HAWTHORNE ROAD IMPROVEMENTS EVALUATION MEMO

DATE: **11/1/2019**

TO: **City of Mequon**

FROM: **Troy Hartjes, P.E., raSmith**

CC: **Kristen Lundeen, P.E.**

RE: **Hawthorne Road Improvements Evaluation and Gravel Road Analysis**

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BACKGROUND

Hawthorne Road is a 2-mile stretch, spanning between Granville Road and Wauwatosa Road. Hawthorne road is the City of Mequon's last public gravel road, and currently is designated as Rustic Road by the State of Wisconsin. Due to on-going maintenance of the gravel road, safety concerns, road failures and resident input the City is looking at potential improvement options for the roadway along with the long term maintenance. This memo is to provide a summary of the existing conditions and background information and an analysis of options for repairs and reconstruction (including a range of new cross-section improvements), costing, long term maintenance impacts and exhibits for each of the options and analysis. The goal of this memo is to provide the City with the information to know "what's wrong with this road", the impacts with possible improvements (if any) and the ability for the City to meet with residents and allow the City to provide an ultimate solution for the roadway. See Exhibit 1 in Appendix A for an overview of the project limits.

FEATURES OF A GRAVEL ROAD

Before proceeding into evaluating the condition of the existing gravel road and possible road improvements the following items include general information on how a gravel road should function and items that will help extend the life of a gravel road. Properly maintained gravel roads have the following features:

A Proper Crown: Problems develop quickly when a gravel road has no crown. A crown describes the raised center of a roadway. On gravel roads, the crown should be several inches higher than the shoulder, allowing water to drain of the road surface and into ditches. Without a crown, water will quickly collect on the road surface during a rain event or snow melt and will soften the road's protective crust. Water retained on the roadway surface can lead to rutting and potholes.

Drainage: The most important drainage feature on a gravel road is adequate drainage. A ditch runs along the side of the road to allow water to drain out of the road base and away from the road to help keep the road base dry which greatly reduces the chance of soft spots and rutting in the roadway. If a ditch or

outlet becomes obstructed from eroded soil or debris, it must be cleaned. Improving drainage can be a major project requiring loaders, excavators, trucks and other equipment. In order to maintain the design life of a gravel road, water must be able to drain off the surface (helped by the crown stated above), into a ditch or storm pipe and carried away so the road base is not saturated.

Compacted Surface: Gravel roads should have a tight, impervious surface in order to drain properly. Rollers and heavy trucks are used to compact and lock the irregular gravel and limestone stones together to create a strong and smooth road. Good surface material has an appropriate mix of: (1) stone, which gives the road the strength it needs to support heavy vehicles, (2) sand-sized fragments that fill the void between the stones, and (3) very fine particles that binds the material together and allows a gravel road to form a crust and shed water. A geotechnical report is often prepared to help determine if an existing road meets these characteristics.

Material Loss: Traffic naturally pushes gravel from the road's surface into the shoulder or ditch. Ruts and potholes form as the road loses material. The more potholes and ruts the more maintenance is needed. Gravel roads perform well under low traffic volumes, but high traffic volumes will cause a road to deteriorate faster, which increases the need (and cost) of maintenance. When a gravel road sees 500+ vehicles per day, paved roads are many times recommended. Hawthorne Road has traffic of 550 vehicles per day per traffic counts performed.

CURRENT ROAD CONDITIONS

Hawthorne Road, located between N. Wauwatosa Road and N. Granville Road, is a 2 mile designated rustic road that is mostly a gravel roadway with asphalt sections of roadway at the N. Wauwatosa Road and N. Granville Road limits. The middle gravel section of roadway is 7,950 feet long and is connected to N. Wauwatosa Road by a 670 foot asphalt pavement section on the east end and is connected to N. Granville Road with a 1920 foot asphalt pavement section on the west end. For the purpose of this memo we are focused on the gravel section, but wanted to point out that small portions of Hawthorne Road have asphalt surface. The gravel roadway has required annual maintenance and in 2019 extensive repairs of the road included adding large stone and ¾-inch traffic bond as well as grading and rolling the pothole and wash board areas. The total cost of the emergency repairs in 2019 was $68,545.85. This is higher than the usual amount, which in typical years is approximately $6,000. This annual maintenance in part is due to spring melting and rain events creating wet gravel conditions that can't support traffic loading, forming potholes and wash boarding. Noting the features of a gravel road from above the current condition of Hawthorne Road have the following:

Proper Crown: The existing crown of the road has an approximate grade of 2% to 3.5% which is adequate for proper road surface drainage. There may be areas and/or times where the crown is insufficient, but in general there is an adequate crown.

Drainage: Hawthorne Road currently has no ditches nor a storm system to drain the road base or surface water away from the road. The current drainage pattern as shown on the exhibits in Appendix E shows multiple low points throughout the roadway with areas of wetlands and inadequate drainage due to the lack of ditches where water can be conveyed out of the road base. The inadequate drainage causes water to remain in the road base which freezes and thaws creating road failures such as potholes, rutting, soft subgrade, subgrade and base materials blending together and cracking at the road surface.

Compacted Surface: The geotechnical report concludes that there are four options to prevent the underlying subgrade mixing with the road base. Those options are presented on page 3 in the Geotechnical Evaluation discussion. For Hawthorne Road the geotechnical report revealed that the upper 10 to 15 inches of stone is dense but the bottom 10 to 15 inches is likely contaminated with fine grained soils such as clay or silt resulting in an overall lower performing gravel surface. A geotechnical report was completed as part of this analysis and discusses the underlying subgrade mixing with the existing base course creating a roadway susceptible to potholes and rutting.

RUSTIC ROAD CHARACTERISTICS

Hawthorne Road between N. Wauwatosa Road and N. Granville Road is designated as a rustic road due to several characteristics as determined by the Wisconsin Department of Transportation. The characteristics that make Hawthorne road a rustic road include the following:

- Outstanding natural features along its borders such as native vegetation and wildlife.
- Lightly traveled local access road serving the adjacent property owners and those wishing to travel by auto, bicycle, or hiking for purposes of recreational enjoyment.
- It is not scheduled nor anticipated for major improvements which would change its rustic characteristics.
- It is at least two miles long and provides a completed closure or loop.

According to the Wisconsin Department of Transportation a rustic road can be dirt, gravel or paved. The maximum speed limit on a gravel road has been established by law at 45 mph. The speed limit of Hawthorne Road is designated at 25 mph. Some of the road improvement options listed in this memo reduce some of the characteristics that make Hawthorne Road rustic but do will not change the roads designation. It should be noted that the designation includes the paved portions of Hawthorne Road. See appendix B for WisDOT Hawthorne Rustic Road description and map.

ROAD IMPROVEMENT ANALYSIS APPROACH

In order to reduce the amount of annual road maintenance this memo will evaluate several options to improve road conditions. A qualitative approach of evaluating each road improvement option was taken to determine the advantages and disadvantages of each option, which included a multitude of factors as described in the options listed below. To help evaluate the existing roadway conditions and determine the possible options several tasks were completed.

One of the items taken into account when evaluating each option is the level of service of that option. The level of service includes items such as comfort of ride, safety concerns (getting stuck), allowable traffic loading and the overall functionality of the roadway. Level of service (LOS) for a rural gravel road takes into account items such as comfort of ride, traffic loading and the overall functionality of the roadway. Descriptions of the various level of service items are listed below and has been evaluated for each option:

1. Comfort of ride: The comfort of ride includes the smoothness of the roadway, amount of dust generated, potholes, icy road conditions in winter and soft spots in the roadway during the spring and after rain.

2. Traffic loading: Traffic loading is the type of traffic that the road can support which is dependent on the weight of the vehicle and the number of axles the vehicle has. If the roadway cannot support heavier traffic then rutting will occur.

3. Functionality of the roadway: Does the road serve the purpose it was designed for. For Hawthorne Road the purpose of the roadway is to serve as a local road to allow residents movement to a collector roadway. Hawthorne Road should also be designed to support traffic loading such as garbage trucks and snow plows.

First a geotechnical analysis was completed based on soil borings and Dynamic Cone Penetrometer tests. A geotechnical analysis provides the engineer information regarding the underlying road base, soil characteristics such as ability to drain and the ability of the soil to support traffic. The geotechnical report that was completed can be found in Appendix C. A total of 11 borings and 11 Dynamic Cone Penetrometer tests were performed. The borings that were drilled consisted of a 1 foot diameter hole in which soil samples were taken to a depth of 10 feet. The borings provide the engineer information regarding the underlying road base including existing thickness of gravel, soil characteristics such as ability to drain and the ability of the soil to support traffic. Dynamic Cone Penetrometer testing is a means of testing soil resistance by forcing a rod with a cone-shaped tip into the soil at a measured rate. The extent of penetration at each stage indicates the resistance to shear and the overall ability of the soil to bear a load. This test helps the engineer determine the ability of the soil and how it will hold up to traffic loading. For this site the test indicates the soil has a low CBR value which correlates to a subgrade that does not support heavy traffic loading unless adequate road design is completed. The results of the geotechnical evaluation show groundwater at depths from 4.5 feet to 9 feet deep with some perched conditions. It is anticipated that the long-term water table is located below a depth of 10 feet. The water table is typical for this area and the closer the water table is to the surface the more chance water will saturate the base course causing conditions for road failure if the water is not adequately drained out of the base. The existing gravel depth ranges from 12-inches to 6 feet with the subgrade being varied between borings and consisting of lean clay, sand, and silty sand with gravel. Overall the subgrade is considered poorly sorted resulting in a lower performing gravel surface. The subgrade material is mixing with the aggregate base and due to poor drainage wet subgrade is being pumped to the surface creating an unstable road surface. The best way to prevent the mixing of subgrade and the base aggregate is by placing a separation fabric or geogrid layer between the base aggregate and the subgrade. The geotechnical report lists four road improvement options as described below and have been incorporated into the road improvement options evaluated in this memo:

Option A) Removal of existing stone, proofroll, undercut where necessary, install drainage and build new gravel section with a separation fabric underlying the gravel.

