

FLAGSTAFF COUNTY

RURAL ROAD STUDY



APRIL 2013

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EXECUTIVE SUMMARY

GENIVAR was retained to provide a "road infrastructure and network study" report.

Following are the key components/recommendations included in the report:

- **Road Network:** The existing roadways throughout the County have been categorized and prioritized into an overall County network system comprised of three specific classifications of roads, that being Arterials, Collectors and Local roads. The purpose of this classification system is to provide a cost-effective-network system complimenting the Two- and Three- digit provincial highway network throughout the County. The County network was established through consultation with County Council, County Administration, and Public Works staff in order to establish an efficient network that will act as a "feeder" system to the Provincial highway network and the local communities within Flagstaff County for the efficient movement of County Ratepayers and the traveling public.
- **Roadway Classification System:** In order to provide an achievable cost-effective and safe network, a hierarchy of five different "Roadway Classifications" have been established. These classifications are Arterial, Collector, Local, Rural Residential, and Field Access roads.
- **Surfacing Program:** Of the existing 1,780 miles of roadway that encompass Flagstaff County, currently 4.5 miles are paved and 45 miles are oiled roads. The County has an oil rehabilitation program in place that is based on a 5-7 year rotation, and a dust suppressant program (calcium) that involves approximately 52 miles of municipal roadway.
- **Bridge Structures:** A cursory overview and evaluation of existing information on bridge structures and capital repair/replacement cost priorities in order to provide a plan that can be integrated with the County's long-term capital plans for road rehabilitation.
- **Recommendations:** This section describes conditions, conclusions and recommendations for Flagstaff County roadways and bridge network as well as a review of available grants which may be applicable.

The County is responsible for 84 bridge structures, 4.5 miles of local paved roads (not including the 4 Towns or 6 Villages), 45 miles of local oiled roads, 1436 miles of local gravel roads, and 290 miles of local field access roads.

In close consultation with Flagstaff County officials and County staff a long-term construction program has been established to identify required upgrades to the existing network. These upgrades were established utilizing specific criteria to evaluate the overall needs of the network including, but not limited to, safety, traffic volume, structural adequacy, alignment elements, and drainage. These required upgrades have been prioritized and categorized into "four" construction priorities, with each priority being comprised of approximately three years of capital construction funding.



Re-evaluation

It should also be noted that an evaluation system has been developed and reviewed with County staff to allow for future re-evaluation of a given roadway by County staff (or consultant) should the need arise. If a major traffic generator develops within the County this may require a re-evaluation and subsequent change to a given roadway-ranking priority. Similarly as there remains many developed roadways that have not been evaluated, these could be added by utilizing the same ranking system and incorporated into the priority-ranking listing should Council and administration so desire. This report and system of evaluation is meant to be a tool to aid in the future evaluation and programming.

As this report is a living and working document it is important to re-evaluate sections of road once improvements have been made and to update the study report accordingly.



TABLE OF CONTENTS

1. INTRODUCTION.....	- 1 -
1.1 COUNTY BACKGROUND	- 1 -
1.2 ROAD STUDY BACKGROUND	- 2 -
1.3 METHODOLOGY	- 3 -
1.3.1 Gravel Roads	- 3 -
1.3.2 Bridges	- 3 -
1.3.3 Surfaced Roads	- 4 -
1.3.4 Major Land Use and Traffic Generation.....	- 4 -
1.3.5 Traffic Count Data.....	- 4 -
2. ROAD NETWORK	- 5 -
2.1 CLASSIFICATIONS.....	- 5 -
2.1.1 Arterial (Dust Free).....	- 6 -
2.1.2 Collector	- 6 -
2.1.3 Local	- 7 -
2.1.4 Rural Residential	- 7 -
2.1.5 Field Access	- 7 -
2.1.6 Resource Road(Where Applicable) for Provincial Grant Application Purposes ...	- 7 -
3. CAPITAL CONSTRUCTION PROJECTIONS	- 8 -
3.1 EXISTING CONDITION	- 8 -
3.2 PRIORITIZATION OF CONSTRUCTION PROJECTS	- 9 -
3.3 SURFACED/DUST FREE ARTERIAL ROADS	- 9 -
3.3.1 General	- 9 -
3.3.2 Arterial (Dust Free).....	- 9 -
3.3.3 Long-Term Calcium Dust Suppressant.....	- 10 -
3.3.4 Paved Surface (Light Membrane) - Spring Ban Required.....	- 10 -
3.3.5 Paved Surface (Full Structure) - Ban Free.....	- 11 -
3.3.6 Life Cycle Capital Cost Comparison (see Appendix for detail breakdown).....	- 11 -
3.4 ADDITIONAL FUNDING.....	- 12 -
3.5 CONSTRUCTION PROGRAM SUMMARY	- 12 -
3.6 UNIT COSTS FOR CONSTRUCTION	- 12 -
4. TOTAL ROAD RE-CONSTRUCTION VERSUS ROAD REHABILITATION.....	- 14 -
5. RECOMMENDATIONS.....	- 18 -



TABLES

Road Inventory Summary
Design Parameters for Existing Road Standards
Road Construction Unit Cost Estimates
Typical Bridge Replacement Unit Costs

APPENDIX "A" - FIGURES

Figure 1 Roadway Network
Figure 2 Traffic Generators
Figure 3 Long-Term Capital Construction Map

APPENDIX "B" - TYPICALS

Typical 1 Arterial Road - 8.0 meter Calcium Dust Free Gravel Surface
Typical 1A Arterial Road - 9.2 meter Paved Surface (Light Membrane) - Spring Road Ban
Typical 1B Arterial Road - 9.0 Meter Paved Surface - Ban Free
Typical 2 Collector Road
Typical 3 Local Road
Typical 4 Residential Access
Typical 5 Field Access

APPENDIX "C" - CAPITAL COSTING

Twenty Year Long Range Capital Costing Tables

APPENDIX "D" - TRAFFIC COUNTS

APPENDIX "E" - BRIDGE PRIORITIES



1. INTRODUCTION

1.1 County Background

Flagstaff County is located approximately 130 kilometres southeast of Edmonton, and 150 kilometres east of Red Deer.

Established in 1944 as the Municipal District of Killam No. 390, Flagstaff County encompasses approximately 4,065 square kilometres within its jurisdiction.

Agriculture is the dominant land use with over 98% of lands within the County under cultivation or used for pasture.

- Urban municipalities located within the County are the Villages of Alliance, Galahad, Forestburg, Heisler and Strome, as well as the Towns of Daysland, Killam, Hardisty and Sedgewick. The population of the County currently is reported as 3,244.
- The oil and gas sector along with the development of the Agricultural Industry including the new grain elevators have had significant impacts on the growth and prosperity of the County.
- The County has continually improved the road network by utilizing contracted construction crews which targets the reconstruction of approximately 7 miles of local road reconstruction per year. Other improvements include the County oiling, dust suppressant and road recovery (shoulder pull) programs to maintain their existing infrastructure. The County also administers its own road maintenance and gravelling programs, both of which appear to be functioning very well and within the financial means of the municipality.

The number of miles for each of the existing types of roads in the County is listed in the following table. This table does not include undeveloped road allowances.

Road Inventory Summary

	LOCAL ROADS					
Surface Type	Pavement	Oiled	Gravel/Calcium	Gravel	Field Access	Total
Miles	4.5	45	52	1384	290	1780



1.2 Road Study Background

GENIVAR Inc. has been retained by Flagstaff County to complete a rural road study to show road categories including bridges and how this infrastructure, based on its condition and utilization, are systematically placed in an order of priority inside a long-term plan.

The rural road study update team within GENIVAR Inc consists of the following staff:

Garth McCulloch	Regional Manager
Darrin Newell	Area Manager
Kurt Petrica, P. Eng.	Senior Bridge Engineer
Mike Moisan	Senior Draftsman
Michelle Laliberté, B. Ed.	Contracts Administrator

Several meetings were held at the Flagstaff County office in Sedgewick. During these meetings, the following events took place:

- A review of Public Works policies, procedures, and priorities was undertaken with the Public Works Superintendent and members of his support staff.
- One-on-one information gathering sessions were held with each Flagstaff County Councillor.
- A work shop review meeting of the draft report with the Public Works Staff and Administration.
- A work shop review meeting of the draft report with the Public Works Staff, Administration, and County Council.

The objective of this study is to:

- Establish a long-term road infrastructure "hierarchy network system" which is complementary to the provincial Highway network within the County.
- Assess and prioritize the select rural roads identified by the County as priority for construction.
- Rank or prioritize identified bridges for the purpose of establishing a priority listing of construction projects.
- Estimate the costs for construction of the road network for the next 10+ years.
- Road Recovery Review.



1.3 Methodology

1.3.1 Gravel Roads

The methodology used for the gravel road portion of this study proceeded with the following steps:

- Rural roads were identified into the following categories: Arterial, Collector and Local.
- Used established set of criteria for evaluation of the existing roads including safety, traffic volumes, existing road cross-section, structural adequacy, and drainage.
- Used existing weighting system for each of the criteria to be utilized during evaluation.
- Gather, review, and analyze existing and new data.
- Gather field data, review all available traffic counts and incorporate these into the study, review land use and traffic generators that may have changed in the last 10 years.
- Review the evaluation technique with County staff to ensure compatibility and consistency for future updates to the report by County staff.
- Rank each road in the overall study to determine an order for prioritizing capital construction projects.
- Coordinate road construction projects with major bridge repairs/construction where possible.
- Assign cost estimates to each of the prioritized roads
- Assemble data, make conclusions and put forth recommendations in a report format. Include electronic copies of report as well as hard copies.

1.3.2 Bridges

In order to provide a general overview of capital expenditure requirements a cursory review of the following existing bridge information for Flagstaff County was conducted:

- Bridge Information System (BIS)
- Bridge Inspection and Maintenance System (BIM).
- Some of the information regarding the condition of bridge structures is up to five years old. Therefore, between the date of last inspection and the writing of this report, the condition of those structures may have changed. Change resulting from repairs performed during that period or further deterioration from weather and usage will be determined during the next round of BIM inspections conducted by the County.

The latest BIM and BIS information was obtained from Alberta Transportation (AT) and analyzed.

Firstly, the BIS was reviewed to gather general information on standard bridges, major structures, and culverts located on all rural roads in the County. Some of the important information obtained from the BIS were: land location, roadway, category, year built, number of spans, span lengths, bridge length, gross deck width, and Average Annual Daily Traffic (AADT).

Secondly, the BIM was reviewed to gather further information on current conditions of the bridge structures. Information gathered such as the date of the last inspection, general ratings on superstructure, substructure, approach, channel, horizontal/vertical alignments, height restrictions



(on through trusses), weight restriction (if below standard) and the anticipated remaining life of the structures is important when prioritizing the County's Bridge Upgrade/Replacement Program.

Thirdly, the previously completed Three Year Bridge Plan was reviewed for completeness.

Non-bridge sized culverts on rural roads are not included in this study.

1.3.3 Surfaced Roads

A review of the existing conditions of the surfaced local roads within the County was conducted. Information previously gathered such as width, length, surface treatment and condition was reviewed. The County's current proposed construction/maintenance program for surfaced roads was reviewed and recommendations made as to future construction priorities to complete the County's Arterial (Dust Free) network.

1.3.4 Major Land Use and Traffic Generation

Agriculture, oil and gas activity as well as recreation/tourism play a major role in the County's economy. The increased haul distance to the new larger grain terminals have resulted in an increase in the number of combination agricultural trucks, such as "B" train configurations, using the rural road network.

The following number of Agricultural Industry and Oil and Gas sites are major traffic generators within Flagstaff County:

Agricultural Industry Sites	59
Oil/Gas Industry Sites	33
Waste Management Facilities	11
Aggregate Resources	10
Well Sites	+ 2700

Flagstaff County has seen a steady rise in oil and gas activity. This significant increase in activity has, in turn, increased the potential of road damage as a result of the movement of heavy equipment on local roadways. The majority of these moves are made by commercial companies servicing the oil and gas industry.

The "Two- and Three- Digit" highway network in the County consists of an estimated 265 miles of provincial highway network. The relative spacing of these provincial highways provides excellent access throughout the county for the public and industry.

If Council approves of the recommended County network and budgets over the long term for systematic improvements to this system, the County will meet the needs of its transportation demands and ratepayer expectations for the safe and efficient movement of people and goods to markets throughout the County.

1.3.5 Traffic Count Data

The traffic count data gathered for this study came from the County.

The County conducts their own traffic counts at various locations throughout the County. The locations and respective volumes are found in the appendix of the report.

The County's traffic counts have been undertaken for several years and although the count data



has not been converted or processed to obtain AADT numbers, they do provide exact vehicle counts for the period counted.

2. ROAD NETWORK

2.1 Classifications

It is recommended that Flagstaff County consider establishing five specific classifications to implement and complete an overall network system within and throughout the County. The classifications currently being considered are:

- Arterial: (Dust Free) 9 meter(A.C.P) or 8 meter(Calcium) width - 100 km/hr posted Speed Limit (110km/hr Design).
- Collector: Gravel 8 meter width –80 km/hr posted Speed Limit (90 km/hr Design).
- Local: Gravel 8 meter width – No posted Speed Limit (90 km/hr Design).
- Rural Residential: Gravel 7.3 meter width - No posted Speed Limit.
- Field Access: Gravel 5.0 meter width – No posted Speed Limit.

For the detailed "Typicals" refer to the appendices.

Together with the County, GENIVAR Inc. has defined the classifications.

Design speeds have been reviewed and applied to the various classifications based on practical costs and expectations from the traveling public.

The design of any given road or highway in Alberta is completed at "design parameters" for a speed of 10 kms higher than the required legal-speed-limit posting. This "safety factor" is incorporated into the design of any road due to the "85th speed percentile" of the traveling public in which the 85th percentile speed is approximately 8 -10 kms over the posted speed limit. The "Arterial" will be designed for a posted speed of 100 km/hr while the "Collector" will be designed for a posted speed of 80 km/hr. "Local" roads will also be designed for posted speed of 80 km/hr which is also the default speed limit for non-signed rural gravel roads.

