

Gravel Roads Modernization Initiative

Update



Sturgeon
C O U N T Y

Background

Motion 418/23 at the November 22, 2023 Council Budget Meeting authorized the following:

- An ongoing annual allocation of \$250,000 to the General Operating reserve for maintenance improvements, and,
- \$250,000 to the Road Network Reserve for direct or indirect capital investments to the gravel road network.

In line with Council's direction, Administration is proposing a delivery strategy that addresses immediate and long-term improvements that modernizes the County's Gravel Roads Program.

The delivery strategy:

1. Recognizes that current levels of service for gravel roads do not meet the expectations of users.
2. Recommends improvements to grading and graveling frequency, snow clearing response times, as well as investments with long term improvements impacts.

Gravel Roads Modernization Initiative

Delivery Plan

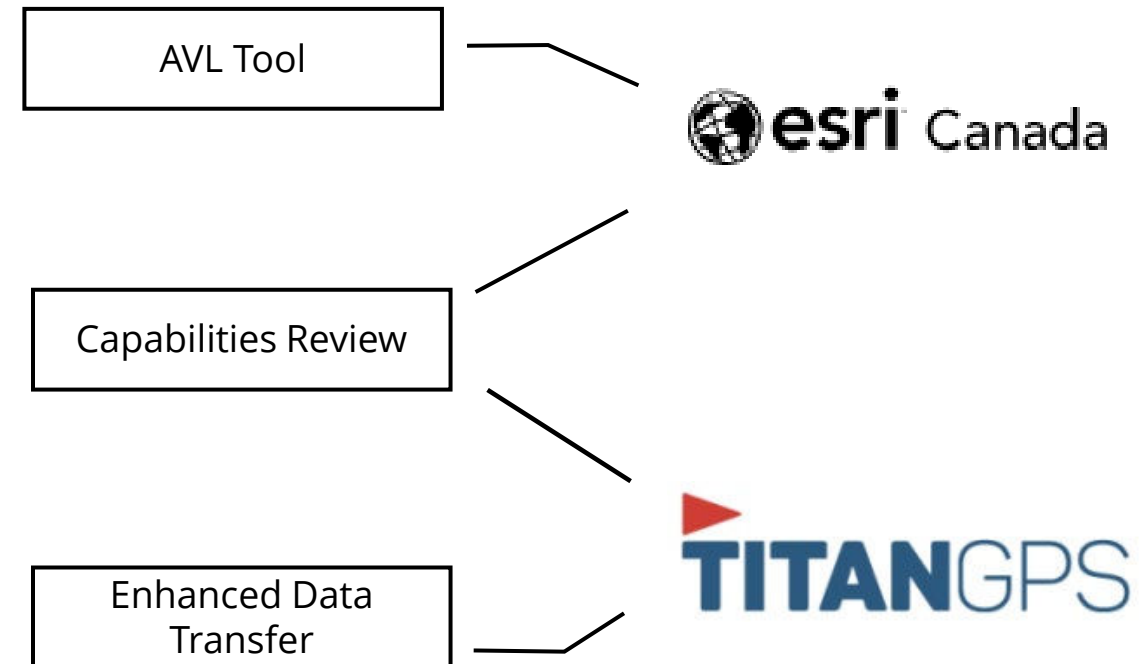
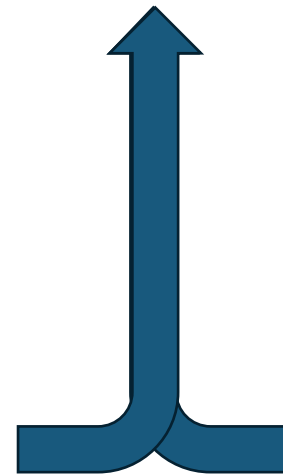
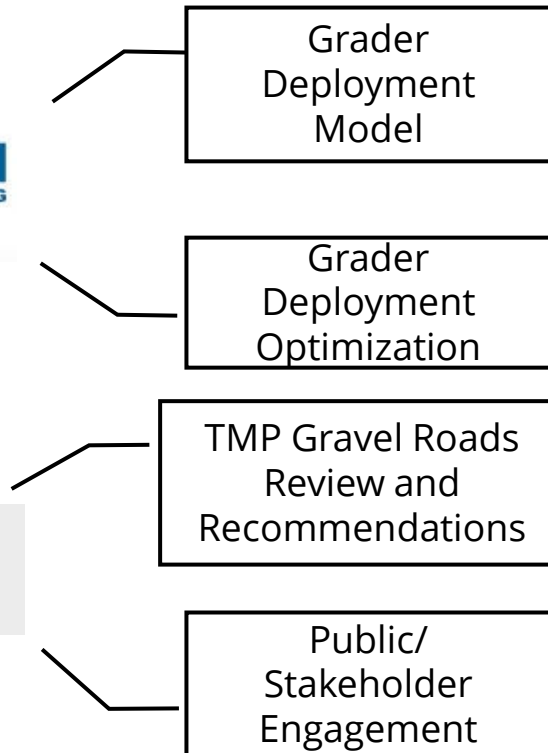
Phase 1: Immediate Operational Response to Improve Gravel Roads Users' Experience

Phase 2: Data Analysis / Optimization / Service Level Policy Review

Phase 3: Monitoring and Reporting Technology

Phase 4: Asset Management (Infrastructure Recommendations)