Option B) Option #[illegible]ut build an asphalt pavement over an aggregate base course.

Option C) Proofroll existing stone, observe where it is failing proofroll, undercut those areas and backfill with stone. Cut in draintile at edge of road to improve drainage.

Option D) Chemically stabilize the upper 12 inches of the existing gravel surface using Portland Cement or Lime Kiln Dust to create a structural layer. Cut in draintile prior to performing at a level deeper than the planned chemical stabilization in order to improve drainage.

Next, a topographic survey was completed to understand the current site conditions including crown of road, existing features of the site such as trees, fences and existing storm and drainage patterns. These items from the topographic survey help the engineer determine what may cause any of the existing failures and which improvement options may best fit the site conditions. The topographic survey was used to create a drainage exhibit shown in Appendix E. The drainage exhibit shows a profile of the road and how the road drains. By determining how the road drains and where low points are located based on the drainage exhibit, the engineer can better evaluate where water may be trapped in the road base leading to road failures such as potholes and cracking at the road surface. Wetland and floodplain information were added to the drainage exhibit to assist in evaluating environmental impacts.

A pavement analysis was completed using WisPave software to aid the engineer in recommending base course and pavement thicknesses required for the current traffic loading. The pavement analysis helps the engineer determine the thickness of gravel base course and possible asphalt thickness based on soil information obtained from the geotechnical report, anticipated traffic volume and type of traffic. The City supplied traffic counts and traffic information that was used in the software which can be found in Appendix J. Some of the road improvement options cited below include a new reconstructed roadway which includes a new aggregate base and asphalt cross section. WisPave software was used to determine the cross sections for the reconstruction options. The WisPave software accounts for the existing soil conditions as detailed in the geotechnical report as well as the amount and type of traffic the road receives. The City supplied traffic counts and traffic information that was used in the software. The life of the road is affected by the number of vehicles and the weight of the vehicles using it. If larger and heavier vehicles such as semi-trucks traverse Hawthorne Road then the roadway will deteriorate considerably faster. Based on the information provided by the geotechnical report and the traffic analysis a gravel roadway would need to be at least 30-inches thick without geogrid between the aggregate and the subgrade and 18-inches thick with geogrid. If asphalt pavement is used the Wispave analysis shows that a minimum of 4-inches of asphalt on 11-inches of aggregate base course is required. According to the boring samples and dynamic cone penetrometer tests the existing base in some areas is only 12-inches thick and therefore does not meet the minimum base requirement to support the current traffic load. The WisPave and geogrid analysis can be found in Appendix D.

EXISTING CULVERT EVALUATION

A total of nine cross culverts were evaluated to determine current condition of pipe and impacts to drainage. The culvert inspection reports with pictures can be found in Appendix I. An overview map with the cross culverts shown can be found in Appendix E. Costs for replacing existing cross culverts are included in the cost estimate for Option 2A. Itemized cost estimates can be found in Appendix H.

CULVERT INSPECTION SUMMARY

- 11” x 14” CMP @ STA 35+28 – Houses 13206 Hawthorne Ct and 9909 Hawthorne Rd

Pipe is in poor condition with bottom most likely rusted out. Pipe is half full of sediment. Flow is restricted due to sediment and water may back-up along roadway creating saturated roadway base conditions leading to soft spots and rutting in roadway. Recommended to clean out sediment or replace pipe.

- Dual 14" x 16" CMP's @ STA 45+26 – Houses 9500 and 9503 Hawthorne Rd

  Pipe is in fair condition with a rusty bottom. Pipe is fairly clean with small amount of sediment. Recommended to clean out sediment or replace pipe. Culverts are raised 2 to 3-inches above the surrounding ground creating a chance for water to infiltrate the ground under the road base. Recommend lowering the culverts to be flush with the ground.
- 15" & 48" CMP @ STA 51+20 – Houses 9226 and 9431 Hawthorne Rd

  Both pipes are in fair condition. The 48" CMP is half submerged in water and the 15" CMP invert elevation is 2.3' above the 48" invert elevation. There is some sediment in the 15" CMP. Recommend cleaning sediment out of 15" CMP and lowering pipe invert to surface water elevation.

- 18" HDPE @ STA 58+17 – Houses 9226 and 9111 Hawthorne Rd

  Pipe is in good condition with no maintenance required.

- 48" CMP @ STA 71+10 – Houses 8833 and 8525 Hawthorne Rd

  Pipe is in good condition. Recommend remove branches from end of culvert that may be inhibiting flow.

- 48" & 66" CMP's @ STA 103+50 – Houses 8833 and 8525 Hawthorne Rd

  Pipes are in good condition. Recommend remove branches and debris from end of culverts that may be inhibiting flow.

ROAD IMPROVEMENT EVALUATION

Seven road improvement options were chosen to be evaluated along with the level of service. When evaluating the options factors such as cost, disturbance to private properties, future maintenance, budget, disturbance to the environment and aesthetics were key considerations.

OPTION 1 - MAINTAIN EXISTING GRAVEL ROADWAY

This option has no disturbance to the existing gravel roadway or areas adjacent to the roadway. Basically the existing roadway would remain with no efforts to prevent future road washouts or road damage caused by rain events. The road would continue to be repaired as washouts and rutting happens after rain events. The Qualitative Evaluation Factors are shown below:

1. *Public Disturbance:* No public disturbance except for continual annual maintenance.

2. *Economic:* Total Estimated Construction Cost = $0.00. See annual costs below for on-going costs.
3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* Tree removal will not be required.
6. *Environmental impacts:* No environmental impacts besides dust.
7. *Annual Maintenance:* The minimum annual maintenance cost includes items that are required to be completed on a yearly basis regardless of large rain events. Annual maintenance costs of approximately $6000 includes grading, rolling and adding gravel twice a year and fixing potholes as needed. Those minimal items include:

    - Maintaining a proper crown by grading roadway.
    - Add gravel and use graders to reclaim displaced material and smooth the road surface.

    The higher maintenance cost of $68,545.85 from 2019 includes items that are not expected to be completed on a yearly basis but could be realized at any year. Those items include:

    - Emergency crews responding to road failures due to extreme weather.
    - Adding large stone and ¾-inch traffic bond as well as grading and rolling potholes and wash board areas.

8. *Level of Service:*
    1. Comfort of ride: This option does not improve the overall smoothness of ride with the amount of dust, potholes, and other road conditions remaining the same, except immediately after the maintenance occurs.

    2. Traffic loading: This option does not change anything with traffic loading and depending on the time of year, notably wetter conditions. However, vehicles have the potential to sink and cause rutting.

    3. Functionality of the roadway: This option does not change the overall functionality of the roadway.

Summary

This option does not change any existing or reoccurring road deficiencies such as potholes, level of service, rutting (the sinking of vehicles) and road failure. Nor does it resolve the underlying issues causing these defincicies such as poor drainage and the mixing of subgrade into the base course and the washing out of the roadway during large rain events; but it does keep the existing rustic feel of the road. There would be no impact to residents however, the on-going road maintenance throughout the year and continued potholes, washboarding and rutting will be expected. As the geotechnical report suggests the subgrade will continue to mix with the existing base and therefore road conditions will get worse as time goes on.

OPTION 2 – DRAINAGE IMPROVEMENTS WITH DITCHING AND DRAINTILE

This option can and should be combined with any of the other options including option 1. This option looks to improve drainage both around and under the roadway. Without any drainage improvements continued rutting, potholes and road failure would continue and the deterioration of any improvement would increase. This option includes adding drain tiles over the entire length of the roadway, as stated in geotechnical option C, under the roadway to drain the road base. The draintile then drains into new roadside ditches that will be constructed along the roadway at an elevation below the roadway base. The ditching in this option includes 13,000 feet of ditching over most of the length of gravel roadway where inadequate drainage exists except at water way crossings or other sections of roadway that drain away from the road. The drain tiles would help alleviate rutting, potholes and displacement of the gravel during rain events. The draintiles would be required to drain into the new ditch or any daylight condition. Ditches can be placed where the road has a slope of 1.0 percent or greater which is most of the roadway. The construction of the ditches would involve tree clearing where there are trees adjacent to the road or within 10 to 15 feet from the edge of the existing roadway. By adding ditching along most of the roadway (13,000) this would require over 7,000 feet of tree removal. See Appendix E for plan & profile sheets showing ditching and slope intercept limits and Appendix G for impacts to trees.

1. *Public Disturbance:* Minimal disturbance to traffic during construction operations. Most work will take place along the edge of the roadway. There will be major disturbance to areas outside the roadway. The ditch for this option impacts 13,000 linear feet on both sides of the road with the gravel roadway having a total length on both sides of the road of 15,900 feet. Therefore the ditching accounts for 82% of the gravel roadway length.