Design Parameters for Existing Road Standards

Parameters		Arterial (Dust Free)	Collector	Local Road	Rural Residential	Field Access
Design Speed (km /hr)		110	90	90	70	No Spec
Roadway Width (meters)		8.0 (CaCl), 9.0 (ACP)	8.0	8.0	7.3	5.0
Desirable Sideslopes		4:1	4:1	4:1	4:1	*3:1
Desirable Back Slope		7:1	7:1	7:1	7:1	*3:1
Ditch Width (metres)		3.5	3.5	3.5	3.5	No Spec.
Recommended Right-of-Way (meters)		30	30	20	20	20



Below are detailed descriptions of each type of roadway designation that this document identifies and may be developed within the County boundaries at this time. These descriptions give justification and support to why a particular road is given its designation. Designations may change for any number of reasons as development occurs in the County.

2.1.1 Arterial (Dust Free)

Arterial roads are the main thoroughfares and generally have the highest traffic volumes within the County's network of roads. They are designed to handle traffic that is going from a provincial highway to another provincial highway or going from a community, through other communities on the way to a provincial highway. They may handle traffic heading to and from industrial areas. The Arterial road network provides a complementary integrated network of connections for the efficient and timely movement of traffic to the provincial highway system. They serve both local and through traffic. An Arterial road generally meets one or more of the following criteria:

- Traffic volumes in excess of 100 vehicles per day.
- Connects one Town to another Town.
- Connects a Town or Summer Village to a provincial highway.
- Connects a Town or Summer Village to an Arterial road.
- Connects one provincial highway to another provincial highway.
- Connects traffic going to and from an industrial or surface resource to a provincial highway

The Arterial road standard for the County is a 8 metre finished gravel dust-free surface or 9 metre paved width and constructed to a 110 kilometre per hour design speed in a 30 metre right-of-way. A typical cross-section for the Arterial road is shown in the appendices.

2.1.2 Collector

Collector roads funnel local traffic to the Two-and Three-digit highway network, the Arterial road network or communities throughout the County. A Collector road would generally meet one or more of the following criteria:

- Traffic volumes in excess of 50 vehicles per day.
- Connects an Arterial road to another Arterial road.
- Connects multi-lot rural residential areas, hamlets, summer villages or other populated areas to the provincial highway system or an Arterial road.
- Connects recreational sites to a provincial highway or Arterial road.



The Collector road standard provides a 8 metre finished gravel surface width and constructed to a 90 kilometre per hour design speed in a desirable 30 metre right-of-way. A typical cross-section for the Collector Road is provided in the appendices.

2.1.3 Local

Rural roads that are not included in the above classification system or the provincial highway system are considered to be Local roads. Local roads meet one or both of the following criteria:

- Serves a local function and is not generally used for long distance travel.
- Low volume roads that generally serve only local traffic.

The Local Road standard is an 8.0 metre finished gravel surface built to a 90 kilometres per hour design speed, in a desirable 30 metre but acceptable 20 metre right-of-way if back sloping is agreed to with the landowner. A typical cross-section for a Local Road is provided in the appendices.

2.1.4 Rural Residential

Roads that are not included in the Arterial, Collector, or Local classifications or the provincial highway system and can be defined as a Rural Residential access. The proposed rural residential standard is for a 7.3 metre finished gravel surface built to a 70 km/h design speed within a 20 metre right-of-way. Surfacing gravel specifications shall meet County standards. These roads typically meet one or both of the following criteria:

- Serves a local function for an access to a rural residential site. Low volume road that generally serves only local traffic.

2.1.5 Field Access

These roads are only developed for a singular use, such as access to agricultural land/grain storage facilities/single oil lease etc.

2.1.6 Resource Road(Where Applicable) for Provincial Grant Application Purposes

The term “Resource Road” can be applied to any road that meets Alberta Transportation criteria under their grant-funding program. Normally these roads would be built to a Collector road standard unless surfacing was required in which case the modified Arterial road design would be used. The requirements for funding are specifically defined and therefore the County should annually assess existing and new industrial roads throughout the County for increased activity. Cost sharing may be also be considered an acceptable option to industry to further enhance the



funding application to the Provincial Government as industry typically realizes a long-term transportation cost benefit due to the proposed improvement.

These roads serve the resource sector such as forestry, oil and gas and sometimes agriculture. They usually accommodate higher than average volumes of heavy truck traffic and can link with any Arterial or Collector road and sometimes with Primary and Secondary Highways. Under this application, a Resource road must have the traffic volumes to meet the funding criteria of Alberta Transportation's Resource Roads Program. A Resource road must meet the following criteria:

- The road must be used by at least 25 trucks per day on average during any 3 month period. Points start at overall 100 vehicles per day.
- For roads accessing gravel operations the last 3 years of production must have been hauled outside of the municipality.
- Serves one or more specific resource-based industries.
- Paving will only be supported where the traffic volumes exceed 400 vehicles per day.

Please note that currently there are no roads shown as Resource roads on the hierarchy layout map, as all roads are eligible for funding based on the criteria requirements for a RRP grant application.

3. CAPITAL CONSTRUCTION PROJECTIONS

In conjunction with Flagstaff County staff, GENIVAR Inc. has developed a Long-Term Capital Construction Plan.

The proposed Construction Program rating system for Flagstaff County was developed using a number of factors, including:

- Existing condition of the road
- Functional importance of each road within the proposed network system
- Proposed classification for each road
- Estimated cost of construction based on 2013 dollars
- Review and discussion with County officials and staff to identify ratepayer needs.

The following sub-headings outline the steps taken in developing the Construction Program.

3.1 Existing Condition

Each selected road was visually inspected to determine its existing condition and each is given a rating based on that condition. With input from County Council and the Public Works staff the roads were evaluated based on traffic volume, safety, structural adequacy, and existing road maintenance.



3.2 Prioritization of Construction Projects

Once the roads were rated, the Capital Construction Program was developed. The method used in developing this program is outlined below:

- Once the overall list of required capital upgrades was established, the individual projects were then prioritized (ranked) into a scale from one through four, with one being the highest priority and four being the lowest priority. Each ranking represents approximately three years of capital construction requirements. As a result each specific project regardless of classification, within group of projects/ranking, are considered of similar priority to the County. County Council and/or Administration can interchange the priorities within that given three year window. This can also be applied to the roads ranked in the categories of two, three and four.
- Capital Cost estimates have been calculated and applied to the required upgrades and utilized in providing a long-term-budgetary-requirement planning tool for the development of the Road Network.

3.3 Surfaced/Dust Free Arterial Roads

3.3.1 General

As previously noted the "Two-and Three-Digit" provincial highway system within the County provides excellent access throughout the County for the traveling public and industry. Once fully implemented the proposed Arterial and Collector network will provide an excellent complementary link to this highway system to facilitate the safe and efficient movement of the travelling public and goods to markets throughout the County.

3.3.2 Arterial (Dust Free)

Currently Flagstaff County has a total of 4.5 miles of ban-free paved road, 45 miles of oiled roads and 52 miles of calcium sealed roads. Typically the oiled roads are rehabilitated on a five-to seven-year life cycle with a long-term plan to eliminate most of cold mixed oiled structures throughout the County. The current Arterial roads treated with calcium dust suppressant are rejuvenated on a twice per year or as needed basis.

In order to establish a long-term Arterial network to serve the County's requirements, three different surfacing scenarios/options have been presented for County consideration. The three scenarios include "Long-Term Calcium Dust Suppressant", "Paved Surface (Light Membrane) - Spring Ban Requirement", and " Paved Surface - Ban Free".

The three options for the Arterial network all present positives and negatives. In general, the higher the standard of surfacing structure provided, the higher the level of serviceability, with lower year-year maintenance costs. However, higher capital investment costs are required to develop the higher standard surfacing network.



3.3.3 Long-Term Calcium Dust Suppressant

The Calcium option that Flagstaff County currently provides for a significant portion of the Arterials is the most cost effective option. The roads are typically constructed to a width of 8 meters with higher design criteria (110 km/hr) for vertical and horizontal alignment control.

The sub-grade modulus structure is well constructed to maximum densities at optimum moisture out of natural non-organic materials available throughout the projects limits.

The dust free surface provides for safe travel at a reasonable rate of speed and enhances vision during travel and protects residences along the routes from an excessive amount of dust.

Calcium, however, does require ongoing maintenance/blading and can create a "slippery" surface during wet conditions. Regular rehabilitation with aggregate and calcium are a requirement leading to yearly or bi-yearly expenditures on all the treated surfaces.

The typical capital cost in 2013 dollars for the construction and initial treatment for a mile of calcium treated Arterial is:

- \$335,000 per mile for road grade reconstruction to a finished 8 meter top with 4:1 sideslopes.
- \$ 17,000 per mile for calcium treatment for the initial construction application.
- \$ 18,500 per mile for calcium treatment every year (typically two applications).

Note: Calcium chloride costs include product supply and application/gravel/county input costs, etc.

3.3.4 Paved Surface (Light Membrane) - Spring Ban Required

The second option for consideration requires a higher capital input cost but raises the level of serviceability for the travelling public, while at the same time reduces the year to year maintenance for the required Arterial.

The option requires the reconstruction of the subgrade to an 10.8 meter width and then the application of a "light membrane" Granular Base Course with Hot mix Asphalt structure to finished width of 9.2 meters.

The structure is comprised of 100 mm of Granular Base Course and 100 mm of Asphaltic Concrete Pavement.

Do to the thinner structure a "Spring Ban" is required on the pavement for a period of approximately 6 - 8 weeks during which time industry must utilize alternative routes. The local ratepayers are typically allowed to transport product at 100 percent loads accessing the closest gravel road allowance only prior to leaving the paved surface.

If managed correctly this structure and network can last for 15 to 18 years prior to major rehabilitation requirements.

This system and structure was utilized and resulted in excellent performance for Lacombe County for many years until funding and rehabilitation (after the 18 year life period) lead to an overlay providing a ban-free Asphalt structure.

The typical capital cost in 2013 dollars for the construction and surfacing for a mile of light membrane "Paved Surface" is:



- \$420,000 per mile for road grade reconstruction to a finished 10.8 meter top with 4:1 sideslopes.
- \$370,000 per mile for Granular Base Course and 8.0 meters of Asphaltic Concrete Pavement.

3.3.5 Paved Surface (Full Structure) - Ban Free

The third option is typically what the Province of Alberta ultimately places on Three-digit Highways throughout out Alberta to achieve a very high level of serviceability, safety, with year round-ban-free movement of agricultural and industrial goods throughout the province.

The option requires the reconstruction of the road grade to an 12.2 meter top and then the application of a "ban-free membrane" of Granular Base Course with Hot mix Asphaltic Concrete Pavement.

The structure typically is comprised of a Granular Base Course layer of 300 mm in thickness with an Asphalt structure of 100 mm at a full finished road surface width of 9.0 meters.

The typical capital cost in 2013 dollars for the construction and surfacing for a mile of 9.0 meter wide "Ban-Free Paved Surface" is:

- \$440,000 per mile for road grade reconstruction to a finished 12.2 meter top with 4:1 sideslopes.
- \$710,000 per mile for 300 mm of Granular Base Course and 100 mm of Asphaltic Concrete Pavement 9.0 meters wide

3.3.6 Life Cycle Capital Cost Comparison (see Appendix for detail breakdown)

It is clear from the above examples that the higher the standard of structure chosen for the Arterial network, the initial capital cost requirements for the County will be higher as well.

The total miles of the proposed Arterial network within Flagstaff County is approximately 152 miles. Based on this mileage and various surfacing strategies the following 2013 dollar capital cost outlay requirements for a **20 year period** including required road recovery and grade construction" are as follows:

1. Calcium 8.0 meter gravel width - capital costs, initial treatment, and yearly rehabilitation (including County gravel and application costs)
\$62,019,000/ twenty years = **\$3,100,950 per year expenditure**
2. Paved 9.2 meter Surface (Light Membrane) - Spring Ban required
\$104,220,000/twenty years = **\$5,211,000 per year expenditure**
3. Paved 9.0 (Full Structure) - Ban Free
\$177,840,000/twenty years = **\$8,892,000 per year expenditure**



As the example above indicates, based on a twenty year time period to develop, construct, and maintain an Arterial network in 2013 dollars, the capital and rehabilitation costs vary dramatically pending the "type of surfacing strategy" chosen by Flagstaff County. From a low of \$3.1 million per year for Calcium to a high of almost \$9 million per year for Asphalt surface ban-free structure.

3.4 Additional Funding

From time to time, new sponsorship programs or special project funding arrangements may become available. Typically, Industry, the Provincial or Federal Governments, may share a common interest or goal with Flagstaff County and may be prepared to fund or cost share specific roadway projects. Grading projects should be taken into consideration when applying for funding under these programs. If a project identified in a proposed construction program meets such criteria and qualifies for funding by such an external source not currently anticipated, the start date of the project could be adjusted to accommodate a partnership agreement.

3.5 Construction Program Summary

It should be noted that from time to time Flagstaff County may wish to alter project scheduling from priority rankings shown in this report. These adjustments could be made to accommodate bridge funding, general government grants, or financial support from private industry.

In addition, the County may wish to consider continuing the pursuit of right-of-way for the Lougheed East Road (6 miles). This road is a main collector road and ranks as a high priority under the recommended Construction Program Rating System. Due to the high traffic volumes and an extremely low safety rating, this high priority road requires upgrading. Due to land acquisition delays however, this project is currently not scheduled for construction.

3.6 Unit Costs for Construction

Unit cost estimates were developed in order to project costs for road construction. Road construction costs for prioritizing work and for projecting expenditures were determined using recent tendered project costs. The unit costs used for projecting the construction program budget are summarized in the table below:



Road Construction Unit Cost Estimates

2013 CAPITAL CONSTRUCTION COST "A" ESTIMATE	\$/mile Grading Contract Cost
Grading to 8.0 m width – Arterial (Dust Free) with Calcium Chloride Treatment – Typical 1	\$352,000
Grading, Base, Pave - 9.2 m width – (100 mm GBC + 100 mm ACP) "Banned Structure" – Typical 1A	\$790,000
Grading, Base, Pave for 9.0 m width – Arterial (300 mm GBC + 100 ACP) "Ban Free Structure" – Typical 1B	\$1,150,000
Grading 8.0 m Collector - Gravel - Typical 2	\$335,000
Grading 8.0 m width Local – Gravel -Typical 3	\$335,000
Grading 7.3 m width – Gravel – Typical 4	\$250,000

NB. - All estimated costs are based on 2013 contract tender averages.