Gravel Roads Modernization Initiative



Phase 2- Data Analysis/ Optimization/ Service Level Policy Review

Grader Deployment Optimization- EHAN Engineering

Stage 1 - Review information and develop Deployment Concept

Stage 2 - Develop Grader Deployment Model Simulation

Stage 3 - Development of Grader Deployment Model Optimization

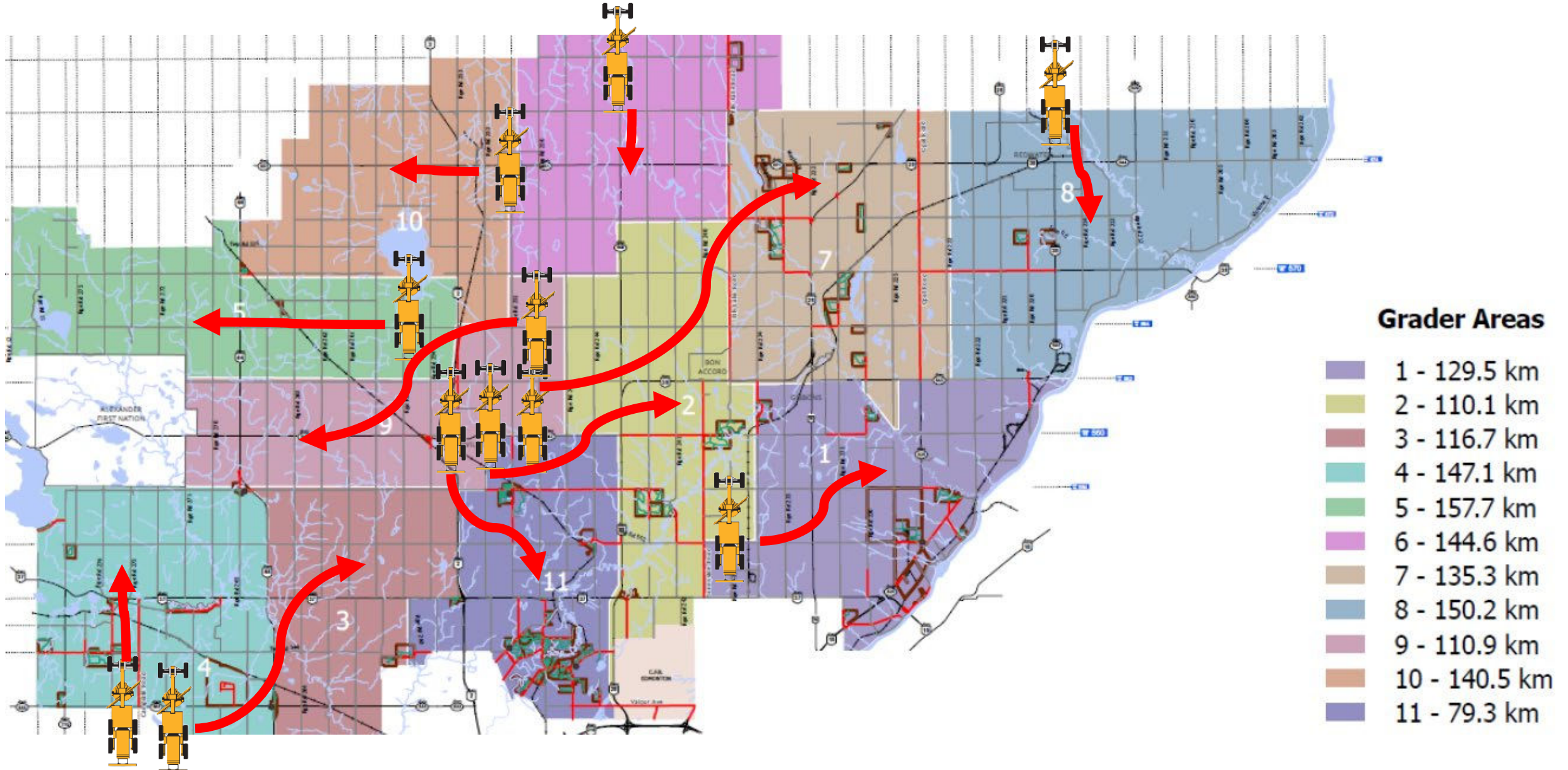
Stage 4 - Run Various Scenarios

Stage 5 - Develop Grading Deployment Dashboard

Stage 6 - Draft/ Finalize Report

Timeline October 2024 – March 2025

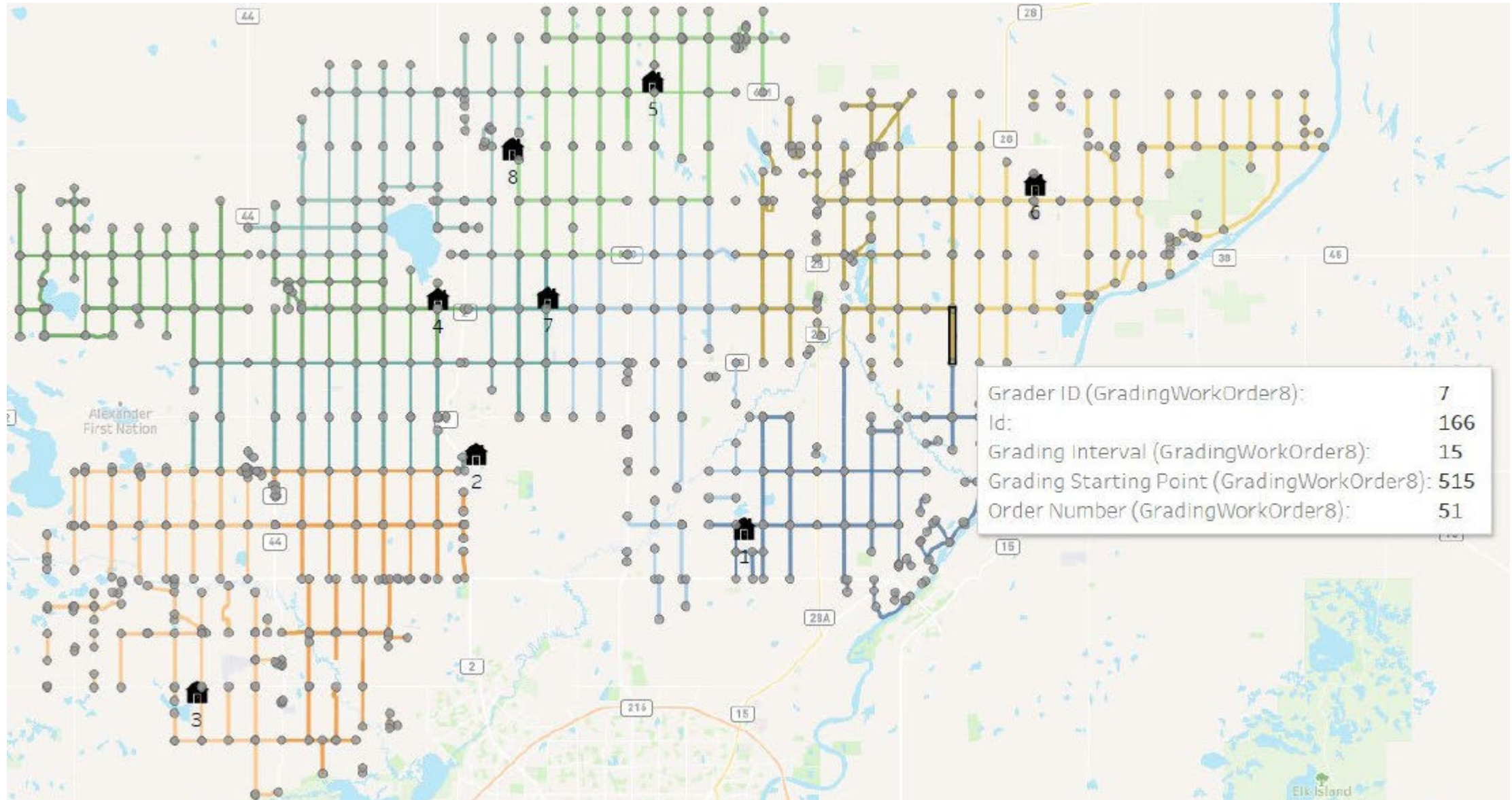
Current Resource Leveling by Grader Division



Resourcing/Remote Grader Sites

- **Morinville Main Shop and Yard (3)**
 - Access to main shop
 - Lighting- Yes
 - Power- Yes
 - Security- Security fence and cameras
- **Legal Public Works Yard (Outdoor Rental Space) (1)**
 - Lighting – Yes
 - Power- No
 - Security- Security fence and monitored alarm system
- **Redwater Public Works Yard (Outdoor Rental Space) (1)**
 - Lighting – Yes
 - Power- No
 - Security- Security fence and monitored alarm system
- **Private Yards (Acreage/ Farms) (4)**
 - Lighting- Yes
 - Power- Yes
 - Security- Various- Gates/ Fences/ Cameras etc.
- **Villeneuve Gravel Pit (2)**
 - 10' x 12' Garden Shed
 - Lighting- None
 - Power- None
 - Security- Barbed Wire Fence and locked gate
- **Town of Gibbons Yard (Moving 2 Graders from the Morinville Main Shop/Yard)**
 - Lighting – Yes
 - Power – Yes
 - Security – Security fence in place

Mapping out each operator's typical weekly work (BASE PLAN)



