Town of Middlesex

2026 Road Improvement Plan



14.12 Shady Rill Rd

With assistance from the Town Roads Committee and in coordination with the Town Staff

Drafted by

Keith Cubbon

Central Vermont Regional Planning Commission

The idea behind this project was to develop a report addressing Middlesex's infrastructure needs and to develop a 5-year implementation plan.

Project deliverables would be a final report outlining a plan for updating culverts based on access and resiliency and a 5-year plan for overall roadway improvement in line with Middlesex roadway usage and goals and to manage drainage to alleviate mud season conditions. Ideally this will cause an increase in resiliency, cost effectiveness, and availability for a variety of uses of the road infrastructure in the town of Middlesex. Ideally causing fewer culvert failures and road washouts and a decrease in mud season road conditions.

During the reconstruction of town roads in the 2023 event 71 culverts were replaced through the FEMA process. With an additional 47 in the 2024 flood event. Many of these were upsized during this process to increase the town's stormwater management capacity. The town took over driveway culverts within the town road right of ways to alleviate maintenance issues of these culverts and prevent the town resources being impacted by private culverts failing and impacting town roads.

In the summer of 2025 interns for the Central Vermont Regional Planning Commission inventoried all roadway and driveway culverts within the town road right of way. This effort identified the location, condition, and sizes of these assets. This survey data is publicly available and can be found on the VT Culverts website. This data was then analyzed for quality control.

The process was to review all culverts with Overall Condition rankings of Urgent, Poor, Critical or Closed. They were then prioritized based on their location. This was done to maximize road crew time and prioritize replacement by road network connectivity for both users and emergency access the attached table was developed. Due to the recent flood events, we recommend utilizing a minimum culvert size for driveways and drainages of 18". Any culvert that is larger than 36" is recommended to have a Hydraulic and Hydrologic study completed to determine sizing. These larger culverts generally require at minimum a stream permit.

At the end of this report is a total list of all culverts inventoried by size and number.

Terms for culvert condition were preselected by the Vermont Association of Planning Development Agencies when the VTculverts application was developed. We utilized this application for this survey and available options for culvert condition are excellent, good, fair, poor, critical, urgent, closed, or unknown. The total counts of the ones needing attention in the short term are listed below.

Overall condition	Count of Overall condition
Closed	21
Critical	25
Poor	93
Urgent	9
Total	142

From discussions with the town road foreman and town staff the town can replace approximately 30 culverts in any given year. A full list of culverts and maps with estimated year of replacement is attached as Appendix A.

We prioritized the culverts list by emergency access to the town and to assisting accessing individuals as far as drainage in relation to mud season conditions. We reviewed the road network and developed the plan based off the trunk lines or main access points for most residents, then moving out to the tertiary roadways. In the first year Center, Molly Supple Hill and East Hill Roads where identified. This was also done to maximize the efficiency of the road crews' time and effort. This way being able to limit transit time especially for necessary excavators needed for replacement. This also limits the inconvenience to residents of a shorter period working on any given road rather than repeated closures due to replacements.

One point of warning in replacing culverts and adjusting grade of a culvert to prevent being perched, is to be aware that grade control may be necessary. This can be done with large stone or other material, and may be necessary to prevent a head cut formation within the drainage channel moving upstream and creating negative effects to the roadway and associated landowners on steeper slopes. Generally, grade control is possible by adding in large stone at minimum of 2 times the size of large stones found in the stream/drainage bed.



Ex. damaged culvert that was perched on Notch Rd.

Budget for Culverts

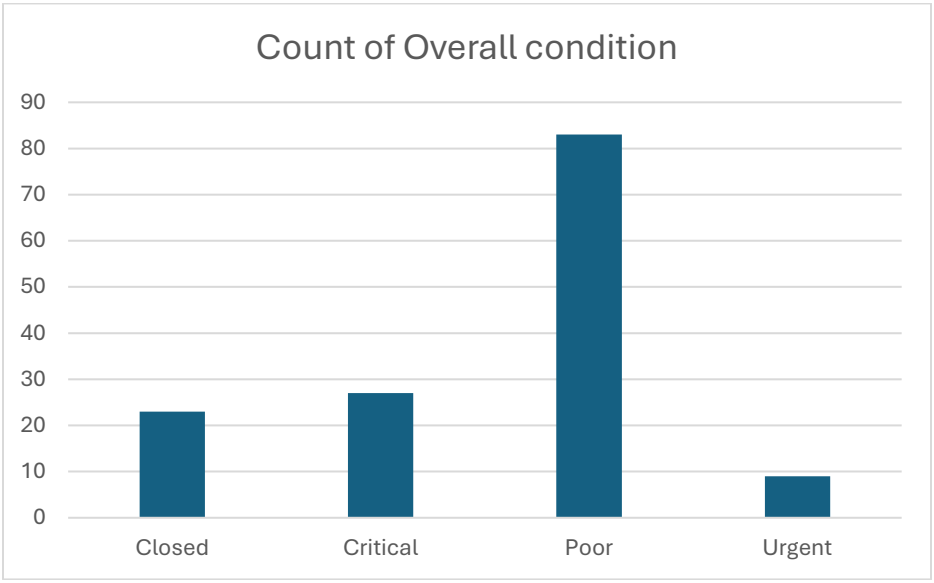
In the first year of the plan. We propose upgrading drainage culverts which run under the roadway with High Density Polyethylene (HDPE) culverts these are double wall culverts.

These are highly resistant to corrosion and abrasion these are estimated to last a minimum of 50 years when installed correctly. For driveway culverts we are recommending the usage of Advanced Drainage Systems (ADS) pipe which is a single wall HDPE product.

Year	Budget	Culverts replaced
1	$35,939.13	27
2	$36,552.16	26
3*	$29,163.74	29
4	$29,264.74	26
5*	$26,177.28	23
	$157,097.05*	

Addendum A- has culverts replaced by year, size, and type. Budget not adjusted for inflation.

A breakout of the yearly allocation of culverts for each year of the plan and what type of culvert is recommended for each. HDPE for drainage culverts and ADS for driveways to maximize savings to the town's residents. For awareness budget number are projects especially for larger projects as inflationary pressures have created a 60% increase in construction costs over the last 5 years.



For culverts deemed in need of replacement.

Funding to assist the town in culvert replacements

State of Vermont VTrans Better Roads Grant Program-Category D grants

Category D grants are for structure/culvert upgrade projects. These grants can be used to replace multiple small culverts or a larger structure. Maximum Grant award $60,000 requires a 20% local match that can be covered by using municipal labor, equipment, and materials. Applications are due annually, usually in the Fall. Better Roads | Agency of Transportation

Municipal Highway and Stormwater Mitigation Program-

Federal funding administered by the State-Can fund Bank Stabilization and culvert replacement/Resizing 80/20 cost share generally for projects greater than $200,000 due to federal requirements. Projects take ~3-5 years from application to completion. May be useful for larger culverts. Municipal Highway and Stormwater Mitigation Program | Agency of Transportation

Town Highway Structures Program

Projects may address maintenance or construction of bridges, culverts larger than 36" on class 2 roadways, and other structures.

State Funds maximum award $175,000 with 20% match. Applications in April town may qualify for reduced match to 10% based on this current plan work for up to 3 years.

Contact VTrans District 6 office for information.

Mud Season Road conditions

At the start of this process the intent was also to plan a budget for identified mud season road locations found within the town. Locations were identified in winter of 2024/2025 by the town road's committee. The list can be found at the end of this report in Addendum C. Many of these problem locations have seen improvement in the wake of the flooding and the installation of granite-based plant mix added to the roadways. This is a minor increase in cost to utilize this better material rather than shale-based plant mix but with conversely better results. The following are a series of examples for targeted based issues due to seeps, springs, and wetland areas for dealing with drainage of the subsurface waters that are not generally able to be dealt with by drainage culverts. Multiple documents have been shared with the town road crew staff on best management practices that we will briefly address in this document. Many studies from the Center for Dirt and Gravel Road Studies where used to develop the options available.