2. *Economic:* Total Estimated Construction Cost = $1,442,160 (does not include annual maintenance) (See appendix H for detailed cost estimate) (Cost is a category 2 estimate for budgetary purposes) A breakdown of the construction cost is below:

1	Traffic Control	LS	1	$5,000.00	$5,000
2	6" PVC Draintile	LF	15,900	$40.00	$636,000
3	Ditching and Grading	LF	13,000	$12.00	$156,000
4	Tree Removal	LF	7,320	$15.00	$109,800
5	15" Driveway Culverts (15)	LF	540	$100.00	$54,000
6	Lawn Restoration	SY	28,500	$8.00	$228,000
7	Silt Fence	LF	13,000	$1.00	$13,000
				Subtotal:	$1,201,800
				20% Contingencies:	$240,360
				Total:	**$1,442,160**

3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* Tree removal will be required from the edge of the roadway to approximately 15 feet outside of the edge of roadway. The tree removal would only be necessary in areas where ditching is added. If specific trees are desired to be saved then draintiles can be used in those areas instead of the ditching.
6. *Environmental impacts:* Environmental impacts include removal of trees and wetland disturbance.
7. *Annual Maintenance:* This option may reduce annual road maintenance by properly draining the existing base aggregate and therefore preventing freeze/thaw conditions. The maintenance costs this option reduces includes washboarding, rutting and complete road failure due to soft spots. This option would reduce the amount of gravel that would be need to be added to the roadway on a yearly basis as well as reduce the frequency of repairs to the roadway.
8. *Level of Service:*
    1. Comfort of ride: This option does not improve amount of dust. The comfort of ride will be improved due to the reduction of rutting and less chance of soft spots in the roadway during the spring and after rain.

    2. Traffic loading: This option does not change anything with traffic loading and depending on the time of year, notably wetter conditions. However, vehicles have less potential to sink and cause rutting due to the drainage improvements.

    3. Functionality of the roadway: This option does not change the overall functionality of the roadway.

Summary

By adding ditching the trees and wetlands would be impacted by 10 to 15 feet from the edge of the roadway. The overhanging trees located directly adjacent to the roadway would be removed eliminating the canopy that currently covers the road. See topographic exhibit in Appendix G for tree removal limits. The ditching for this option accounts for 82% of the gravel roadway length. The percent of ditching for this option can be reduced if required to save more trees or certain specimen trees but in turn you reduce the areas where you improve drainage. Draintile does require more maintenance than ditching and can be clogged from time to time so ditching is more cost effective for the long term. If the road remains gravel the drainage improvements and reduced canopy would help dry out the road faster making it less likely to rut or form potholes. If ditching is proposed the wetlands as shown on the wetland map in Appendix E would be impacted and DNR permitting would be required. The 100 year floodplain crosses the road at two locations and additional DNR permitting may be required if the area within the 100 year floodplain is impacted. As a stand-alone project this option would not eliminate potholing in its entirety and therefore some gravel maintenance would still be required.

OPTION 2A – DRAINAGE IMPROVEMENTS WITH DITCHING ONLY

This option includes adding ditches with no draintiles. The ditching in this option includes 13,000 feet of ditching over most of the length of gravel roadway where inadequate drainage exists except at water way crossings or other sections of roadway that drain away from the road. Ditches can be placed where the road has a slope of 1.0 percent or greater which is most of the roadway. The construction of the ditches would involve tree clearing where there are trees adjacent to the road or within 10 to 15 feet from the edge of the existing roadway. By adding ditching along most of the roadway (13,000) this would require over 7,000 feet of tree removal. See Appendix E for plan & profile sheets showing ditching and slope intercept limits and Appendix G for impacts to trees.

1. *Public Disturbance:* Minimal disturbance to traffic during construction operations. Most work will take place along the edge of the roadway. There will be major disturbance to areas outside the roadway. The ditch for this option impacts 13,000 linear feet on both sides of the road with the gravel roadway having a total length on both sides of the road of 15,900 feet. Therefore the ditching accounts for 82% of the gravel roadway length.

2. *Economic:* Total Estimated Construction Cost = $678,960 (does not include annual maintenance) (See appendix H for detailed cost estimate) (Cost is a category 2 estimate for budgetary purposes) A breakdown of the construction cost is below:

1	Traffic Control	LS	1	$5,000.00	$5,000
2	Ditching and Grading	LF	13,000	$12.00	$156,000
3	Tree Removal	LF	7,320	$15.00	$109,800
4	15" Driveway Culverts (15)	LF	540	$100.00	$54,000
5	Lawn Restoration	SY	28,500	$8.00	$228,000
6	Silt Fence	LF	13,000	$1.00	$13,000
				Subtotal:	$565,800
				20% Contingencies:	$113,160
				Total:	**$678,960**

3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* Tree removal will be required from the edge of the roadway to approximately 15 feet outside of the edge of roadway. The tree removal would only be necessary in areas where ditching is added.
6. *Environmental impacts:* Environmental impacts include removal of trees and wetland disturbance.
7. *Annual Maintenance:* This option may reduce annual road maintenance by properly draining the existing base aggregate and therefore preventing freeze/thaw conditions. The maintenance costs this option reduces includes washboarding, rutting and complete road failure due to soft spots. This option would reduce the amount of gravel that would be need

to be added to the roadway on a yearly basis as well as reduce the frequency of repairs to the roadway.

8. *Level of Service:*
    1. Comfort of ride: This option does not improve amount of dust. The comfort of ride will be improved due to the reduction of rutting and less chance of soft spots in the roadway during the spring and after rain.

    2. Traffic loading: This option does not change anything with traffic loading and depending on the time of year, notably wetter conditions. However, vehicles have less potential to sink and cause rutting due to the drainage improvements.

    3. Functionality of the roadway: This option does not change the overall functionality of the roadway.

Summary

By adding ditching the trees and wetlands would be impacted by 10 to 15 feet from the edge of the roadway. The overhanging trees located directly adjacent to the roadway would be removed eliminating the canopy that currently covers the road. See topographic exhibit in Appendix G for tree removal limits. The ditching for this option accounts for 82% of the gravel roadway length. If the road remains gravel the drainage improvements and reduced canopy would help dry out the road faster making it less likely to rut or form potholes. If ditching is proposed the wetlands as shown on the wetland map in Appendix E would be impacted and DNR permitting would be required. The 100 year floodplain crosses the road at two locations and additional DNR permitting may be required if the area within the 100 year floodplain is impacted. As a stand-alone project this option would not eliminate potholing in its entirety and therefore some gravel maintenance would still be required.

OPTION 2B – DRAINAGE IMPROVEMENTS WITH NO DITCHING

This option looks to improve the drainage similar to option 2, while eliminating or at least drastically decreasing the need to remove so many trees. This would mean no off road ditching but instead utilizing just the draintiles with little amounts of storm sewer added at the outfalls. This option can be combined with any of the following options to improve drainage under the roadway. This option includes adding draintiles, as stated in geotechnical option C, under the entire length of gravel roadway that drains into storm sewer located at the low points. The draintiles would help alleviate the frequency of rutting, potholes and displacement of the gravel during rain events and chance of road failure. However, draintiles are smaller in nature and without the option to discharge into ditches, large rain events and times of increased saturation (springs after heavy snow falls) complete road failure and rutting would still occur because the road base is wet. The storm sewer includes storm sewer pipe at low spots and would not involve tree clearing and would be installed within the roadway at the discharge locations. The discharge locations would be at low points and the storm sewer would replace existing cross culverts. By the existing 48" & 66" dual culverts the roadway is several feet above the surrounding ground elevation and therefore it is assumed that the draintile will discharge out the side of the raised roadway onto an erosion control device such as turf reinforcement mat to avoid connecting the

draintile into the existing culverts. The total amounts of storm sewer and draintile are shown in the cost estimate below.

1. *Public Disturbance:* Minimal disturbance to traffic during construction operations. Most work will take place along the edge of the roadway. There will be minor disturbance to areas outside the roadway for installation of new cross culverts.
2. *Economic:* Total Estimated Construction Cost = $839,472 (does not include annual maintenance) (See appendix H for detailed cost estimate) (Cost is a category 2 estimate for budgetary purposes) A breakdown of the construction cost is below:

1	Traffic Control	LS	1	$5,000.00	$5,000
2	6" PVC Draintile	LF	15,900	$40.00	$636,000
3	24" Storm Sewer	LF	180	$120.00	$21,600
4	48" Storm Sewer	LF	122	$180.00	$21,960
5	Erosion Control	LS	1	$15,000	$15,000
				Subtotal:	$699,560
				20% Contingencies:	$139,912
				Total:	**$839,472**

3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* No tree removal.
6. *Environmental impacts:* No Environmental impacts.
7. *Annual Maintenance:* This option by itself may reduce annual road maintenance slightly by better draining the existing base aggregate and therefore preventing freeze/thaw conditions. However, with a gravel road some losses and filling of potholes will always remain. Plus the chance of road failure and large maintenance costs still remains.
8. *Level of Service:*
    1. Comfort of ride: This option does not improve amount of dust. The comfort of ride will be increased due to the reduction of pothole formation, less chance of soft spots in the roadway during the spring and after rain.

    2. Traffic loading: This option does not change anything with traffic loading and depending on the time of year, notably wetter conditions. However, vehicles have less potential to sink and cause rutting due to the drainage improvements.

    3. Functionality of the roadway: This option does not change the overall functionality of the roadway.

Summary

By not adding ditching the trees and wetlands would be not be impacted. The overhanging trees located directly adjacent to the roadway would not need to be removed. If the road remains gravel the addition of the draintile would help dry out the road faster making it less likely to rut or form potholes. This option is dependent on tying the draintile under the roadway into culverts or storm sewer at the low discharge points and does not allow for the draintile to discharge into a ditch at a

specified interval. There may be some limited tree pruning depending on size of equipment required to install the draintile and culverts. Draintile does require more maintenance than ditching and can be clogged from time to time therefore there is more long term maintenance costs associated with draintile over ditching.