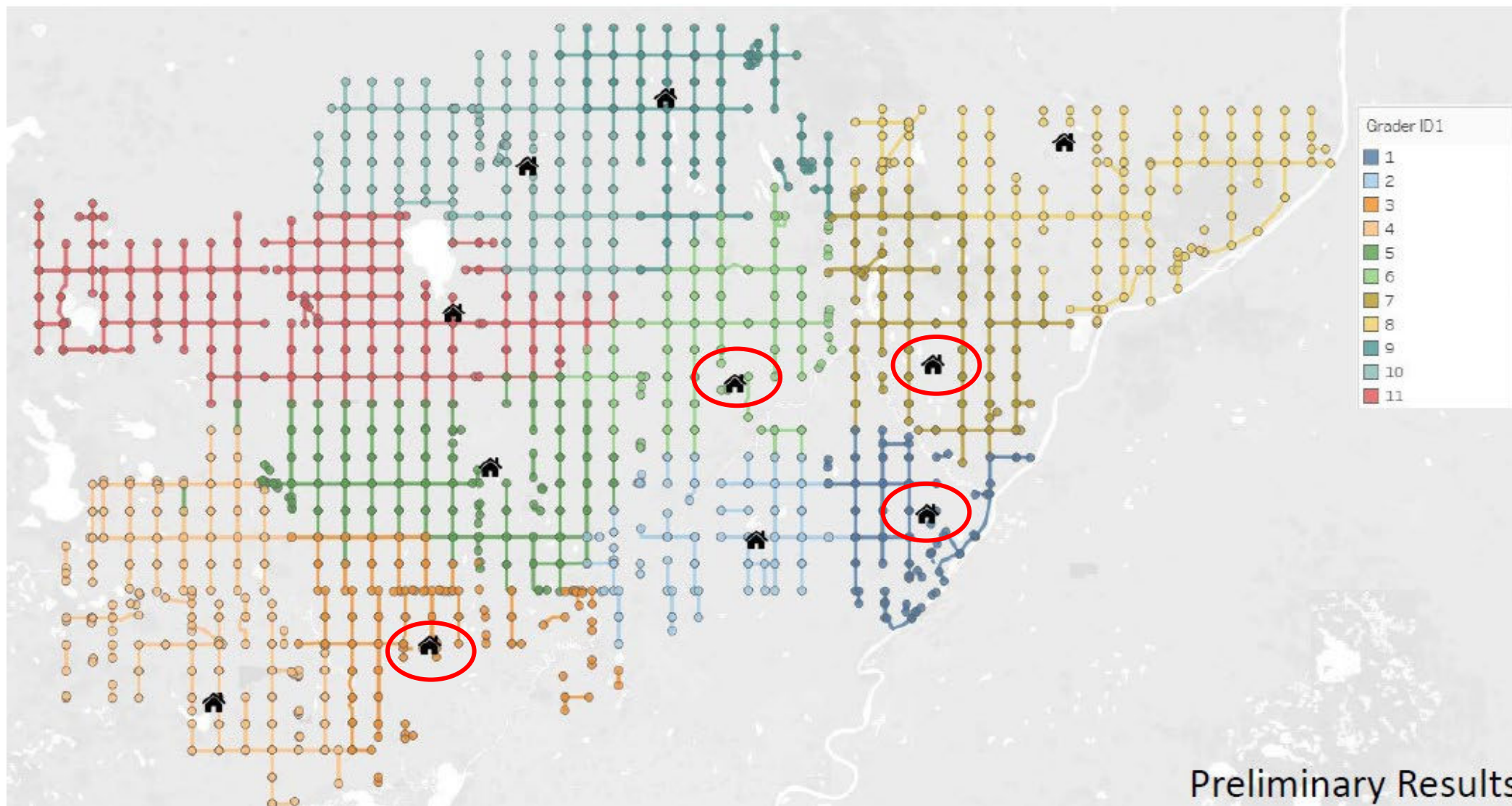
Detailed Analysis - BASE PLAN

No.	Analysis Results	Unit	Grader ID											Total
			1	2	3	4	5	6	7	8	9	10	11	
1	Number of Road Sections	Section	56	49	55	81	59	50	61	62	36	55	43	607
2	Total Grading Length	km	297.38	435.35	475.67	589.12	352.36	289.17	505.85	385.51	444.13	314.62	350.52	4440
3	Total Travel Distance Between Shed and Sections	km	293.70	466.93	397.32	361.46	605.86	98.85	1234.50	200.14	347.64	162.23	201.68	4370
4	Total Travel Distance Between Sections	km	154.09	173.97	145.55	209.30	154.79	147.78	157.17	171.54	145.27	133.35	190.56	1783
5	Total Travel Distance	km	745.16	1076.25	1018.54	1159.88	1113.02	535.80	1897.52	757.19	937.05	610.19	742.75	10593
6	Total Grading Time	hrs	40.91	57.69	63.12	79.04	47.98	39.48	67.30	52.32	57.92	42.99	46.68	595
7	Total Travel Time Between Shed and Sections	hrs	7.34	11.67	9.93	9.04	15.15	2.47	30.86	5.00	8.69	4.06	5.04	109
8	Total Travel Time Between Sections	hrs	3.85	4.35	3.64	5.23	3.87	3.69	3.93	4.29	3.63	3.33	4.76	45
9	Total Travel Time	hrs	52.10	73.71	76.70	93.31	67.00	45.65	102.09	61.61	70.24	50.38	56.49	749
11	First Home Shed	ID	1	2	3	3	4	5	2	6	7	8	2	
12	Last Home Shed	ID	1	2	3	3	4	5	2	6	7	8	2	
13	Number of Home Sheds	Sheds	1	1	1	1	1	1	1	1	1	1	1	
14	Number of Back-to-Back Sections	Sections	5	1	8	5	7	3	6	11	2	8	2	58
15	Grading Cost	\$	\$ 14,536	\$ 20,565	\$ 21,398	\$ 26,033	\$ 18,692	\$ 12,735	\$ 28,483	\$ 17,190	\$ 19,597	\$ 14,057	\$ 15,760	\$ 209,046
16	Grading Distance/Total Travel Distance	%	40%	40%	47%	51%	32%	54%	27%	51%	47%	52%	47%	42%
17	Travel Distance Between Shed and Sections/Total Travel Distance	%	39%	43%	39%	31%	54%	18%	65%	26%	37%	27%	27%	41%
18	Total Travel Distance Between Sections/Total Travel Distance	%	21%	16%	14%	18%	14%	28%	8%	23%	16%	22%	26%	17%

Detailed Analysis - BASE PLAN - Simulate 4-Passes

No.	Analysis Results	Unit	Grader ID											Total
			1	2	3	4	5	6	7	8	9	10	11	
1	Number of Road Sections	Section	56	49	55	81	59	50	61	62	36	55	43	607
2	Total Grading Length	km	504.90	435.95	469.51	577.01	630.85	578.34	529.00	579.29	445.76	544.86	312.11	5608
3	Total Travel Distance Between Shed and Sections	km	355.60	466.93	400.53	359.80	913.40	268.03	1235.74	289.32	366.89	315.45	219.88	5192
4	Total Travel Distance Between Sections	km	152.28	173.97	145.52	196.20	137.27	146.18	166.72	154.85	147.71	131.34	149.27	1701
5	Total Travel Distance	km	1012.78	1076.86	1015.57	1133.01	1681.52	992.56	1931.46	1023.46	960.37	991.64	681.26	12500
6	Total Grading Time	hrs	66.85	57.76	62.36	77.53	82.79	75.63	70.19	76.54	58.12	71.77	41.88	741
7	Total Travel Time Between Shed and Sections	hrs	8.89	11.67	10.01	9.00	22.84	6.70	30.89	7.23	9.17	7.89	5.50	130
8	Total Travel Time Between Sections	hrs	3.81	4.35	3.64	4.90	3.43	3.65	4.17	3.87	3.69	3.28	3.73	43
9	Total Travel Time	hrs	79.54	73.78	76.01	91.43	109.06	85.98	105.25	87.65	70.99	82.94	51.11	914
11	First Home Shed	ID	1	2	3	3	4	5	2	6	7	8	2	
12	Last Home Shed	ID	1	2	3	3	4	5	2	6	7	8	2	
13	Number of Home Sheds	Sheds	1	1	1	1	1	1	1	1	1	1	1	
14	Number of Back-to-Back Sections	Sections	4	1	7	6	5	2	6	8	2	7	2	50
16	Grading Distance/Total Travel Distance	%	50%	40%	46%	51%	38%	58%	27%	57%	46%	55%	46%	45%
17	Travel Distance Between Shed and Sections/Total Travel Distance	%	35%	43%	39%	32%	54%	27%	64%	28%	38%	32%	32%	42%
18	Total Travel Distance Between Sections/Total Travel Distance	%	15%	16%	14%	17%	8%	15%	9%	15%	15%	13%	22%	14%