Subsurface Water

Roads often must cross wet areas and can intercept subsurface flows. The degree to which a road intercepts subsurface flow and subsequently redirects it varies from location to location. Wetlands, springs, and seeps can become problem areas if not addressed properly. Left untreated, perpetually wet conditions can expedite road degradation, which requires more frequent maintenance and often times creates hazardous driving conditions. Most subsurface water is clean, meaning free of sediment (unlike overland flow). Redirecting subsurface water away from the traveled way will dry the road surface and reduce erosion and maintenance costs.

It is important to identify the SOURCE of any water on the road.

This generally can be dealt with in one or a combination of ways available, and each location may use multiple measures. Those being underdrains, French drains, French mattresses,

geotextile installation, or permeable fills. These are all designed to remove subsurface water from the roadway. These methods are not designed for surface flow except for the permeable fill when installed with culverts.

Underdrains

An underdrain is a drainage system installed under a road or road ditch to collect and transport subsurface water. These buried conduits come in a variety of shapes and sizes and are usually wrapped in geotextile fabric, which allows water to enter the conduit while keeping sediment out. Underdrains can either be prefabricated or constructed.



This drain collects water from springs and seeps under the road ditch.Allowing the road to dry and preventing the seeps moisture from impacting the roadway. .

French Mattresses

A structure under a road consisting of clean coarse rock wrapped in geotextile fabric through which water can pass freely. French mattresses are used in extremely wet areas, such as wetlands, to support the roadbed while allowing unrestricted water movement



Example of Small mattresses installed to drain several springs or seeps that cross roadway.

Will reviewing some of the town roads in relation to mud season conditions we took photos of locations on East Hill road that were showing signs of washboarding. This is most often in association of spring seeps that were coming to the surface from under the roadbed. This shows areas that are in need of drainage installation practices the above example is an option we would recommend experimenting with..

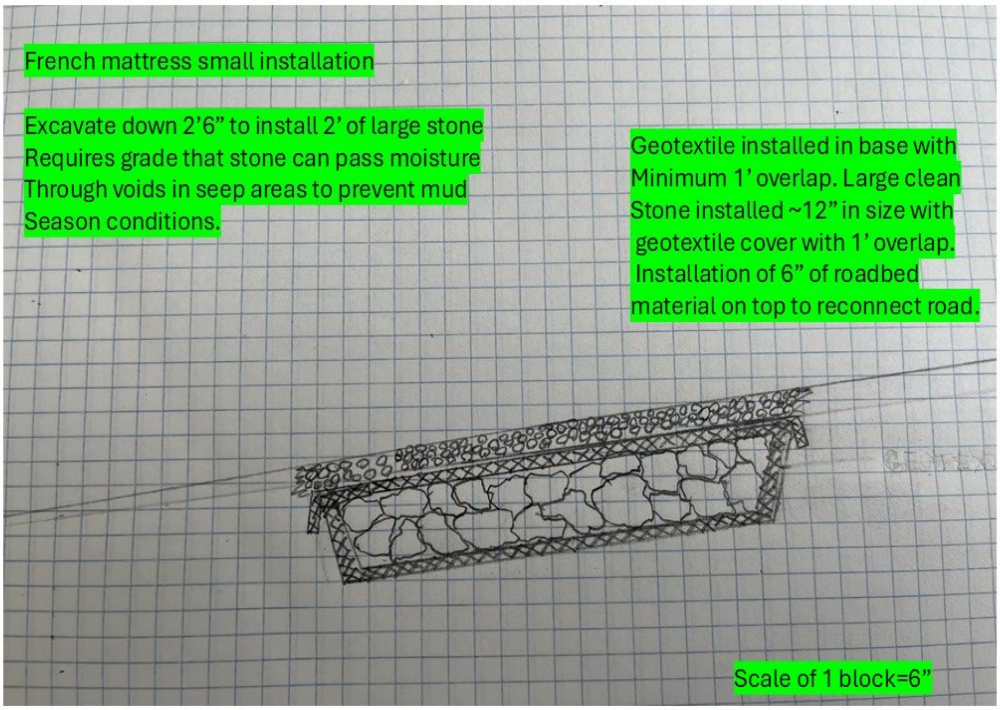


Next to 350 East Hill Rd.

The moisture once trapped with in the roadway creates ice formation. Due to the lack of drainage this creates the frost thaw cycle in the roadway which negatively impacts access and greatly slows the effective speeds of the roadway.

Drainage installation utilizing geotextiles for lining this area and type I stone clean fill with geotextile installed over and crushed granite type 1 fine on to cover to roadway depth.

We recommend documenting or marking these areas for work in the spring. Then returning when conditions improve and installing during the summer. This will take multiple years but will dryout segments of roadway with the intention of improvements building to a better roadway network and minimize costs to town budget on areas that slope will allow for installation.





Large mattress installation allows for wetlands adjacent flow locations

Permeable Fills

Install a permeable fill as part of the road to promote the passage of subsurface and surface flows with minimum flow concentration and maximum spreading across meadows and wetlands. The road fill is permeable because of its construction with relatively large, preferably angular, uniformly graded rock sandwiched between layers of geotextile fabric that preserves voids in the structure and promotes the uninterrupted ground water flow. The permeable fill is similar to the French mattress but differs in its ability to spread surface flows with culvert placement.



Example of Permeable fill with culverts spreads out areas of surface flow. Wetland area that roadway passes through.

Bridges

The town has 2 long bridge structures identified by the State of Vermont as Structure longer than 20 feet in length. These are inspected by VTrans bridge inspection staff on a every other year basis. Those being the Wood Road structure over the Martins Brook and the Old Brook Road Extension the Great Brook. Both of these structures are currently listed in Fair condition and with funding delays we would advise the community to set up a budget allocation for bridge maintenance and budget for match when these structures are replaced. The current structures would not meet the current requirements for capacity and permitting and would need to be significantly upsized. Expected costs in 2026 dollars for replacement would be over 1.5 million each for engineering, permitting and construction. We propose that the town sets up a $7500 budget allocation each year to address maintenance costs to preserve these structures as long as possible and allow for every 10 years to have a contractor with engineer on staff review and perform needed maintenance. Any short structures that end up needing replacement would be recommended for box culvert installation as these have reduced costs and maintenance.

Funding available

Better Roads-Category B-Category B grants are for structure/culvert upgrade projects. These grants can be used to replace multiple small culverts on ephemeral streams. Maximum grant award: $20,000 requires a 20% town match.

Grants in Aid- Can be used for ditching and possibly underdrain in ditches. Amounts vary based on a set of metrics developed under the Municipal Roads General Permit program. Town offers of funding and information can be found here: VTrans Grants in Aid Program | Agency of Transportation

Town Highway Class 2 Program
Projects shall include detailed work for preservation of class 2 town highways such as paving and gravel resurfacing. It can be used for gravel reconstruction based on identified needs. State Funds maximum award of $175,000 with a 30% match. Town may qualify for 20% match based on this study for up to 3 years. Applications are due in April. The local VTrans district prioritizes funds. Due to the work on this inventory and plan the town should qualify for a reduced match of 20% due to this planning work.
Contact VTrans District 6 office for more information

Town Highway Structures grants
Projects may address the maintenance (including actions to extend the life expectancy) and construction of bridges, culverts, and other structures including retaining walls. In general, the improvement must preserve the integrity of the eligible structure of Class 1, 2, or 3 town highways. Due to the work on this inventory and study the town should qualify for a reduced match of 10% for this funding. Maximum award is $175,000 and would be beneficial for at least year 3 and 5 for the culverts that are larger then 36" or for the replacement of the Daniel's Farm Road Bridge.

Process moving forward.
From site visits to the Center Road and East Hill Road locations listed in the addendum. Each of these locations would ideally have some level of plan developed for each segment. There is not a one size that fits all answer due to site issues of ledge, historic trees, or other issues. Ideally the town would concentrate as this plan has on the main throughfares and work outward. This will create the greatest benefit for the most residents and all for improved emergency vehicle access and shortened commute times during mud season conditions for the highest number of individuals.

