Cass County Comprehensive Highway Plan

2015-2019

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 2015-2019. 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: Due to increased transportation funding from the ND Legislature, Cass County received an additional $12.5 million over the 2013-2014 biennium. To ensure adequate planning and project design, this comprehensive plan assumes continued state revenue stream that includes an additional $6 million per year from 2015 to 2019. This is the most proactive approach and will ensure we have adequate highway and bridge projects designed and ready for bidding and construction. If we see reductions in state funding, these projects may be moved into future calendar years. The 2015 project list includes projects based on estimated additional state funding. Due to the unknowns of the 2015 Legislative Session, the 2015 budgeted projects are allocated based only on known funding sources.

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 Assistant 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 flooding, changes in construction costs, 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. 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, gravelling rural roads, or building a new bridge, the safety of our employees and the travelling public always comes first.

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 2015-2019 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 628 miles of roadway covering more than 1,700 square miles and 518 bridges of which 241 span a distance of 20 feet in length or greater.

Safe, efficient, and responsive transportation infrastructure is necessary to the incidents of commerce, public safety, recreation, and education. Two goals in the 2005 Cass County Comprehensive Plan describe Cass County's commitment to transportation:

2005 Cass County Comprehensive Plan Goal Two: *"To provide the citizens of Cass County with essential public facilities, services, and infrastructure."*

2005 Cass County Comprehensive Plan Goal Three: "*To provide an efficient, safe, environmentally sensitive, and cost effective county transportation system to effectively meet citizen's current and future needs for personal mobility and movement of goods."*

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 from Consultant Engineers
- Cass County Highway Department
- Cass County Planning Department
- Cass County GIS Department
- Cass County Tax Equalization

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 a number of complimentary studies that offer guidance to programming.

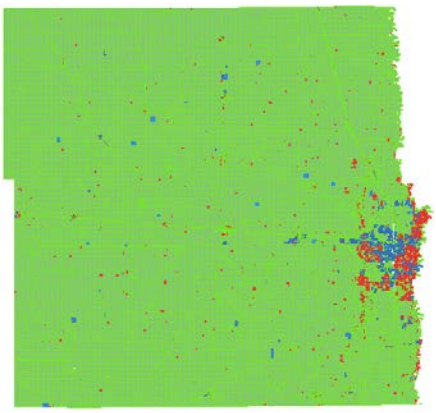
The development of a Regionally Significant Transportation Infrastructure in the Traffic Operations Incident Management Strategy identifies the importance of moving traffic quickly in times of disaster. Some County Highways have been identified in this strategic plan and are noted as new projects and 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 assist Cass County Highways in the metro area 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 shows from 2010 to 2013 Cass County grew to 162,829, an increase of 8.7%. With 885 single family building permits and nearly $250 million in total residential building permits just in 2012, Cass County can expect continued strong growth. In addition to utilizing Census data to project growth, Cass County participates with the Fargo-Moorhead Metropolitan Council of Governments 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.

Table 1 - Population - US Census				
City	1990 Census	2000 Census	2010 Census	2012 Census Estimate
Fargo	75,111	90,559	105,549	109,779
West Fargo	12,287	14,940	25,830	27,478
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 as a whole remains primarily agricultural. Ninety-seven 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. Goal One of the Cass County Comprehensive Plan: *"To achieve orderly, balanced, and sensible development"* includes objectives that pursue this goal and prevent incompatible land uses thus preventing a need for large infrastructure improvements in areas that currently are rural in nature. Goal Five: *"To preserve and maintain Cass County's rural heritage"* further emphasizes the desire of the County to continue its existing land use.

Highway Safety

Cass County and its agents have committed to maintaining the safest network of roads possible. The planning process takes into account 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.

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. As of 2014, nearly all asphalt County Highways have rumble strips. The only remaining roads without rumble strips are those with a projected paving project within the next few years and our older concrete roads. Intersection improvements and safety enhancements also are implemented where collisions have historically happened or where it 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.

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 is able to 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. The objective of the workshop is to enhance Cass County and the cities of Fargo and West Fargo's local road safety efforts. Through group discussion and review of crash data, participants worked to address severe crashes on the County

roadways. During the workshop, national strategies were presented and prioritized via a voting process that became the foundation of efforts to reduce the number of local road fatalities and life changing injuries on these roads. Critical emphasis areas discussed were: Unbelted Vehicle Occupants, Intersection Crashes, Lane Departure Crashes, Involving Drivers Under Age 21, Excessive Speed or Aggressive Driving, and Alcohol Related Crashes.

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
Head-On	***7%***	***6%***	***14***	***9%***	***7***	***4%***	***7***
Run-off-the-Road Crashes	***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

Cass County is doing quite well in regards to 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. With

this in mind, our biggest safety issue involves our intersections. Because of adequate signing and lower traffic volumes, many of our intersections are safe and don't 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 street lights, signage, pavement markings, and dynamic warning signs. We will work with the NDDOT to determine the best safety options at the intersection of state highways. We will then submit the critical intersections for safety funding for the required improvements.

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 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: As previously discussed, the County actively permits any new access to County Highways through the Highway Access Ordinance #2007-1.
5. Subdivision Platting/Permitting: The County Planning Office also 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 $110 million in projects and maintenance on both our highways and bridges.

The current average cost to totally rebuild a paved highway is $1.4 million. To rebuild our 316 miles of paved highway to a width of 32 feet would cost over $442 million.

With 518 structures, our bridges and large box culverts also have a significant asset value. Of the 241 major structures (20 feet in length or greater), the average structure length is 94 feet with an average width of 28 feet. Replacement values for these 241 structures, at a cost of $205 per square foot (cost based on the Upper Great Plains Transportation Institute study) would be just over $140 million.

When factoring the additional cost to replace the 277 minor structures, the total replacement cost of our highway and bridge infrastructure is nearly 2/3 of a billion dollars. 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. The 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 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 2005 to 2013, ND's overall Construction Cost Index increased annually by more than 18%. Rebuilding just one mile of road can cost up to $1.4 million. In light of this reality it is important to maintain a road maintenance policy to reduce the need for reconstruction.

While Construction Costs have increased annually at 18% since 2005, 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 of. 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 Moving Ahead for Progress in the 21st Century Act (MAP-21), we now only receive $900k in Federal Aid Highway Funds, which equates to a 25% decrease. Since 2000 we have continued to receive approximately $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 $19.6 million, an annual average increase of 6%. 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.

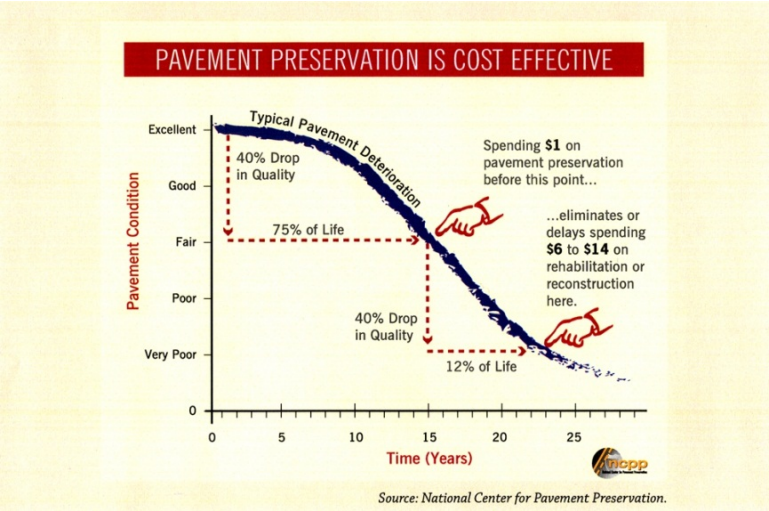


Table 2 shows the estimated revenue for the Cass County Highway Department from 2015 through 2019. These estimates use revenue inflation rates of 1.5% for Federal Funding, 3% for State Funding, and 4% for Local Funding. These inflation rates were developed by Metro COG. In addition, the Operation Cost inflation rate use was 4%. **It includes projections for special Legislative funding similar to what Cass County received in the 2013-2014 biennium. The estimated Highway Distribution Tax totals are based on a past funding and the 2015-2016 funding will not be allocated until the 2015 Legislative Session.** 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 state wide for county bridges (Cass County competes for these funds based on other county needs throughout the state). Federal Aid Bridge Funding for 2015 is allocated. Funding for 2016-2019 is estimated and not allocated.

Table 2 - Estimated Revenue

Revenue Description	2015	2016	2017	2018	2019
Property Tax	$4,568,580	$4,659,952	$4,753,151	$4,848,214	$4,945,178
Highway Distribution Tax and Additional State Funding	$14,970,000	$15,269,400	$15,574,788	$15,886,284	$16,204,009
Other	$121,775	$124,211	$126,695	$129,229	$131,813
Total Revenues	$19,660,355	$20,053,562	$20,454,633	$20,863,726	$21,281,001
Federal Aid Highway Funding	$1,800,000	$0	$0	$1,800,000	$0
Federal Aid Bridge Funding	$660,000	$715,000	$810,000	$545,000	$600,000
Total Revenues & Federal Aid	$22,120,355	$20,768,562	$21,264,633	$23,208,726	$21,881,001
Total Operating Cost (not including Road/Bridge Projects)	$5,843,000	$6,076,720	$6,319,789	$6,572,580	$6,835,484
Total Available for Road/Bridge Projects	$16,277,355	$14,691,842	$14,944,845	$16,636,146	$15,045,517

Long Range Funding Estimates

In 2013-2014, Metro COG updated its Long Range Transportation Plan – Metro 2040. This plan contains revenue estimates that include Short-Range (2015-2020), Mid-Range (2021-2030), and Long-Range (2031-2040). 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 State funding (this is the difference between the Table 2 2015-2019 total of $78,119,000 and the Table 3 Short-Range total of $56,053,300). With the continued support of one-time funding from the ND Legislature, Cass County could have an additional $40 million in Short-Range funding and more than $300 million over the next 30 years. Unfortunately when looking out to 2045, additional one time state funding only keeps up with maintaining our highway system. Continued funding at the current 2013 Legislative Session 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. If the additional funding was pulled back, as shown below, we would only be able to annually fund 13.5 miles of overlays, 2 miles of reconstruction, 1-2 bridges, and no gravel road construction.