Typical Bridge Replacement Unit Costs

Bridge Type	Existing Structures	Average Replacement Cost*	Average County Cost**
Culvert	1500 – 2000 mm Equivalent Diameter	\$300,000	\$120,000
	2000 – 3000 mm Equivalent Diameter	\$400,000	\$160,000
	3000 – 4000 mm Equivalent Diameter	\$550,000	\$190,000
Standard Bridge	<10m in Length	\$550,000	\$100,000
	10m Length<17m	\$700,000	\$170,000
	17m Length<26m	\$950,000	\$190,000
Major Bridge	Any Size	\$6500/m ²	\$1000/m ²
<p>Note:</p> <ul style="list-style-type: none"> ▪ * - The Average Replacement Cost is the total of construction and engineering before any GAP contributions are applied. ▪ ** - The Average County Cost is calculated by taking the total cost of construction and engineering and subtracting the GAP contributions. ▪ Costs are based on provincial averages. 			



4. TOTAL ROAD RE-CONSTRUCTION VERSUS ROAD REHABILITATION

Typical Alberta Rural Road History

Throughout a significant portion of Alberta and specifically Central Alberta, the original rural road network was constructed within 66 foot road allowances.

These road allowances were established by the "Third System of Survey" (ie., Townships, Township Roads, and Range Roads; the "First and Second Systems", which differed mainly in allotment and width of road allowances, were laid out in southern Manitoba and south-eastern Saskatchewan up to about 1881) in the late 1800's.

As construction of rural roadways commenced various types of equipment were utilized to complete the construction of low cost access roads to the rural community. Equipment such as the horse drawn Fresno Scraper, and horse and power drawn mechanical graders were utilized to construct the original trails and roads in Alberta.

As late as the 1950's and regardless of the equipment utilized, the methodology for constructing a rural road was relatively consistent and resulted in the term "elevated graded road". The methodology for constructing this type of road consisted of cutting/stripping the ditches and backslopes outside a road width of approximately 20 feet (6 meters) and placing the black dirt organic material into the "middle of the road" in order to elevate the road for drainage. After the moving of the organic material into the road structure, the operations included continuing to lower the ditch prism into the subsoil and clay material. This material was then placed or "capped" upon the black organic soil in the road core to provide a solid structure for traffic approximately 2 feet above the newly cut ditch prism. The combination of ditch lowering and grade raising with in-place material provided a cost effective operation that was structurally adequate for the traffic volumes and axle loads of the early 1900's up to and including the 1950/60's.

Re-Construction Requirements

Into the late 1900's, and today, axle loading and structural requirements have greatly increased due to population and industrial growth.

The typical "elevated roads" of the past cannot support the current requirements and due to the narrowness of the road, the organic soils utilized during original construction, and the structural loading of the modern traffic, these structures typically need to be reconstructed.



When analyzing roads of this nature for reconstruction some of the basic elements that require review are:

- Vertical and Horizontal Alignments
- Road Surface Width
- Sideslope ratio
- Culvert Conditions (ie. rusted through, vertically or structurally compromised, performing corrective drainage mitigation, etc.)
- Structural adequacy of the road core
- Composition of the road core (ie. clay capped with 6 inches of clay on top of organic/black soil).
- Significant maintenance requirements such as above average aggregate usage and above average maintenance grading requirements.
- Drainage obstructions

Typically roads with the deficiencies listed above are subject to total - reconstructive requirements. Basically, these roads do not have the "structural foundation" or appurtenances required to be able to provide adequate and cost effective maintenance operations or maintenance rehabilitative measures. There is nothing to "work with" to maintain a road originally constructed with "clay capping and black soil structure" to a finished narrow road surface width.

There are numerous factors with regards to the ability of a jurisdiction to adequately maintain their rural road infrastructure. As previously noted, rural roads that have not been originally constructed to a standard required for the present day industrial environment are candidates for "total reconstruction".

During the typical re-construction process, alignments are improved, topsoil is salvaged within the Right-of-Way, drainage is improved, sideslope ratios are improved, but most importantly the roadway prism structure is improved to adequately support the heavy axle loading with today's traffic.

Pending various existing conditions such as the alignment, moisture content, existing roadway width, depth of existing "clay cap", and the depth of organic material in the core, the structure is improved on by typically either "undercutting/coring" out the existing structure and replacing all the organic material with natural suitable material, or by adding to the "thin cap" to provide a "minimum" of two feet (0.60 meters) of non-organic material to bridge the existing weak structure.

Throughout the reconstruction process culverts are replaced with 50 year structures,



drainage is greatly enhanced and typically the jurisdiction will construct new agricultural fence where required.

Road Maintenance and Rehabilitation Methods

Upon the completion of a newly constructed rural road, it is imperative that a high level of maintenance is carried out on a regular and frequent basis.

Just as the original "elevated grader roads" in some cases lasted for over 50 years, so must the newly constructed roads of today. As basic example, your jurisdiction has over 1400 miles of roadway within the County. Given a 50-year life span, the County would need to reconstruct over 25 miles of road per year just to keep pace on infrastructure upgrades and replacements.

Typically this volume of infrastructure enhancement and investment cannot take place and therefore the requirement for significant and exemplary maintenance operations are increasingly more important.

There are many aspects and functions to "regular maintenance". Upon re-constructing the older grade, the new road structure must be protected by continual blading and re-gravelling.

Due to traffic volume and loading, over time a gravel/clay road bed will lose some of its elevation and will typically increase in width (ie. push out). Due to this "pushing/widening" it often becomes difficult through regular blading to manage gravel consumption, vegetation control (especially on the outside shoulders), and snow removal.

At some point the "rehabilitation" of the road is warranted. Since the roadway was reconstructed with the proper structural adequacy, typically the rehabilitation requirements are limited to the need to "shoulder pull/narrow" the road prism back into its post construction condition.

In order to complete this maintenance activity, an evaluation of the total road cross-section is usually completed. During this evaluation the Public Works Staff will determine the needs of the road and the extent of the "recovery" operation that needs to be carried out.

Items such as drainage performance (ditches may silt in and become over vegetated over time), sideslope ratio's, and road top width are the main criteria that is evaluated.

Upon completion of the evaluation a decision may be made to denude and salvage all topsoil from the road prism, including or excluding the ditches pending drainage performance, after which a reshaping of the road cross-section is completed. This cross-



section re-shaping requires the scarification of existing road surface and then the "pulling" of the clay material from the "pushed out" sideslopes back on top of the widened road surface.

Upon the reshaping operation the road prism is basically returned to its "new" post construction height and width properties with the structural integrity being returned by compaction efforts performed during the recovery operations.

Obviously at the end of the "shoulder pulling/recovery" operation the road top is resurfaced with new aggregate and dust control if warranted.

These types of concentrated rehabilitation operations are performed on a regular basis on rural gravel roadways through Alberta which in turn promotes the extension of the life cycle of the gravel road infrastructure.

Summary

In summary, proper and timely maintenance activities are a significant component for the longevity of all infrastructure systems. However, in order to perform these maintenance activities, a properly constructed and structurally adequate road prism is a basic requirement prior to performing regular ongoing maintenance functions. Trying to maintain any infrastructure system that was inadequately constructed for the intended current needs and use of the system typically leads to "higher" than acceptable infrastructure maintenance costs and "lower" than acceptable end user satisfaction.



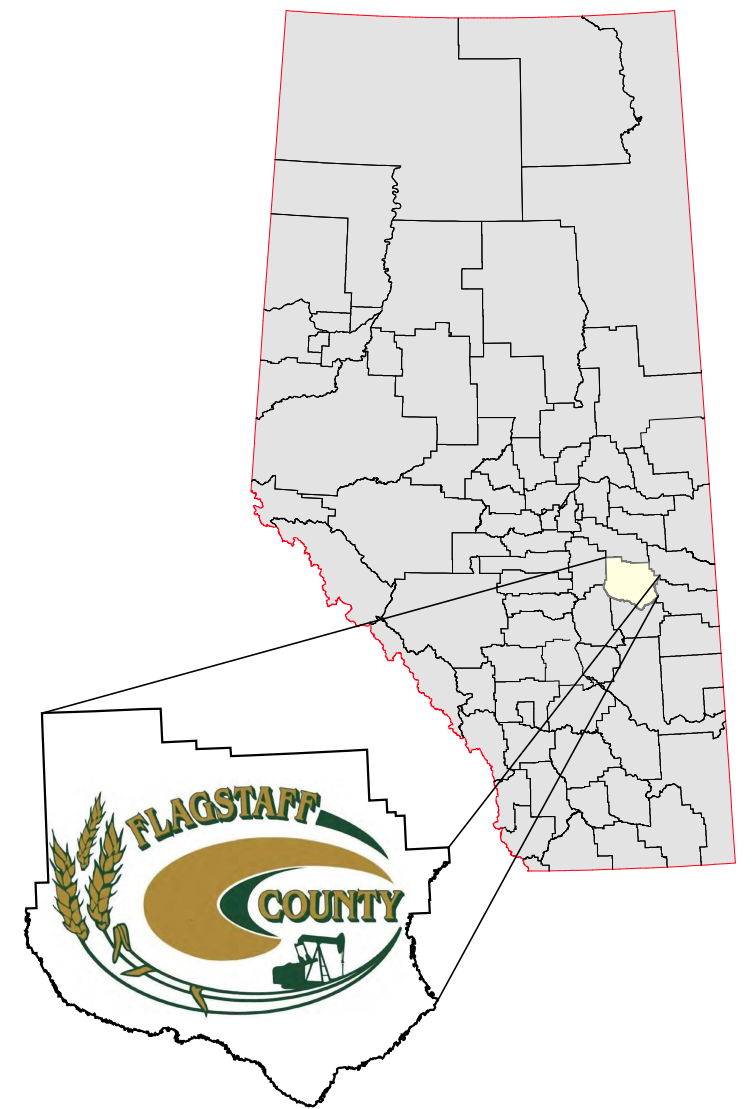
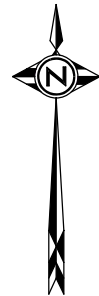
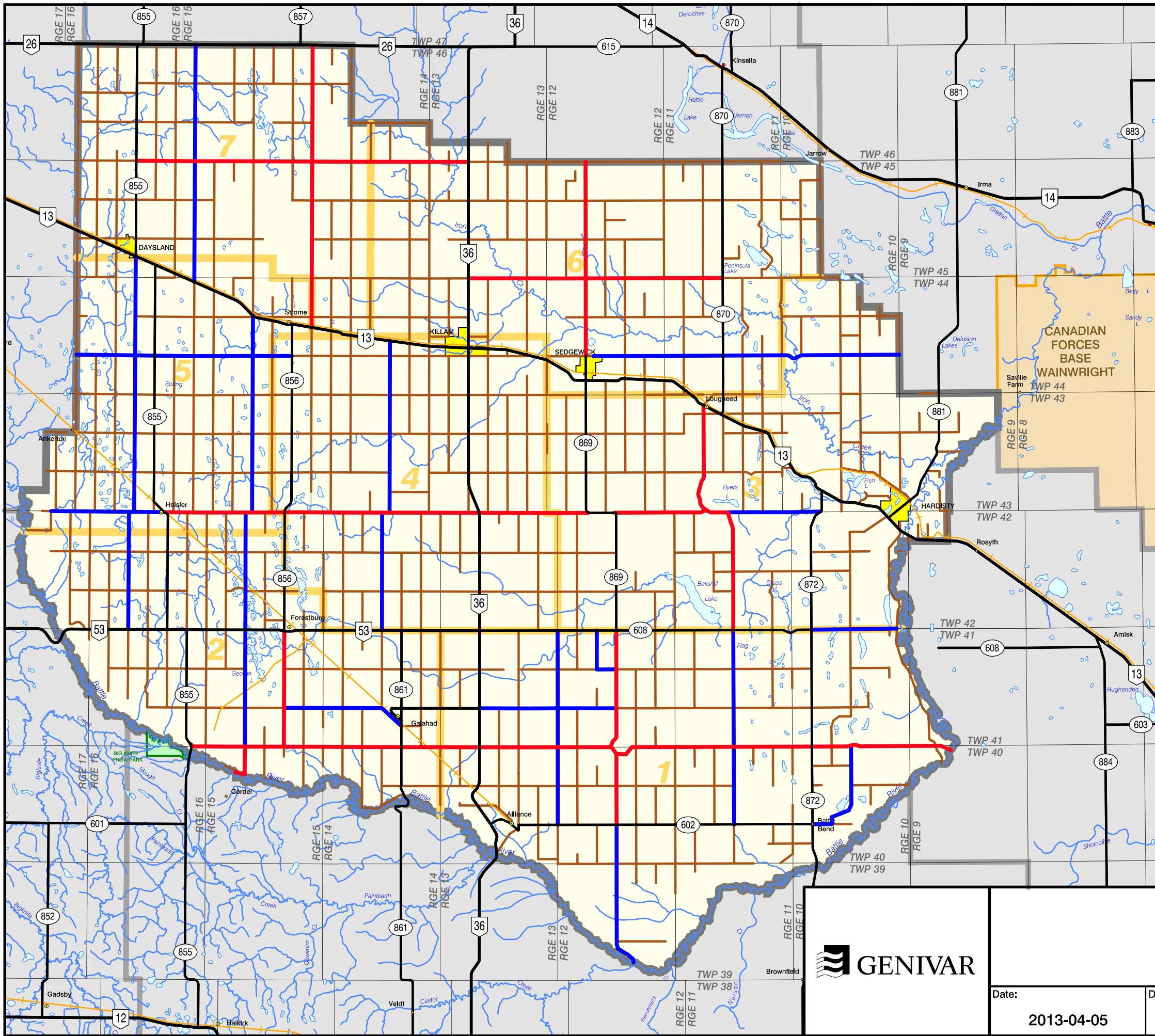
5. RECOMMENDATIONS

Currently there is a strategically placed Provincial Highway Infrastructure System throughout the County. By implementing and developing a long term network to compliment the provincial network, the county will be providing an efficient and cost effective system to move the people, agricultural, and industrial goods throughout the County for the foreseeable future.

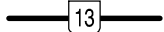




By approving and implementing this internal road network system that anticipates and directs the County's growth, the future County's infrastructure needs will be met and maintained to acceptable standards. Changes to this "living document" will inevitably be prompted by growth of industry and residential expansion throughout the County.