Addendum A
Total Culverts by size found in Middlesex.

Total of Middlesex Culverts	
Culvert size	**Count**
10	2
12	51
15	242
18	189
20	10
24	143
25	2
30	23
35	1
36	26
40	1
42	1
44	1
46	1
48	13
54	1
56	1
60	6
62	1
72	9
78	1
84	1
96	1
102	1
120	1
144	2
Grand Total	731

Addendum B
Yearly break out of culverts by size and type.

Year 1	
HDPE	ADS
18"-8	18"-10
24"-6	
30"-2	
36"-1	

$35939.13

Year 2	
HDPE	ADS
18"-12	15"-1
24"-8	18"-3
30"-2	

$36552.16

Year 3	
HDPE	ADS
18"-13	15"-4
24"-3	18"-7

*$29163.74**

Year 4	
HDPE	ADS
18"-9	15"-2
24”-9	18”-6

$29,264.74

Year 5	
HDPE	ADS
18"-6	15"-3
24"-5	18"-7

*$26,177.28**

*2-will be determined by H & H studies so current size is unknown

Addendum C

Areas Identified by town roads committee in Winter of 2024-2025 that need to be rebuilt from the ground up. Estimates from that effort. We recommend a more targeted approach utilizing the methods mentioned above to minimize costs to the community. And prioritize by connectivity of road network. Starting on trunk routes such as Center and East Hill Roads then moving out by connections to reach the most individuals.

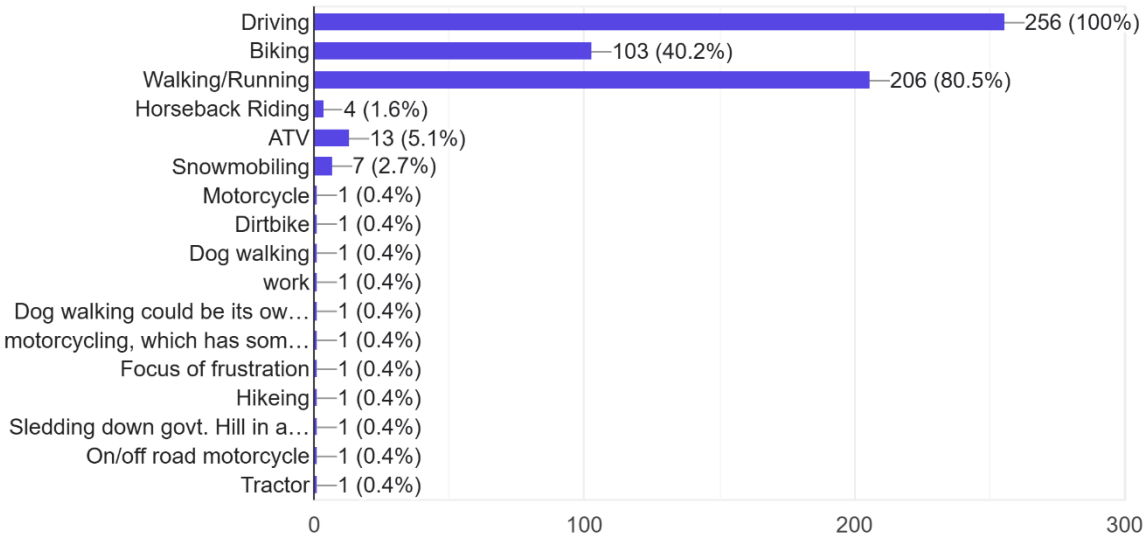
Road / Spots	Coordinates	Estimate
Center Road		
#367 Center Rd	44.307067 – 72.661417	$83,475
#501 Center Rd to Zdon	44.319379 – 72.659097	$350,595
#822 to Leland Farm Road	44.329933 – 72.63677	$167,050
Weeds Flats	44.333111 – 72.630519	$250,950
Brook Rd		
Northern first 600' of Brook Rd	44.332336 – 72,633083	$100,380
#430 Brook Rd to 600' South	44.308375 – 72.648729	$100,170
#587 to intersection w/ Center Rd.	44.302048 – 72.659804	$250,425
East Hill Rd		
#76 East Hill to 600' toward McCullough	44.323365 – 72.625719	$100,674
#273 East Hill south 600'	44.311806 – 72.620198	$100,980
Wrenwood Lane to SE 1,000'	44.305702 – 72.611025	$169,050
#454 East Hill to #467 East Hill	44.304131 – 72.607540	$68,040
Bolduc Road to #575	44.298322 – 72.604518	$171,030
#601 East Hill to #662 East Hill	44.293035 – 72.604582	$171,700

#758 East Hill to Portal Rd.	44.285967 – 72.598835	$103,260
Portal Road		
#293 - #241 - 1,000’	44.28779 – 72.59503	$172,900
#232 to #215 - 500’	44.29186 – 72.59303	$86,450
#190 to #182 - 400’	44.29490 – 72.59296	$69,160
#134 south towards Big Culvert -1000’	44.29835 – 72.59041	$172,900
#120 to #110 - 300’	44.29902 – 72.59000	$51,870
High Meadow Ln to #88 – 200’	44.30077 – 72.58790	$34,580
#14 to intersection of Bolduc – 600’	44.30517 – 72.58520	$103,740
Bolduc Rd		
#30 to Rt 12 – 600’	44.30690 – 72.58189	$69,160
Culver Hill Rd		
#468 to #456 – 400’	44.33813 – 72.59700	$103,740
French Rd		
#60 to #37 – 600’	44.34072 – 72.60626	$51,870
Story Road		
In Front of #24 – 300’	44.35272 – 72.60599	$51,870
#48 to #60 – 300’	44.35427 – 72.60678	$51,870
West Hill		
In Front of #640 – 500’	44.36344 – 72.61106	$86,450
Guilmette Rd toward Macey Rd – 500’	44.36982 – 72.60620	$86,450
		Total All Roads = $3,380,789

Addendum D-Survey Results Summary (all results shared with town)

How do you use the roads in Middlesex.

256 responses

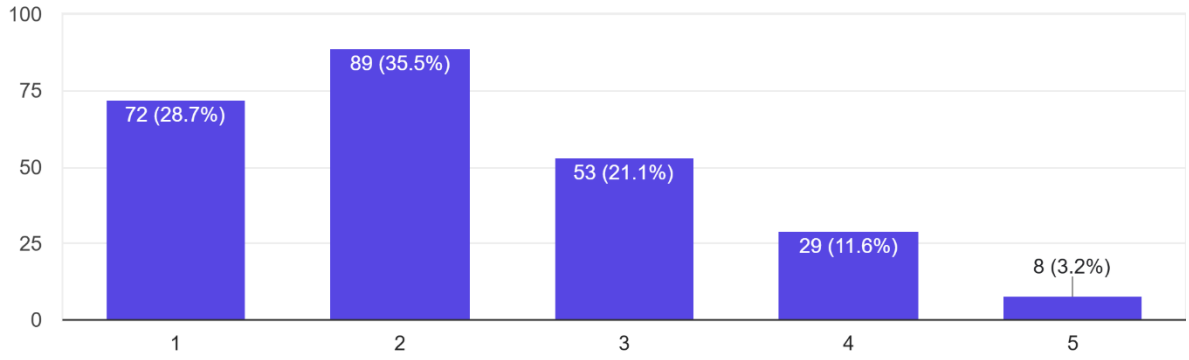


Maintenance

A. Grading

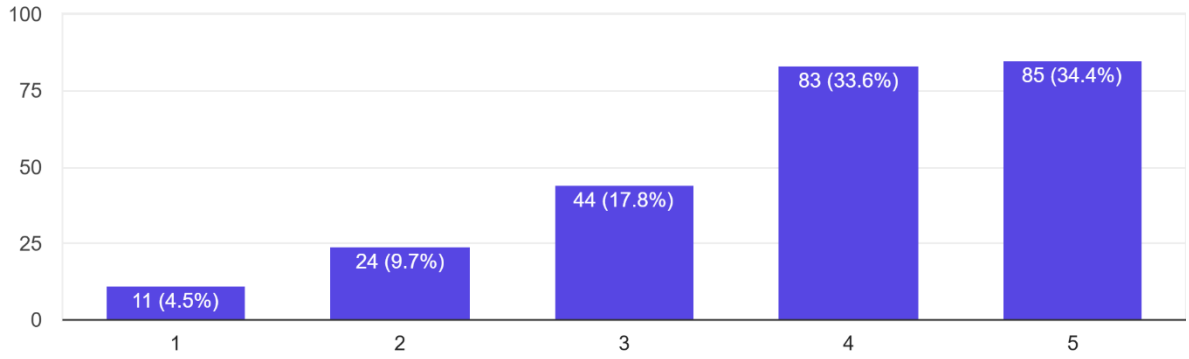
1. I think the frequency of grading is About Right – I understand sometimes I need to travel slower to avoid dings on my car from loose gravel or harming my car's suspension