Table 3 - Long Range Revenue Estimates

Revenue Description	Short-Range	Mid-Range	Long-Range	Total
Property Tax	$29,711,100	$68,047,500	$100,727,000	$198,485,600
Highway Distribution Tax	$54,464,000	$115,256,900	$154,895,700	$324,616,600
Other	$928,600	$2,126,800	$3,148,200	$6,203,600
Total Revenues	$85,103,700	$185,431,200	$258,770,900	$529,305,800
Federal Aid Highway Funding	$5,690,700	$10,690,500	$12,406,800	$28,788,000
Federal Aid Bridge Funding	$4,109,900	$7,720,900	$8,960,500	$20,791,300
Total Revenues & Federal Aid	$94,904,300	$203,842,600	$280,138,200	$578,885,100
Total Operating Cost (not including Road/Bridge Projects)	$38,851,000	$88,981,000	$131,713,906	$259,545,906
Total Available for Road/Bridge Projects	$56,053,300	$114,861,600	$148,424,294	$319,339,194

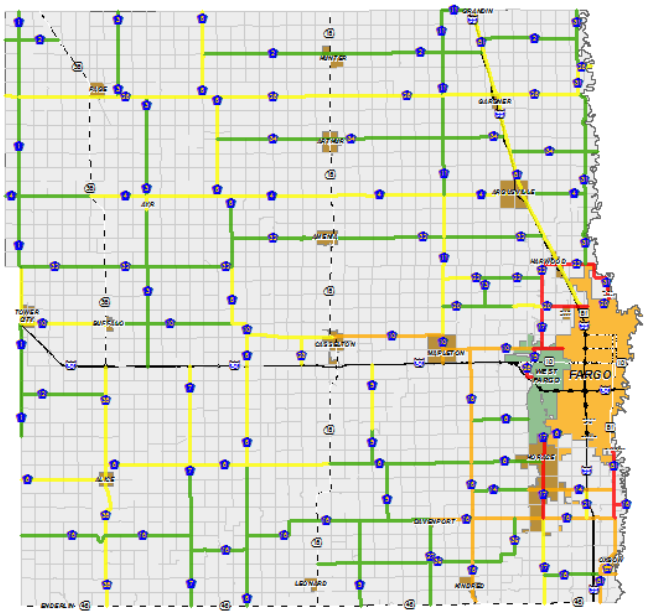
Cass County Highways: Design Standards for New or Reconstruction of Existing Facilities

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 in a color code; red is priority 1, orange is priority 2, yellow is priority 3, and green is priority 4.



Map 2: Road Priorities

Cass County Highways: Current Status of Paved Highways

Cass County currently maintains 316 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 2012 and results are shown in Appendix 3. Additionally, seal coats are applied to asphalt highways two years after paving or overlaying has been completed to increase the life of the pavement to 15-20 years. 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 312 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.

Bridge Maintenance and Construction

Cass County maintains 518 structures of which 241 span a distance of 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 518 structures, nearly 40% 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 241 bridges spanning over 20 feet, we have 50 that are structurally deficient and 8 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 a large number of bridges are now over 50 years old, over the next twenty years we will have a higher number of bridge replacements, further taxing 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. As of 2014, we no longer have any bridges with load restrictions on the County Highway network. The North Dakota Department of Transportation 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 5 bridges in the 50-58 range. These would be potential sites for replacement in the near future 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 approximately 20 bridges with a sufficiency rating below 50. Several 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 is in the process of developing a 5 year rotation for inspecting these structures.

Strategic Long Range 2040 Goals

Now through the year 2040, Cass County will continue to aggressively design, build, and maintain our future highway network. Below are the goals listed by decade:

Now through 2020:

- Inventory, inspect, and develop a detailed maintenance/inspection program for Minor Structures (bridges/structures less than 20 feet in length).
- Complete design/plans on 75% of the highway and bridge projects at least 18 months prior to construction.

2021 to 2030:

- 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.

2031 to 2040:

- Complete implantation of 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.

2015-2019 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 Fargo-Moorhead Metropolitan Council of Governments, 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 Paved Highway Improvements

Hwy	Proejct Location	Type of Project	Funding Source (Local/Fed Aid)	Year to be Completed *	Project Cost
4	Hwy 3 - Hwy 5 North	Mill and Overlay	Federal	2015	$1,000,000
1	Tower City - Hwy 32	Mill and Overlay	Local	2015	$900,000
3	City of Ayr - Hwy 4	Mill and Overlay	Local	2015	$100,000
5	Hwy 34 - Hwy 4	Mill and Overlay	Local	2015	$700,000
6	Hwy 38 - Hwy 5	Mill and Overlay	Local	2015	$2,000,000
10	City of Wheatland - State Hwy 18	Crack & Seat - Bituminous Overlay	Local	2015	$2,800,000
10	Hwy 19 to City of Fargo Limits	Grading & Surfacing	Local	2015	$1,000,000
19	Drain 21 - Hwy 10 (12th Ave N)	Grading & Surfacing	Local	2015	$700,000
31	Hwy 20 1.5 Miles North	Grading & Surfacing	Local	2016	$2,500,000
7	I-94 - City of Embden	Mill and Overlay	Local	2016	$1,000,000
7	City of Embden - Hwy 6	Mill and Overlay	Local	2016	$400,000
38	Hwy 38 to I94 - South 12 Miles	Grading	Local	2016	$7,200,000
11	I94 - S End of Mapleton (Concrete)	Mill and Overlay	Local	2017	$200,000
21	Hwy 14 - Hwy 16	Mill and Overlay	Local	2017	$500,000
28	Main Avenue in West Fargo - 1 Miles S. & 0.4 Miles E.	Mill and Overlay	Local	2017	$300,000
38	Hwy 38 to I94 - North 5 Miles	Grading	Local	2017	$3,000,000
38	Hwy 38 to I94 - South 10 Miles	Mill and Overlay	Local	2017	$5,000,000
11	Hwy 4 - Hwy 22	Mill and Overlay	Federal	2018	$360,000
4	State Hwy 38 - Hwy 3	Mill and Overlay	Local	2018	$800,000
5	Hwy 26 - Hwy 34	Mill and Overlay	Local	2018	$700,000
9	I-94 - 4.6 Miles South	Grading	Local	2018	$2,700,000
15	South End of Kindred - Richland Co. Line	Mill and Overlay	Local	2018	$250,000
15	Hwy 16 - 1 Mi. N. of the City of Kindred	Mill and Overlay	Local	2018	$1,200,000
15	1 Mile South of Hwy 36 - North End of Kindred	Mill and Overlay	Local	2018	$150,000
16	RR West 580' of Hwy 27 - Hwy 15	Mill and Overlay	Local	2018	$1,000,000
27	Hwy 16 - 0.2 Mi. S. thru City of Davenport	Mill and Overlay	Local	2018	$100,000
38	Hwy 38 to I94 - North 7 Miles	Mill and Overlay	Local	2018	$3,500,000
5	Trail Co. Line - Hwy 26	Mill and Overlay	Local	2019	$1,500,000
9	I-94 - 4.6 Miles South	Mill and Overlay	Local	2019	$2,250,000
10	State Hwy 18 - Hwy 11	Grading	Local	2019	$5,500,000

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

2015-2019 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. 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
UNK	To Be Determined		Drain Tile	2015	Local	$0
16	State Hwy 18 to Davenport	8	Drain Tile	2016	Local	$400,000
34	State Hwy 18 to I29	12	Drain Tile	2017	Local	$600,000
34	C5 to State Hwy 18	8	Drain Tile	2018	Local	$400,000
6	State Hwy 18 to C15	10	Drain Tile	2019	Local	$500,000
UNK	To Be Determined		Subgrade Repair	2015	Local	$0
3	C10 to Ayr	8.5	Subgrade Repair	2016	Local	$1,275,000
16	State Hwy 18 to Davenport	8	Subgrade Repair	2017	Local	$1,200,000
32	State Hwy 18 to C11	8	Subgrade Repair	2018	Local	$1,200,000
34	State Hwy 18 to I29	12	Subgrade Repair	2019	Local	$1,800,000
16	C16 Curves		Reshaping	2015	Local	$0
UNK	To Be Determined		Reshaping	2016	Local	$0
UNK	To Be Determined		Reshaping	2017	Local	$0
UNK	To Be Determined		Reshaping	2018	Local	$0
UNK	To Be Determined		Reshaping	2019	Local	$0