- As noted in the report a significant portion of the existing infrastructure has not been field evaluated for inclusion in the rating portion of this study assessment. This task could be completed at any time the County experiences a significant alteration in industrial/residential growth and associated traffic patterns.
- The information gathered can also be transferred into the current County GIS system and updated on a regular basis.
- The County may wish to consider creating a infrastructure reserve fund for future capital expenditures. This reserve could then be targeted to enable the County to tender projects of a larger size thereby realizing "Scale of Economy" savings.
- Once a long term infrastructure network plan is adopted by Flagstaff County the most cost effective method for long-term expenditure utilization is to ensure that all ongoing upgrades to the local infrastructure are made to the correct standard for the long term designation of the specific road section (ie. Arterial, Collector, or Local standard).

In closing GENVIAR Inc. would like to sincerely thank Flagstaff County Council, Administration, and the Public Works staff. In spite of their busy schedules, all stakeholders and participants were very accommodating in supplying information, while at the same time allowing the consultant the freedom to evaluate your municipal infrastructure without bias or direction other than the proposal directives. GENIVAR Inc. is grateful for the opportunity to have been a part of this project.



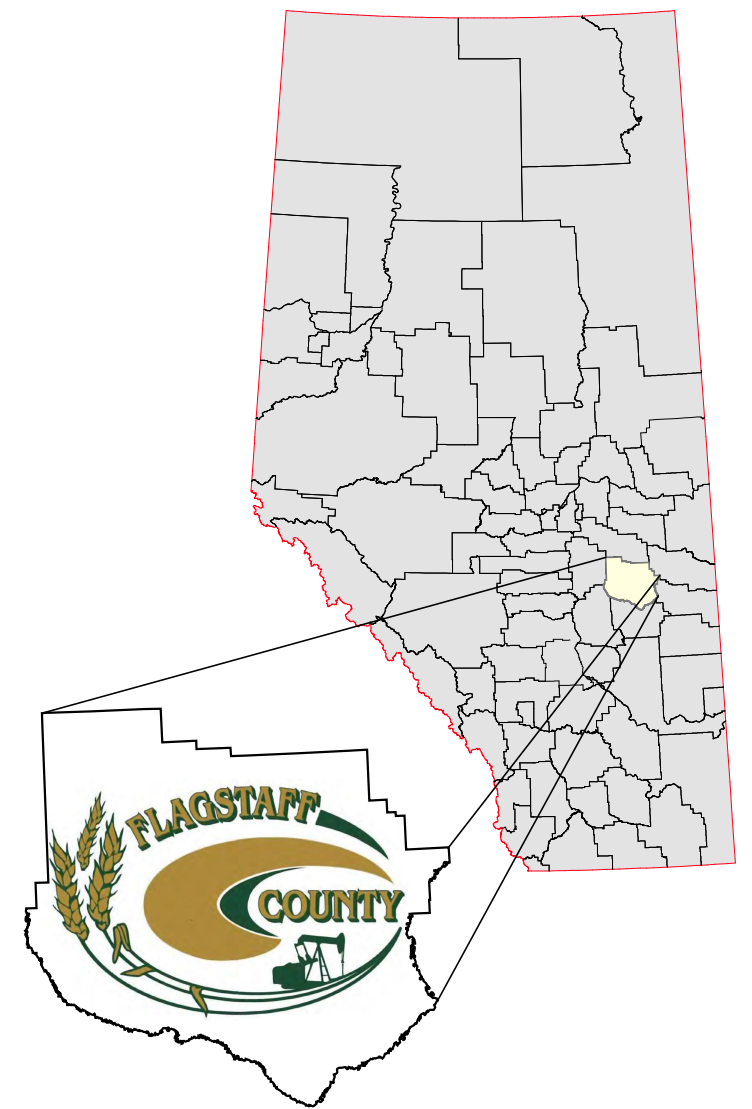
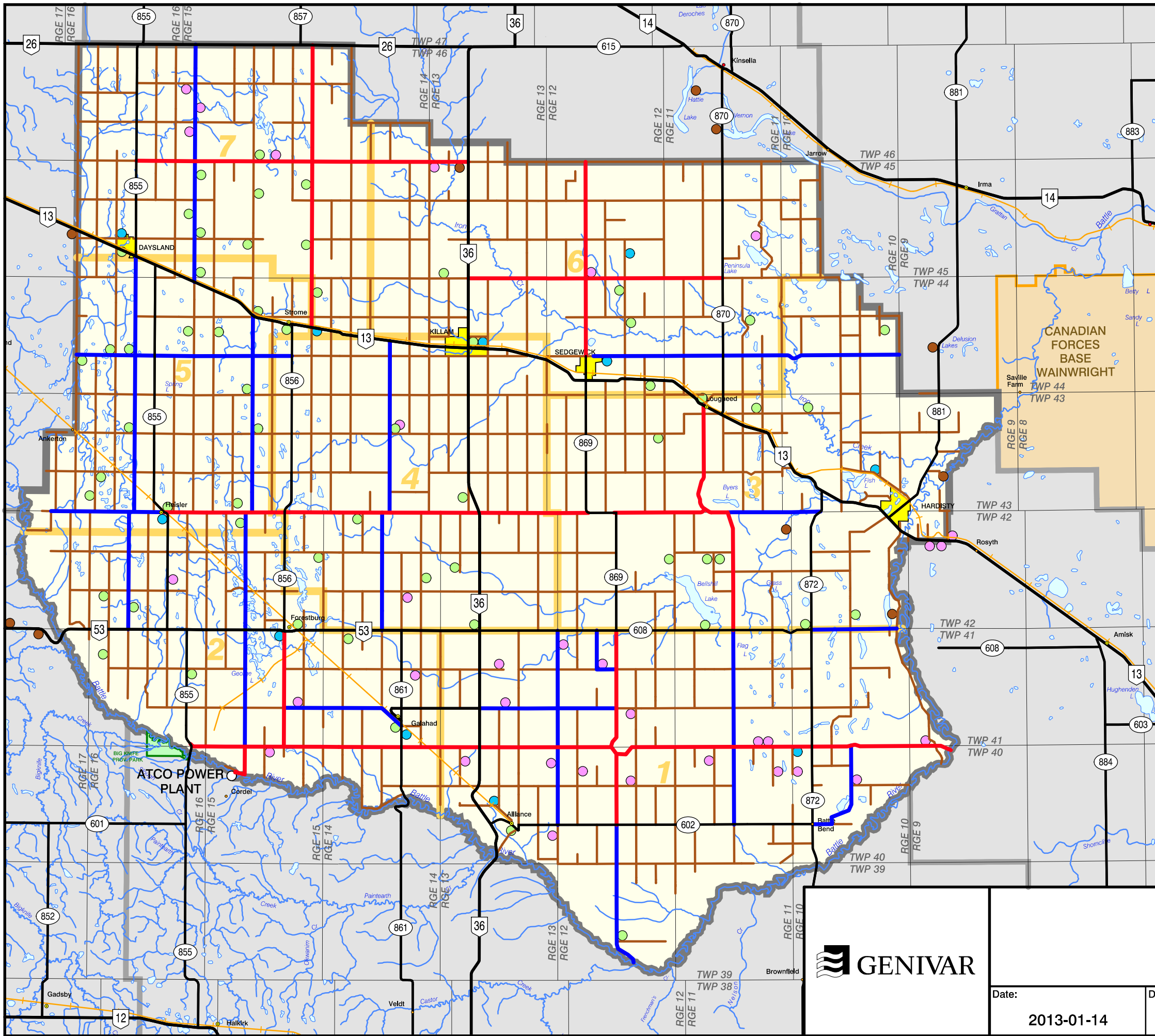
LEGEND

-  PROVINCIAL HIGHWAY 1 - 215
-  PROVINCIAL HIGHWAY 500 - 986
-  (152 Miles) COUNTY ARTERIAL ROAD
-  (161 Miles) COUNTY COLLECTOR ROAD
-  (1179 Miles) COUNTY LOCAL ROAD


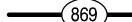









**FIGURE 1
ROADWAY NETWORK**

Date:	Drawn By:	Scale:	Sheet:	Drawing No.
2013-04-05	MRM	1:325 000	1 of 3	18613-01



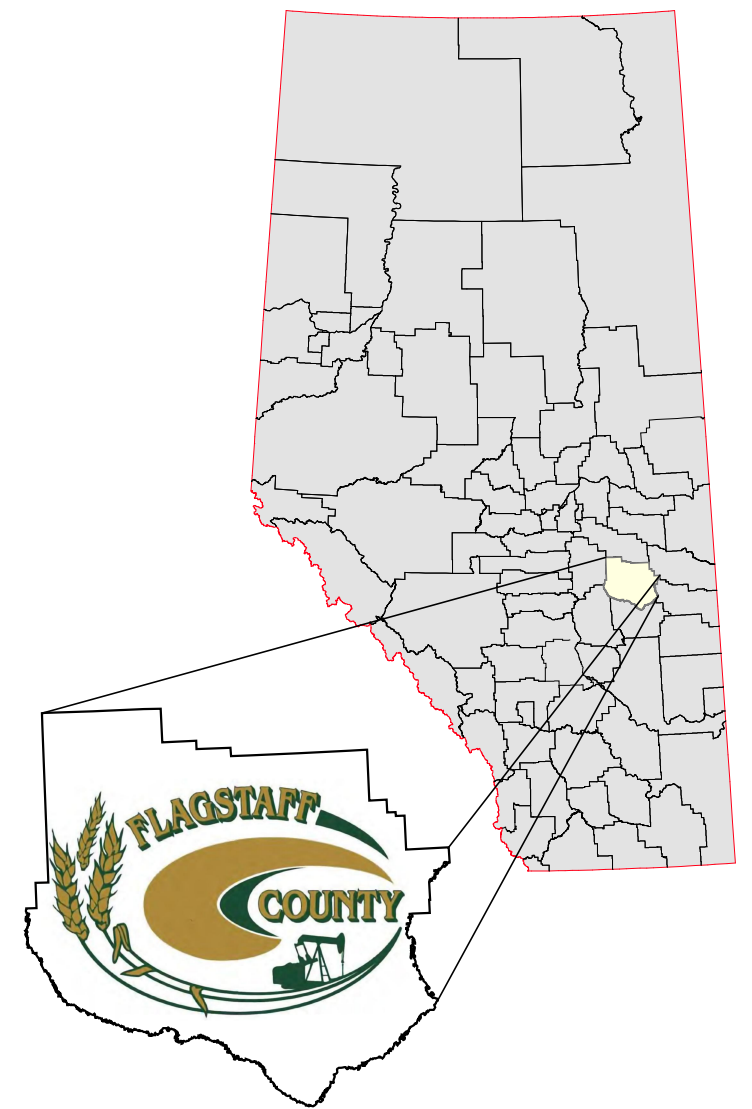
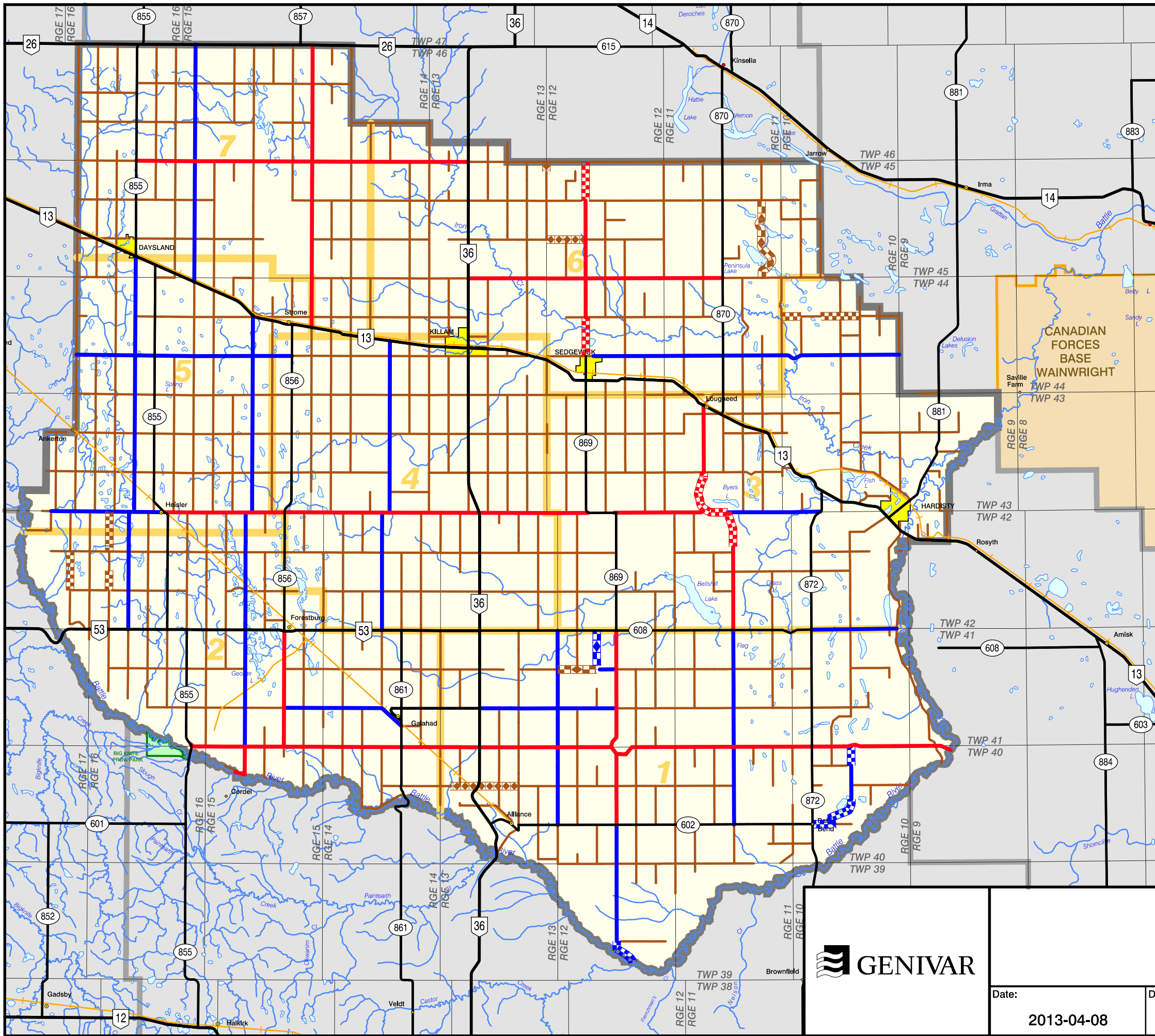
LEGEND