Detailed Analysis- OPTIMIZATION



Detailed Analysis- OPTIMIZATION

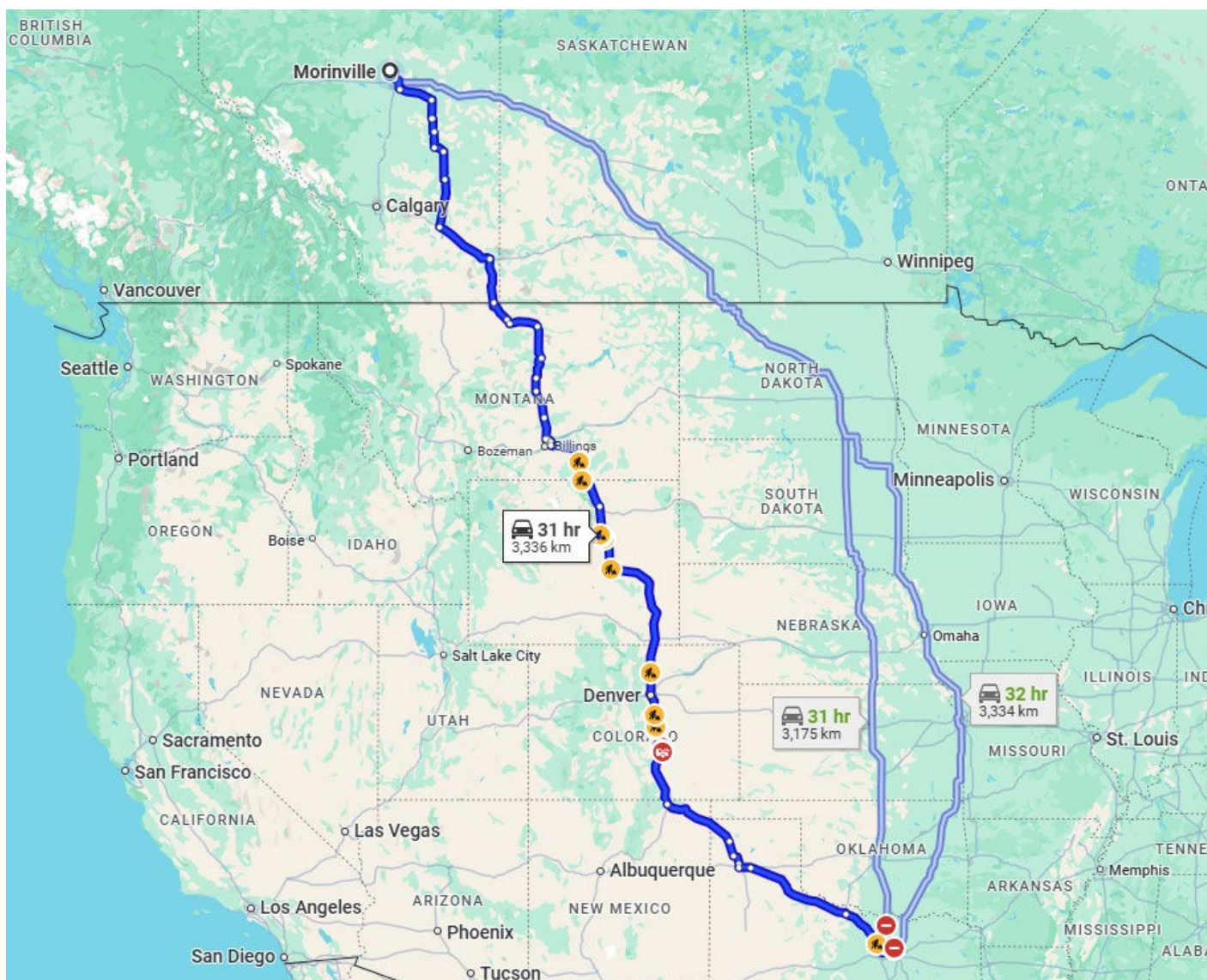
1

2

3

No.	Analysis Results	Unit	Same Number of Passes AS Base				3 Passes				4 Passes			
			Simulation	Optimization	Diff.	Difference %	Simulation	Optimization	Diff.	Difference %	Simulation	Optimization	Diff.	Difference %
1	Number of Road Sections	Section	607	982			607	982			607	982		
2	Total Grading Length	km	4440	4440			4206	4201			5608	5601		
3	Total Travel Distance Between Shed and Sections	km	4370	1861		-57%	4040	1856		-54%	5192	2232		-57%
4	Total Travel Distance Between Sections	km	1783	1313		-26%	1863	1614		-13%	1701	1295		-24%
5	Total Travel Distance	km	10593	7615	2978	-28%	10108	7670	2438	-24%	12500	9127	3373	-27%
6	Total Grading Time	hrs	595	621		4%	566	591		4%	741	766		3%
7	Total Travel Time Between Shed and Sections	hrs	109	47		-57%	101	46		-54%	130	56		-57%
8	Total Travel Time Between Sections	hrs	45	33		-26%	47	40		-13%	43	32		-24%
9	Total Travel Time	hrs	749	700		-7%	714	677		-5%	914	854		-7%
11	First Home Shed	ID												
12	Last Home Shed	ID												
13	Number of Home Sheds	Sheds												
14	Number of Back-to-Back Sections	Sections	58	314			75	291			50	269		
15	Grading Distance/Total Travel Distance	%	42%	58%			42%	55%			45%	61%		
16	Travel Distance Between Shed and Sections/Total Travel Distance	%	41%	24%			40%	24%			42%	24%		
17	Total Travel Distance Between Sections/Total Travel Distance	%	17%	17%			18%	21%			14%	14%		

Detailed Analysis - OPTIMIZATION



Savings of **3,373** km every cycle
That's equivalent to driving a grader from Morinville to Dallas, Texas.... Every 3 weeks