2015-2019 Bridge Improvement Plan

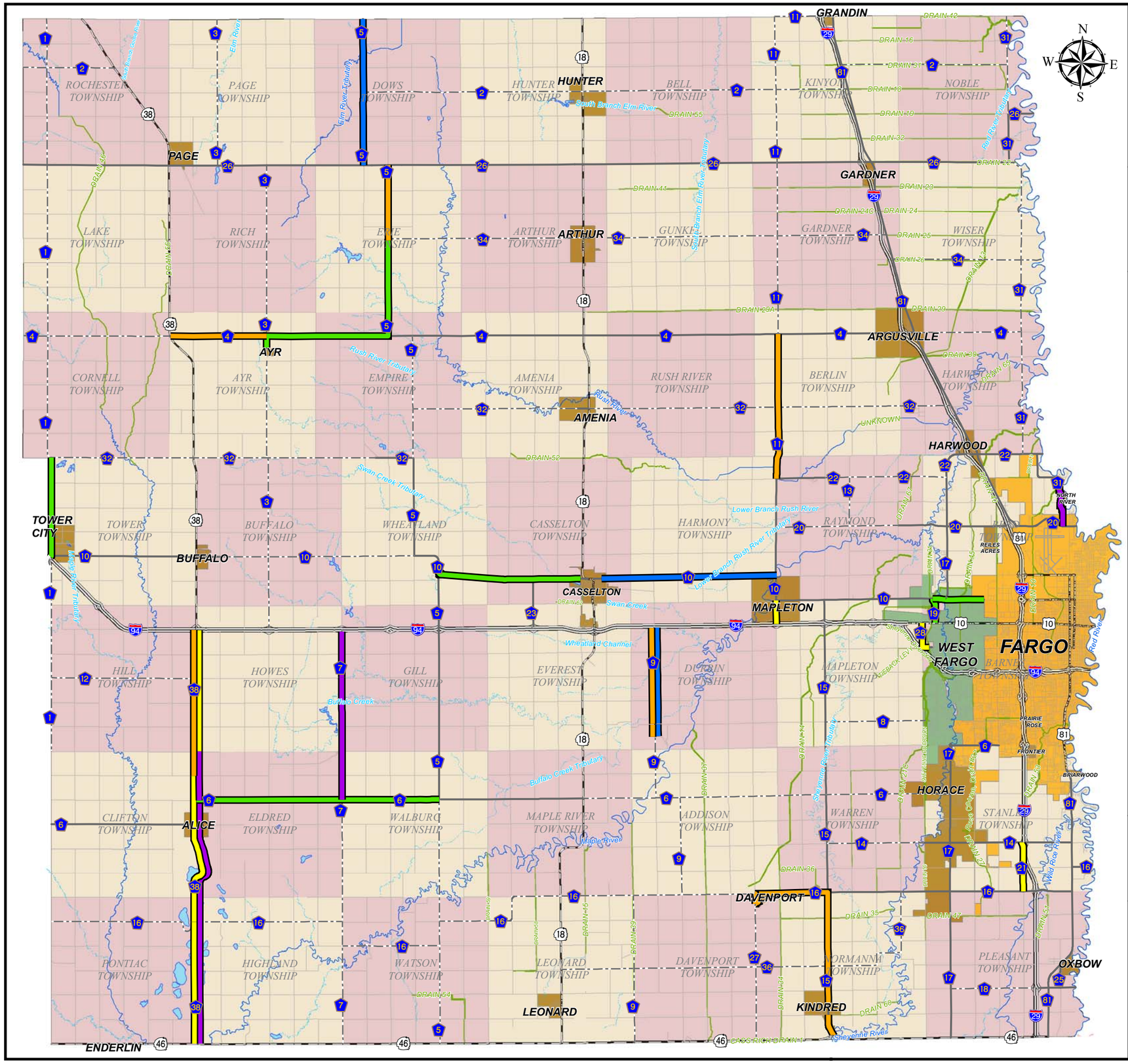
The County utilizes bi-annual inspection reports provided by the North Dakota Department of Transportation to identify necessary improvements to County and township structures. $1 million is allocated annually to account for these necessary improvements. In addition to these improvements the County includes, in the construction schedule, necessary flood repairs which combine local and federal funds. There are approximately 30 bridges currently slated for improvements. Table 7 illustrates the proposed bridge improvements for 2015-2019.

Table 7 - Proposed Bridge Improvements							
HWY	TWP	LOCATION	PROJECT TYPE	STRUCTURE TYPE	YEAR	FUNDING	BUDGET
	Hill	15 -16 Hill Township - Tributary of Maple River	Bridge Removal	Major	2015	Local	$ 50,000
	Durbin	10 Durbin Township - Maple River	Bridge Replacement	Major	2015	Federal	$ 270,000
	Buffalo & Wheatland	36 Buffalo/31 Wheatland Townships - Tribuitary of Bufalo Creek	Box Culvert	Major	2015	Local	$ 275,000
10	10	C10 - 27/34 Casselton Township - Swan Creek	Box Culvert	Major	2015	Local	$ 600,000
	Gill	19/20 Gill Township - Tribuitary of Buffalo Creek	Box Culvert	Major	2015	Local	$ 350,000
	Howes	24/25 Howes Township - Tributary of Buffalo Creek	Box Culvert	Major	2015	Local	$ 300,000
				Major Structures			$ 1,845,000
				Minor Structures			$ -
	Dows	3 Dows Township - Tributary of Elm River	Bridge Replacement	Major	2016	Local	$ 450,000
	Tower	2/11 Tower Township - Maple River	Box Culvert	Major	2016	Federal	$ 11,000
9	Durbin	C9 - 17/18 Durbin Township - Tributary of Swan Creek	Bridge Replacement	Major	2016	Local	$ 325,000
6	Barnes & Stanley	C6 - 33 Barnes/4 Stanley Township - Maple River	Bridge Replacement	Major	2016	Local	$ 1,000,000
	Cornell	27/34 Cornell Township - Maple River	Box Culvert	Major	2016	Local	$ 550,000
	Davenport	28/33 Davenport Township - Maple River WRD Drain 37	Box Culvert	Major	2016	Local	$ 100,000
	Everest & Durbin	1 Everest/6 Durbin Townships - Swan Creek	Box Culvert	Major	2016	Local	$ 400,000
		Various Minor Structures - TBD	Box Culverts/CMP's	Minor	2016	Local	$ 500,000
				Major Structures			$ 2,836,000
				Minor Structures			$ 500,000
	Erie & Empire	1 Empire/36 Erie Township - Tributary of Rush River	Box Culvert	Major	2017	Local	$ 275,000
	Tower & Hill	32 Tower/5 Hill Township - Tributary of Maple River	Box Culvert	Major	2017	Local	$ 250,000
16	16	C16 -33 Addison/4 Davenport Townhsip - Maple River WRD - Drain 37	Box Culvert	Major	2017	Local	$ 250,000
26	Rochestor & Lake	C26 - 34 Rochestor/3 Lake Townships - Maple River	Box Culvert	Major	2017	Local	$ 500,000
	Durbin	9/16 Durbin Township - Maple River	Bridge Replacement	Major	2017	Local	$ 325,000
	Walburg	26/35 Walburg Township - Maple River	Bridge Replacement	Major	2017	Federal	$ 175,000
34	Wiser	C34 - 28/29 Wiser Township - North Cass WRD - Drain 26	Box Culvert	Major	2017	Local	$ 300,000
6	Addison	C6 - 7/18 Addison Township - Maple River	Bridge Repair - Abut - Rip Rap	Major	2017	Local	$ 150,000
	Mapleton	29/32 Mapleton Township - Maple River WRD Drain 14	Box Culvert	Major	2017	Local	$ 450,000
16	Warren & Normanna	C16 - 31 Warren/6 Normanna Townships Maple River WRD - Drain 34	Box Culvert	Minor	2017	Local	$ 300,000
		Various Minor Structures - TBD	Box Culverts/CMP's	Minor	2017	Local	$ 500,000
				Major Structures			$ 2,675,000
				Minor Structures			$ 800,000
	Noble	23/26 Noble Township - Red River Tributary	Box Culvert	Major	2018	Local	$ 225,000
	Hill	28/33 Hill Township - Maple River	Bridge Replacement	Major	2018	Local	$ 800,000
	Gill & Everest	25 Gill/30 Everest Township - Buffalo Creek	Box Culvert	Major	2018	Local	$ 450,000
	Walburg & Maple River	25 Walburg/30 Maple River - Maple River	Bridge Replacement	Major	2018	Federal	$ 200,000
	Erie	25/36 Erie Townhship - Tributary of Rush River	Box Culvert	Major	2018	Local	$ 375,000
	Durbin	18/19 Durbin Township -Tributary of Swan Creek	Box Culvert	Major	2018	Local	$ 400,000
	Everest	11/12 Everest Township - Wheatland Channel	Box Culvert	Minor	2018	Local	$ 200,000
		Various Minor Structures - TBD	Box Culverts/CMP's	Minor	2018	Local	$ 500,000
				Major Structures			$ 2,450,000
				Minor Structures			$ 700,000
	Addison & Durbin	5 Addison/32 Durbin Township - Maple River	Bridge Replacement	Major	2019	Federal	$ 200,000
	Noble	27/34 Noble - North Cass WRD Drain 32	Box Culvert	Major	2019	Local	$ 90,000
15	Mapleton	C15 - 8/9 Mapleton Township on Drain 14	Bridge Replacement	Major	2019	Local	$ 1,000,000
	Maple River	3/4 Maple River Township - Tributary of Buffalo Creek	Box Culvert	Major	2019	Local	$ 450,000
	Noble	15/16 Noble - North Cass WRD Drain 18	Box Culvert	Major	2019	Local	$ 90,000
	Gardner	3/10 Gardner - North Cass WRD - Drain 23	Box Culvert	Major	2019	Local	$ 150,000
16	Maple River & Leonard	C16 - 36 Maple River/1 Leonard Townships - Drain 39	Bridge Replacement	Major	2019	Local	$ 240,000
16	Maple River & Leonard	C16 - 35 Maple River/2 Leonard Townships - Drain 15	Bridge Replacement	Major	2019	Local	$ 240,000
		Various Minor Structures - TBD	Box Culverts/CMP's	Minor	2019	Local	$ 500,000
				Major Structures			$ 2,460,000
				Minor Structures			$ 500,000
				Total Major Structures			$12,266,000
				Total Minor Structures			$ 2,500,000
* Note: Years to be completed are illustrative and subject to change and approved annually and/or as necessary by the Road Advisory Committee.							

2015-2019 Revenues vs Project Costs

Table 8 illustrates the revenue stream and estimated costs of the 2015-2019 Plan. Appendix 2 and 3 illustrate the proposed capital improvements over the 2015-2019 time period.