-  PROVINCIAL HIGHWAY 1 - 215
-  PROVINCIAL HIGHWAY 500 - 986
- (152 Miles)  COUNTY ARTERIAL ROAD
- (161 Miles)  COUNTY COLLECTOR ROAD
- (1179 Miles)  COUNTY LOCAL ROAD
-  AGRI INDUSTRY SITE
-  OIL / GAS INDUSTRY SITE
-  WASTE MANAGEMENT FACILITY
-  AGGREGATE RESOURCE

**FIGURE 2
TRAFFIC GENERATORS**



Date:	Drawn By:	Scale:	Sheet:	Drawing No.
2013-01-14	MRM	1:325 000	2 of 3	18613-02



LEGEND

- PROVINCIAL HIGHWAY 1 - 215
- PROVINCIAL HIGHWAY 500 - 986
- (152 Miles) COUNTY ARTERIAL ROAD
- (161 Miles) COUNTY COLLECTOR ROAD
- (1179 Miles) COUNTY LOCAL ROAD

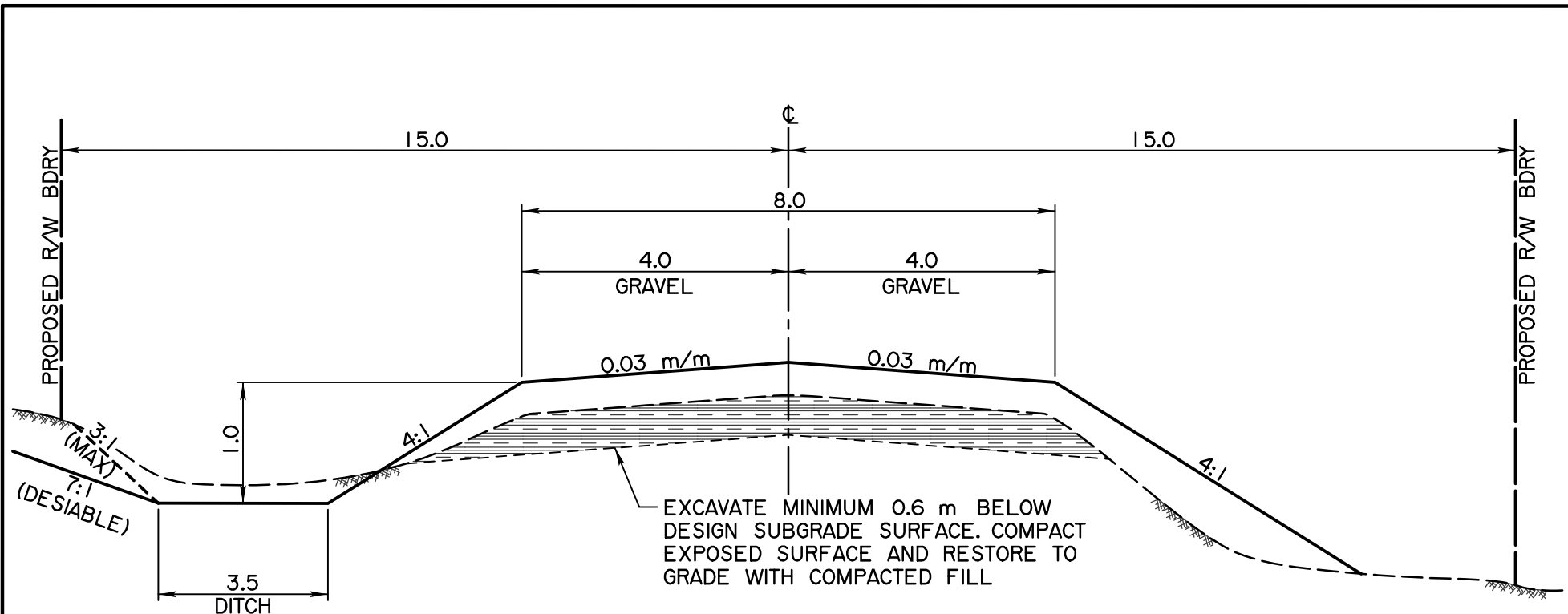
CONSTRUCTION

	ARTERIAL	COLLECTOR	LOCAL
PRIORITY 1 (2013 - 2015)			
PRIORITY 2 (2016 - 2018)			
PRIORITY 3 (2019 - 2021)			
PRIORITY 4 (2022 - 2024)			

**FIGURE 3
CONSTRUCTION PRIORITIES**



Date:	Drawn By:	Scale:	Sheet:	Drawing No.
2013-04-08	MRM	1:325 000	3 of 3	18613-03



NOTE:

- ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE
- DESIGN SPEED 100 - 110 km/h
POSTED SPEED 90 - 100 km/h
- DUST CONTROLLED GRAVEL SURFACE

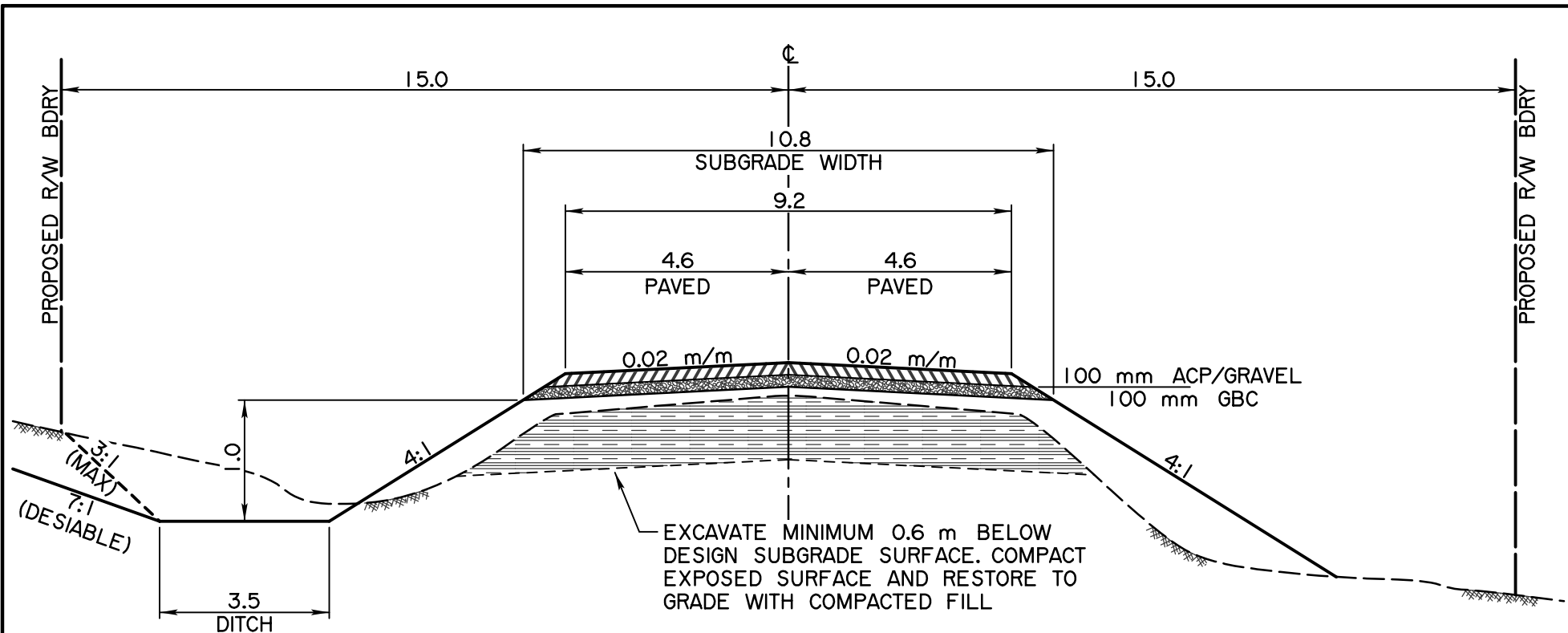


**TYPICAL 1
ARTERIAL - DUST FREE CALCIUM
2013 CAPITAL COST - \$352, 000/Mile**



Date:	Drawn By:	Scale:	Sheet:	Drawing No.
2013-04-04	MRM	NTS	1 of 7	18613-T01

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NOTE:

- ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE
- DESIGN SPEED 100 - 110 km/h
POSTED SPEED 90 - 100 km/h
- ACP DRIVING SURFACE w GRAVEL SHOULDERS
(SPRING BAN REQUIRED)

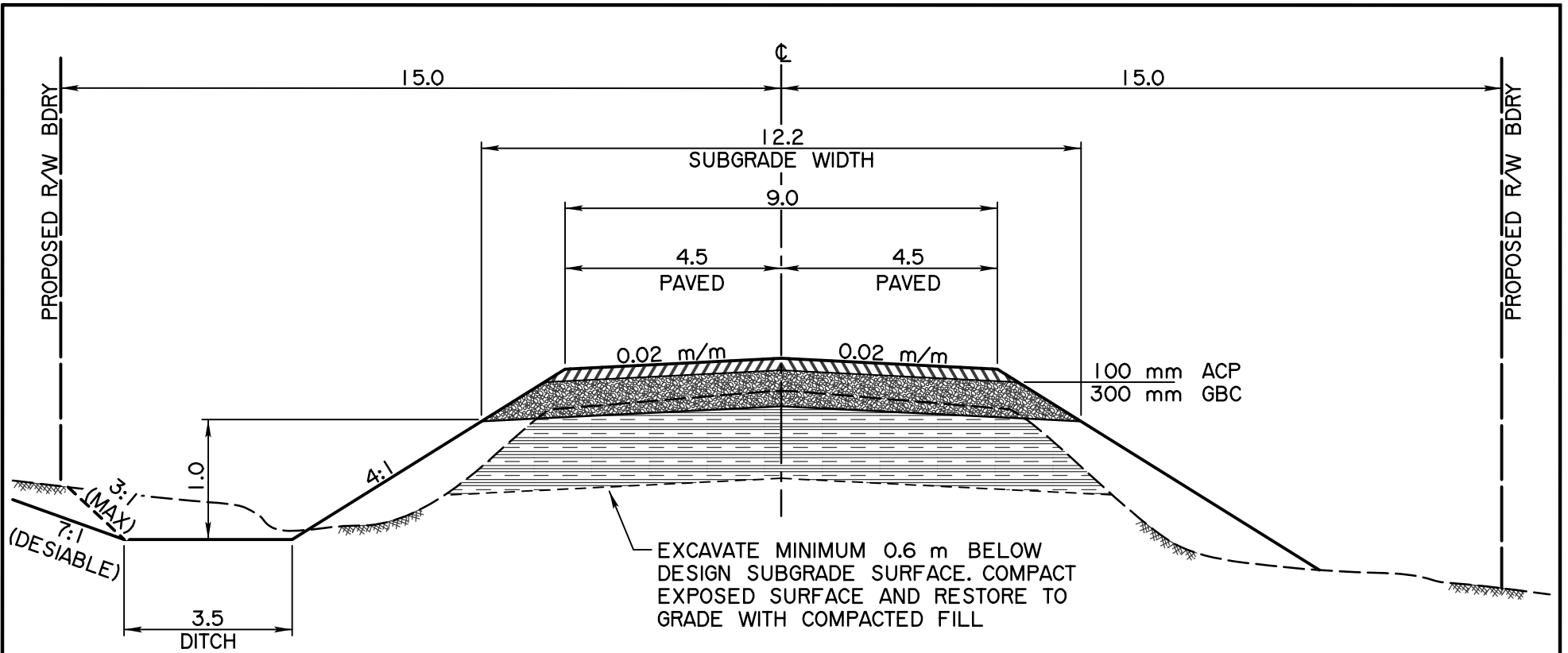
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**TYPICAL 1A
ARTERIAL - SPRING BAN
2013 CAPITAL COST - \$790, 000/Mile**



Date:	Drawn By:	Scale:	Sheet:	Drawing No.
2013-04-04	MRM	NTS	2 of 7	18613-T02



NOTE:

- ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE
- DESIGN SPEED 100 - 110 km/h
POSTED SPEED 90 - 100 km/h
- BAN FREE ACP DRIVING SURFACE

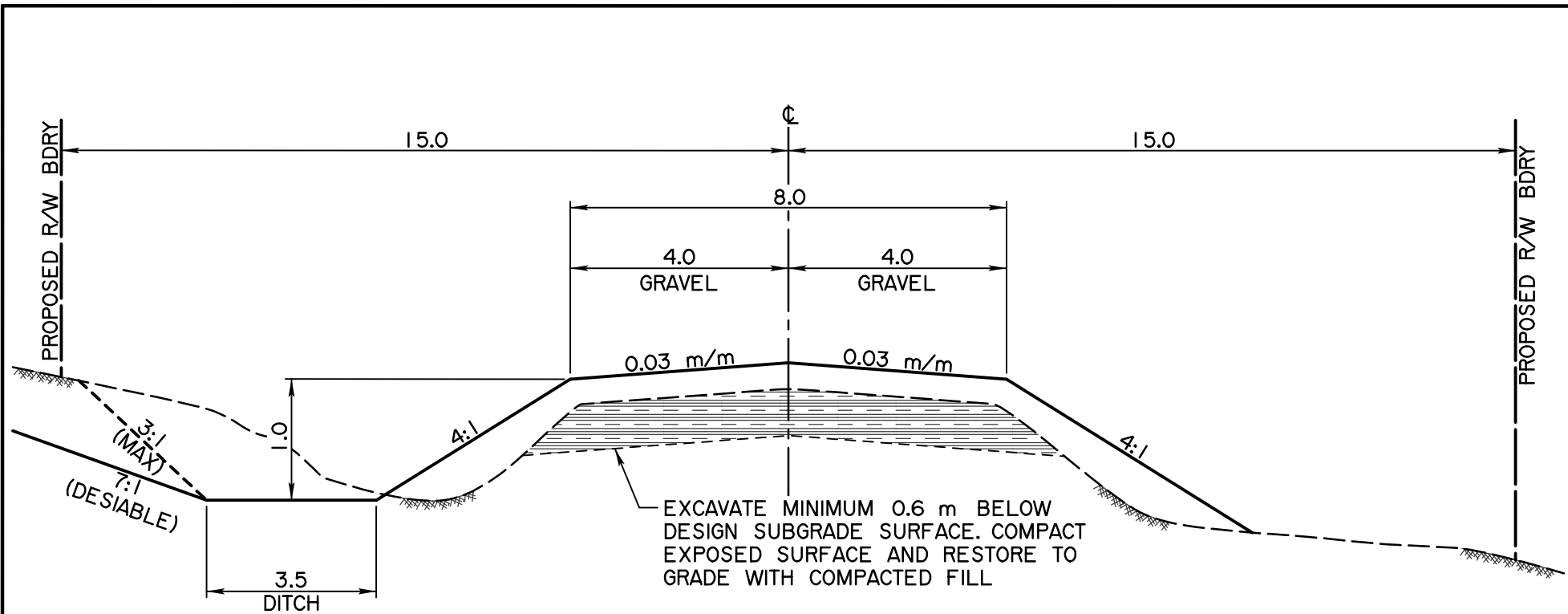
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**TYPICAL 1B
ARTERIAL - BAN FREE
2013 CAPITAL COST - \$1,150, 000/Mile**