OPTION 3 – CHEMICAL STABILIZER

This option has minimal disturbance to the area adjacent to the roadway and involves adding a chemical stabilizer, as stated in geotechnical option D, to the top 12-inches of the existing gravel roadway. The stabilizer would bind the existing aggregate to form an impervious surface similar to concrete with a rustic gravely look as shown below.

The chemically stabilized base can be surfaced with 2 to 4-inches of gravel or asphalt if desired. Since the chemically stabilized base has a rough surface the 2 to 4-inches of gravel surface stays in place due to friction. The impervious surface would help prevent water to infiltrate into the underlying gravel making it unlikely to rut and washout after rain events. If the drainage and the underling base course is not improved as part of this alternative then soft spots will still exist in wet weather conditions and in time cracks will likely form. Once cracking starts, the impervious surface will erode quickly due to freeze/thaw conditions. The Qualitative Evaluation Factors are shown below:

1. *Public Disturbance:* Minimal public disturbance during construction operations.
2. *Economic:* Total Estimated Construction Cost = $471,960 (does not include annual maintenance) (See appendix H for detailed cost estimate) (Cost is a category 2 estimate for budgetary purposes) A breakdown of the construction cost is below:

1	Mobilization		LS	1	$2,500.00	$2,500
2	Traffic Control		LS	1	$5,000.00	$5,000
3	Road Preparation and Grading		LS	1	$165,000.00	$165,000
4	Chemical Stabilizer (Portland Cement)		SF	190,800	$1.00	$190,800
5	Gravel Surface Course (2-inch Depth)		TON	1,500	$20	$30,000
					Subtotal:	$393,300
					20% Contingencies:	$78,660
					Total:	**$471,960**

3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* Tree removal will not be required.
6. *Environmental impacts:* No environmental impacts.
7. *Annual Maintenance:* Minimal continual annual maintenance costs up front. Future road cracking is likely if drainage is not improved to properly drain base aggregate and prevent freeze/thaw conditions. The maintenance costs this option eliminates includes repairing potholes, washboarding and rutting but only over the first few years. This option would eliminate the amount of gravel that would be need to be added to the roadway on a yearly basis as well as reduce the frequency of repairs to the roadway. Maintenance that may now occur for this option includes sealing cracks.
8. *Level of Service:*
    1. Comfort of ride: This option will improve amount of dust generated. The comfort of ride will be increased due to the reduction of pothole formation and less soft spots in the roadway during the spring and after rain. The smoothness of the ride will be increased due to the rigid layer within the road cross section.

    2. Traffic loading: This option will increase the amount traffic loading the road can support due to a rigid layer within the road cross section.

    3. Functionality of the roadway: This option does not address the overall functionality of the roadway

Summary

This option creates a hard impervious roadway that eliminates dust and maintains existing rustic feel of the road with no asphalt. This option may be combined with drainage options 2 or 2A. There may be some limited tree pruning depending on size of equipment required to install the cement and grade the road.

OPTION 4 – BASE PATCH/GRAVEL SPOT REPLACEMENT

This option consists of identifying areas of poor soils and base course to be removed and replaced with new stone as stated in geotechnical option A. The roadway would be excavated in the identified areas to a minimum 12-inches below the subgrade and filled in with stone. Prior to filling with new stone and replacing the roadway a geogrid will be placed. This helps keep the

poor soils below the road base from migrating into the road base. Based on the geotechnical report this option may encompass 50% of the roadway due to the poor drainage and poor soils under the road. By fixing the known poor areas and adding the geogrid this should help solidify these locations and drastically prolong the time these areas will start to fail but potholes and maintenance will still exist.

1. *Public Disturbance:* Disturbance to traffic during construction operations. Possible lane closures during excavation and gravel replacement operations.
2. *Economic:* Total Estimated Construction Cost = $900,762 (does not include annual maintenance) (See appendix H for detailed cost estimate) (Cost is a category 2 estimate for budgetary purposes) Because this work is done at multiple small locations and not as one massive excavation the cost per square yard does increase. A breakdown of the construction cost is below:

1	Traffic Control	LS	1	$2,500.00	$2,500
2	Mobilization	LS	1	$2,500.00	$2,500
3	Base Patch (50% of Roadway)	SY	10,600	$50.00	$530,000
4	Excavation Below Subgrade (50% of Roadway)	CY	3,535	$17.00	$60,095
5	Crushed Aggregate, 3-inch (EBS)	TON	7,070	$22.00	$155,540
6	Geogrid	SY	10,600	$6.00	$63,600
				Subtotal:	$750,635
				20% Contingencies:	$150,127
				Total:	**$900,762**

3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* Tree removal will not be required.
6. *Environmental impacts:* No environmental impacts besides dust.
7. *Annual Maintenance:* Continual annual maintenance costs and use of City staff to resolve on-going road repairs after wet conditions. Annual maintenance would be reduced due to base repair and gravel spot replacement but would not be eliminated.
8. *Level of Service:*
    1. Comfort of ride: This option will not reduce the amount of dust generated. The comfort of ride will not be as smooth as the paved options but the reconstructed base course with geogrid will be less likely to form potholes and rutting.

    2. Traffic loading: This option will increase the amount traffic loading the road can support due to a stronger base in the areas that have been replaced.

    3. Functionality of the roadway: This option does not address the overall functionality of the roadway.

Summary

This option reduces but does not eliminate existing or reoccurring road deficiencies since water will still migrate into the aggregate base. There would be limited impact to residents and the rustic look of the road would remain the same. The drainage contour map overview Exhibit in Appendix E identifies some areas of poor drainage that may need replacement. This option would work well in conjunction with other options such as improving the drainage or adding an impervious surface to reduce water from infiltrating the base.

OPTION 4A – BASE PATCH/GRAVEL SPOT REPLACEMENT WITH DRAINAGE IMPROVEMENTS

This option consists of identifying areas of poor soils and base course to be removed and replaced with new stone as stated in geotechnical option A. This option also includes the addition of drainage improvements including ditching and draintile. The roadway would be excavated in the identified areas to a minimum 12-inches below the subgrade and filled in with stone. Based on the geotechnical report this option may encompass 50% of the roadway due to the poor drainage and poor soils under the road.

1. *Public Disturbance:* Disturbance to traffic during construction operations. Possible lane closures during excavation and gravel replacement operations.
2. *Economic:* Total Estimated Construction Cost = $2,419,242 (does not include annual maintenance) (See appendix H for detailed cost estimate) (Cost is a category 2 estimate for budgetary purposes) A breakdown of the construction cost is below:

1	Traffic Control	LS	1	$2,500.00	$7,500
2	Mobilization	LS	1	$2,500.00	$2,500
3	Base Patch (50% of Roadway)	SY	10,600	$50.00	$530,000
4	Excavation Below Subgrade (50% of Roadway)	CY	3,535	$17.00	$60,095
5	Crushed Aggregate, 3-inch (EBS)	TON	7,070	$22.00	$155,540
6	Geogrid	SY	10,600	$6.00	$63,600
7	6" PVC Draintile	LF	15,900	$40.00	$636,000
8	Ditching and Grading	LF	13,000	$12.00	$156,000
9	Tree Removal	LF	7,320	$15.00	$109,800
10	15" Driveway Culverts (15)	LF	540	$100.00	$54,000
11	Lawn Restoration	SY	28,500	$8.00	$228,000
12	Silt Fence	LF	13,000	$1.00	$13,000
				Subtotal:	$2,016,035
				20% Contingencies:	$403,207
				Total:	**$2,419,242**

3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* Tree removal will not be required.

6. *Environmental impacts:* No environmental impacts besides dust.
7. *Annual Maintenance:* Continual annual maintenance costs and use of City staff to resolve on-going road repairs after wet conditions. Annual maintenance would be reduced due to base repair and gravel spot replacement but would not be eliminated.
9. *Level of Service:*
    2. Comfort of ride: This option will not reduce the amount of dust generated. The comfort of ride will not be as smooth as the paved options but the reconstructed base course with geogrid will be less likely to form potholes and rutting.

    2. Traffic loading: This option will increase the amount traffic loading the road can support due to a stronger base in the areas that have been replaced. The additional drainage improvements will make it less likely for the road to develop rutting due to saturated base conditions in the spring and after rain.

    3. Functionality of the roadway: This option does not address the overall functionality of the roadway.

Summary

This option reduces reoccurring road deficiencies since water will no longer migrate into the aggregate base. There would be limited impact to residents and the rustic look of the road would remain the same. The drainage contour map overview Exhibit in Appendix E identifies some areas of poor drainage that may need replacement.

OPTION 5 – ASPHALT OVERLAY OVER EXISTING GRAVEL

This option involves overlaying the existing gravel with new asphalt. As part of this option the existing gravel would stay in place with no repairs to the existing gravel being completed except for the grading of the gravel to ensure a proper crown before asphalt is installed. Much like option 3 the asphalt would prevent water to infiltrate within the gravel making it unlikely to rut and washout after rain events. The impervious surface would help prevent water to infiltrate into the underlying gravel making it unlikely to rut and washout after rain events. If the drainage and the underling base course is not improved as part of this alternative then soft spots will still exist in wet weather conditions and in time cracks will likely form. Once cracking starts, the impervious surface will erode quickly due to freeze/thaw conditions. The thickness of the asphalt would be based upon the depth (4") required for the amounts and type of traffic on this road. Without the proper base improvements there would be premature asphalt failure. The extent and the timing of this failure is unknown but would be expected to begin within a few years. The life of the asphalt could then be increased with maintenance on the asphalt. A gravel shoulder may be added at the edge to eliminate any roadway drop off.