Table 8 - Revenue vs. Project Costs					
Revenue Description	2015	2016	2017	2018	2019
Property Tax	$4,568,580	$4,659,952	$4,753,151	$4,848,214	$4,945,178
Highway Distribution Tax	$14,970,000	$15,269,400	$15,574,788	$15,886,284	$16,204,009
Other	$121,775	$124,211	$126,695	$129,229	$131,813
Total Revenues	***$19,660,355***	***$20,053,562***	***$20,454,633***	***$20,863,726***	***$21,281,001***
Federal Aid Highway Funding	$1,800,000	$0	$0	$1,800,000	$0
Federal Aid Bridge Funding	$660,000	$715,000	$810,000	$545,000	$600,000
Total Revenues & Federal Aid	$22,120,355	$20,768,562	$21,264,633	$23,208,726	$21,881,001
Total Operating Cost (not including Road/Bridge Projects)	$5,843,000	$6,076,720	$6,319,789	$6,572,580	$6,835,484
Total Available for Road/Bridge Projects	***$16,277,355***	***$14,691,842***	***$14,944,845***	***$16,636,146***	***$15,045,517***
Total Paved Highway Project Costs	$11,700,000	$8,600,000	$9,000,000	$10,760,000	$9,250,000
County Bridge Project Costs	$1,845,000	$3,435,000	$3,445,000	$3,150,000	$2,960,000
Chipseal, Crackseal, Striping, Reshaping, Subgrade Repair & Draintile	$1,235,000	$3,110,000	$3,235,000	$2,035,000	$4,235,000
Total Project Costs	***$14,780,000***	***$15,145,000***	***$15,680,000***	***$15,945,000***	***$16,445,000***
Differences (Revenues-Costs)	***$1,497,355***	***-$453,158***	***-$735,155***	***$691,146***	***-$1,399,483***



Appendix 1.

Cass County Highway Department

2015-2019

5 Year Capital Improvement Plan

Proposed Highway Projects

Planned Year

2015 2016 2017 2018 2019

Table 5 - Proposed Paved Highway Improvements					
Hwy	Proejct Location	Type of Project	Funding Source (Local/Fed Aid)	Year to be Completed *	Project Cost
4	Hwy 3 - Hwy 5 North	Mill and Overlay	Federal	2015	$1,000,000
1	Tower City - Hwy 32	Mill and Overlay	Local	2015	$900,000
3	City of Ayr - Hwy 4	Mill and Overlay	Local	2015	$100,000
5	Hwy 34 - Hwy 4	Mill and Overlay	Local	2015	$700,000
6	Hwy 38 - Hwy 5	Mill and Overlay	Local	2015	$2,000,000
10	City of Wheatland - State Hwy 18	Crack & Seat - Bit. Overlay	Local	2015	$2,800,000
10	Hwy 19 to City of Fargo	Grading & Surfacing	Local	2015	$1,000,000
19	Drain 21 - Hwy 10 (12th	Grading & Surfacing	Local	2015	$700,000
31	Hwy 20 1.5 Miles North	Grading & Surfacing	Local	2016	$2,500,000
7	I-94 - City of Embden	Mill and Overlay	Local	2016	$1,000,000
7	City of Embden - Hwy 6	Mill and Overlay	Local	2016	$400,000
38	Hwy 38 to I94 - South 12	Grading	Local	2016	$7,200,000
11	I94 - S End of Mapleton	Mill and Overlay	Local	2017	$200,000
21	Hwy 14 - Hwy 16	Mill and Overlay	Local	2017	$500,000
28	Main Ave, West Fargo - 1 Miles S. & 0.4 Miles E.	Mill and Overlay	Local	2017	$300,000
38	Hwy 38 to I94 - North 5	Grading	Local	2017	$3,000,000
38	Hwy 38 to I94 - South 10	Mill and Overlay	Local	2017	$5,000,000
11	Hwy 4 - Hwy 22	Mill and Overlay	Federal	2018	$360,000
4	State Hwy 38 - Hwy 3	Mill and Overlay	Local	2018	$800,000
5	Hwy 26 - Hwy 34	Mill and Overlay	Local	2018	$700,000
9	I-94 - 4.6 Miles South	Grading	Local	2018	$2,700,000
15	South End of Kindred - Richland Co. Line	Mill and Overlay	Local	2018	$250,000
15	Hwy 16 - 1 Mi. N. of the City of Kindred	Mill and Overlay	Local	2018	$1,200,000
15	1 Mile South of Hwy 36 - North End of Kindred	Mill and Overlay	Local	2018	$150,000
16	RR West 580' of Hwy 27 - Hwy 15	Mill and Overlay	Local	2018	$1,000,000
27	Hwy 16 - 0.2 Mi. S. thru City of Davenport	Mill and Overlay	Local	2018	$100,000
38	Hwy 38 to I94 - North 7 Miles	Mill and Overlay	Local	2018	$3,500,000
5	Trail Co. Line - Hwy 26	Mill and Overlay	Local	2019	$1,500,000
9	I-94 - 4.6 Miles South	Mill and Overlay	Local	2019	$2,250,000
10	State Hwy 18 - Hwy 11	Grading	Local	2019	$5,500,000
* 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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Miles

Jason Benson
County Engineer, P.E.

Richard Sieg
Highway Superintendent

DATE: July, 2014

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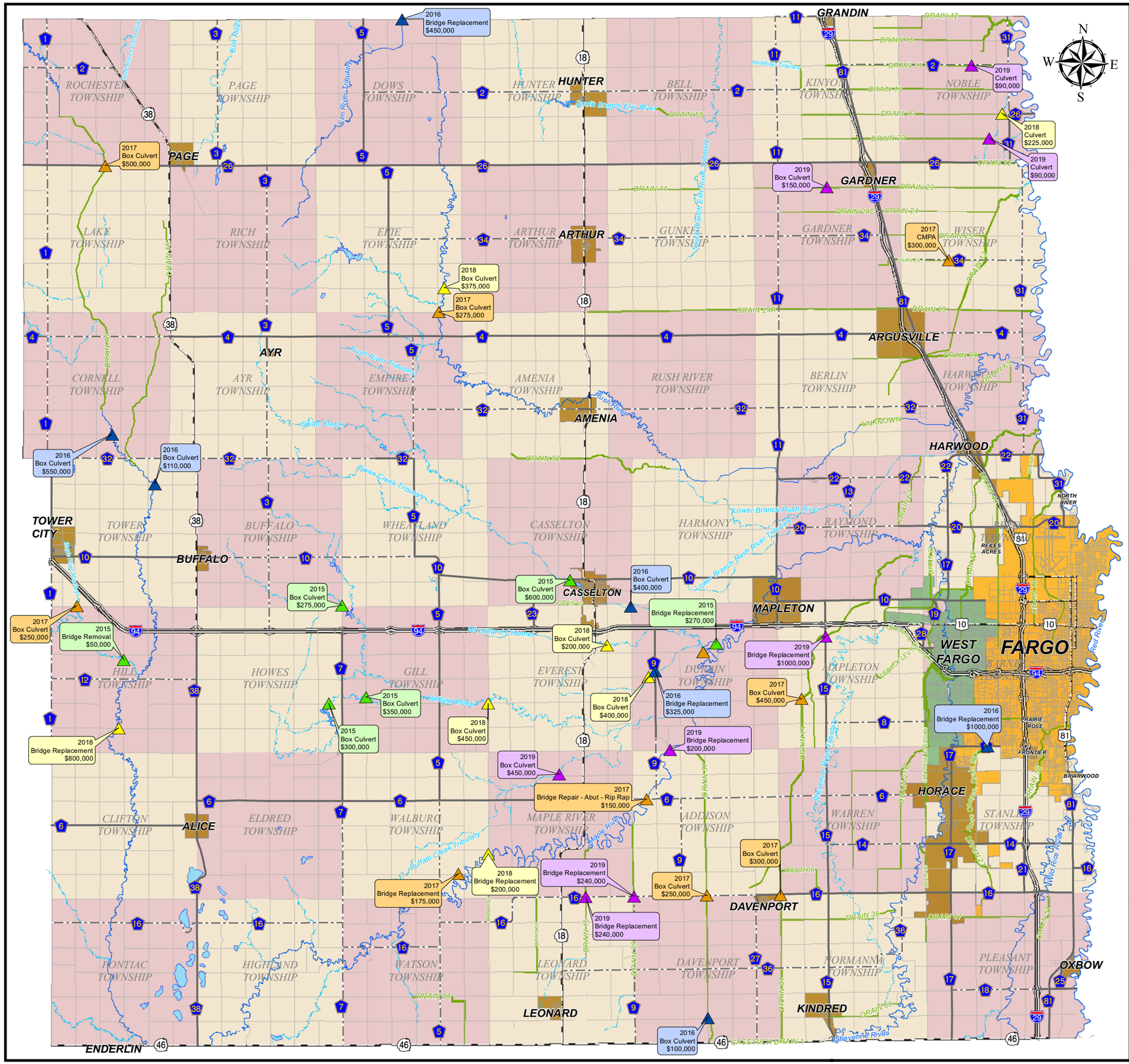

Appendix 2.