Date:	Drawn By:	Scale:	Sheet:	Drawing No.
2013-04-04	MRM	NTS	3 of 7	18613-T03



NOTE:

- ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE
- DESIGN SPEED 100 km/h
POSTED SPEED 90 km/h
- GRAVEL SURFACE

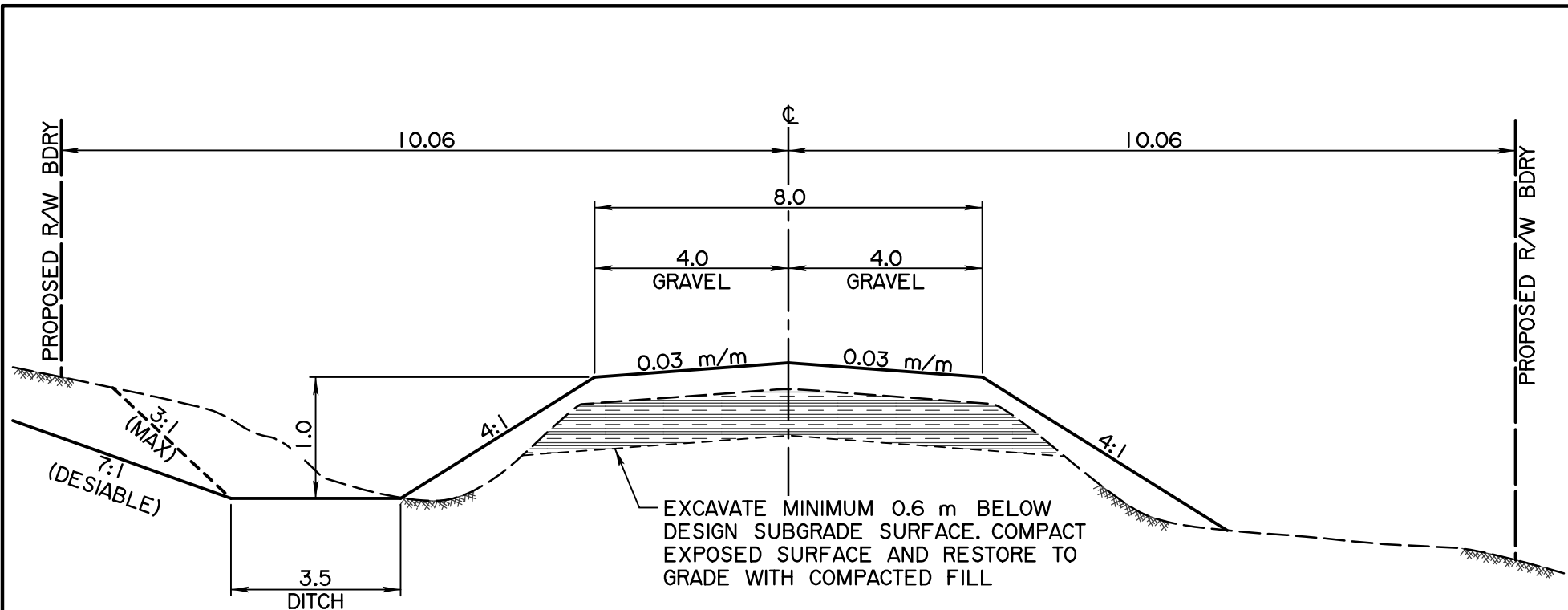
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**TYPICAL 2
COLLECTOR**
2013 CAPITAL COST - \$335, 000/Mile



Date:	Drawn By:	Scale:	Sheet:	Drawing No.
2013-04-04	MRM	NTS	4 of 7	18613-T04



NOTE:

- ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE
- DESIGN SPEED 90 km/h
POSTED SPEED 80 km/h
- GRAVEL SURFACE

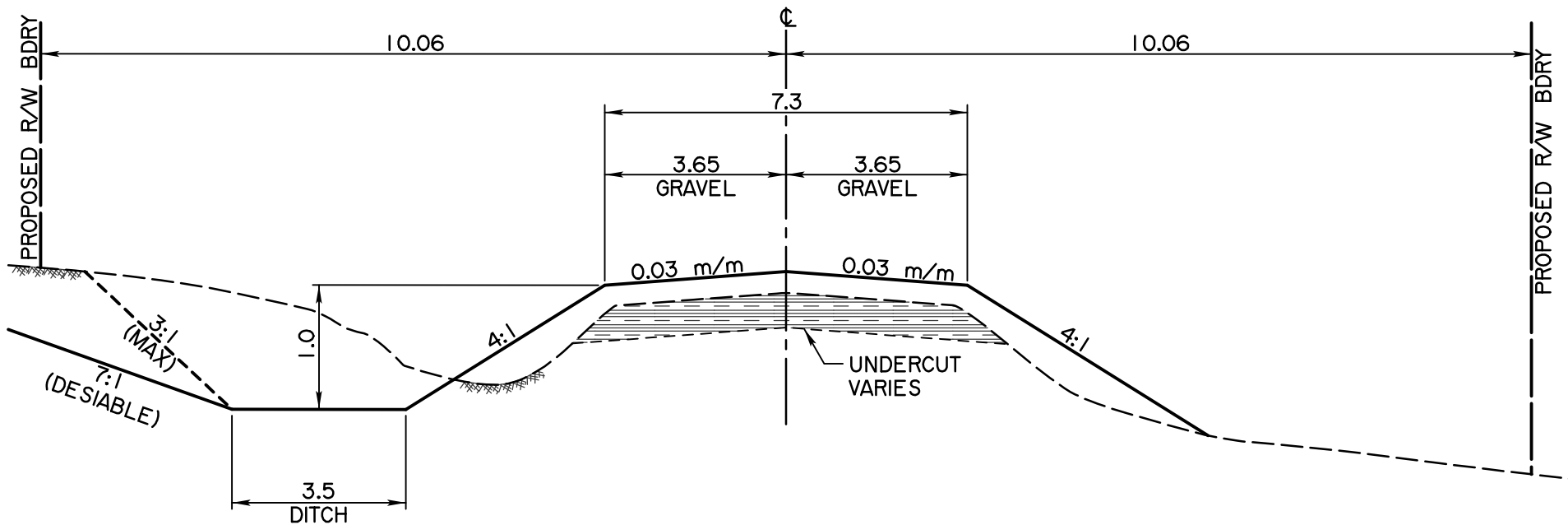
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**TYPICAL 3
LOCAL ROAD
2013 CAPITAL COST - \$335, 000/Mile**



Date:	Drawn By:	Scale:	Sheet:	Drawing No.
2013-04-04	MRM	NTS	5 of 7	18613-T05



NOTE:

- ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE
- DESIGN SPEED 70 km/h
POSTED SPEED 60 km/h
- GRAVEL SURFACE

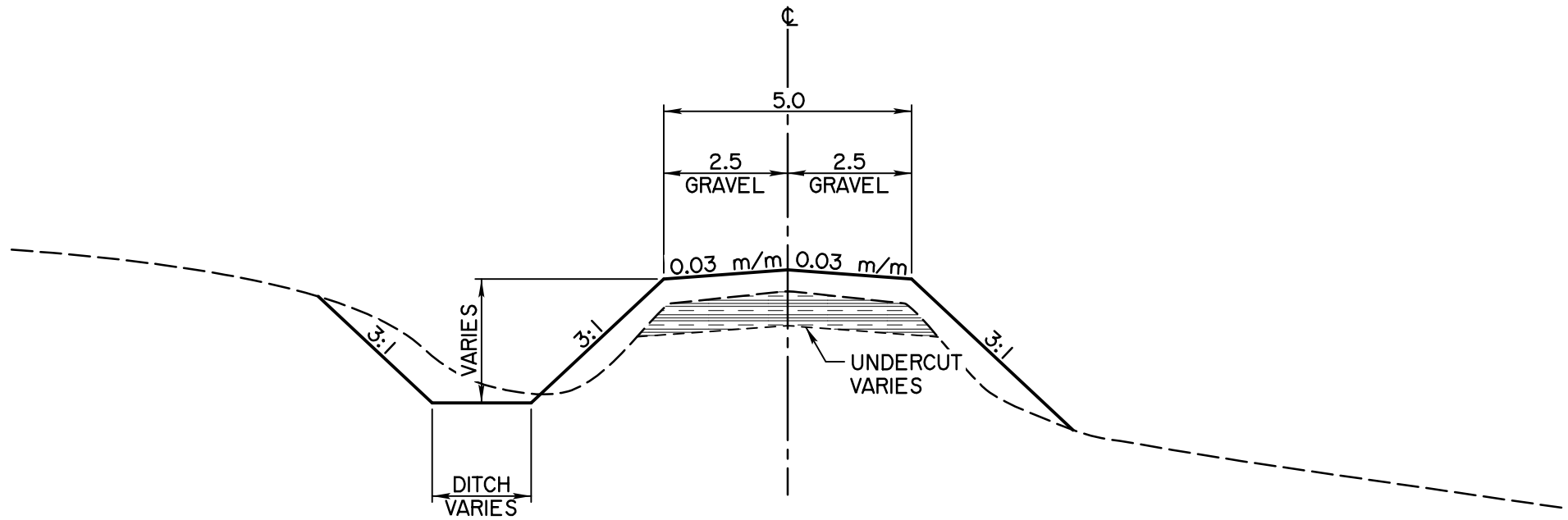
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**TYPICAL 4
RURAL RESIDENTIAL ACCESS
2013 CAPITAL COST - \$250, 000/Mile**



Date:	Drawn By:	Scale:	Sheet:	Drawing No.
2013-04-04	MRM	NTS	6 of 7	18613-T06



NOTE:

- ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE
- DESIGN SPEED N/A
POSTED SPEED N/A
- GRAVEL SURFACE

MODIFIED: 2013-04-04 10:12:46



**TYPICAL 5
FIELD ACCESS**



Date:	Drawn By:	Scale:	Sheet:	Drawing No.
2013-04-04	MRM	NTS	7 of 7	18613-T07

FLAGSTAFF COUNTY

RURAL ROAD STUDY



CAPITAL COSTING ESTIMATES

APRIL 2013



CALCIUM - CAPITAL CONSTRUCTION AND LIFE CYCLE EXPENDITURES (2013 Dollars)

Year 1-20 Capital and Rehabilitation Costs

Classification	Length Miles	2013 Grading Cost \$335,000 per mile	2013 Road Recovery & Gravel Costs \$30,000 per mile	2013 Initial Supply & Application of Calcium \$17,000 per mile	Calcium/Gravel Supply & Application \$18,500 per mile/year x's 20 Years	Total Cost
CALCIUM	4	\$1,340,000		\$68,000	\$1,480,000	\$2,888,000
CALCIUM	93		\$2,790,000	\$1,581,000	\$34,410,000	\$38,781,000
CALCIUM	55		\$0	\$0	\$20,350,000	\$20,350,000
<i>Sub-Total</i>	<i>152</i>	<i>\$1,340,000</i>	<i>\$2,790,000</i>	<i>\$1,649,000</i>	<i>\$56,240,000</i>	<i>\$62,019,000</i>

Year 1-20 - Total Capital Costs

\$62,019,000

Total Yearly Life-Cycle Average Cost (based on a 20 year cycle)

\$3,100,950

ASPHALT "LIGHT MEMBRANE" - CAPITAL CONSTRUCTION AND LIFE CYCLE EXPENDITURES (2013 dollars)

Year 1 -20 - Total Capital Costs

Classification	Location	Length Miles	2013 Grading Cost \$420,000 per mile	2013 Asphalt Cost \$370,000 per mile	Crack Sealing and Line Painting \$1,000 per mile	Total Costs
ARTERIAL	N.NW. 33-42-11 - East 1 Mile	1	\$420,000	\$370,000	\$20,000	\$810,000
ARTERIAL	E.NE. 9-39-12 - South 1.5 Miles	1.5	\$630,000	\$555,000	\$30,000	\$1,215,000
ARTERIAL	E.NE. 24-45-14 - South 6.5 Miles	6.5	\$2,730,000	\$2,405,000	\$130,000	\$5,265,000
ARTERIAL	E.NE. 36-46-14 - South 8 Miles	8	\$3,360,000	\$2,960,000	\$160,000	\$6,480,000
ARTERIAL	N.NW. 31-45-13 - East 8 Miles	8	\$3,360,000	\$2,960,000	\$160,000	\$6,480,000
ARTERIAL	N.NW. 34-45-16 - East 9 Miles	9	\$3,780,000	\$3,330,000	\$180,000	\$7,290,000
ARTERIAL	N.NW. 33-44-12 - East 7 Miles	7	\$2,940,000	\$2,590,000	\$140,000	\$5,670,000
ARTERIAL	N.NW. 33-44-13 - East 6 Miles	6	\$2,520,000	\$2,220,000	\$120,000	\$4,860,000
ARTERIAL	N.NW. 7-44-16 - East 4 Miles	4	\$1,680,000	\$1,480,000	\$80,000	\$3,240,000
<i>Sub-total</i>		<i>51</i>	<i>\$21,420,000</i>	<i>\$18,870,000</i>	<i>\$1,020,000</i>	<i>\$41,310,000</i>
ARTERIAL	<i>Remaining Mileage requiring Grading</i>	<i>56</i>	<i>\$23,520,000</i>	<i>\$20,720,000</i>	<i>\$1,120,000</i>	<i>\$45,360,000</i>
ARTERIAL	<i>Remaining Mileage requiring Surfacing</i>	<i>45.0</i>		<i>\$16,650,000</i>	<i>\$900,000</i>	<i>\$17,550,000</i>
Year 1-20 - Total Capital Costs		152	\$44,940,000	\$56,240,000	\$3,040,000	\$104,220,000
Total Yearly Life-Cycle Average Cost (20 year cycle)			\$2,247,000	\$2,812,000	\$152,000	\$5,211,000