1. *Public Disturbance:* Disturbance to traffic during construction operations. Lane closures during paving operations.
2. *Economic:* Total Estimated Construction Cost = $533,400 (does not include annual maintenance) (See appendix H for detailed cost estimate) (Cost is a category 2 estimate for budgetary purposes) A breakdown of the construction cost is below:

1	Mobilization		LS	1	$2,500.00	$2,500
2	Traffic Control		LS	1	$2,500.00	$2,500
3	Road Preparation		LS	1	$10,000.00	$10,000
4	2.25" HMA Pavement Binder Course (3 LT 58-28 S)		TON	2,900	$65.00	$188,500
5	1.75" HMA Pavement Surface Course (4 LT 58-28 H)		TON	2,300	$70.00	$161,000
6	Gravel Shoulder		LF	16,000	$5.00	$80,000
					Subtotal:	$444,500
					20% Contingencies:	$88,900
					Total:	**$533,400**

3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* Tree removal will not be required.
6. *Environmental impacts:* No environmental impacts.
7. *Annual Maintenance:* Minimal continual annual maintenance costs. Future road cracking will occur if drainage is not improved to properly drain base aggregate and prevent freeze/thaw conditions.
8. *Level of Service:*
    1. Comfort of ride: This option will eliminate dust generated. The comfort of ride will be increased due to the impervious road surface. Over the long term the smoothness of ride will decline as cracks develop due to poor base and subgrade conditions.

    2. Traffic loading: This option will increase the amount traffic loading the road can support due to a rigid surface although if the base is not improved then heavy trucks will cause cracking.

    3. Functionality of the roadway: This option does not address the overall functionality of the roadway.

Summary

This option creates a hard impervious roadway that eliminates dust and maintains existing rustic feel of the road but with a new asphalt surface. Other than option 1 this would be the cheapest option. There may be some limited tree pruning depending on size of equipment required to install the asphalt and grade the road. This option could be combined with option 2 or 2A to improve the drainage under the roadway. If drainage is improved as part of this option then the asphalt will be less prone to cracking due to unstable base course. If the drainage and existing base course is not improved as part of this option this it is anticipated that cracks would form due to the inadequate and undrained subsurface.

OPTION 5A – ASPHALT OVERLAY OVER EXISTING GRAVEL WITH BASE PATCH

This option is the same as option 5 above but includes the addition of base patch. Before the asphalt overlay was completed the areas of poor soils and base course would be identified and removed and replaced with new stone as stated in geotechnical option A. The roadway would

be excavated in the identified areas to a minimum 12-inches below the subgrade and filled in with stone.

1. *Public Disturbance:* Disturbance to traffic during construction operations. Lane closures during paving operations.
2. *Economic:* Total Estimated Construction Cost = $1,414,482 (does not include annual maintenance) (See appendix H for detailed cost estimate) (Cost is a category 2 estimate for budgetary purposes) A breakdown of the construction cost is below:

1	Mobilization	LS	1	$2,500.00	$2,500
2	Traffic Control	LS	1	$2,500.00	$2,500
3	Road Preparation	LS	1	$10,000.00	$10,000
4	2.25" HMA Pavement Binder Course (3 LT 58-28 S)	TON	2,900	$65.00	$188,500
5	1.75" HMA Pavement Surface Course (4 LT 58-28 H)	TON	2,300	$70.00	$161,000
6	Traffic Control	LS	1	$2,500.00	$2,500
7	Mobilization	LS	1	$2,500.00	$2,500
8	Base Patch (50% of Roadway)	SY	10,600	$50.00	$530,000
9	Excavation Below Subgrade (50% of Roadway)	CY	3,535	$17.00	$60,095
10	Crushed Aggregate, 3-inch (EBS)	TON	7,070	$22.00	$155,540
11	Geogrid	SY	10,600	$6.00	$63,600
				Subtotal:	$1,178,735
				20% Contingencies:	$235,747
				Total:	**$1,414,482**

3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* Tree removal will not be required.
6. *Environmental impacts:* No environmental impacts.
7. *Annual Maintenance:* Minimal continual annual maintenance costs. Future road cracking possible if drainage is not improved to properly drain base aggregate and prevent freeze/thaw conditions.
8. *Level of Service:*
    1. Comfort of ride: This option will eliminate dust generated. The comfort of ride will be increased due to the impervious road surface. Over the long term the smoothness of ride will decline as cracks develop due to poor base and subgrade conditions although cracks will develop slower than option 5 due to the adding base patching which will eliminate areas of poor base course.

    2. Traffic loading: This option will increase the amount traffic loading the road can support due to a rigid surface although if the base is not improved then heavy trucks will cause cracking.

    3. Functionality of the roadway: This option does not address the overall functionality of the roadway.

Summary

This option creates a hard impervious roadway that eliminates dust and maintains existing rustic feel of the road but with a new asphalt surface with the addition of identifying areas of poor soils and base course to be removed and replaced with new stone. There may be some limited tree pruning depending on size of equipment required to install the asphalt and grade the road.

OPTION 6 – GRAVEL RECONSTRUCTION

This option includes the full reconstruction of the existing gravel roadway by removing the existing gravel to a minimum depth of 18 inches and undercutting the poor soils to a minimum depth of 12-inches below the subgrade. The areas excavated below subgrade would be replaced with stone and geogrid would be placed on the subgrade as recommended in the geotechnical report. Gravel would then be placed on top of the geogrid to a minimum depth of 18-inches. Wispave software was used to determine the gravel thickness of the roadway and the strength would be adequate for the amount and type of traffic on this road. The City supplied traffic counts and traffic information that was used in the Wispave software.

1. *Public Disturbance:* Disturbance to traffic during construction operations. Possible lane closures during paving operations.
2. *Economic:* Total Estimated Construction Cost = $786,696 (does not include annual maintenance) (See appendix H for detailed cost estimate) (Cost is a category 2 estimate for budgetary purposes) A breakdown of the construction cost is below:

1	Traffic Control		LS	1	$5,000.00	$5,000
2	Common Excavation		LS	1	$100,000.00	$100,000
3	Excavation Below Subgrade		CY	3,550	$17.00	$60,350
4	Crushed Aggregate, 3-inch (EBS)		TON	7,100	$22.00	$156,200
5	12-inch Crushed Aggregate Base, 1 1/4-inch		TON	7,100	$20.00	$142,000
6	6-inch Crushed Aggregate Surface, 3/4-inch		TON	3,600	$18.00	$64,800
7	Geogrid		SY	21,205	$6.00	$127,230
					Subtotal:	$655,580
					20% Contingencies:	$131,116
					Total:	**$786,696**

3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* Tree removal will not be required.
6. *Environmental impacts:* No environmental impacts besides dust.
7. *Annual Maintenance:* Minimal continual annual maintenance costs besides periodic grading to maintain road crown.
8. *Level of Service:*

1. Comfort of ride: This option will not reduce the amount of dust generated. The comfort of ride will not be as smooth as the paved options but the reconstructed base course with geogrid will initially be less likely to form potholes and rutting but gravel roads will ultimately get potholes and rutting.

2. Traffic loading: This option will increase the amount traffic loading the road can support due to a stronger base although if the base course is saturated after rain and melting in the spring due to no drainage improvement then heavy trucks may cause rutting.

3. Functionality of the roadway: This option does not address the overall functionality of the roadway.

Summary

This option greatly reduces existing or reoccurring road deficiencies and keeps the existing rustic feel of the road. There may be some limited tree pruning depending on size of equipment required to install the gravel and grade the road. If drainage improvements such as ditching and draintiles are not included as part of this option then it is likely that soft spots will develop over time and rutting may result. The geogrid or paving fabric would help to keep the soft subgrade soils separate from the new base course and therefore soft spots would be less likely to form. It should be noted that the existing roadway varies from 22' to 24' wide with no shoulders which does not meet the City of Mequon Standard roadway width of 22' with 3' gravel shoulders.

OPTION 6A – GRAVEL RECONSTRUCTION WITH DRAINAGE IMPROVEMENTS

This option is the same as option 6 above but includes the addition of option 2 drainage improvements.

1. *Public Disturbance:* Disturbance to traffic during construction operations. Possible lane closures during paving operations.
2. *Economic:* Total Estimated Construction Cost = $2,229,000 (does not include annual maintenance) (See appendix H for detailed cost estimate) (Cost is a category 2 estimate for budgetary purposes) A breakdown of the construction cost is below:

1	Traffic Control	LS	1	$5,000.00	$5,000
2	Common Excavation	LS	1	$100,000.00	$100,000
3	Excavation Below Subgrade	CY	3,550	$17.00	$60,350
4	Crushed Aggregate, 3-inch (EBS)	TON	7,100	$22.00	$156,200
5	12-inch Crushed Aggregate Base, 1 1/4-inch	TON	7,100	$20.00	$142,000
6	6-inch Crushed Aggregate Surface, 3/4-inch	TON	3,600	$18.00	$64,800
7	Geogrid	SY	21,205	$6.00	$127,230
8	Traffic Control	LS	1	$5,000.00	$5,000
9	6" PVC Draintile	LF	15,900	$40.00	$636,000
10	Ditching and Grading	LF	13,000	$12.00	$156,000
11	Tree Removal	LF	7,320	$15.00	$109,800
12	15" Driveway Culverts (15)	LF	540	$100.00	$54,000
13	Lawn Restoration	SY	28,500	$8.00	$228,000
14	Silt Fence	LF	13,000	$1.00	$13,000
				Subtotal:	$1,857,380
				20% Contingencies:	$371,476
				Total:	**$2,228,856**

3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* Extensive tree removal will be required.
6. *Environmental impacts:* Environmental impacts include continued dust, tree removal and wetland disturbance.
7. *Annual Maintenance:* Minimal continual annual maintenance costs besides periodic grading to maintain road crown.
8. *Level of Service:*
    1. Comfort of ride: This option will not reduce the amount of dust generated. The comfort of ride will not be as smooth as the paved options but the reconstructed base course with geogrid will be less likely to form potholes and rutting.