Cass County Highway Department

2015-2019

5 Year Capital Improvement Plan

Proposed Structure Projects

Planned Year

2015 2016 2017 2018 2019

Table 7 - Proposed Bridge Improvements							
HWY	TWP	LOCATION	PROJECT TYPE	STRUCTURE TYPE	YEAR	FUNDING	BUDGET
	Hill	15 -16 Hill Township - Tributary of Maple River	Bridge Removal	Major	2015	Local	$ 50,000
	Durbin	10 Durbin Township - Maple River	Bridge Replacement	Major	2015	Federal	$ 270,000
	Buffalo & Wheatland	36 Buffalo/31 Wheatland Townships - Tribuitary of Bufalo Creek	Box Culvert	Major	2015	Local	$ 275,000
10	10	C10 - 27/34 Casselton Township - Swan Creek	Box Culvert	Major	2015	Local	$ 600,000
	Gill	19/20 Gill Township - Tribuitary of Buffalo Creek	Box Culvert	Major	2015	Local	$ 350,000
	Howes	24/25 Howes Township - Tributary of Buffalo Creek	Box Culvert	Major	2015	Local	$ 300,000
	Dows	3 Dows Township - Tributary of Elm River	Bridge Replacement	Major	2016	Local	$ 450,000
	Tower	2/11 Tower Township - Maple River	Box Culvert	Major	2016	Federal	$ 110,000
9	Durbin	C9 - 17/18 Durbin Township - Tributary of Swan Creek	Bridge Replacement	Major	2016	Local	$ 325,000
6	Barnes & Stanley	C6 - 33 Barnes/4 Stanley Township - Drain 27	Bridge Replacement	Major	2016	Local	$ 1,000,000
	Cornell	27/34 Cornell Township - Maple River	Box Culvert	Major	2016	Local	$ 550,000
	Davenport	28/33 Davenport Township - Maple River WRD Drain 37	Box Culvert	Major	2016	Local	$ 100,000
	Everest & Durbin	1 Everest/6 Durbin Townships - Swan Creek	Box Culvert	Major	2016	Local	$ 400,000
		Various Minor Structures - TBD	Box Culverts/CMP's	Minor	2016	Local	$ 500,000
	Erie & Empire	1 Empire/36 Erie Township - Tributary of Rush River	Box Culvert	Major	2017	Local	$ 275,000
	Tower & Hill	32 Tower/5 Hill Township - Tributary of Maple River	Box Culvert	Major	2017	Local	$ 250,000
16	16	C16 -33 Addison/4 Davenport Townhsip - Maple River WRD - Drain 37	Box Culvert	Major	2017	Local	$ 250,000
26	Rochestor & Lake	C26 - 34 Rochestor/3 Lake Townships - Maple River	Box Culvert	Major	2017	Local	$ 500,000
	Durbin	9/16 Durbin Township - Maple River	Bridge Replacement	Major	2017	Local	$ 325,000
	Walburg	26/35 Walburg Township - Maple River	Bridge Replacement	Major	2017	Federal	$ 175,000
34	Wiser	C34 - 28/29 Wiser Township - North Cass WRD - Drain 26	Box Culvert	Major	2017	Local	$ 300,000
6	Addison	C6 - 7/18 Addison Township - Maple River	Bridge Repair - Abut - Rip Rap	Major	2017	Local	$ 150,000
	Mapleton	29/32 Mapleton Township - Maple River WRD Drain 14	Box Culvert	Major	2017	Local	$ 450,000
16	Warren & Normanna	C16 - 31 Warren/6 Normanna Townships Maple River WRD - Drain 34	Box Culvert	Minor	2017	Local	$ 300,000
		Various Minor Structures - TBD	Box Culverts/CMP's	Minor	2017	Local	$ 500,000
	Noble	23/26 Noble Township - Red River Tributary	Culvert	Major	2018	Local	$ 225,000
	Hill	28/33 Hill Township - Maple River	Bridge Replacement	Major	2018	Local	$ 800,000
	Gill & Everest	25 Gill/30 Everest Township - Buffalo Creek	Box Culvert	Major	2018	Local	$ 450,000
	Walburg & Maple River	25 Walburg/30 Maple River - Maple River	Bridge Replacement	Major	2018	Federal	$ 200,000
	Erie	25/36 Erie Townhship - Tributary of Rush River	Box Culvert	Major	2018	Local	$ 375,000
	Durbin	18/19 Durbin Township -Tributary of Swan Creek	Box Culvert	Major	2018	Local	$ 400,000
	Everest	11/12 Everest Township - Wheatland Channel	Box Culvert	Minor	2018	Local	$ 200,000
		Various Minor Structures - TBD	Box Culverts/CMP's	Minor	2018	Local	$ 500,000
	Addison & Durbin	5 Addison/32 Durbin Township - Maple River	Bridge Replacement	Major	2019	Federal	$ 200,000
	Noble	27/34 Noble - North Cass WRD Drain 32	Culvert	Major	2019	Local	$ 90,000
15	Mapleton	C15 - 8/9 Mapleton Township on Drain 14	Bridge Replacement	Major	2019	Local	$ 1,000,000
	Maple River	3/4 Maple River Township - Tributary of Buffalo Creek	Box Culvert	Major	2019	Local	$ 450,000
	Noble	15/16 Noble - North Cass WRD Drain 18	Culvert	Major	2019	Local	$ 90,000
	Gardner	3/10 Gardner - North Cass WRD - Drain 23	Box Culvert	Major	2019	Local	$ 150,000
16	Maple River & Leonard	C16 - 36 Maple River/1 Leonard Townships - Drain 39	Bridge Replacement	Major	2019	Local	$ 240,000
16	Maple River & Leonard	C16 - 35 Maple River/2 Leonard Townships - Drain 15	Bridge Replacement	Major	2019	Local	$ 240,000
		Various Minor Structures - TBD	Box Culverts/CMP's	Minor	2019	Local	$ 500,000

* 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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Miles

Jason Benson
County Engineer, P.E.

Richard Sieg
Highway Superintendent

DATE: July, 2013

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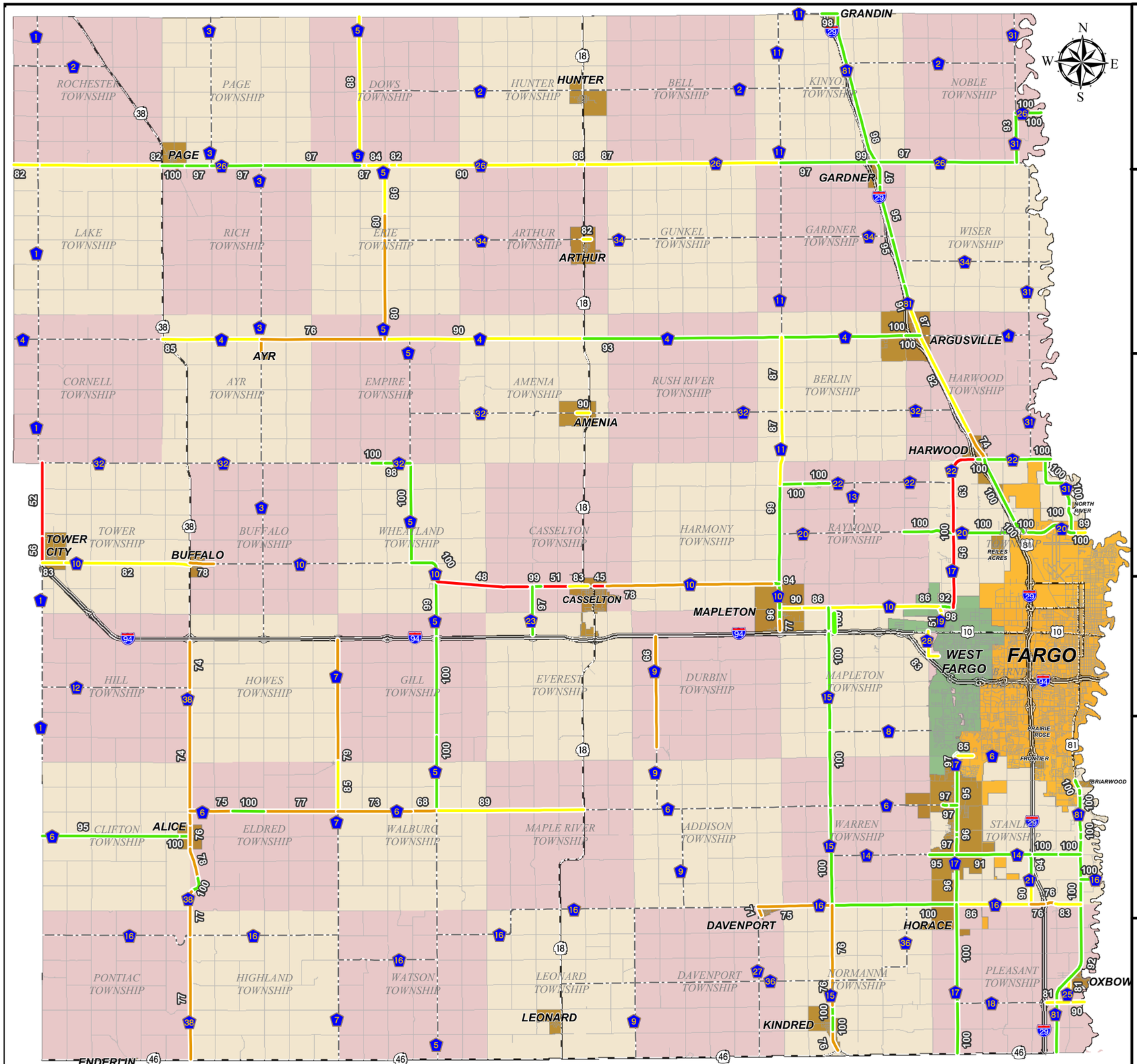

Appendix 3.

Cass County Highway Department

Pavement Condition Index (PCI)*

Poor — Good — Gravel
Fair — Very Good

*based on PCI Scale

	Poor 0-65	Fair 66-80	Good 81-90	Very Good 91-100
Miles	16.10	63.54	86.16	149.23
Average PCI	52.8	75.24	85.92	98.14
High PCI	63	80	90	100
Low PCI	45	66	81	91

*Pavement Evaluation completed by American Engineering Testing in 2012. 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.

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles

Jason Benson
County Engineer, P.E.

