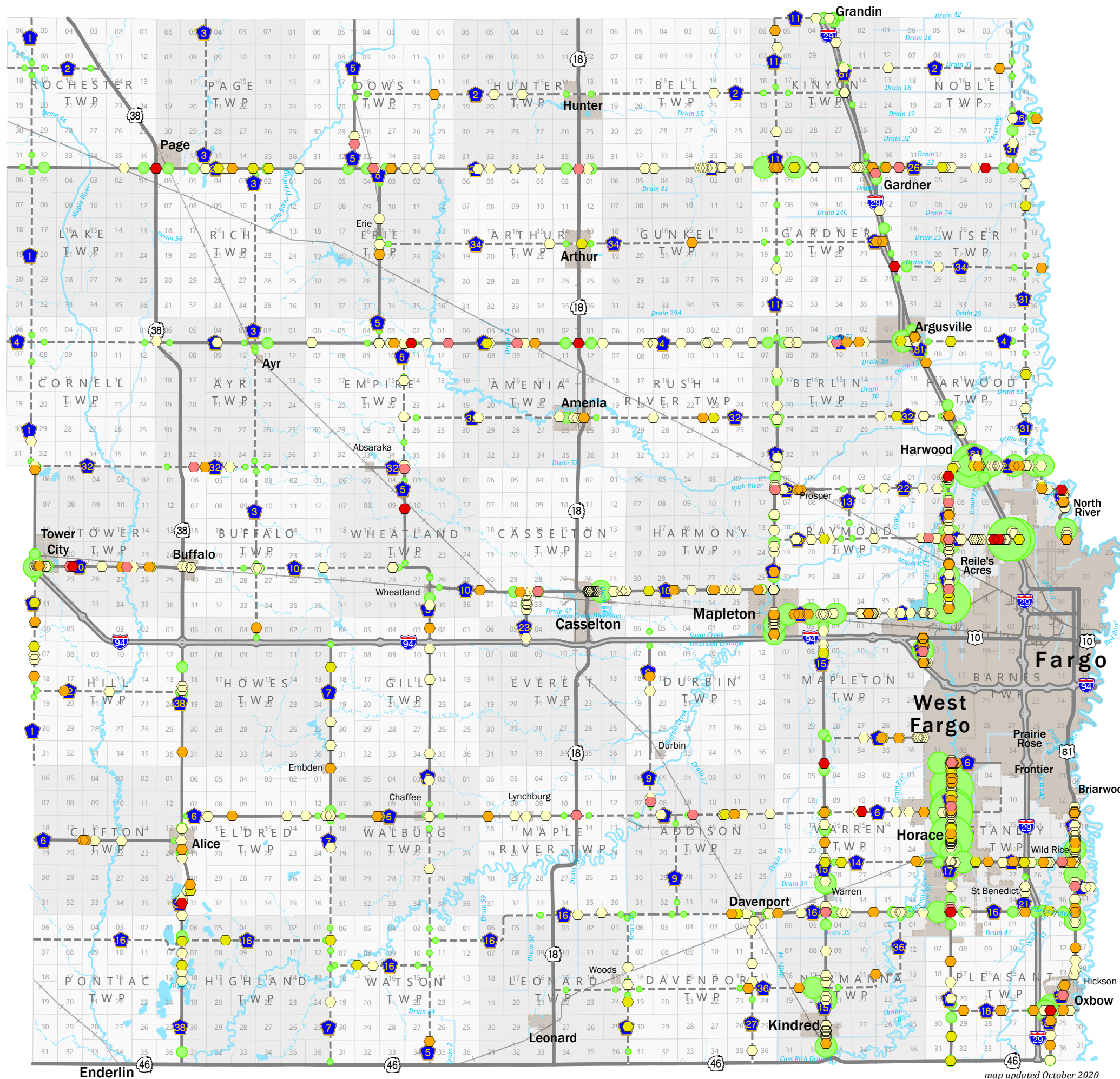
1201 Main Ave. W
West Fargo, ND 58078

(701) 298-2370

www.casscountynd.gov
highway@casscountynd.gov

Appendix 18

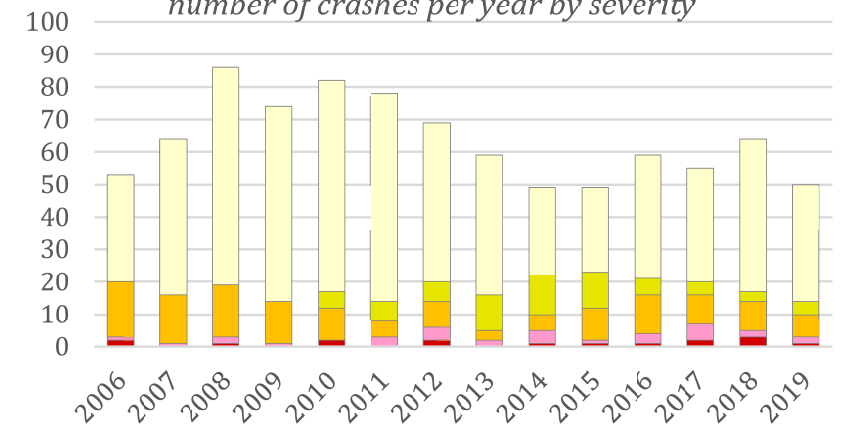
**Crashes on County Highways:
2006 - 2019**



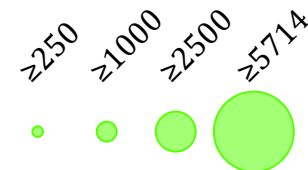
Crash Severity

- Fatal
- Incapacitating Injury
- Non-incapacitating Injury
- Possible Injury