251 responses



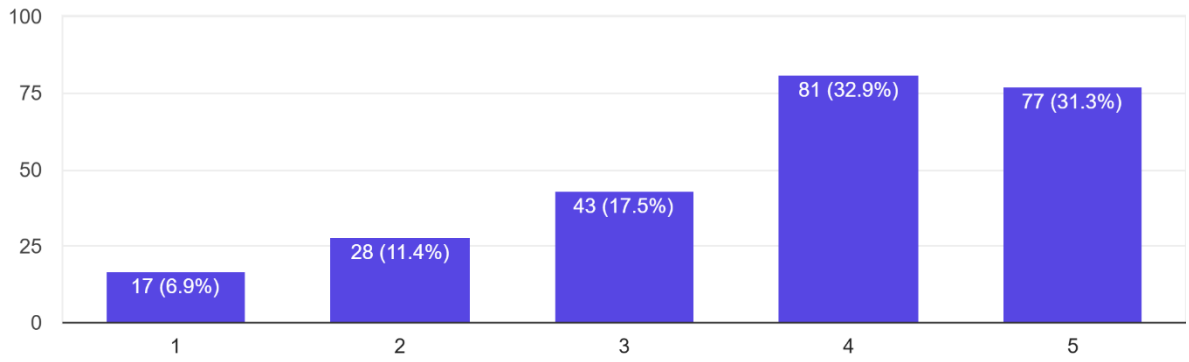
2. I think the frequency of grading is Too Frequent – It costs a lot to grade the road, and it is fine to travel more slowly on roads that have variable conditions to avoid damage or hazards

247 responses



3. I think the frequency of grading is Too seldom – I want the roads to be smoother more of the time. If grading was done twice as often, I think it...nance budget, and the taxes needed to achieve this.

246 responses



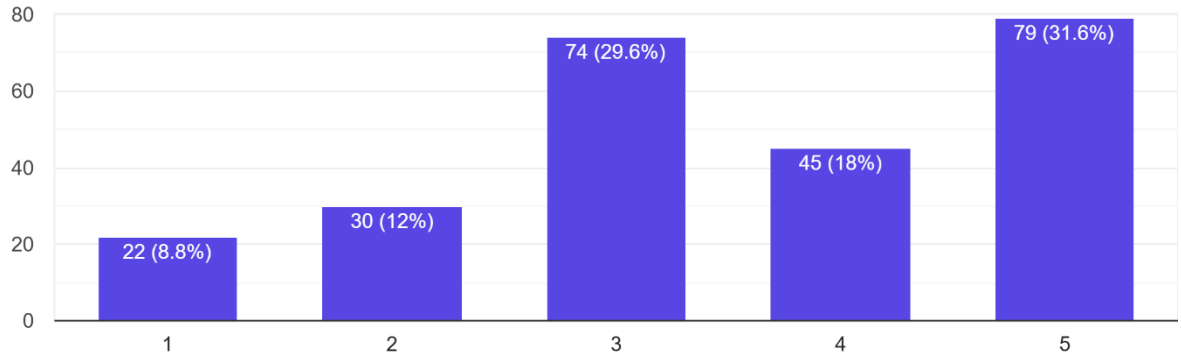
4. Comments

79 responses

B. Gravel

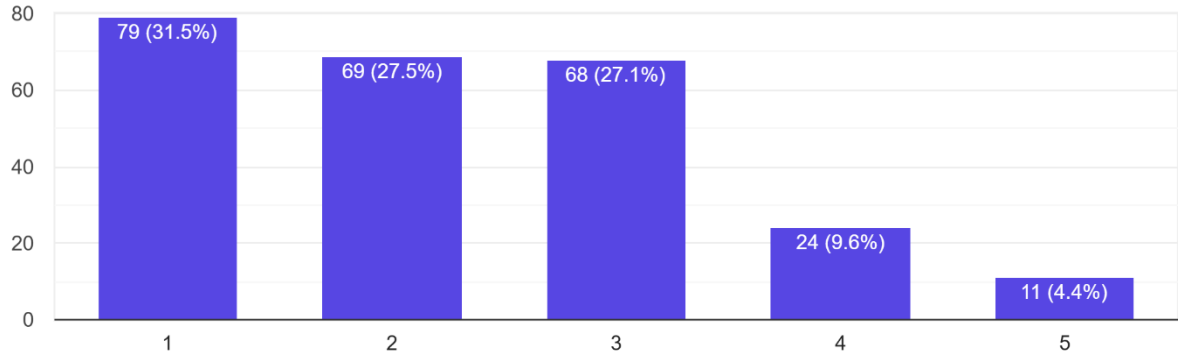
1. I would like the Town to explore using better quality gravel &/or road treatments to reduce dust and I think it would be worth paying up to twice the current cost of gravel to achieve this.

250 responses



2. I think what the Town is doing now is fine and the level of dust loose gravel we have on roads now is expected and fine.

251 responses



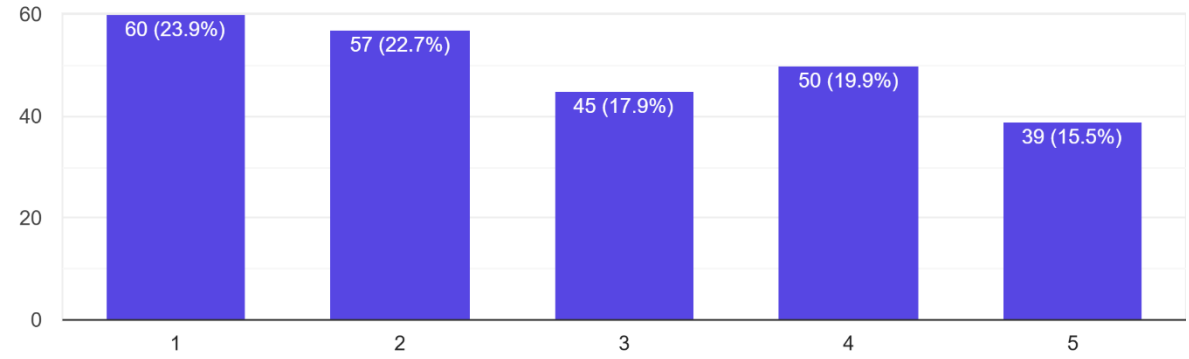
3. Comments

64 responses

Mud Season

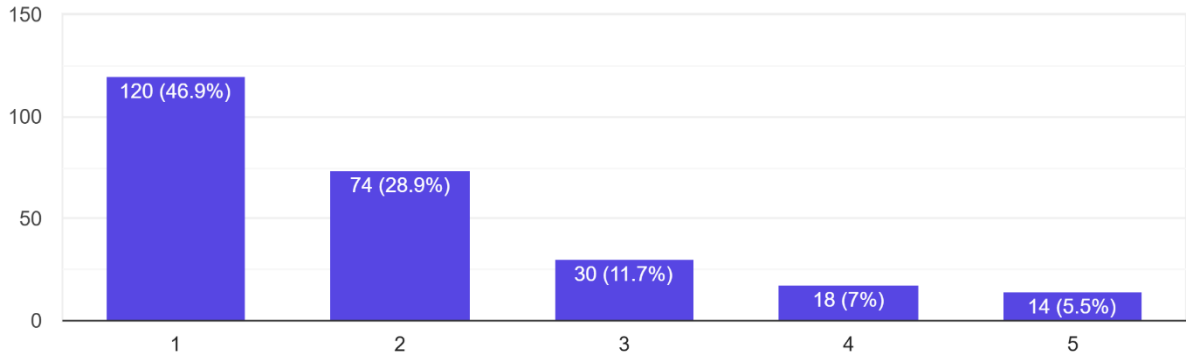
1. I am fine driving less and using only a pick-up truck, a four-wheel drive car or a neighbor's help to get where I am going.