Richard Sieg
Highway Superintendent

DATE: July, 2014

CASS COUNTY GOVERNMENT

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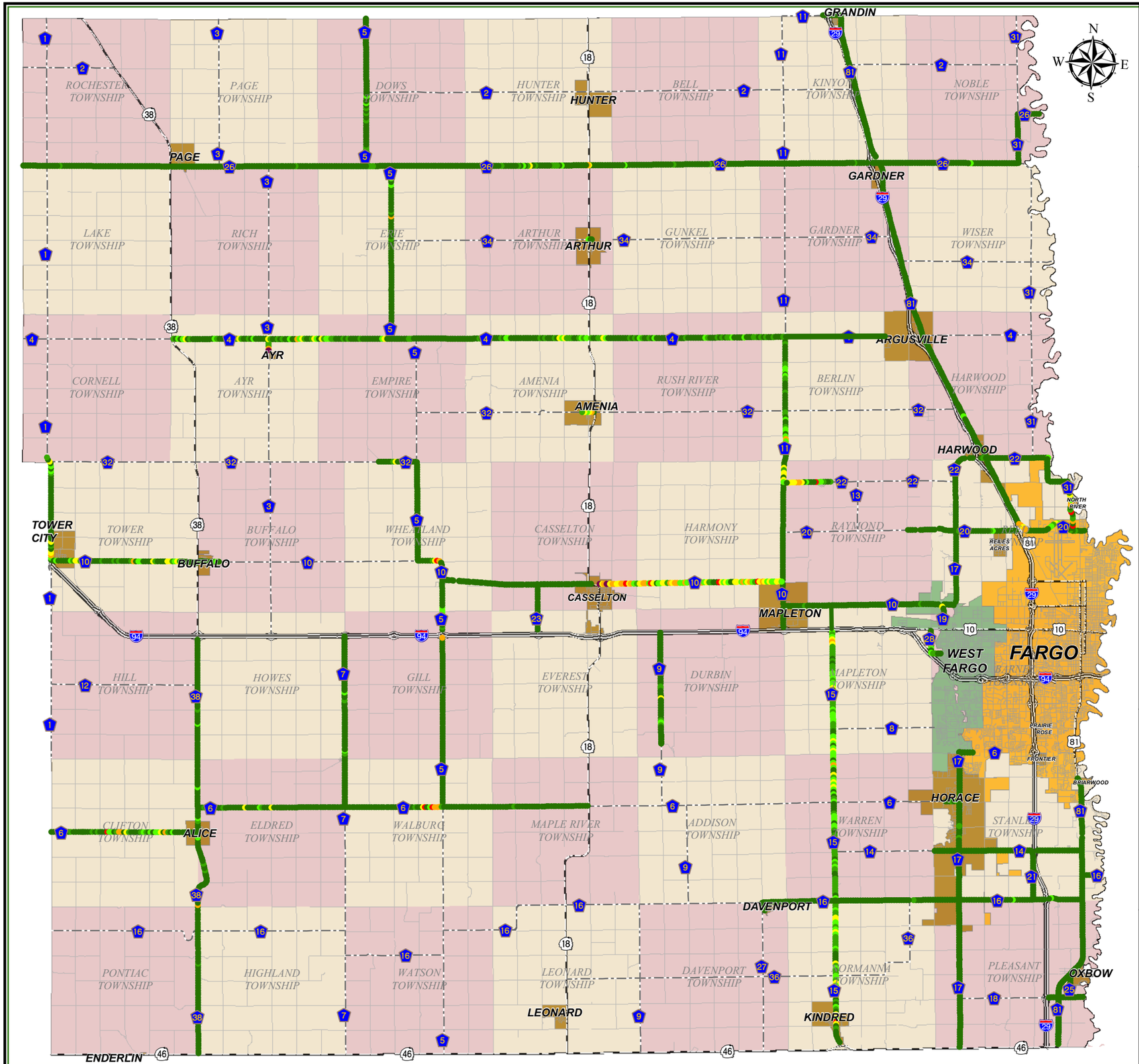

Appendix 4.

Cass County Highway Department

Highway Load Capacity

- 4 Tons/Axle
- 5 Tons/Axle
- 6 Tons/Axle
- 7 Tons/Axle
- 8 Tons/Axle
- 9 Tons/Axle
- 10 Tons/Axle

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles

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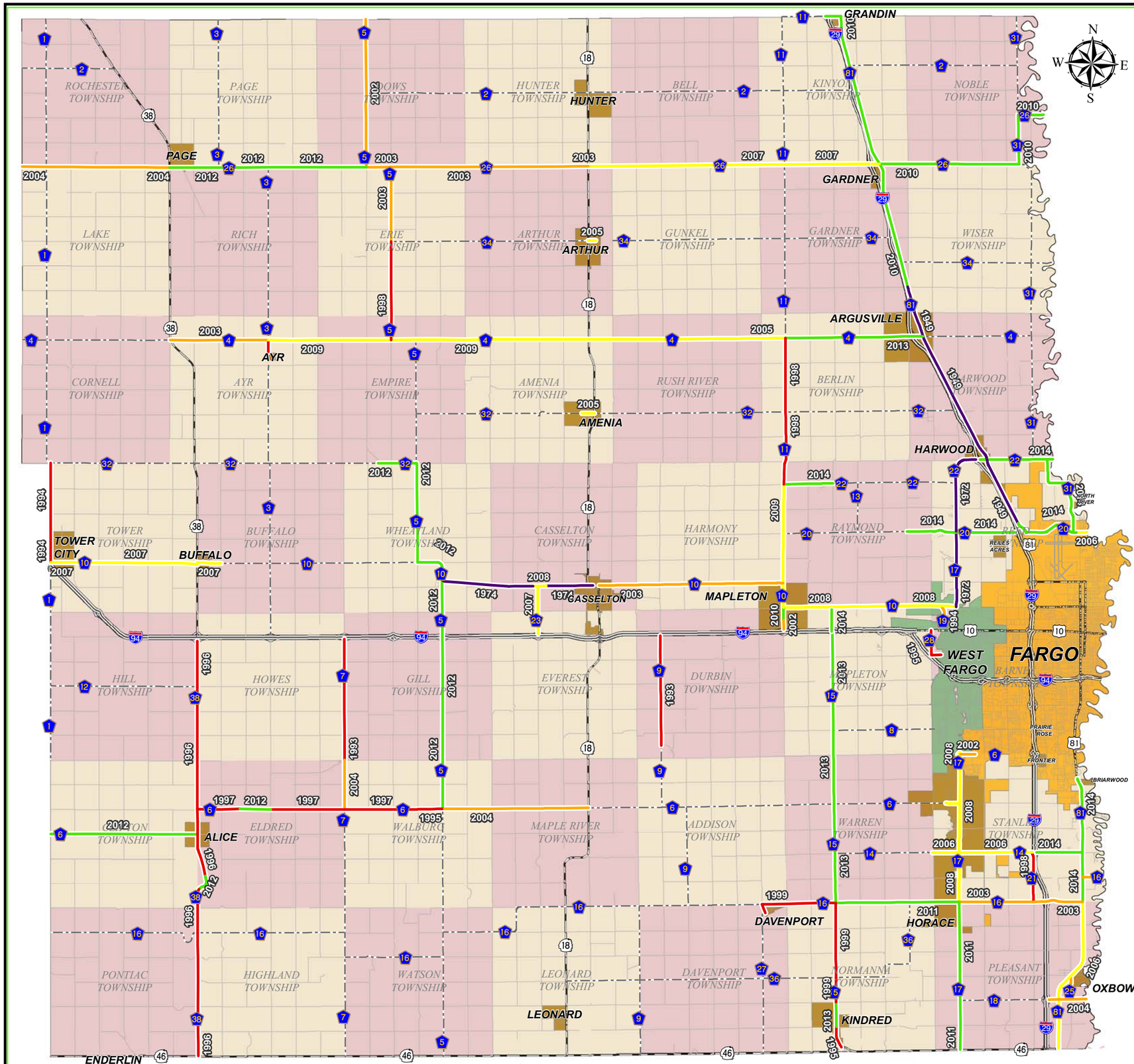
Appendix 5.

Cass County Highway Department

Paving Projects



Year of Last Paving Project

- 1949 - 1974
- 2005 - 2009
- 1993 - 1999
- 2010 - 2014
- 2000 - 2004
- Gravel

	1949-1974	1993-1999	2000-2004	2005-2009	2010-2014
Miles	22.77	60.73	52.61	72.82	106.08
Average PCI*	71.5	74.67	83.16	91.58	99.14

*Pavement Evaluation completed by American Engineering Testing in 2012. 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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Kilometers

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Miles

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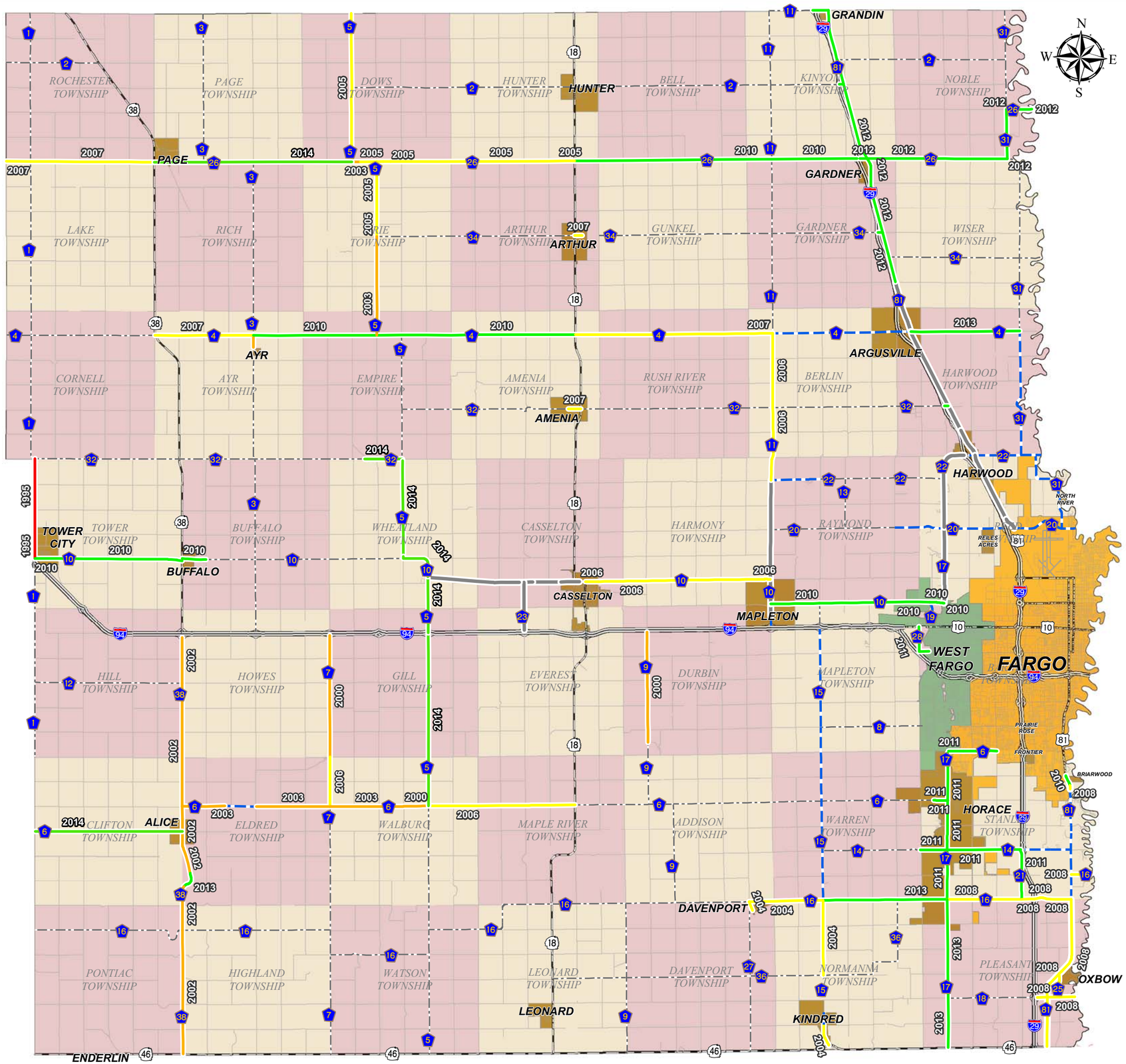