- Property Damage Only (PDO)

number of crashes per year by severity



Average Daily Traffic Count (2018)



County Highway Type

- Paved
- Gravel

Crash Data Source: North Dakota Department of Transportation
Traffic Count Source: KJ Engineering

Cass County Highway Department

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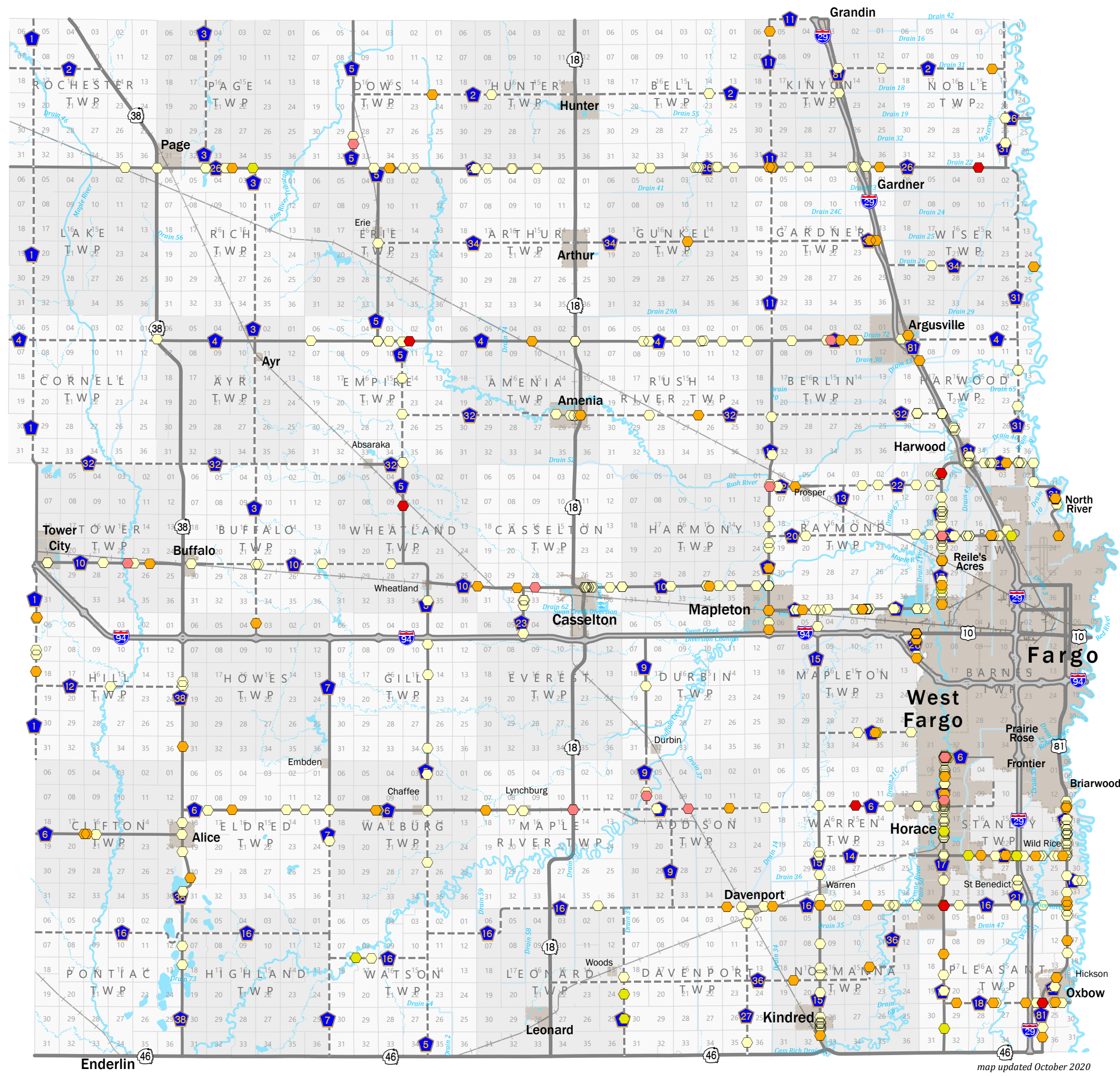