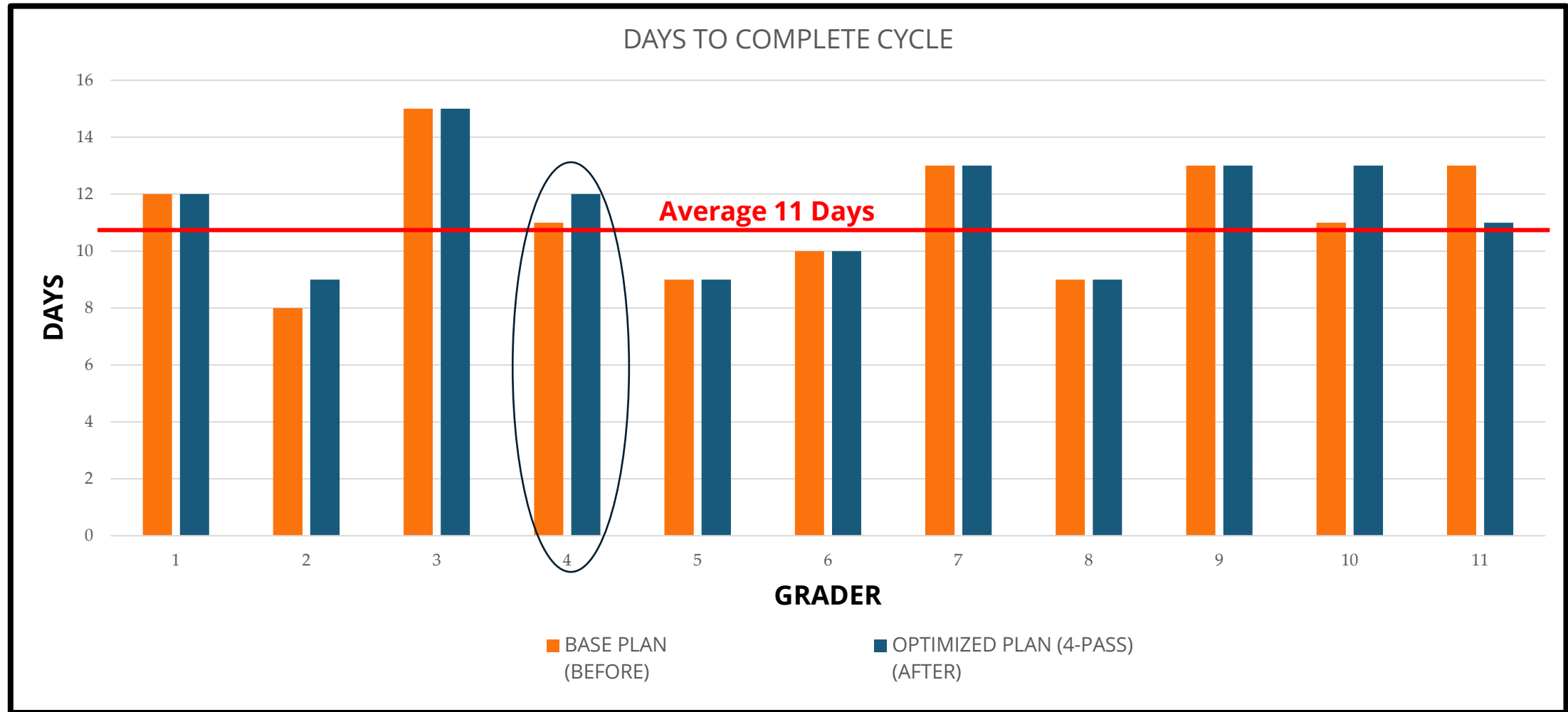
Or.. Driving 11 graders from Morinville to Airdrie...every 3 weeks

At 50kph that would take 67.50 hours.

That equates to a total of **877.50** hrs of opportunity gain in one summer season.
The financial value of that gain is \$244,822.50.

Phase 2- Grader Optimization

Grader Deployment Optimization- Results



Level of Service- Practical Expression

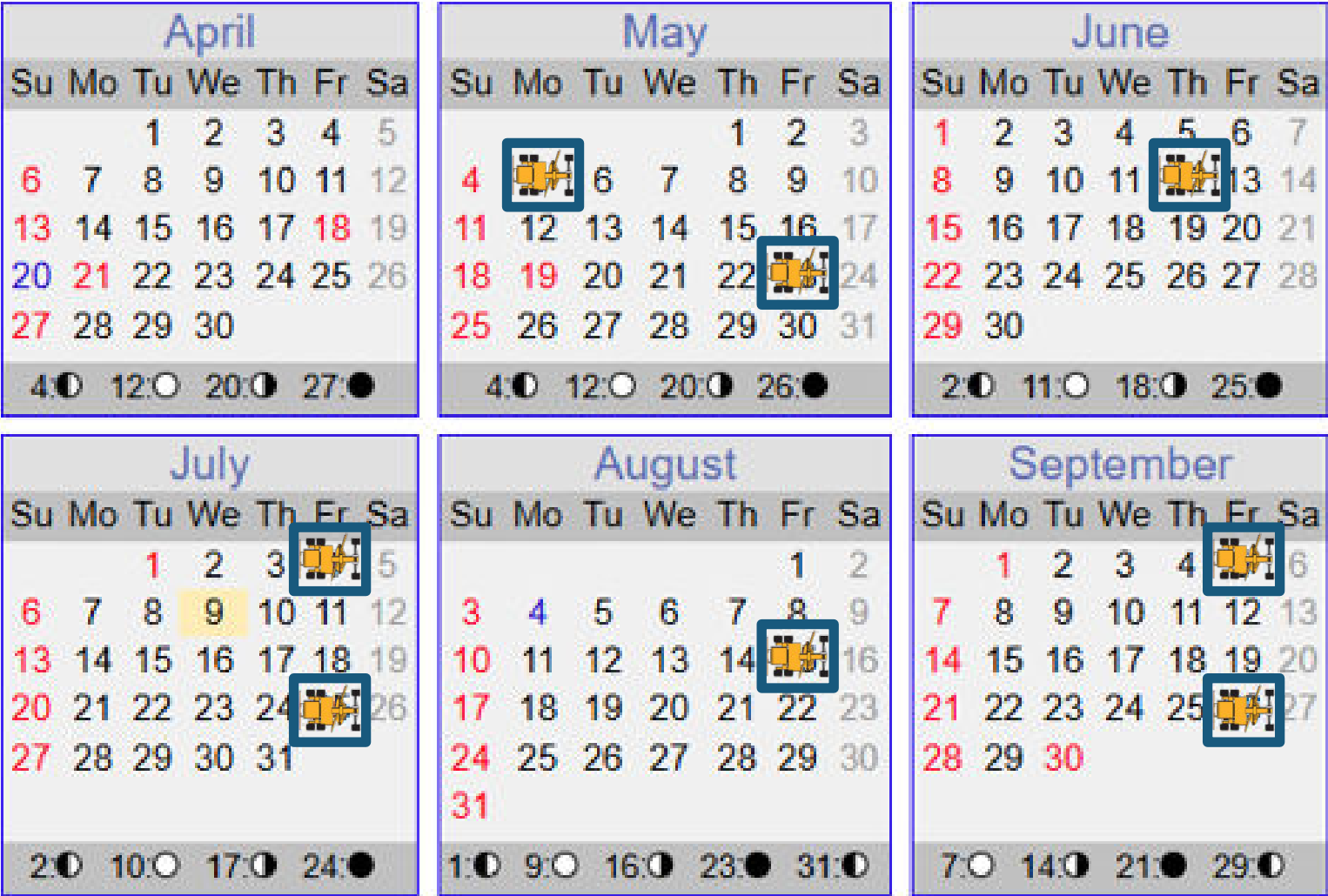
It's a math exercise....

DAYS PER SUMMER (May 1 - Sept 30.)	154
MINUS- WEEKEND DAYS (Sat-Sun)	-44
MINUS- STAT HOLIDAYS	-4
MINUS PREVENTATIVE MAINTENANCE AND SERVICE DAYS	-2.5
MINUS AVERAGE SICK DAYS	-1
MINUS SAFETY MEETINGS/ TRAINING DAYS	-5
MINUS RAIN DAYS	-15