ASPHALT "BAN FREE" - CAPITAL CONSTRUCTION AND LIFE CYCLE EXPENDITURES (2013 dollars)

Year 1-20 - Total Capital Costs

Classification	Location	Length Miles	2013 Grading Cost \$440,000 per mile	2013 Asphalt Cost \$710,000 per mile	Crack Sealing and Line Painting \$1,000 per mile	Total Cost
ARTERIAL	N.NW. 33-42-11 - East 1 Mile	1	\$ 440,000	\$ 710,000	\$ 20,000	\$ 1,170,000
ARTERIAL	E.NE. 9-39-12 - South 1.5 Miles	2	\$ 660,000	\$ 1,065,000	\$ 30,000	\$ 1,755,000
ARTERIAL	E.NE. 24-45-14 - South 6.5 Miles	7	\$ 2,860,000	\$ 4,615,000	\$ 130,000	\$ 7,605,000
ARTERIAL	E.NE. 36-46-14 - South 8 Miles	8	\$ 3,520,000	\$ 5,680,000	\$ 160,000	\$ 9,360,000
ARTERIAL	N.NW. 31-45-13 - East 8 Miles	8	\$ 3,520,000	\$ 5,680,000	\$ 160,000	\$ 9,360,000
ARTERIAL	N.NW. 34-45-16 - East 9 Miles	9	\$ 3,960,000	\$ 6,390,000	\$ 180,000	\$ 10,530,000
ARTERIAL	N.NW. 33-44-12 - East 7 Miles	7	\$ 3,080,000	\$ 4,970,000	\$ 140,000	\$ 8,190,000
ARTERIAL	N.NW. 33-44-13 - East 6 Miles	6	\$ 2,640,000	\$ 4,260,000	\$ 120,000	\$ 7,020,000
ARTERIAL	N.NW. 7-44-16 - East 4 Miles	4	\$ 1,760,000	\$ 2,840,000	\$ 80,000	\$ 4,680,000
<i>Sub-total</i>		<i>51</i>	<i>\$ 22,440,000</i>	<i>\$ 36,210,000</i>	<i>\$ 1,020,000</i>	<i>\$ 59,670,000</i>
ARTERIAL	<i>Remaining Mileage requiring Grading</i>	<i>101.0</i>	<i>\$ 44,440,000</i>	<i>\$ 71,710,000</i>	<i>\$ 2,020,000</i>	<i>\$ 118,170,000</i>
Year 1-20 - Total Capital Costs		152.0	\$ 66,880,000	\$ 107,920,000	\$ 3,040,000	\$ 177,840,000
Total Yearly Life-Cycle Average Cost 20 year cycle)			\$ 3,344,000	\$ 5,396,000	\$ 152,000	\$ 8,892,000

COLLECTOR AND LOCAL ROADS - CAPITAL CONSTRUCTION EXPENDITURES (2013 Dollars)

Classification	Location	Length Miles	Local 2013 Grading Cost \$335,000 per mile	Collector 2013 Grading Cost \$335,000 per mile	2013 Road Recovery & Gravel Costs \$30,000 per mile	Total Cost
<u>COLLECTOR ROADS</u>						
COLLECTOR	E.NE. 33-40-10 - South 6 Miles	3		\$1,005,000		
COLLECTOR	E.NE. 32-41-12 - South 2 Miles	2		\$670,000		
COLLECTOR	E.NE. 9-39-12 - South 1.5 Miles	1.5		\$502,500		
B.F. 01811	N.NW. 4-42-11			\$120,000		
B.F. 01696	N.NW. 14-43-10			\$160,000		
COLLECTOR	Total Grading Requirments	5		\$2,457,500		
COLLECTOR	Requires Road Recovery	93			\$2,790,000	
COLLECTOR	Total Costs			\$2,457,500	\$2,790,000	\$5,247,500
<u>LOCAL ROADS</u>						
LOCAL	E.NE. 18-42-16 - South 1 Mile	1	\$335,000			
LOCAL	E.NE. 31-42-16 - South 2 Miles	2	\$670,000			
LOCAL	N.NW. 19-44-10 - East 1 Mile	1	\$335,000			
LOCAL	N.NW. 21-44-10 - East 2 Miles	2	\$670,000			
LOCAL	E.NE. 23-42-17 - South 2 Miles	2	\$670,000			
LOCAL	N.NW. 19-40-13 - East 3.5 Miles	3.5	\$1,172,500			
LOCAL	E.NW. 19-41-12 - East 2 Miles	2	\$670,000			
LOCAL	N.NW. 7-45-12 - East 2 Miles	2	\$670,000			
LOCAL	E.NE. - 36-45-13 - South 0.5 Miles	0.5	\$167,500			
LOCAL	E.NE. 23-45-11 - South 5.5 Miles	5.5	\$1,842,500			
LOCAL	Total Costs	21.5	\$7,202,500			\$7,202,500
Total Capital Costs						\$12,450,000
20 Year Capital Construction Plan Yearly Costs for Collector and Local Roads Only						\$622,500

20 YEAR CAPITAL EXPENDITURE OPTIONS SUMMARY

Classification	Description	Total Costs
<u>Scenario 1 - Arterial Calcium, Collectors, and Locals</u>		
Arterial	Grading, Road Recovery, and Calcium	\$62,019,000
Collectors	Grading	\$5,247,500
Local	Grading	\$7,202,500
<i>Total Capital Costs</i>		<i>\$74,469,000</i>
<i>Capital Yearly Costs</i>		<i>\$3,723,450</i>
<u>Scenario 2 - Arterial Asphalt "Light Membrane", Collectors, and Locals</u>		
Arterial	Grading and Asphalt "Light Membrane"	\$104,220,000
Collectors	Grading and Road Recovery	\$5,247,500
Local	Grading	\$7,202,500
<i>Total Capital Costs</i>		<i>\$116,670,000</i>
<i>Capital Yearly Costs</i>		<i>\$5,833,500</i>
<u>Scenario 3 - Arterial Asphalt "Ban Free", Collectors, and Locals</u>		
Arterial	Grading and Asphalt "Ban Free"	\$177,840,000
Collectors	Grading and Road Recovery	\$5,247,500
Local	Grading	\$7,202,500
<i>Total Capital Costs</i>		<i>\$190,290,000</i>
<i>Capital Yearly Costs</i>		<i>\$9,514,500</i>

ROAD TRAFFIC COUNTS

2012

Date:	Road:	Total:
24-May	Twp Rd 454 & Rge Rd 150	32
24-May	Twp Rd 452 (Daysland East), East of SH #855	85
23-May	Twp Rd 442 and Rge Rd 163	33
23-May	Ross Hinkey Road, Twp Rd 442, East of Sedgewick	54
28-Jun	Hardisty Airport-Twp Rd 103	55
22-Jun	Rosalind Road-Twp Rd 442	62
21-Jun	Wavy Lake Rd-Rge Rd 151	18
21-Jun	Daysland East-Twp Rd 452	20
20-Jun	Bruce Road-Rge Rd 150	25
15-Jun	Correction Line-Twp Rd 430	60
14-Jun	Lougheed East-Twp Rd 435	42
19-Jul	Heisler Correction Line-Twp Rd 430	119
19-Jul	Hardisty Access-between Rge Rd 100 & 95	283
17-Jul	Lougheed South-Rge Rd 114	36
17-Jul	South of Correction Line/South Lougheed-Rge Rd 114	23
12-Jul	Armitage Road-Rge Rd 123, South of Sedgewick	35
4-Jul	Rosalind Road-Twp Rd 442	61
4-Jul	Bruce Road-Rge Rd 150	65
3-Aug	Wavy Lake Rd-Rge Rd 151 & Daysland East-Twp 452	47
3-Aug	Rosalind Road-Twp Rd 442	38
2-Aug	Forestburg South-Rge Rd 152, 1 mile East of Bish Corner-Twp Rd 412	162
2-Aug	Forestburg South-Rge Rd 152, Bish Corner-Twp Rd 412	15

2011

Date:	Road:	Total:
22-Jul	Twp Rd 430 & Rge Rd 120 (2012 Construction Project)	34
25-Aug	Twp Rd 410 & Rge Rd 103 (Choice Battery Road)	92
28-Jun	Shop Road-Twp Rd 442	317
15-Jul	Correction Line-Sedgewick-Twp Rd 430	49
15-Jul	Eckstrand Rd-Rge Rd 125	55
14-Jul	Rosalind Road & Truck Route-Twp Rd 442	54
14-Jul	Rge Rd 123 & SH #602 (Hutterite Road)	78
29-Jul	Rge Rd 120 & Twp Rd 430	19
7-Aug	Rge Rd 113 & SH #608 (Bellshill South /North)	41
15-Jul	Metro Rd-Twp Rd 454 & Rge Rd 105	7
20-Jul	Lougheed South & Correction Line-Rge Rd 114	42
13-Jul	Hardisty West-Rge Rd 102	44
13-Jul	Forestburg South-Rge Rd 152 & Coal Trail-Twp Rd 410	129
20-Jul	Bellshill North-Rge Rd 113 & Twp Rd 424	23

2010

21-May	Shop West-Twp Rd 442	267
4-May	Sedgewick North at Trinity-Rge Rd 124 & Twp Rd 450	211
20-Jul	Sedgewick North-Rge Rd 124	188
20-Jul	Trinity East Rd-Rge Rd 450	136