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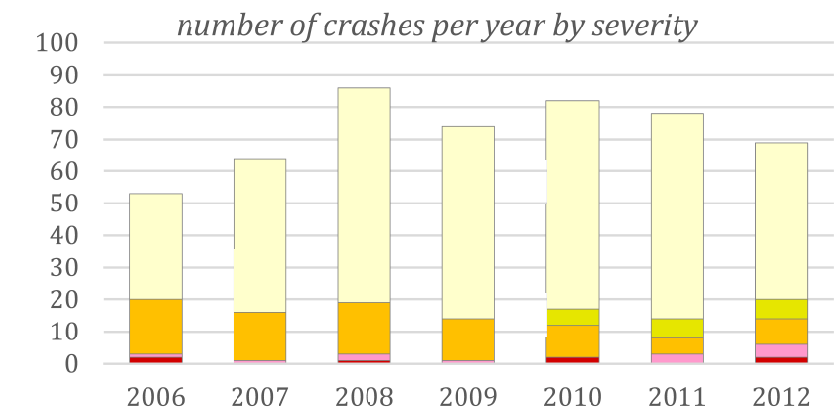
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Crashes on County Highways: 2006 - 2012



Crash Severity

- Fatal
- Incapacitating Injury
- Non-incapacitating Injury
- Possible Injury
- Property Damage Only (PDO)



County Highway Type

- Paved
- Gravel

Crash Data Source: North Dakota Department of Transportation
Traffic Count Source: KJ Engineering