    2. Traffic loading: This option will increase the amount traffic loading the road can support due to a stronger base.

    3. Functionality of the roadway: This option does not address the overall functionality of the roadway.

Summary

This option greatly reduces existing or reoccurring road deficiencies and keeps the existing rustic feel of the road. There may be some limited tree pruning depending on size of equipment required to install the gravel and grade the road. This option also includes the addition of drainage improvements as shown in option 2. The drainage improvements of ditching and draintiles as described in option 2 that are included with this option will extend the longevity of the repairs to

the road per option 6 and reduce the probability of reoccurring issues with potholes, rutting and soft spots in the roadway. It should be noted that the existing roadway varies from 22' to 24' wide with no shoulders which does not meet the City of Mequon Standard roadway width of 22' with 3' gravel shoulders.

OPTION 7 – ASPHALT PAVEMENT RECONSTRUCTION

This option includes the full reconstruction of the existing gravel roadway, as stated in geotechnical option B, by removing the existing gravel to a minimum depth of 15 inches and undercutting the poor soils to a minimum depth of 12-inches below the subgrade. The areas excavated below subgrade would be replaced with stone and geogrid would be placed on the subgrade as recommended in the geotechnical report. Gravel base would then be placed on top of the geogrid to a minimum depth of 11-inches. Asphalt would then be placed on the base course at a thickness of 4-inches. Wispave software was used to determine the asphalt and aggregate base thickness of the roadway to meet the strength of road for the existing type and amount of traffic. The City supplied traffic counts and traffic information that was used in the Wispave software.

1. *Public Disturbance:* Disturbance to traffic during construction operations. Lane closures during excavation, aggregate base construction and paving operations.
2. *Economic:* Total Estimated Construction Cost = $1,225,116 (does not include annual maintenance) (See appendix H for detailed cost estimate) (Cost is a category 2 estimate for budgetary purposes) A breakdown of the construction cost is below:

1	Traffic Control		LS	1	$5,000.00	$5,000
2	Common Excavation		LS	1	$100,000.00	$100,000
3	Excavation Below Subgrade		CY	9,000	$17.00	$153,000
4	Crushed Aggregate, 3-inch (EBS)		TON	7,100	$22.00	$156,200
5	Crushed Aggregate, 1 1/4-inch		TON	6,500	$20.00	$130,000
6	2.25" HMA Pavement Binder Course (3 LT 58-28 S)		TON	2,900	$65.00	$188,500
7	1.75" HMA Pavement Surface Course (4 LT 58-28 H)		TON	2,300	$70.00	$161,000
8	Geogrid		SY	21,205	$6.00	$127,230
					Subtotal:	$1,020,930
					20% Contingencies:	$204,186
					Total:	**$1,225,116**

3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* Tree removal will not be required.
6. *Environmental impacts:* No environmental impacts.
7. *Annual Maintenance:* Minimal continual annual maintenance costs. Future road cracking possible if drainage is not improved to properly drain base aggregate and prevent freeze/thaw conditions.
8. *Level of Service:*

1. Comfort of ride: This option will eliminate dust generated. The comfort of ride will be increased due to the impervious road surface. Over the long term the smoothness of ride will decline as cracks develop due to poor base and subgrade conditions although cracks will develop slower than option 5 which does not improve the base course due to the new base and geogrid which will eliminate areas of poor base course.

2. Traffic loading: This option will increase the amount traffic loading the road can support due to a stronger base although if the base course is saturated after rain and melting in the spring due to no drainage improvement then heavy trucks may cause rutting.

3. Functionality of the roadway: This option does not address the overall functionality of the roadway.

Summary

This option creates a hard impervious roadway that eliminates dust and maintains existing rustic feel of the road but with a new asphalt surface. This is one of the most expensive options but annual road maintenance would be very minimal and the new roadway should last 10 to 15 years or more. The impact to traffic would be the most significant compared to the previous options due to the construction time required for excavation and placement of base and asphalt. There may be some limited tree pruning depending on size of equipment required to install the asphalt and grade the road. If drainage improvements are not included as part of this option then it is likely that there will be cracking and premature failure of the roadway. The extent of the cracking is unknown and is dependent on how soft spots form under the roadway. The proposed geogrid for this option will help keep the underlying subgrade separate from the new base course which will help reduce the formation of soft spots. It should be noted that the existing roadway varies from 22' to 24' wide with no shoulders which does not meet the City of Mequon Standard roadway width of 22' with 3' gravel shoulders.

OPTION 7A – ASPHALT PAVEMENT RECONSTRUCTION WITH DRAINAGE IMPROVEMENTS

This option is the same as option 7 above but includes the addition of option 2 drainage improvements.

1. *Public Disturbance:* Disturbance to traffic during construction operations. Lane closures during excavation, aggregate base construction and paving operations.
2. *Economic:* Total Estimated Construction Cost = $2,556,000 (does not include annual maintenance) (See appendix H for detailed cost estimate) (Cost is a category 2 estimate for budgetary purposes) A breakdown of the construction cost is below:

1	Traffic Control	LS	1	$5,000.00	$5,000
2	Common Excavation	LS	1	$100,000.00	$100,000
3	Excavation Below Subgrade	CY	3,550	$17.00	$60,350
4	Crushed Aggregate, 3-inch (EBS)	TON	7,100	$22.00	$156,200
5	Crushed Aggregate, 1 1/4-inch	TON	6,500	$20.00	$130,000
6	2.25" HMA Pavement Binder Course (3 LT 58-28 S)	TON	2,900	$65.00	$188,500
7	1.75" HMA Pavement Surface Course (4 LT 58-28 H)	TON	2,300	$70.00	$161,000
8	Geogrid	SY	21,205	$6.00	$127,230
9	Traffic Control	LS	1	$5,000.00	$5,000
10	6" PVC Draintile	LF	15,900	$40.00	$636,000
11	Ditching and Grading	LF	13,000	$12.00	$156,000
12	Tree Removal	LF	7,320	$15.00	$109,800
13	15" Driveway Culverts (15)	LF	540	$100.00	$54,000
14	Lawn Restoration	SY	28,500	$8.00	$228,000
15	Silt Fence	LF	13,000	$1.00	$13,000
				Subtotal:	$2,130,080
				20% Contingencies:	$426,016
				Total:	**$2,556,096**

3. *Disturbance to Private Property:* No disturbance to private property.
4. *Disturbance to existing utilities:* No disturbance to existing utilities.
5. *Tree removal:* Extensive tree removal will be required.
6. *Environmental impacts:* Environmental impacts include continued dust, tree removal and wetland disturbance.
7. *Annual Maintenance:* Minimal continual annual maintenance costs. Future road cracking possible if drainage is not improved to properly drain base aggregate and prevent freeze/thaw conditions.
8. *Level of Service:*
    1. Comfort of ride: This option will eliminate dust generated. The comfort of ride will be increased due to the impervious road surface. Over the long term the smoothness of ride will decline as cracks develop. This option is the best option for preventing cracks, potholes, soft spots and rutting as it addresses all ways that a road can fail including proper drainage and road base.

    2. Traffic loading: This option will increase the amount of traffic loading the road can support due to a stronger base, rigid surface and proper drainage. This option will be able to support heavier vehicles without cracking more than all other options.

    3. Functionality of the roadway: This option does not address the overall functionality of the roadway.

Summary

This option creates a hard impervious roadway that eliminates dust and maintains existing rustic feel of the road but with a new asphalt surface. This is the most expensive option but annual road maintenance would be very minimal and the new roadway would last for 20 years or more. The impact to traffic would be the most significant compared to the previous options due to the construction time required for excavation and placement of base and asphalt. This option also includes the addition of drainage improvements as shown in option 2. The combination of new base course, an impervious surface and drainage improvements would make this option the longest lasting option with the least amount of annual maintenance costs such as crack and pothole repairs. It should be noted that the existing roadway varies from 22' to 24' wide with no shoulders which does not meet the City of Mequon Standard roadway width of 22' with 3' gravel shoulders.