Appendix 6.

Cass County Highway Department

Seal Coat Projects

Year of Last Seal Coat

- 1993 - 1998
- 1999 - 2003
- 2004 - 2008
- 2009 - 2014
- Asphalt - No Seal Coat
- Concrete Surface
- Gravel

Category	Miles	Average PCI*
1993-1998	4.04	54
1999-2003	39.25	75
2004-2008	79.22	83
2009-2014	87.45	91
Asphalt - No Seal Coat	77.23	96
Concrete Surface	37.88	80

*Pavement Evaluation completed by American Engineering Testing in 2012. 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.

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles

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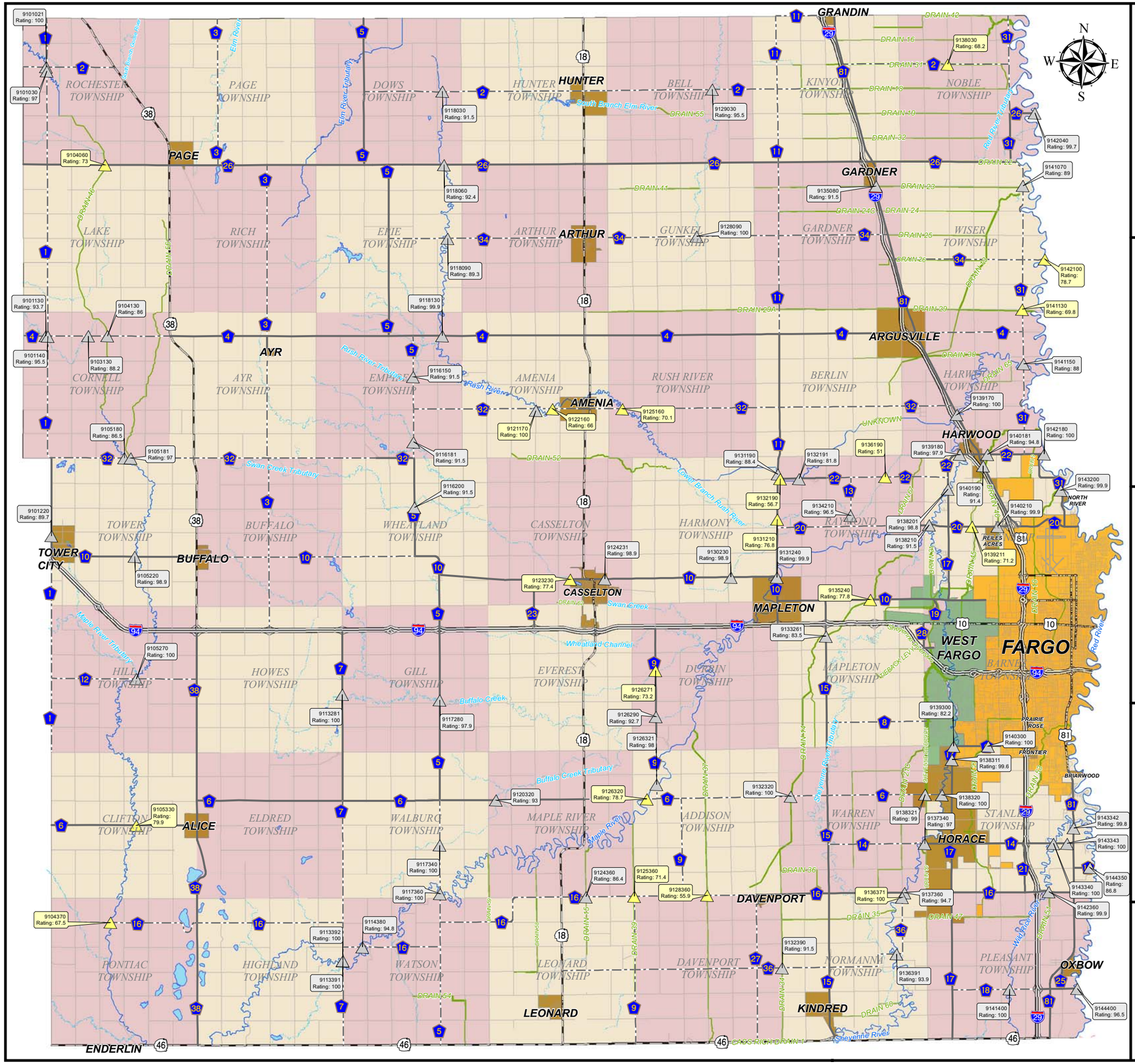

Appendix 7.

Cass County Highway Department

ND DOT 2013/2014
Bridge Inspection and Appraisal
Bridges on County Roads

Bridge Sufficiency Rating Categories

- 0-49.9 Sufficiency
- 50-79.9 Sufficiency
- 80+ Sufficiency
- ★ Code Three Structure

	80+	50-79.9	0-49.9	Code 3
Total	70	18	0	0
Average	95.28	70.18	N/A	N/A
Low	81.8	51	N/A	N/A
High	100	79.9	N/A	N/A

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles

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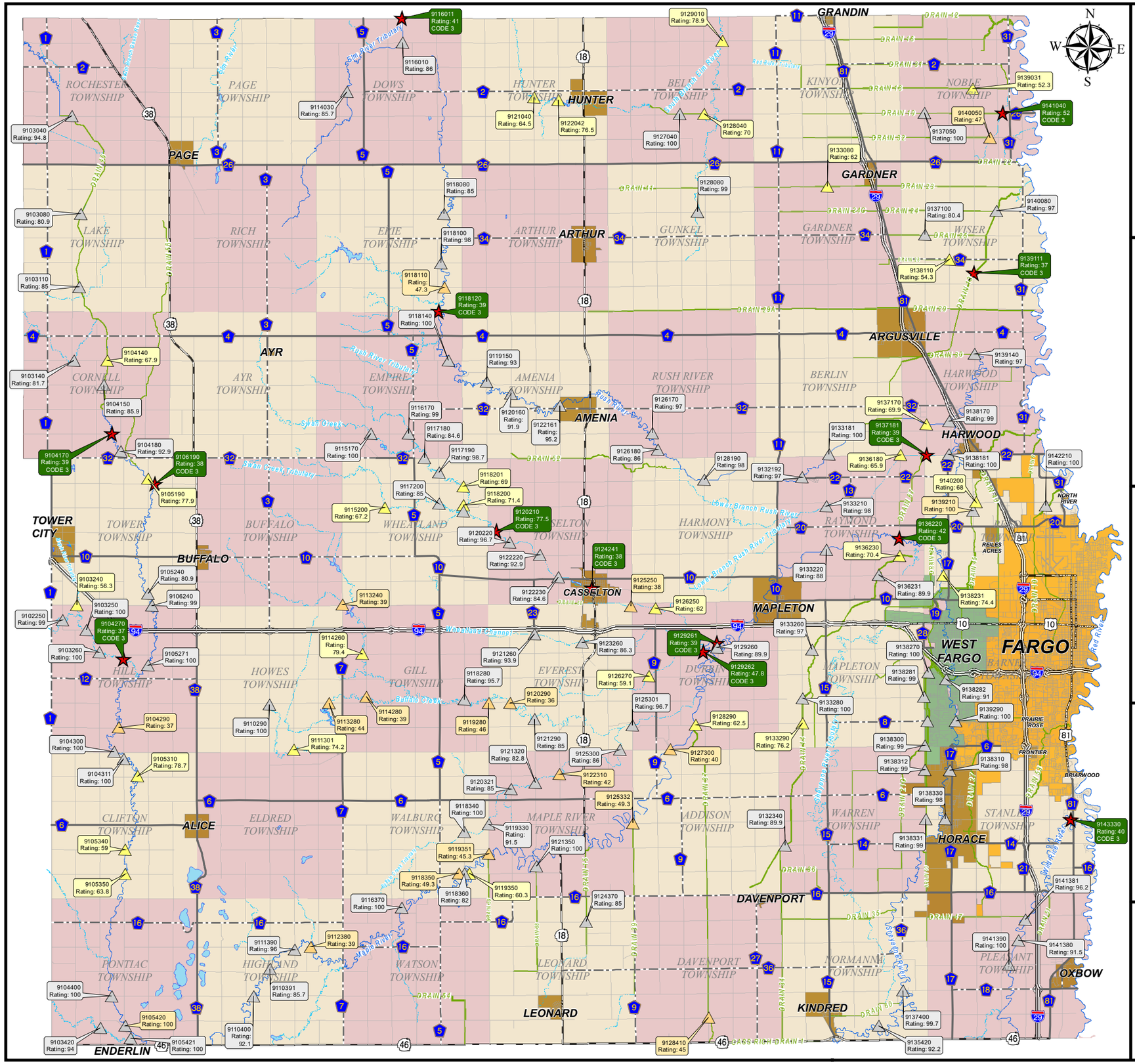

Appendix 8.