251 responses



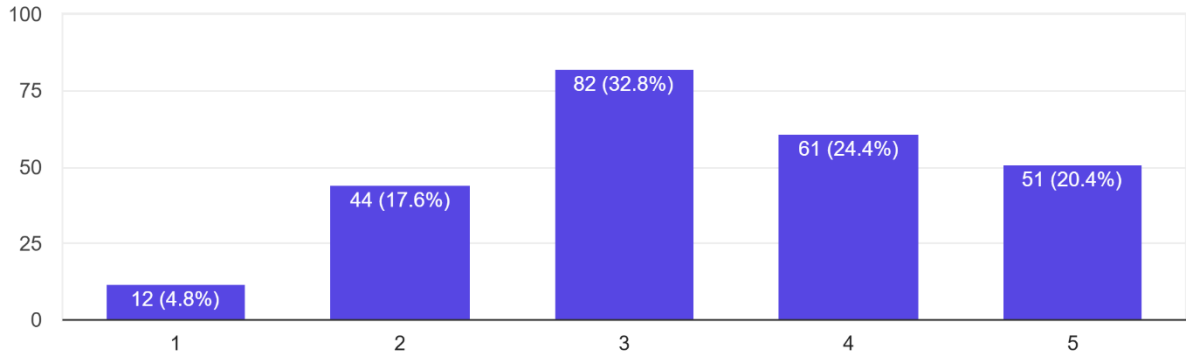
2. I am fine reducing my own travel but want to make sure emergency responders continue to have access using 4-wheel drive, ATVs or larger trucks during mud season.

256 responses



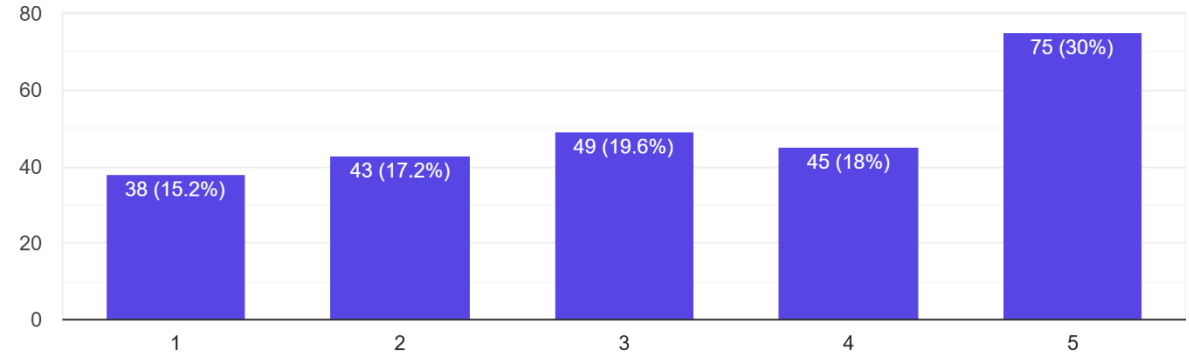
3. I would like to see the Town increase maintenance / scraping during mud season, even though this costs more and puts more stress on the roads.

250 responses



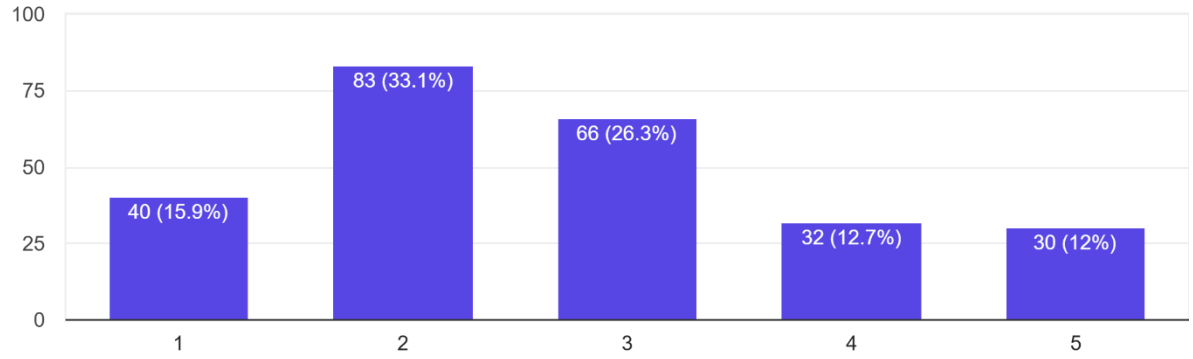
4. I am fine to park a car at the end of the road and walk for up to ½ mile to get to my house.

250 responses



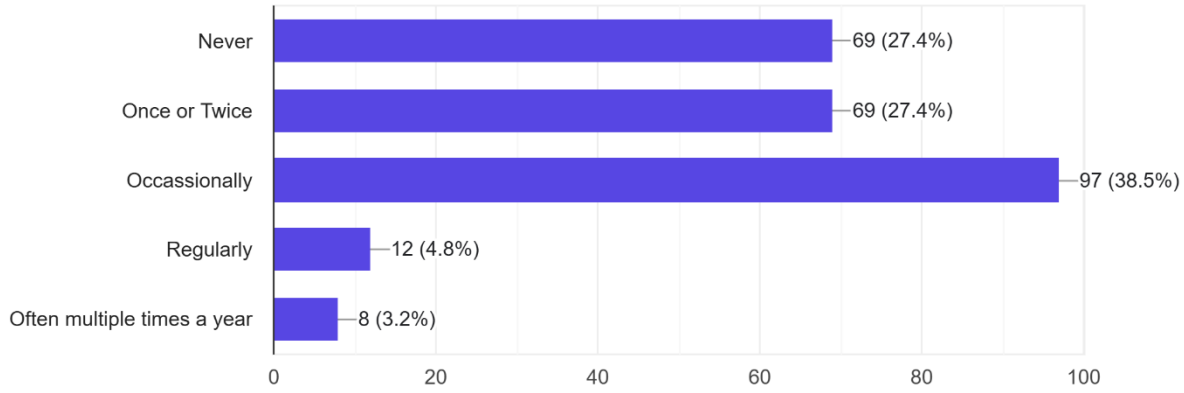
5. I think curtailing my travel for 1 to 3 weeks is all right but the Town should do more to improve the roadbeds, so travel is not curtailed more than 3 weeks per year.