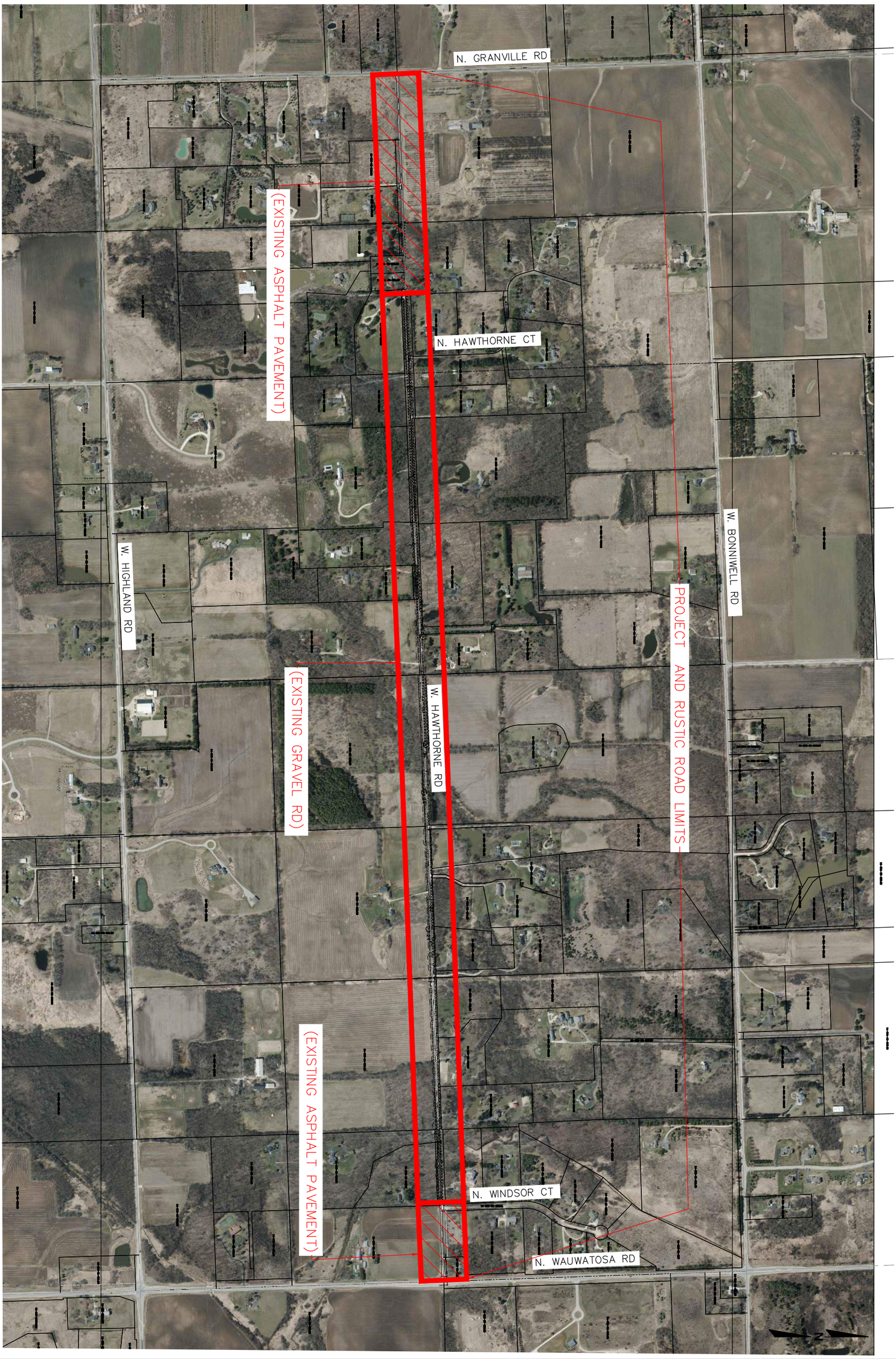
CONCLUSION

Based on the foregoing, all options have attributes with many advantages and disadvantages. Improving the drainage is an option that would help alleviate many of the road problems due to excess moisture in the aggregate base. Ditching would come at an environmental and aesthetic cost of removing trees, reducing the canopy over the roadway and disturbing natural areas such as wetlands. Improved drainage is one option to reduce moisture into the aggregate base but the other option would be to create an impervious layer over the top of the road. However, this option would not help when the soil surrounding the roadway is saturated allowing water to infiltrate the aggregate base. Another major issue is the migration of subgrade material into the base course. To prevent this situation a barrier (geogrid) between the subgrade and aggregate base is required. There are many ways to improve the roadway and ultimately it is a give and take between cost, aesthetics, and road function. It is possible to have a progression of work performed on the roadway to improve the road conditions over a period of time. The progression could start with reconstructing the base and creating a barrier between the base and subgrade, then drainage improvements could be made at a later date and lastly an impervious surface could be added once it is determined the base is holding up over time.

APPENDIX

Appendix A:	Project Limits Overview
Appendix B:	WisDOT Hawthorne Rustic Road Description
Appendix C:	Geotechnical Report
Appendix D:	WisPave Analysis and Geogrid Design
Appendix E:	Plan & profile and Drainage Exhibits
Appendix F:	Typical Sections of Road Improvement Options
Appendix G:	Topographic Exhibit
Appendix H:	Cost Estimates
Appendix I:	Culvert Inspection Reports
Appendix J:	Traffic Data

J:\1190486\Dwg\Overview Exhibit.dwg, Hawthorne Rd Overview, 8/20/2019 9:10:37 AM, mjg



SHEET NUMBER	EXHIBIT 1
CHECKED BY: TJH	
DESIGNED BY: MJG	
PROJECT MANAGER: TROY T. MARTJES, P.E.	
JOB NO. 1190486	
SCALE: 1" = 400'	
DATE: 7-16-19	

CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
PROJECT LIMITS OVERVIEW

raSmith
CREATIVITY BEYOND ENGINEERING

City of Mequon

APPENDIX B

WisDOT Hawthorne Rustic Road Description

State of Wisconsin
Department of Transportation

Rustic Road 65

Explore the Rustic Roads

Rustic Roads Guide

Maps and descriptions

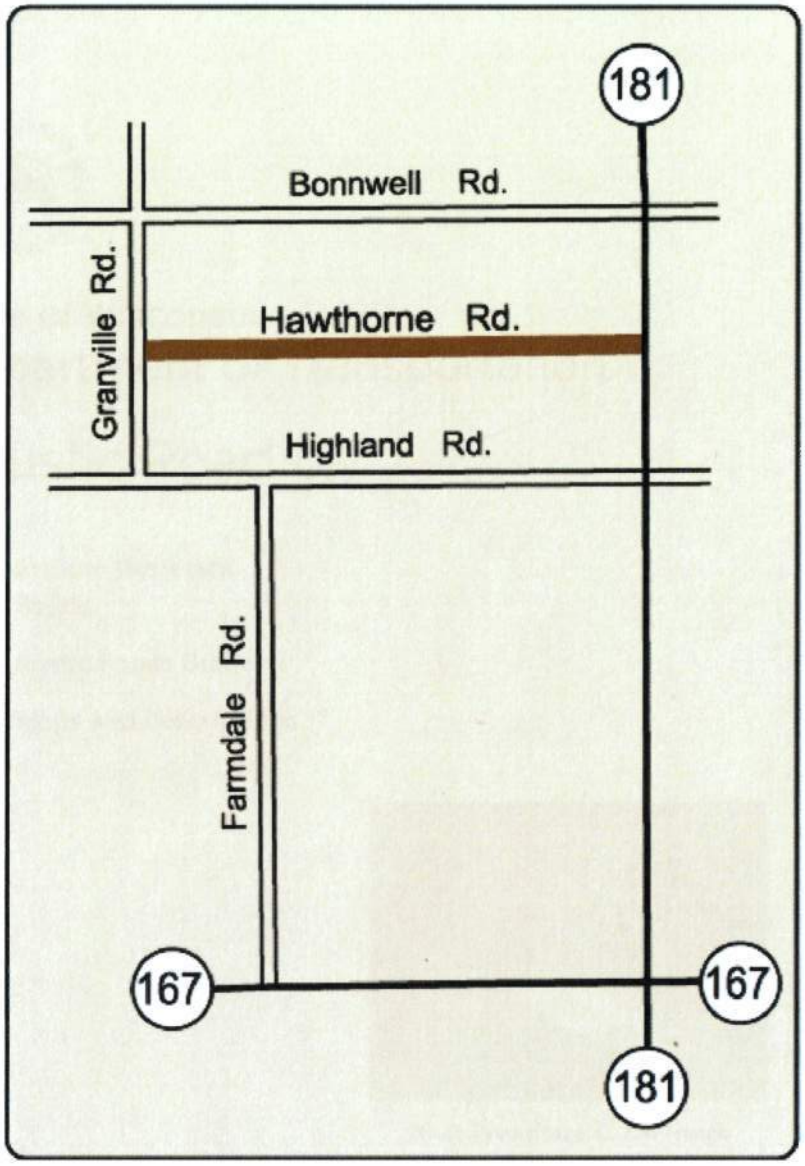
Photo Credit: Jane C. Van Treeck

Location: Southeast Wisconsin, Ozaukee County. Hawthorne Road between Wauwatosa Road and Granville Road in the city of Mequon.

Length: 2 miles

Surface: Gravel

Hawthorne Road is the only gravel road in the city of Mequon. Much of the road is lined with oak, maple and weeping willow trees that provide a canopy in the summer and a blaze of color in the fall. The open land along R-65 is under cultivation or is pasture land for horses and sheep making pleasant agricultural vistas. The area surrounding the road is habitat for deer, rabbits, hawks and songbirds. The road is popular with hikers, bikers, equestrians and motorists.


181
Bonnwell Rd.
Granville Rd.
Hawthorne Rd.
Highland Rd.
Farmdale Rd.
167
167
181

APPENDIX C

GEOTECHNICAL REPORT

Geotechnical Summary Letter

Pavement Exploration

Hawthorne Road

City of Mequon, Wisconsin

October 31, 2019

Terracon Project No. 58195078-Rev 1

Prepared for:

RA Smith, Inc.