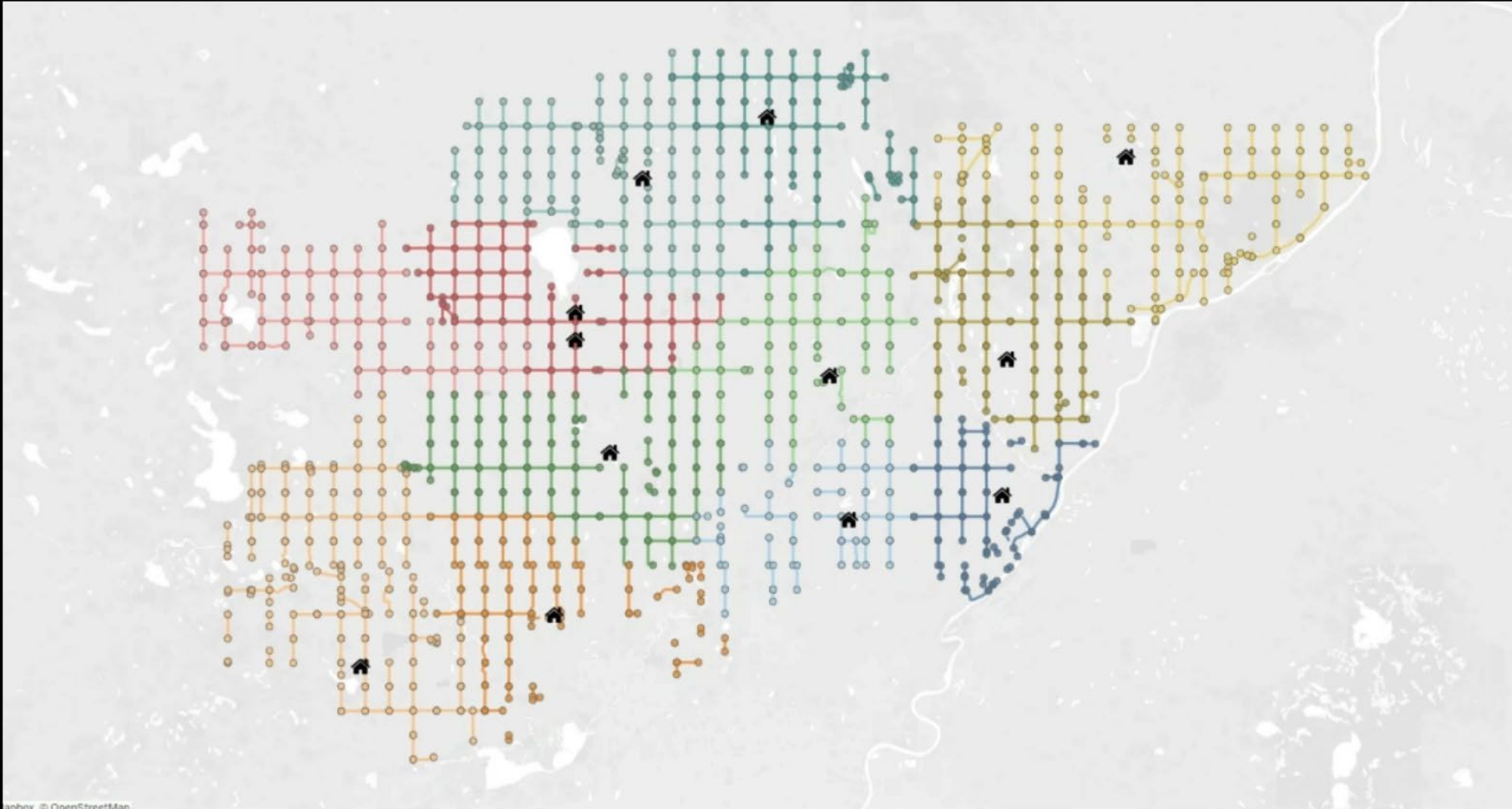
82.5

LEVEL OF SERVICE (DAYS)	11
NO. OF CYCLES PER SUMMER SEASON	7.5

Level of Service- Practical Expression



ROUTING- What does it look like?



Phase 2- Grader Optimization

Grader Deployment Optimization- Results

- Confirming what we already knew:
 - Although all operators strive for the same outcomes- each takes a different approach, resulting in a variety of service levels across the network
 - Some division service levels are impacted by increased travel times more than others
 - Each division is un-balanced for several reasons- But this complicates service levels
- What we learned:
 - Travel times had a much larger impact than we even thought
 - Grader operators were inherently very efficient in planning their work most of the time
 - Ancillary roads such as dead-end roads and service roads were more much inefficient than we thought
 - When taking into account all aspects of work- Operators cannot provide a consistent base service level of 4 passes in 10 days- Not even close

ACTION PLAN- What should we do with what we learned?

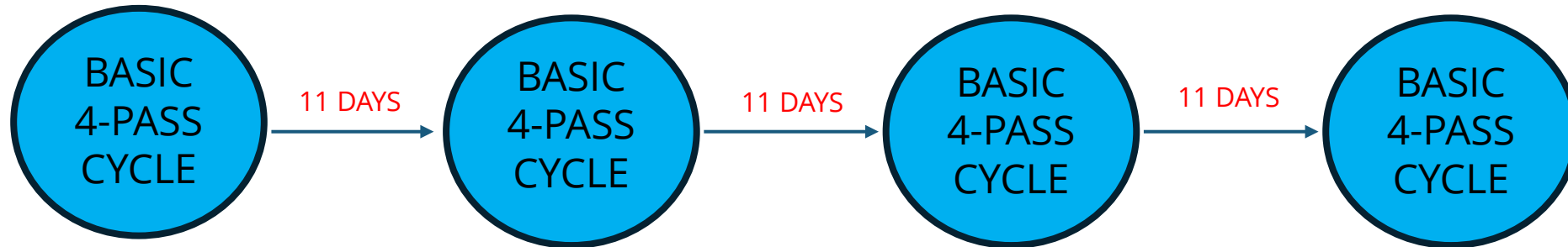
- CONSISTANT AND SYSTEMATIC MAINTENANCE APPROACH
 - EX: 2 Pass system vs 4- Pass System or Hybrid approach
 - Incorporate intersections into the cycle
- ROUTING
 - Provide operators defined routing that removes objectivity and softens judgement
 - Creates predictability but lowers reactivity
- LEVEL OF SERVICE
 - How do we define levels of service?
- SCHEDULING
 - Can schedules be provided to residents and if so how can this be accomplished?

What problem are we trying to solve?

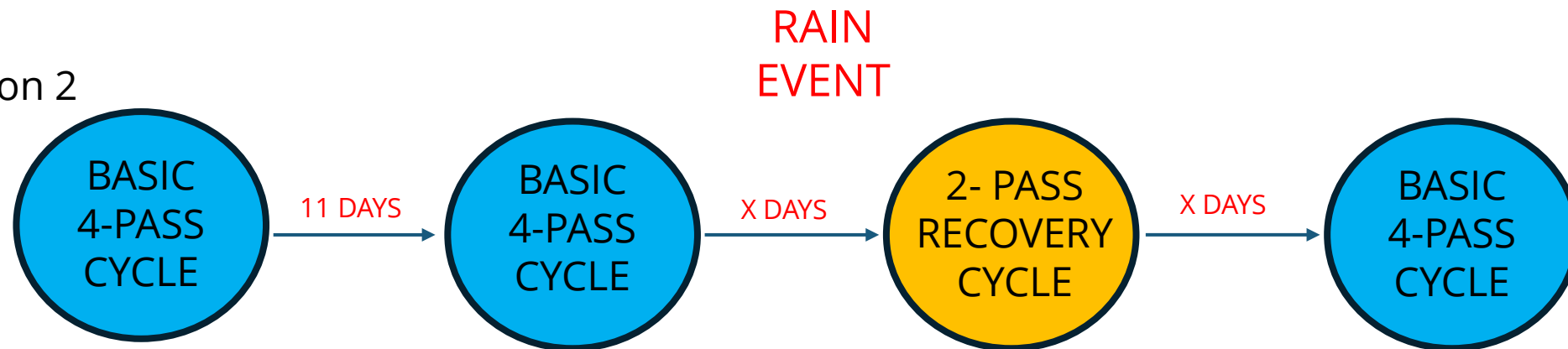
Is it complaints about the road conditions or is it complaints about when the roads are (or are not) graded?