251 responses



6. How many times has mud season road conditions kept you from getting where you need to go?

252 responses

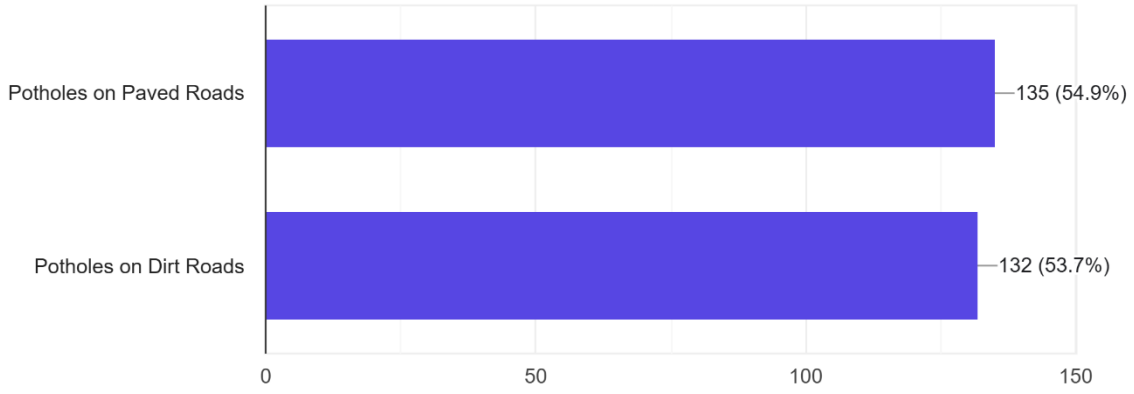


7. Comments

82 responses

D. Potholes: Potholes occur in both dirt and paved roads. Which seem to be more of a problem to you in your driving through Middlesex?

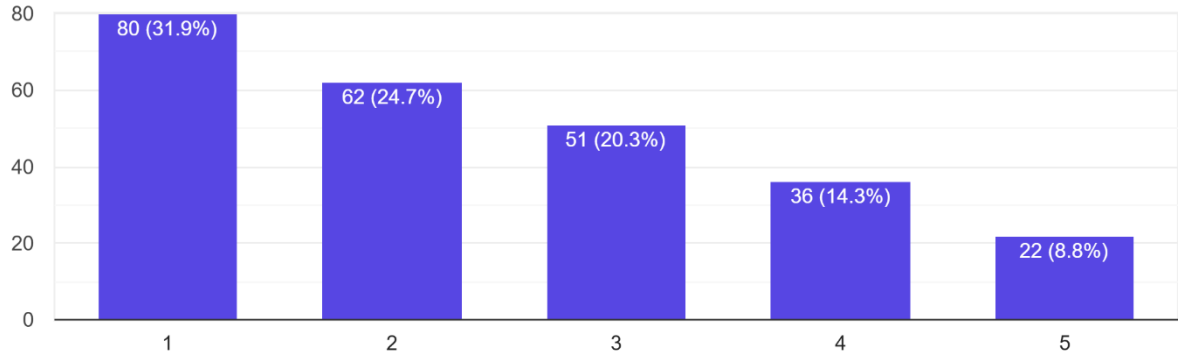
246 responses



Snowplowing

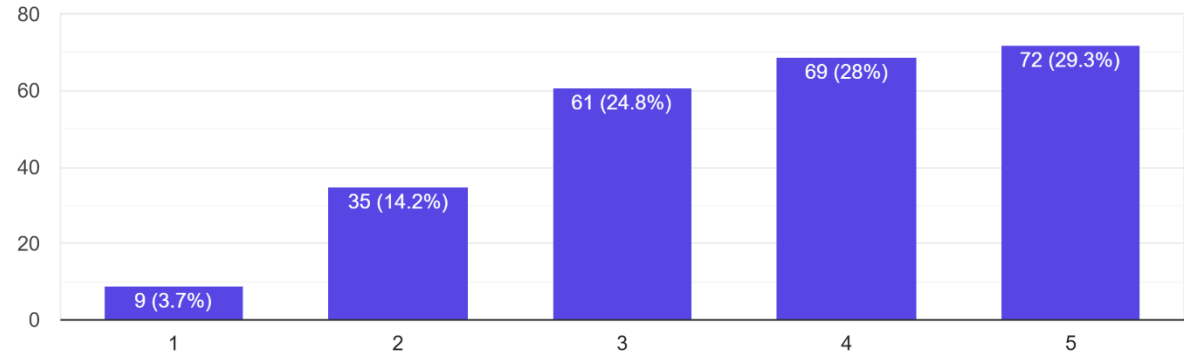
1. I don't think the Town needs to do more to manage snow and ice on roads. I have a flexible schedule, or I can drive less or I can rely on neighbors for help.

251 responses



2. I would like the Town to increase its snowplowing and sanding to ease travel on roadways during storms and believe a 20% budget and time increase would be justified to achieve this.

246 responses



3. If neither of the above is right, describe your expectations regarding snowplowing on Town roads.

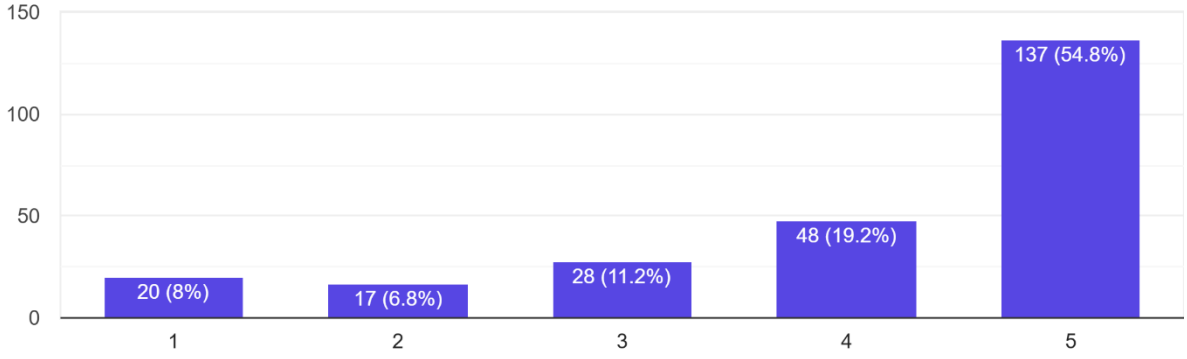
4. Comments

44 responses

Paving

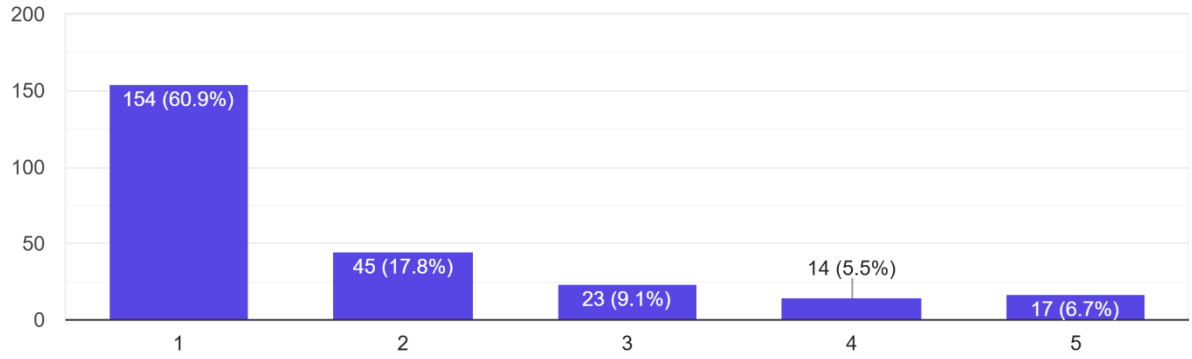
1. The Town should pave more roadways and rebuild the roadbeds on new and existing paved roads to reduce mud impacts and ease car travel. I think...improve and pave one mile each year is reasonable.