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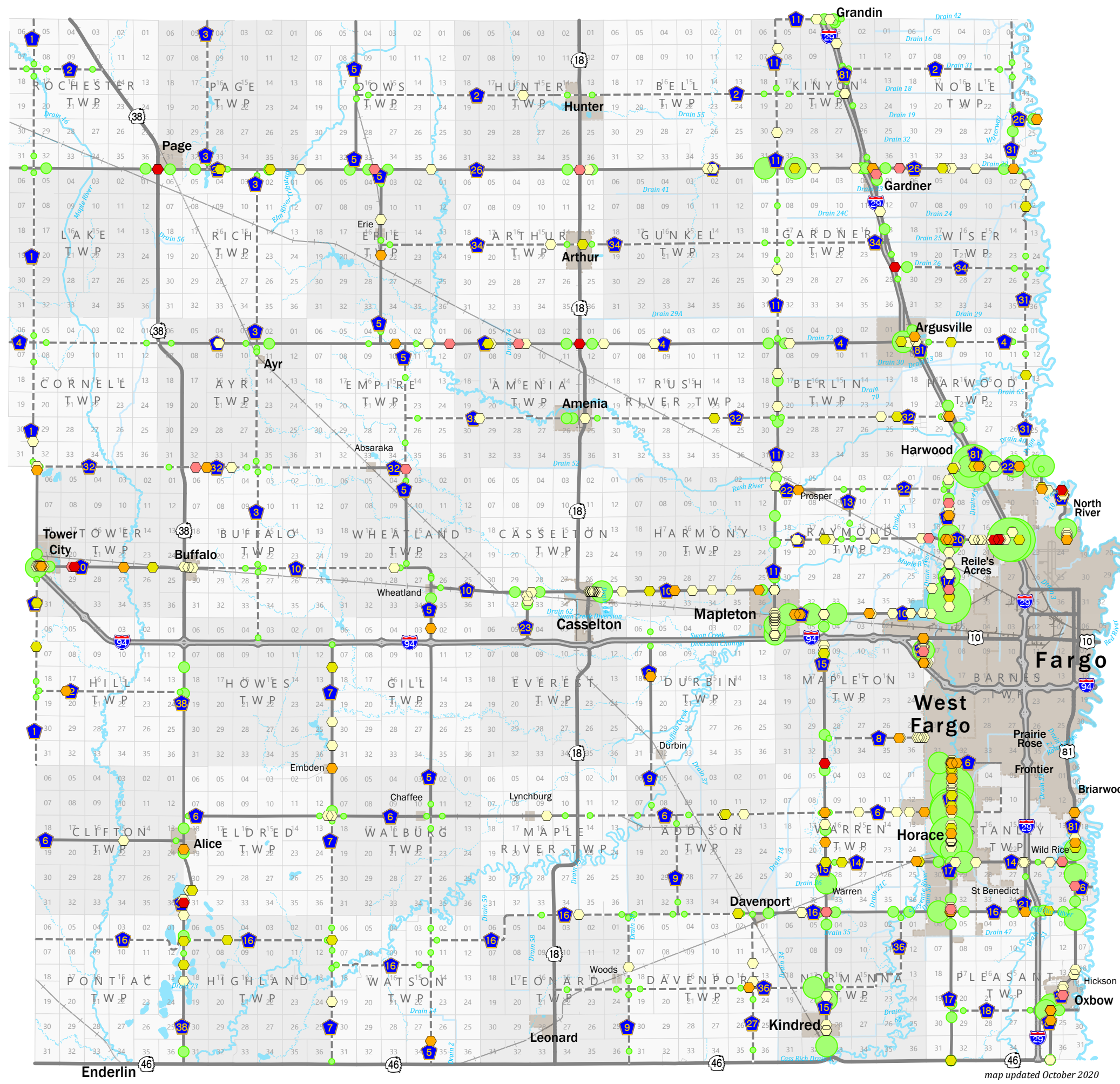


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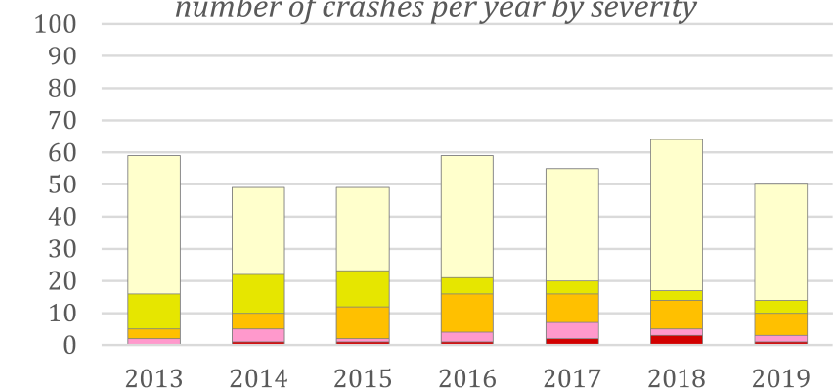
Crashes on County Highways: 2013 - 2019



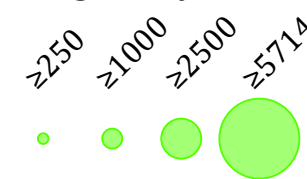
Crash Severity

- Fatal
- Incapacitating Injury
- Non-incapacitating Injury
- Possible Injury
- Property Damage Only (PDO)

number of crashes per year by severity



Average Daily Traffic Count (2018)



County Highway Type

- Paved
- Gravel

Crash Data Source: North Dakota Department of Transportation
Traffic Count Source: KJ Engineering

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