Grading Cycle Configuration Examples

Option 1

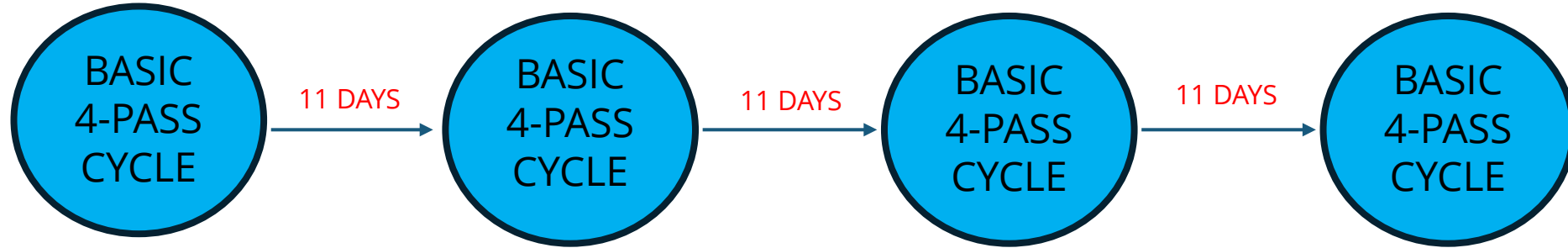


Option 2

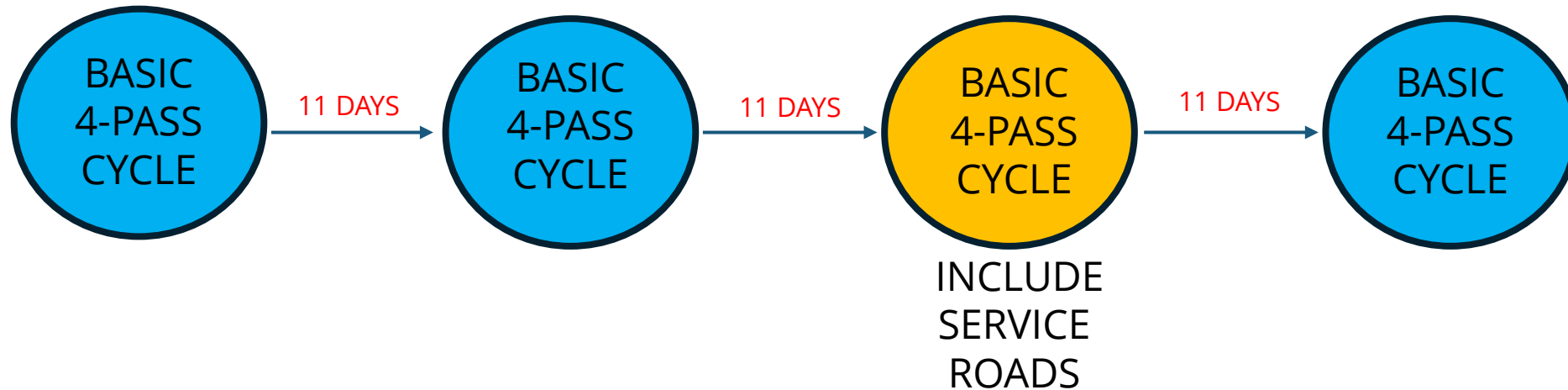


Grading Cycle Configuration Examples

Option 1



Option 2



ACTION PLAN- What are the barriers?

- PEOPLE & CHANGE
 - It can be very difficult for people to change
 - Changing how things have been done for 40 years
 - Shift hours/ Payroll impacts
 - Increasing shift hours will also increase machine hours and replacement cycles
- TECHNOLOGY
 - Running scenarios when circumstances change
 - Monitoring and reporting for accountability

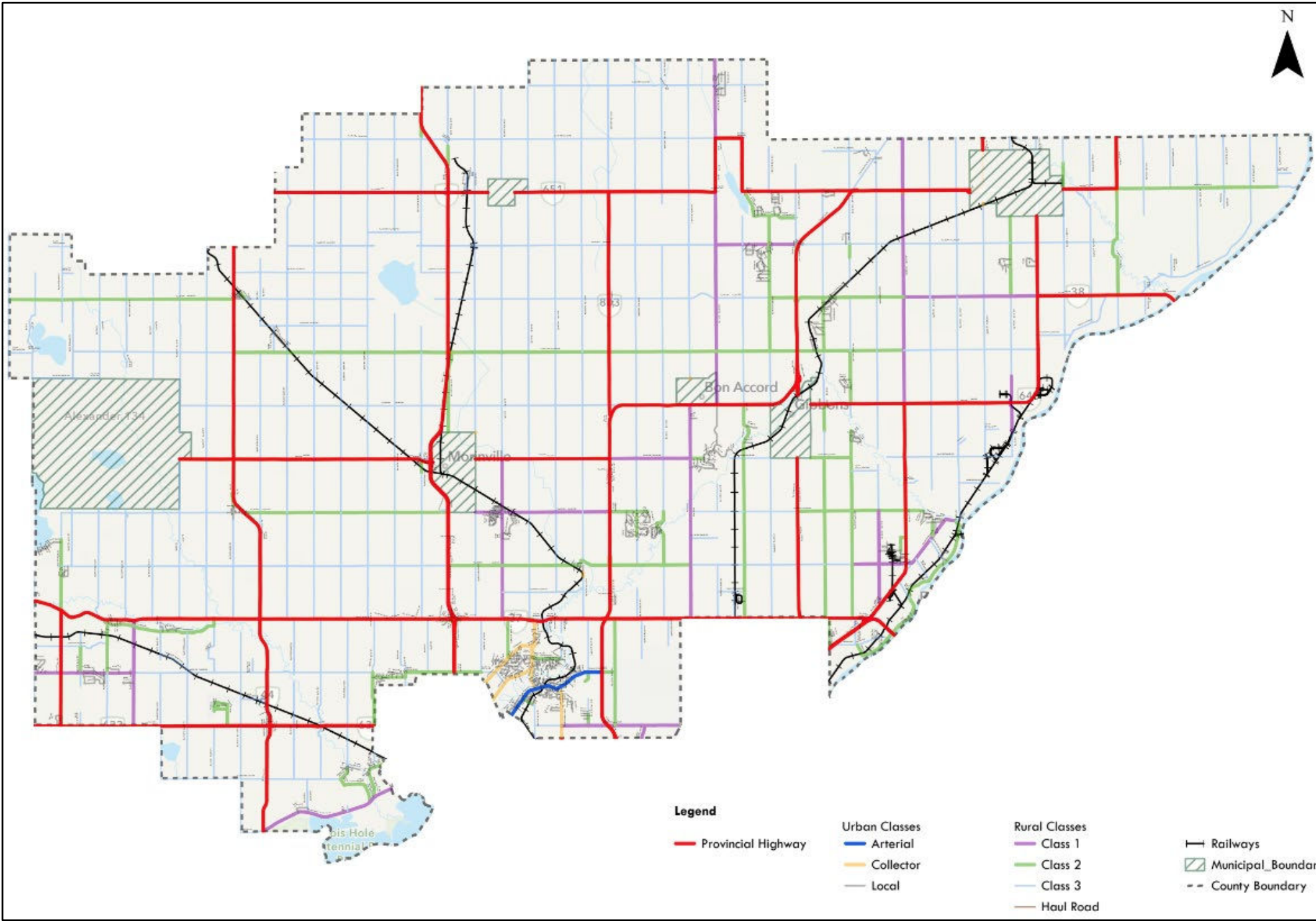
Phase 2- Data Analysis/ Optimization/ Service Level Policy Review

Transportation Master Plan

Gravel Roads Focus Report- McElhanney

- Review and recommend Road Subclassification
- Review and recommend current practices
 - Activities
 - Commercial Activity/ Road Use
 - Policies and funding
 - Levels of Service
- Public and stakeholder engagement
- Review and recommend data input drivers