250 responses



2. I like the lower cost &/or rural character of dirt roads and don't want the Town to pave more roads.

253 responses



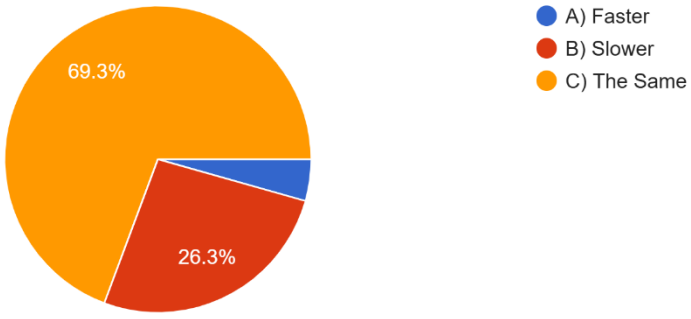
3. Comments

79 responses

Speed

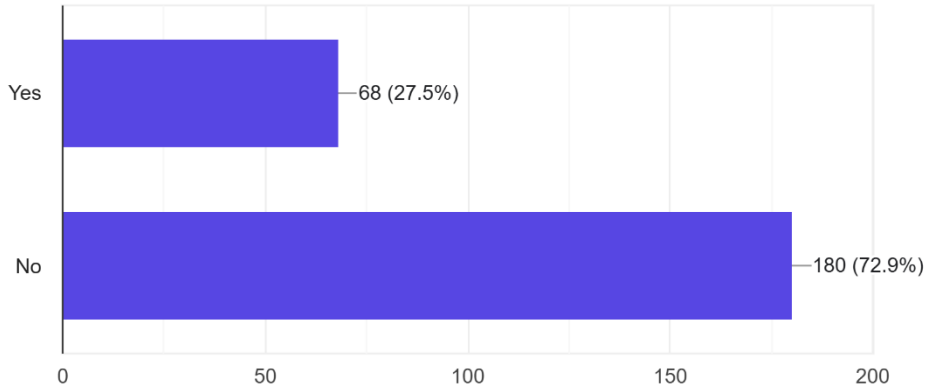
1. In general, do you think roads should be managed for speeds that are:

251 responses



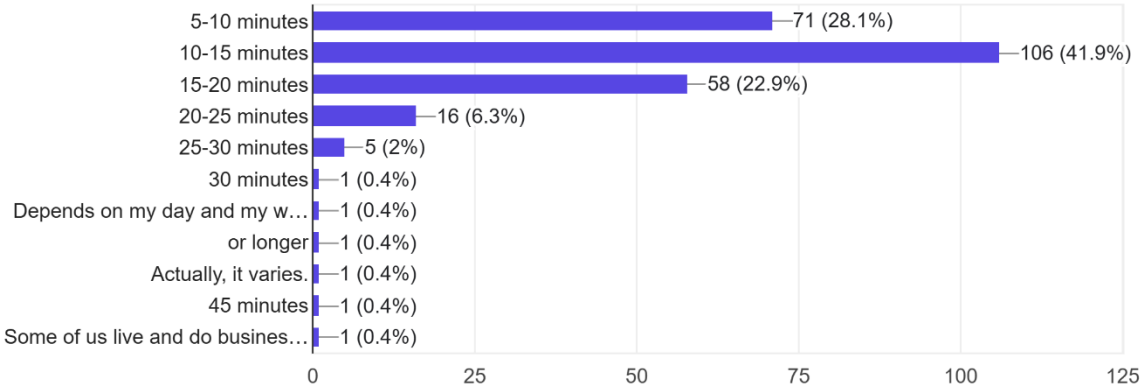
2. Should “main” roads (Center Rd; Molly Supple; Shady Rill; East Hill) be managed for higher speeds than other roads?

247 responses



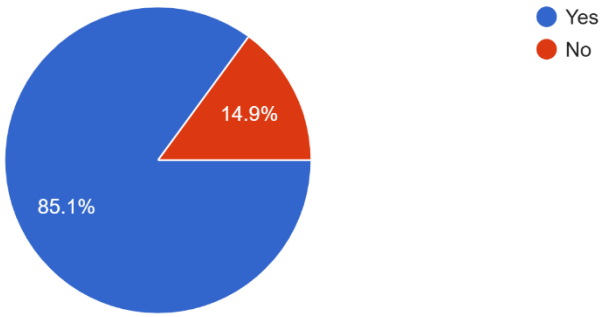
3. How long is your average trip on Middlesex roads?

253 responses



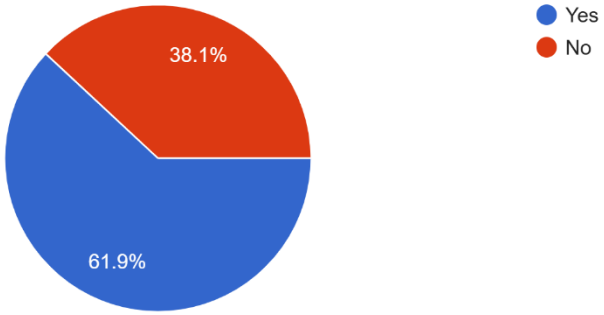
4. Would you be willing to take 5 minutes longer if doing so improved the road cost, safety, and maintenance?

248 responses



5. Would you like to see Middlesex design and maintain roads to reduce building and maintenance costs and accommodate slower travel speeds, by nar...in place, keeping tighter turns on roads in place?

239 responses



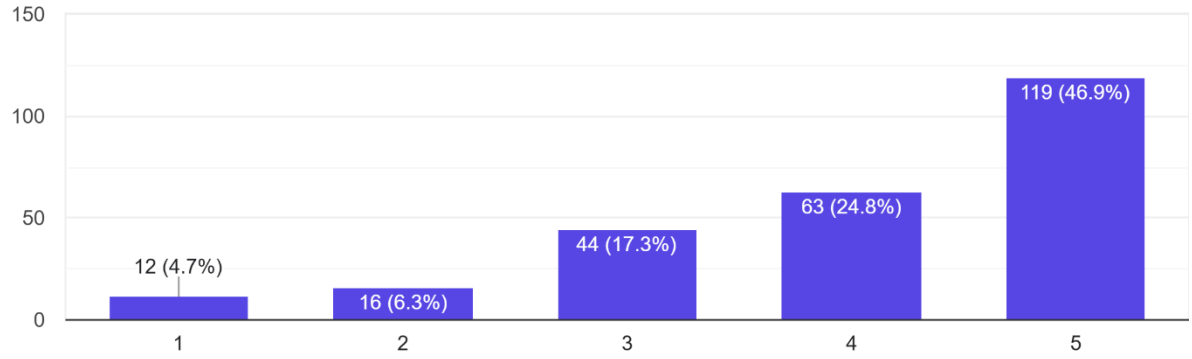
6. Other thoughts or comments on **road speed**

80 responses

Class 4 Roadways

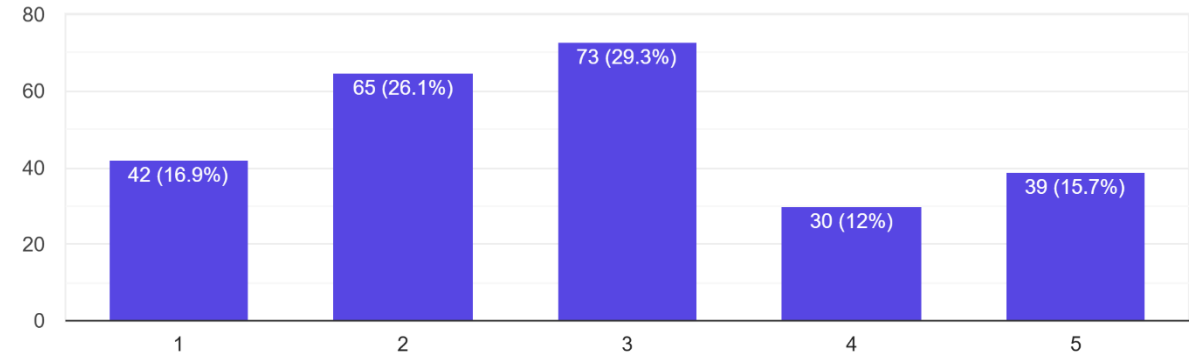
1. The Town should consider upgrading these roads to Class 3 standards over time to improve access for the residents who live there, and to incr...300 more in property taxes annually to achieve this

254 responses



2. Residents who live on Class 4 roads should decide and pay for any road upgrades. Once upgraded, the Town should take over maintenance o...ase property taxes on those parcels accordingly.