Cass County Highway Department

ND DOT 2013/2014
Bridge Inspection and Appraisal
Bridges on Township Roads

Bridge Sufficiency Rating Categories

- 0-49.9 Sufficiency
- 50-79.9 Sufficiency
- 80+ Sufficiency
- Code Three Structure

	80+*	50-79.9*	0-49.9*	Code 3
Total	91	28	21	14
Average	94.08	67.57	42.72	43.31
Low	80.4	52.3	37	37
High	100	79.4	49.3	77.5

*Not including Code 3 Structures

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles

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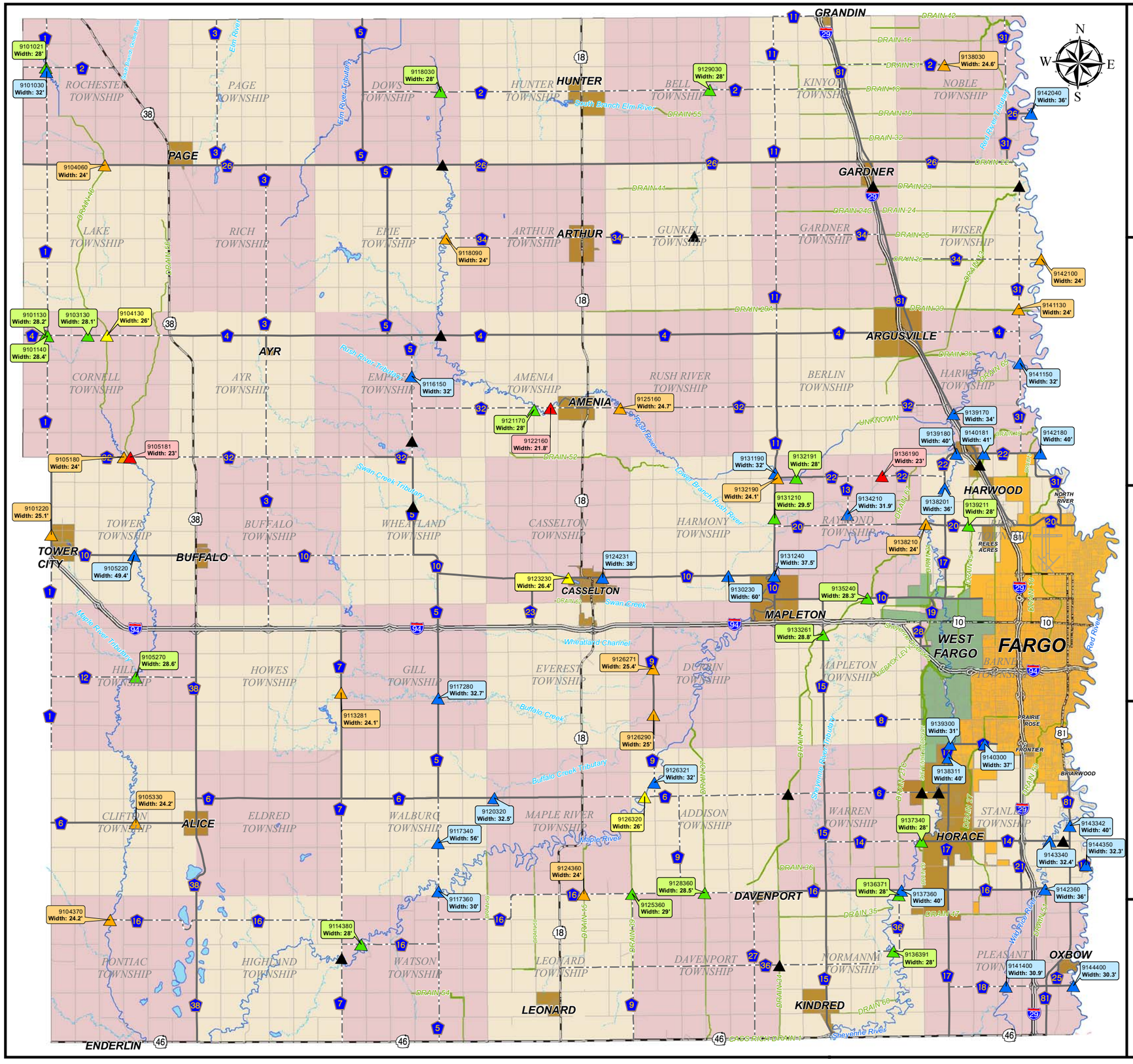

Appendix 9.

Cass County Highway Department

ND DOT 2013/2014
Curb to Curb Roadway Width
Bridges on County Roads

Roadway Width (Feet)

- ▲ Under 24'
- ▲ 24' - 25.9'
- ▲ 26' - 27.9'
- ▲ 28' - 29.9'
- ▲ 30' and Over
- ▲ Unknown/No Data

	Number of Bridges
Under 24'	3
24' - 25.9'	16
26' - 27.9'	3
28' - 29.9'	19
30' and Over	30

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles

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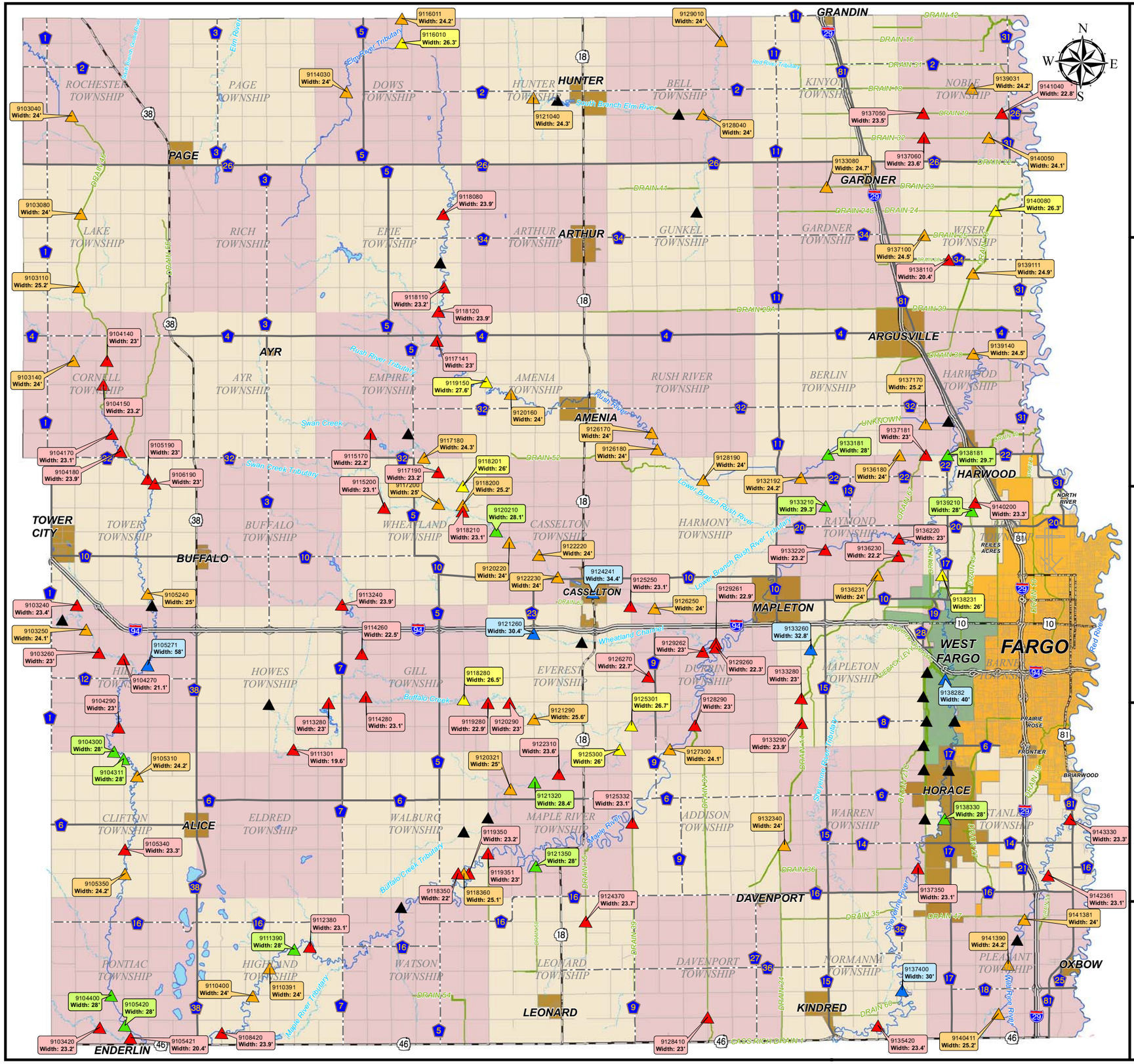

Appendix 10.

Cass County Highway Department

ND DOT 2013/2014
Curb to Curb Roadway Width
Bridges on Township Roads

Roadway Width (Feet)

- ▲ Under 24'
- ▲ 24' - 25.9'
- ▲ 26' - 27.9'
- ▲ 28' - 29.9'
- ▲ 30' and Over
- ▲ Unknown/No Data

	Number of Bridges
Under 24'	59
24' - 25.9'	44
26' - 27.9'	8
28' - 29.9'	13
30' and Over	6

0 5 10 15 20
Kilometers

0 5 10 15 20
Miles

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