Phase 2- Gravel Roads Technical Report



Phase 2-Gravel Roads Technical Report

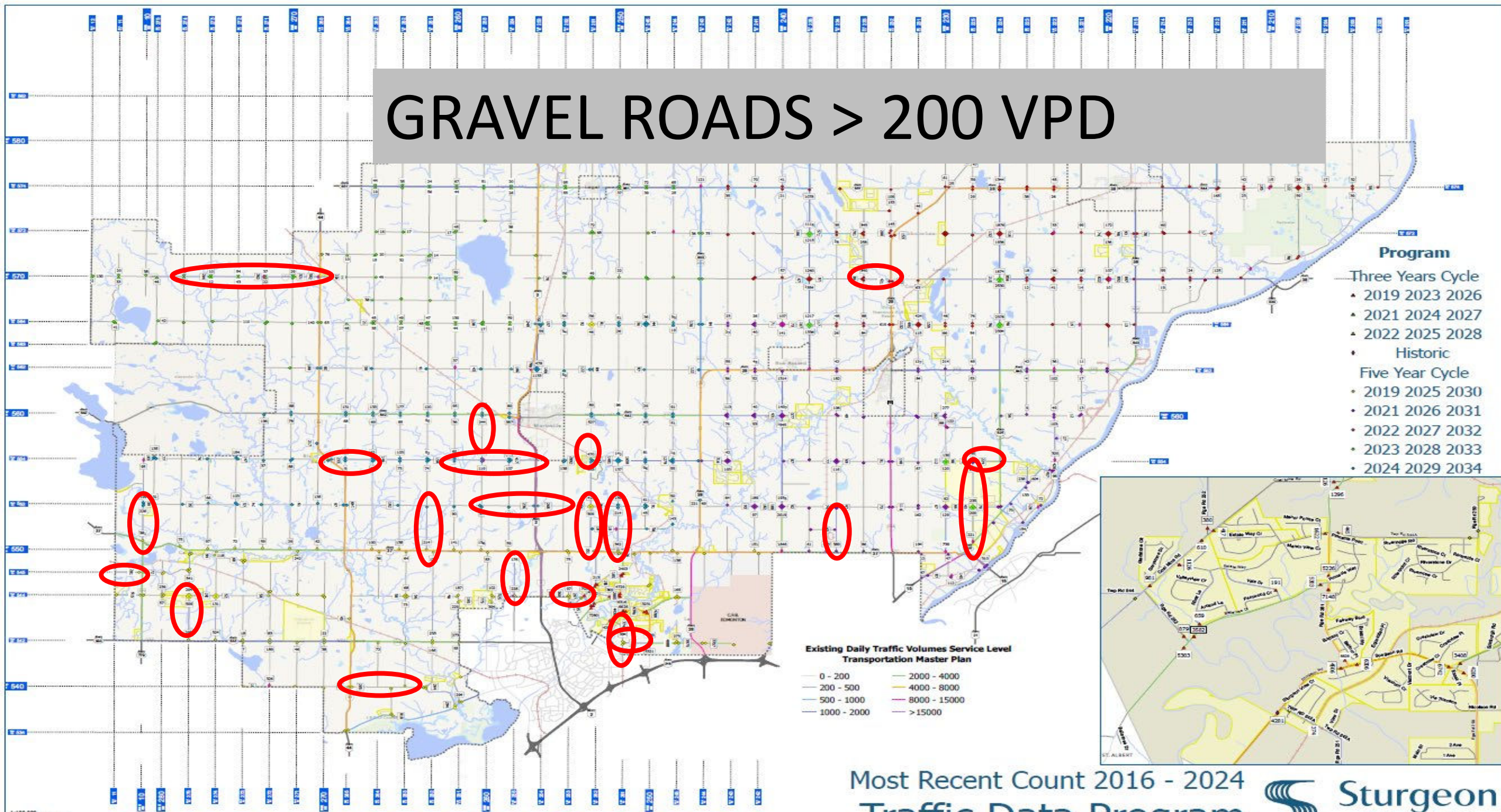
Sturgeon County Road Classification		Daily Traffic Volume Threshold	Design Speed	Typical Road Cross-Section Width	Minimum Right-of-Way Width	Surface Treatment
Urban Roads						
Arterial	Four-Lane Divided	< 30,000 vpd	80 km/h	20.3m	42.0m	Paved
	Sturgeon Valley				34.0 – 35.0m	
Collector	Minor Residential	< 5,000 vpd	50 - 60 km/h	12.0m	23.0m	Paved
	Major Residential	< 10,000 vpd		12.5m	25.0m	
	Industrial /Commercial	< 10,000 vpd		13.5m	26.0m	
	Sturgeon Valley Residential	<5,000 vpd – 10,000 vpd		12.5m	25.5 – 28.5m	
	Sturgeon Valley Commercial/Mixed Use	< 10,000 vpd		12.5m	22.5m	
Local	Lane	<1,000 vpd	20 km/hr	5.8m	6.0m	Paved
	Residential	<1,000 vpd	50 km/h	7.5 – 9.0m	20.0 – 30.0m	
	Industrial/Commercial	<1,000 vpd	50 km/h	11.0m	22.0m	
	Sturgeon Valley	<1,000 vpd	50 km/h	11.0m	24.0 – 28.0m	
Rural Roads						
Class I Rural Grid		>1,000 vpd	80 - 100 km/h	9.0m	40.0m	Hot mix asphaltic concrete
Class II Rural Grid		200 – 1,000 vpd	60 - 90 km/h	8.0m	30.0 – 40.0m	Hot mix asphaltic concrete or gravel
Class III Rural Grid		<200 vpd	60 - 90 km/h	7.5m	30.0m	Gravel (dust mitigation)
Haul Road		<200 vpd	60 - 90 km/h	10.0m	30.0m	Gravel (dust mitigation)

Phase 2- Gravel Roads Technical Report

DRAFT

Classification	Typical Cross Section Width (m)	Traffic Conditions	Road Conditions	Use Case
Class 2 Roadways				
Class 2(b)	8.0	600 to 1000 vpd and / or facilitating a high percentage of truck traffic.	Has a significant number of features that may cause quicker deterioration- Such as Curves, hills, bridges, culverts, etc	Bus routes, Transportation Corridors, Rural Residential Roads, Community Access Roads, Postal Routes, industrial Roads, Emergency access roads, etc
Class 2(c)	8.0	200 to 600 vpd and / or facilitating a lower percentage of truck traffic.	Has a limited number of features that may cause quicker deterioration - Such as Curves, hills, bridges, culverts, etc	Agricultural roads, resources extraction sites, rural residential roads with lower traffic
Class 3 Roadways				
Class 3(a)	7.5	100 to 200 vpd and / or facilitating a high percentage of truck traffic.	Has a significant number of features may cause quicker deterioration - Such as Curves, hills, bridges, culverts, etc	Bus routes, Transportation Corridors, Rural Residential Roads, Community Access Roads, Postal Routes, industrial Roads, Emergency access roads, etc
Class 3(b)	7.5	50 to 100 vpd and / or facilitating a moderate percentage of truck traffic.	Has a moderate number of features may cause quicker deterioration - Such as Curves, hills, bridges, culverts, etc	Agricultural roads, resources extraction sites, rural residential roads with lower traffic
Class 3(c)	7.5	< 50 vpd and / or facilitating a lower percentage of truck traffic.	Has a limited number of features may cause quicker deterioration - Such as Curves, hills, bridges, culverts, etc	Individual access roads, dead end roads.

GRAVEL ROADS > 200 VPD



LEVEL OF SERVICE

Class 2(b) >200 VPD
Upgraded collectors/
Arterials etc.

FULL
RECONSTRUCTION
AND PAVING



Class 2(c) >200 VPD
High Traffic Rural Grid Roads.

FULL LENGTH DUST
SUPPRESSION/
STABILIZATION



Class 1(b) 100 – 200
VPD
Most Rural Grid Roads

GRADING FREQUENCY
(LEVEL 3- 1 X PER 5 D)



Class 3(b) 20- 100 VPD
Low Traffic Rural Grid Roads

GRADING FREQUENCY
(LEVEL 2- 1 X PER 15 D)



Class 3(c) < 20 VPD
Service Roads
Dead end roads

GRADING FREQUENCY
(LEVEL 1 QUARTERLY)

Questions?



Sturgeon
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