249 responses

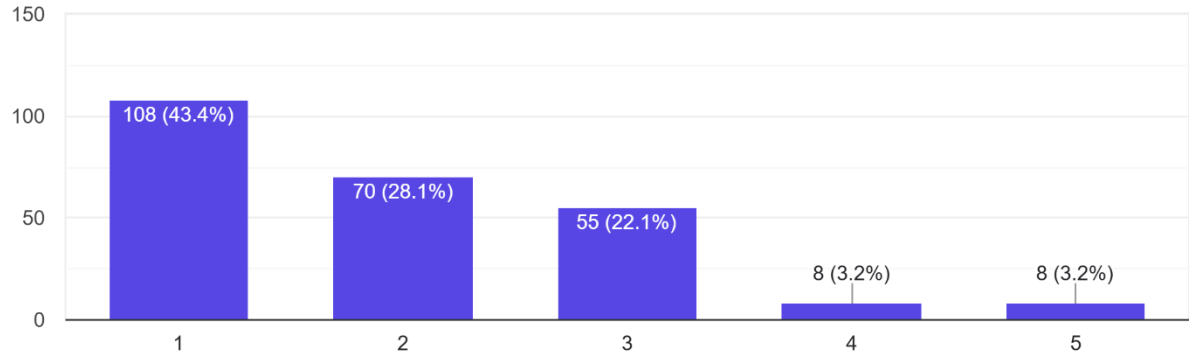


3. Other thoughts or comments

44 responses

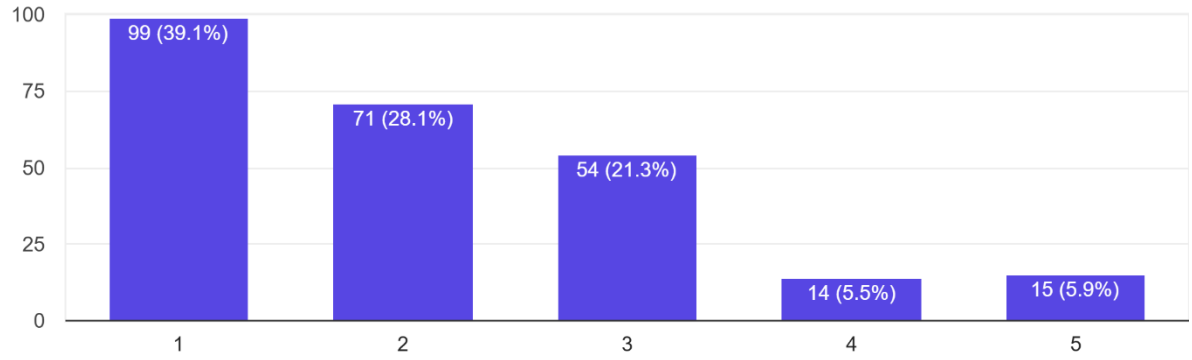
3. Since fewer people live on and use Class 4 roads, the added expense of improving them is not justified. They are, however, valuable recreationa...ep some areas of Middlesex more remote and quiet.

249 responses



4. Class 4 roads should be managed to accommodate only local traffic (not through traffic) and quiet, non-motorized uses (walking, biking, skiing, horseback riding).

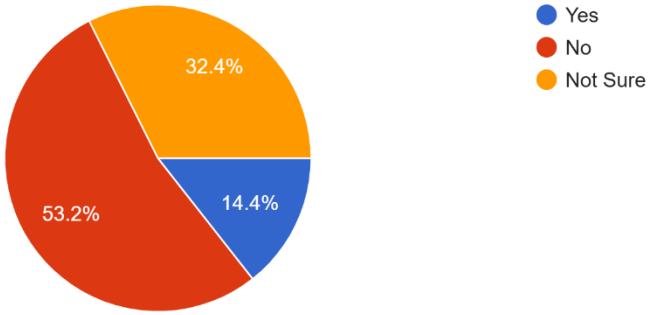
253 responses



Cost

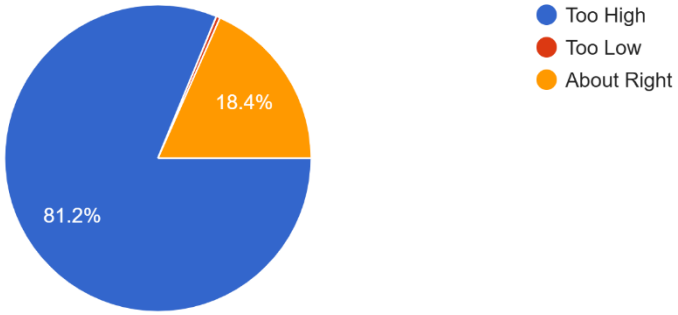
1. I think it would be reasonable to spend 30-40% more each year to improve overall maintenance and make progress on selective road upgrades.

250 responses



2. I think a 30-40% increase in cost is:

245 responses



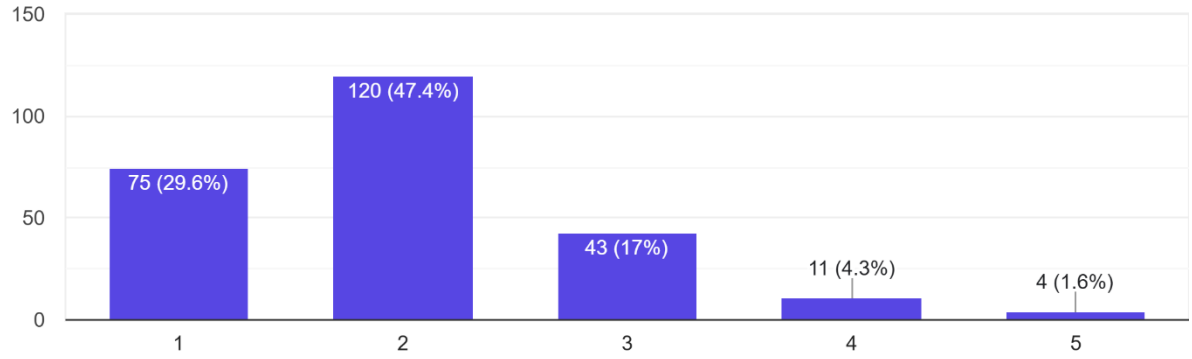
3. Comments

59 responses

Upgrades

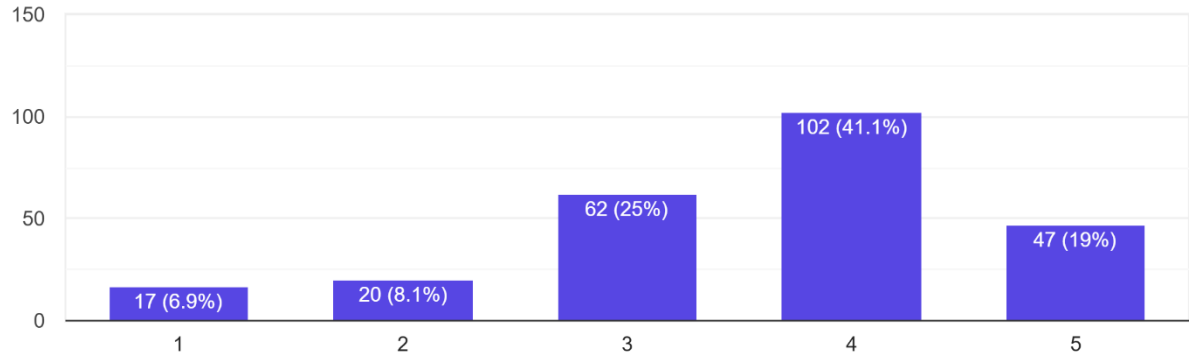
1. Money and time should be set aside each year to upgrade some of the worst road sections, so that in 5-10 years they can all be remedied.

253 responses



2. Middlesex should make only the repairs needed to keep roads maintained and passable but should not upgrade the roads.

248 responses



3. Other thoughts or comments

44 responses