**Flagstaff County
Bridge Funding Priorities by Replacement Year**

BRIDGE FILE NUMBER	STRUCTURE TYPE	LEGAL LAND LOCATION	LOCATION DESCRIPTION	SPAN/BARREL TYPES	YEAR BUILT	NUMBER OF SPANS/PIPPES	LENGTH/DIAMETER SPAN 1	LENGTH/DIAMETER SPAN 2	LENGTH/DIAMETER SPAN 3	LENGTH/DIAMETER SPAN 4	STRUCTURE LENGTH	SKEW DEGREES	TOTAL CLEAR ROADWAY	SINGLE LOAD RATING	SEMI LOAD RATING	TRAIN LOAD RATING	DETOUR LENGTH	ESTIMATED AADT	SUFFICIENCY RATING	CONDITION RATING	LAST INSPECTION DATE	TOTAL ESTIMATED REPLACEMENT COST	TOTAL ESTIMATED FUNDING	TOTAL ESTIMATED COUNTY AMOUNT	ESTIMATED REPLACEMENT YEAR
09064	Standard Bridge	NW 18-44-12-4	WATERCOURSE BRIDGE ON LOCAL ROAD NEAR SEDGEWICK	TT	1957	1	6.1				6.1		6.1			54	999	2 / 2010 (E)	48.7	38.9	18-May-10	\$600,000	\$480,000	\$120,000	2010
81723	Bridge Culv	SW 29-44-16-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR DAYSLAND	FP	1960	1	1118				12		6.8					6 5 / 2011 (E)	51.3	22.2	15-Aug-11	\$300,000	\$180,000	\$120,000	2011
81724	Bridge Culv	SW 29-44-16-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR DAYSLAND	FP	1960	1	1372				18		6.5					3 5 / 2011 (E)	48.1	22.2	15-Aug-11	\$300,000	\$180,000	\$120,000	2011
01459	Standard Bridge	NW 18-42-11-4	WATERCOURSE BRIDGE ON LOCAL ROAD NEAR HARDISTY	HC	1963	1	8.5				8.5		7.3	30	52	75	3 40 / 2007 (E)	66.9	44.4	22-Jul-12	\$500,000	\$400,000	\$100,000	2012	
01696	Standard Bridge	NW 14-43-10-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR HARDISTY	PG	1957	3	6.1	8.5	6.1		20.7		7.3	28	49	62	3 100 / 2012 (E)	52.2	33.3	21-Jul-12	\$820,000	\$660,000	\$160,000	2012	
01811	Bridge Culv	NW 3-42-11-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR HARDISTY	MP	1961	2	1524	1524			21.3		7.3				6 75 / 2012 (E)	57.8	33.3	22-Jul-12	\$300,000	\$180,000	\$120,000	2012	
72912	Bridge Culv	SE 10-40-13-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR ALLIANCE	MP	1973	1	1524				15.8		7.3				2 50 / 2008 (E)	46.5	55.6	07-May-08	\$300,000	\$180,000	\$120,000	2013	
77114	Bridge Culv	NW 29-43-16-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR DAYSLAND	FP	1970	1	1118				15.8	-10	7.3				3 30 / 2008 (E)	41.8	22.2	07-May-08	\$300,000	\$180,000	\$120,000	2013	
06660	Standard Bridge	NW 29-43-10-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR HARDISTY	HC	1963	3	6.1	8.5	6.1		20.7		7.3	28	49	65	10 50 / 2008 (E)	60.5	50	07-May-08	\$820,000	\$660,000	\$160,000	2015	
06665	Standard Bridge	SW 14-43-10-4	WATERCOURSE BRIDGE ON LOCAL ROAD NEAR HARDISTY	PG	1957	1	6.1				6.1		7.5	28	49	62	5 100 / 2012 (E)	57	55.6	21-Jul-12	\$500,000	\$400,000	\$100,000	2015	
06834	Bridge Culv	SW 19-45-13-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR SEDGEWICK	MP	1955	1	1800				12.8		7				3 20 / 2007 (E)	53.7	44.4	21-Jul-12	\$300,000	\$180,000	\$120,000	2015	
09786	Standard Bridge	SW 6-44-10-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR HARDISTY	PA	1952	1	8.5				8.5	15	7.3				6 2 / 2012 (E)	60.5	38.9	21-Jul-12	\$500,000	\$400,000	\$100,000	2015	
80861	Bridge Culv	SW 28-44-13-4	WATERCOURSE CULVERT ON LOCAL ROAD	MP	1985	2	1000	900			8.3		5.7				2 10 / 2011 (E)	58.4	55.6	15-Aug-11	\$300,000	\$180,000	\$120,000	2015	
13353	Standard Bridge	SW 5-46-13-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR KILLAM	PG	1953	3	6.1	6.1	6.1		18.3		8.2	28	49	62	6 75 / 2012 (E)	57.9	38.9	21-Jul-12	\$730,000	\$590,000	\$140,000	2017	
77983	Bridge Culv	NW 29-43-16-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR DAYSLAND	FP	1975	1	1118				18.3		7.3				3 30 / 2011 (E)	57.4	33.3	15-Aug-11	\$300,000	\$180,000	\$120,000	2017	
76355	Standard Bridge	SW 15-42-12-4	WATERCOURSE BRIDGE ON LOCAL ROAD NEAR ALLIANCE	HC	1966	1	8.5				8.5		7.3	30	52	75	6 50 / 2007 (E)	66.1	50	07-May-08	\$500,000	\$400,000	\$100,000	2018	
77980	Bridge Culv	SW 12-42-13-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR KILLAM	MP	1974	1	1524				27.4		7.3				6 50 / 2008 (E)	63.3	66.7	07-May-08	\$300,000	\$180,000	\$120,000	2018	
02116	Bridge Culv	NW 32-41-12-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR ALLIANCE	SPE	1961	1	1901				40.8		7.5				3 30 / 2012 (E)	59.6	66.7	22-Jul-12	\$480,000	\$290,000	\$190,000	2020	
02408	Standard Bridge	SW 21-44-12-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR SEDGEWICK	PG	1959	3	8.5	8.5	8.5		25.5	-15	8.2	28	49	62	6 150 / 2007 (E)	67.2	55.6	07-May-08	\$1,020,000	\$820,000	\$200,000	2020	
06703	Standard Bridge	NE 7-44-10-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR HARDISTY	PG	1960	3	8.5	8.5	8.5		25.5		8.2	28	49	62	10 100 / 2010 (E)	61.3	50	19-May-10	\$1,020,000	\$820,000	\$200,000	2020	
07688	Standard Bridge	SW 23-44-12-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR SEDGEWICK	HC	1966	3	8.5	8.5	8.5		25.5		8.2	30	52	75	6 60 / 2008 (E)	71.3	55.6	07-May-08	\$1,020,000	\$820,000	\$200,000	2020	
07692	Standard Bridge	SW 2-45-13-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR KILLAM	PG	1960	3	6.1	8.5	6.1		20.7		8.2	28	49	62	3 100 / 2008 (E)	62	44.4	07-May-08	\$820,000	\$660,000	\$160,000	2020	
07717	Standard Bridge	SW 6-46-13-4	WATERCOURSE BRIDGE ON LOCAL ROAD NEAR KILLAM	HC	1963	1	8.5				8.5	30	9.1	30	52	75	6 75 / 2012 (E)	65.3	44.4	21-Jul-12	\$500,000	\$400,000	\$100,000	2020	
08273	Standard Bridge	SE 21-43-9-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR HARDISTY	PG	1952	3	6.1	8.5	6.1		20.7		8.2	28	49	62	999 50 / 2005 (E)	59.9	55.6	23-Oct-09	\$920,000	\$740,000	\$180,000	2020	
09055	Standard Bridge	NW 17-45-13-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR KILLAM	TT	1967	3	6.1	6.1	6.1		18.3		6.1	32	56	80	3 5 / 2010 (E)	53.8	50	18-May-10	\$730,000	\$590,000	\$140,000	2020	
09462	Standard Bridge	NW 29-45-13-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR KILLAM	TT	1971	1	6.1				6.1		6.1	28	49	68	3 10 / 2010 (E)	50.1	44.4	18-May-10	\$500,000	\$400,000	\$100,000	2020	
72402	Standard Bridge	SW 36-44-13-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR KILLAM	PG	1950	3	6.1	8.5	6.1		20.7	-45	9.1	28	49	62	3 20 / 2008 (E)	65.9	50	07-May-08	\$820,000	\$660,000	\$160,000	2020	
74378	Bridge Culv	SW 23-42-11-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR HARDISTY	MP, RPP	1955	2	1549	900			15.2		6.9				10 20 / 2010 (E)	73.1	77.8	18-May-10	\$300,000	\$180,000	\$120,000	2020	
74649	Standard Bridge	SW 3-43-10-4	WATERCOURSE BRIDGE ON LOCAL ROAD NEAR HARDISTY	PG	1952	1	6.1				6.1		7.3	28	49	62	999 10 / 2011 (E)	59.5	50	15-Aug-11	\$600,000	\$480,000	\$120,000	2020	
77262	Bridge Culv	SW 4-44-16-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR DAYSLAND	FP	1970	1	1370				15.2		7.3				6 30 / 2011 (E)	72.4	66.7	15-Aug-11	\$300,000	\$180,000	\$120,000	2020	
77283	Bridge Culv	NW 7-44-16-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR DAYSLAND	MP	1971	1	1520				17.1		6.8				3 30 / 2011 (E)	82.4	88.9	15-Aug-11	\$300,000	\$180,000	\$120,000	2020	
77282	Bridge Culv	SW 6-44-16-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR DAYSLAND	MP	1971	1	1524				18.9	-15	6.7				6 30 / 2011 (E)	75.8	77.8	15-Aug-11	\$300,000	\$180,000	\$120,000	2021	
01019	Standard Bridge	SE 3-46-15-4	WATERCOURSE BRIDGE ON LOCAL ROAD NEAR DAYSLAND	HC	1968	1	6.1				6.1		8.2	28	49	65	6 75 / 2012 (E)	64.4	50	21-Jul-12	\$500,000	\$400,000	\$100,000	2022	
08065	Bridge Culv	NW 19-45-13-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR KILLAM	MP	1973	1	1829				25		7.3				3 20 / 2008 (E)	48.4	66.7	07-May-08	\$300,000	\$180,000	\$120,000	2023	
74033	Bridge Culv	SW 8-42-12-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR ALLIANCE	RPP	1952	1	1450				21.3	20	8				3 35 / 2009 (E)	74.2	77.8	02-Jun-09	\$300,000	\$180,000	\$120,000	2024	
77213	Bridge Culv	SW 18-43-13-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR KILLAM	FP	1970	1	1370				19.5	30	7.5				3 20 / 2009 (E)	67.8	66.7	02-Jun-09	\$300,000	\$180,000	\$120,000	2024	
77832	Bridge Culv	NW 23-43-14-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR KILLAM	MP	1974	1	1524				30.5	45	7.3				6 50 / 2009 (E)	76.4	77.8	02-Jun-09	\$360,000	\$220,000	\$140,000	2024	
79046	Bridge Culv	SW 24-43-14-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR KILLAM	MP	1978	1	1829				29.3	-35	7.3				3 30 / 2009 (E)	78.7	77.8	02-Jun-09	\$300,000	\$180,000	\$120,000	2024	
01218	Standard Bridge	SW 15-45-13-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR KILLAM	HC	1971	3	6.1	6.1	6.1		18.3		7.3	28	49	65	6 30 / 2010 (E)	64.4	50	19-May-10	\$730,000	\$590,000	\$140,000	2025	
06623	Standard Bridge	SW 14-42-12-4	WATERCOURSE BRIDGE ON LOCAL ROAD NEAR HARDISTY	TT	1975	1	8.5				8.5		7.3	33	58	84	999 10 / 2010 (E)	72.2	61.1	18-May-10	\$600,000	\$480,000	\$120,000	2025	
06992	Standard Bridge	NW 18-43-9-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR HARDISTY	HC	1968	3	8.5	8.5	8.5		25.5		7.3	30	52	75	3 50 / 2010 (E)	68.7	55.6	05-Apr-11	\$1,020,000	\$820,000	\$200,000	2025	
07651	Bridge Culv	NE 5-43-11-4	ANIMAL TRAIL CULVERT ON LOCAL ROAD NEAR LOUGHEED	MP	1965	1	1800				14.5		7.5				3 150 / 2012 (E)	50.6	33.3	21-Jul-12	\$300,000	\$180,000	\$120,000	2025	
07718	Standard Bridge	SW 6-46-13-4	WATERCOURSE BRIDGE ON LOCAL ROAD NEAR KILLAM	HC	1971	1	8.5				8.5		7.3	30	52	75	3 25 / 2010 (E)	70.3	55.6	18-May-10	\$500,000	\$400,000	\$100,000	2025	
08318	Standard Bridge	NW 13-43-10-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR HARDISTY	TT	1968	1	8.5				8.5		6.1	29	51	73	3 25 / 2010 (E)	59.4	61.1	19-May-10	\$500,000	\$400,000	\$100,000	2025	
08983	Standard Bridge	SW 26-44-11-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR HARDISTY	TT	1969	3	6.1	6.1	6.1		18.3	30	6.1	28	50	72	3 20 / 2010 (E)	61.4	50	19-May-10	\$730,000	\$590,000	\$140,000	2025	
09054	Standard Bridge	NW 2-45-13-4	IRON CREEK BRIDGE ON LOCAL ROAD NEAR KILLAM	TT	1975	2	6.1	6.1			12.2		7.3	32	56	79	3 2 / 2011 (E)	65.9	44.4	03-Feb-12	\$700,000	\$560,000	\$140,000	2025	
09463	Standard Bridge	NW 32-45-13-4	WATERCOURSE BRIDGE ON LOCAL ROAD NEAR KILLAM	PG	1954	1	6.1				6.1		7.3	28	49	62	3 10 / 2010 (E)	67.2	61.1	18-May-10	\$500,000	\$400,000	\$100,000	2025	
75127	Standard Bridge	SW 15-46-15-4	WATERCOURSE BRIDGE ON LOCAL ROAD NEAR DAYSLAND	TT	1959	1	6.1				6.1		6.1	28	49	67	6 20 / 2010 (E)	62.5	55.6	18-May-10	\$500,000	\$400,000	\$100,000	2025	
77115	Bridge Culv	NE 24-45-14-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR KILLAM	MP	1970	1	1829				21.3		7.3				6 30 / 2003 (E)	69	66.7	07-May-08	\$300,000	\$180,000	\$120,000	2025	
78060	Bridge Culv	SW 27-46-15-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR STROME	MP	1975	1	1520				16.5		6.5				6 25 / 2009 (E)	73.7	77.8	02-Jun-09	\$300,000	\$180,000	\$120,000	2025	
78061	Bridge Culv	SW 27-46-15-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR STROME	MP	1975	1	1520				17.7		7.5				3 50 / 2004 (E)	73.3	77.8	02-Jun-09	\$300,000	\$180,000	\$120,000	2025	
79104	Bridge Culv	SW 4-44-16-4	WATERCOURSE CULVERT ON LOCAL ROAD NEAR DAYSLAND	MP	1980	1	1820				17.7		6.5				3 30 / 2011 (E)	77.7	77.8	15-Aug-11	\$300,000	\$180			

10-Sep	Schultz Lake-Rge Rd 123 at Coal Trail-Twp Rd 410	67
20-Jul	Ross Hinkey Road, Twp Rd 442 & SH #870	58
14-Apr	Rosalind Rd-Twp Rd 442 & Rge Rd 164	39
3-Sep	Lougheed South-Rge Rd 114 at Twp Rd 435	124
10-Sep	Lougheed East-Twp Rd 435 at Rge Rd 111	32
20-Jul	Heisler Correction Line-Twp Rd 430 at Badry's Corner-Rge Rd 154	69
20-Jul	Hardisty North-Rge Rd 100 at SH #881	73
21-May	Hardisty Airport-Twp Rd 103 at Hwy #13	101
4-May	Hardisty Access-Rge Rd 100A at Hwy #13	389 (12 hrs.)
14-Apr	Hardisty Access-Rge Rd 100A at Hwy #13	93 (6 hrs.)
10-Sep	Galahad Coal Trail-Twp Rd 410 at SH #861	55
4-May	Eckstrand Rd-Rge Rd 125	77
4-May	Correction Line-Twp Rd 430	162
6-May	Daysland East-Twp Rd 452 at Rge Rd 160	64
21-May	Coal Trail-Twp Rd 410 at Spady Corner-Rge Rd 130	89
6-May	Coal Trail-Twp Rd 410	133
6-May	Forestburg South-Rge Rd 152	106
21-May	Bruce Road-Rge Rd 150 & Twp Rd 460	40
6-May	Bruce Road-Rge Rd 150 & Twp Rd 444	87
15-Sep	Bruce Road-Rge Rd 150 at Strome Access-Twp Rd 444	118
3-Sep	Bellshill South-Rge Rd 113 at SH #608	65
3-Sep	Bellshill North-Rge Rd 113 at Correction Line-Twp Rd 430	52
6-May	Armitage Road-Rge Rd 123 at Twp Rd 440	34
2009		
13-May	Rge Rd 123 & Twp Rd 414-Viking Energy Rd	238
28-Jul	Sedgewick North-Rge Rd 124 at Twp Rd 454	128
24-Apr	Sedgewick North-Rge Rd 124 at Trinity-Twp Rd 450	182
13-May	Rosalind Rd-Twp Rd 442 & Rge Rd 163	99
28-Jul	Metro Rd-Twp Rd 454 at SH #870	21
24-Apr	Lougheed South-Rge Rd 114 at Twp Rd 435	115
11-Sep	Lougheed South-Rge Rd 114 at Correction Line-Twp Rd 430	91
24-Apr	Lougheed East-Twp Rd 435	50
10-Jul	Landfill Rd at Ross Hinkey Rd (Twp Rd 442 & Rge Rd 122)	119
15-May	Killam North at Rge Rd 141	24
11-Sep	Jim Crawford Corner-Rge Rd 154 & Twp Rd 414	49
9-Jul	Heisler Correction Line-Twp Rd 430 at Rge Rd 154	46
9-Jul	Hardisty West-Rge Rd 102 at Twp Rd 432	19
9-Jul	Galahad Coal Trail-Twp Rd 410 at SH #861	51
15-May	Daysland East-Twp Rd 452	76
13-May	Coal Trail at Spady Corner-Twp Rd 410 at Rge Rd 130	66
10-Jul	Coal Trail-Twp Rd 410 at SH #872	31
15-May	Bruce Road-Rge Rd 150 at Twp Rd 444	111
10-Jul	Bellshill South-Rge Rd 113 at Flagstaff Hill, south of Twp 414	17