Mequon, Wisconsin

Prepared by:

Terracon Consultants, Inc.

Franklin, Wisconsin

TABLE OF CONTENTS

October 31, 2019

RA Smith, Inc.
W182 S8200 Racine Avenue
Mequon, WI 53150

Attention: Mr. Troy Hartjes, PE

Re: Geotechnical Engineering Report
Pavement Exploration
Hawthorne Road
City of Mequon, Wisconsin
Terracon Project No. 58195078-Rev 1

Dear Mr. Hartjes:

Terracon Consultants, Inc. (Terracon) has completed a geotechnical exploration for the above referenced project. This summary letter presents the findings of the subsurface exploration, the soil conditions encountered at the boring locations, laboratory test results, and a discussion of possible rehabilitation and reconstruction options.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Michael Mueller, E.I.T.
Staff Engineer

Paul J. Koszarek, P.E.
Geotechnical Department Manager

GEOTECHNICAL SUMMARY LETTER
RECONSTRUCTION AND UTILITY CONSTUCTION
Hawthorne Road
CITY OF MEQUON, WISCONSIN

Terracon Project No. 58195078-Rev 1
October 31, 2019

1.0 INTRODUCTION

Terracon Consultants, Inc. (Terracon) has completed a geotechnical exploration for the proposed Pavement Exploration project for a portion of Hawthorne Road in the City of Mequon, Wisconsin. A total of 11 borings were performed with planned depths of approximately 10 feet below the existing ground surface. Additionally, and 11 Dynamic Cone Penetrometer (DCP) tests were performed. This summary letter presents the subsurface soil conditions encountered at the boring locations and laboratory test results, as well as a discussion regarding possible methods of pavement rehabilitation/reconstruction.

Boring logs and a Boring Location Diagrams are included in Appendix A. The results of the laboratory testing performed on soil samples obtained from the borings are included on the boring logs in Appendix A. Descriptions of the field exploration and laboratory testing are included in their respective appendices.

2.0 PROJECT INFORMATION

2.1. Project Description

ITEM	DESCRIPTION
Project Description	A majority of Hawthorne Road from N. Granville Road to Wauwatosa Road is currently a designated Rustic Road. This section of the roadway is a gravel road and is not paved with asphalt. Small sections of the western and eastern portions of the road are paved with asphalt. The overall length of the roadway is 2 miles.
Grading	The topographic survey has not been provided; however, based on Google imagery the elevation of the roadway varies by more than 80 feet throughout the route varying from elevation 844 feet on the west end to 760 feet on the east end.
Estimated Start of Construction	Summer/Fall 2019

2.2 . Site Location and Description

ITEM	DESCRIPTION
Site Location	The project spans Hawthorne Road from N. Granville Road on the west to Wauwatosa Road on the east. The overall length of the roadway is 2 miles.
Current Site Improvements	A small section of the western portion of the road is asphalt paved. A majority of the road is gravel covered.

3.0 SUBSURFACE CONDITIONS

3.1 Pavement Observations

Subsurface conditions at each boring location are described on the individual boring logs in Appendix A. The stratification boundaries shown on the boring logs represent the approximate depths where changes in material types occur. In-situ, transitions between material types can be more gradual. Based on the results of the borings, the pavement section thicknesses are summarized in the table below:

Boring Number	Asphalt Thickness (in)	Aggregate Base Thickness (in)
B-1	5	(2.5 of crushed asphalt)
B-2	6	Not observed
B-3	n/a	3.5 feet
B-4	n/a	6 feet
B-5	n/a	1 foot
B-6	n/a	3.5 feet
B-7	n/a	1.5 feet
B-8	n/a	1.8 feet
B-9	n/a	2 feet
B-10	n/a	3.5 feet
B-11	n/a	3.5 feet

3.2 Water Level Observations

The boreholes were observed while drilling and at the completion of drilling for the presence and level of groundwater. Groundwater level observations during drilling are shown in the table below:

Boring Number	Depth to Observed Groundwater While Drilling (ft)
B-1	6 (perched)
B-3	4.5 (perched)
B-9	9
B-10	7

If a boring is not listed in the table above, then water was not present during or at the completion of drilling operations. At borings B-1 and B-3, it is likely that the observed water is being held within the upper more permeable sandy veins or silt layers by the underlying less permeable clayey soils.

Due to the low permeability of clay soils, a longer period of time is necessary for a groundwater level to develop and stabilize in a borehole. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type. However, based on the colorization of the soils being brown and not gray, we anticipate that the long-term water table is located below a depth of 10 feet.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

3.3 DCP Test Results

A dynamic cone penetrometer test (DCP) was completed at each of the boring locations to depth of about 30 inches or refusal, whichever is more, below the existing ground surface. The results of the DCPs are listed in the table below. Typically, in-situ CBR values below 3.5 would indicate soils that would be unstable if subjected to proofroll using a heavily loaded dump truck.

DCP Number	In-Situ CBR Value
B-1	>30 top 15 inches, then 4 to 6 to EOT
B-2	>30
B-3	>30
B-4	>30 top 15 inches, then 8 to EOT
B-5	>30
B-6	>30
B-7	>20 top 10 inches, then 4 to 8 EOT
B-8	>20 top 10 inches, then 4 to 8 EOT
B-9	>30 top 10 inches, then 3 to 10 EOT
B-10	10
B-11	>30 top 6 inches, then 10 EOT

4.0 PAVEMENT DISCUSSION

4.1 Pavement Discussion

Based on our soil boring and DCP data within the gravel portions of the roadway, the gravel surface thickness and density is variable. It appears that the upper 10 to 15 inches of stone is dense but the bottom 10 to 15 inches is likely contaminated with fine grained soils such as clay or silt resulting in an overall lower performing gravel surface. Several options exist in order to rehabilitate or reconstruct the road including the following:

1) Removal of existing stone, proofroll, undercut where necessary, install drainage and build new gravel section with a separation fabric underlying the gravel
2) Option #1, but build an asphalt pavement over an aggregate base course
3) Proofroll existing stone, observe where it is failing proofroll, undercut those areas and backfill with stone. Cut in draintile at edge of road to improve drainage.
4) Chemically stabilize the upper 12 inches of the existing gravel surface using Portland Cement or Lime Kiln Dust to create a structural layer. Cut in draintile prior to performing at a level deeper than the planned chemical stabilization in order to improve drainage. Typically, the upper chemically stabilized layer is designed to obtain a minimum compressive strength of 300 psi in order to be considered a long-term structural layer.

Option #3 would likely have the least life expectancy and will require yearly maintenance in order to maintain the quality of ride. Option 1, 2 and 4 will have a longer life expectancy but will require maintenance in order to maintain the quality of ride and extend the life expectancy.

Other options may be possible besides those provided above. Once a final decision on a solution is determined, then Terracon should be contacted to review and provide a final design level report that could be used for design and construction.

4.2 Pavement Design Parameters

The existing subgrade soils are variable between boring locations and range from lean clay, sand, and silty sand with gravel. As such, Terracon recommends using the following parameters for the design:

Design Parameter	Value
Subgrade Material (fill and native)	Poorly Sorted – II
California Bearing Ratio (CBR)	3
Design Group Index	13
Soil Support Value	4.2
Frost Group Index	F-3
Modulus of Subgrade Reaction	110 pci
Resilient Modulus	2600 psi

4.3 . General Pavement Comments

A critical aspect of pavement performance is site preparation. There is often a time lapse between the end of grading operations and the commencement of paving. Subgrades prepared early in the construction process can become disturbed by construction traffic. Non-uniform subgrades often result in poor pavement performance and local failures relatively soon after pavements are constructed. Depending on the paving equipment used by the contractor, measures may be required to improve subgrade strength to greater depths for support of heavily loaded trucks.

5.0 GENERAL COMMENTS

Terracon should be retained to provide observation and testing services during grading and other earth-related and pavement construction phases of the project.

The information presented in this report is based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not

become evident until during or after construction. We have not been asked to interpret any of the data obtained; therefore, we cannot be responsible for interpretations made by others.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION

Field Exploration Description

The borings were drilled at the approximate locations indicated on the attached Boring Location Diagram (Appendix A). Boring locations were marked in the field by Terracon.

The borings were drilled with an ATV track-mounted, rotary drill rig. The borings were advanced in to the underlying soils using continuous flight augers to advance the boreholes. Typically, four soil samples were obtained within the upper 10 feet of each boring. Soil samples were obtained using the split-barrel sampling procedures, in which a standard 2-inch (outside diameter) split-barrel sampling spoon is driven into the ground with a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. These values, also referred to as SPT N-values, are an indication of soil strength and are provided on the boring logs at the depths of occurrence. The samples were sealed and transported to the laboratory for testing and classification. Upon completion, each of the borings was backfilled with a mixture of soil cuttings and bentonite, and then restored with cold patch asphalt to surrounding grade.

At the DCP test locations, we performed a dynamic cone penetrometer (DCP) test to a depth of about 24 to 30 inches below ground surface elevation. This device provides a continual profile of the stiffness of the soil with depth, and a rough correlation with the subgrade CBR value (strength parameter used by pavement engineers to design pavement thicknesses).

The drill crew prepared a field log of each boring. These logs included visual classifications of the materials encountered during drilling and the technician’s interpretation of the subsurface conditions between samples. The boring logs included with this report represent the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

SITE LOCATION AND EXPLORATION PLANS

SITE LOCATION

Pavement Exploration-Hawthorne Road ■ City of Mequon, WI October 31, 2019 ■ Terracon Project No. 58195078 Rev 1

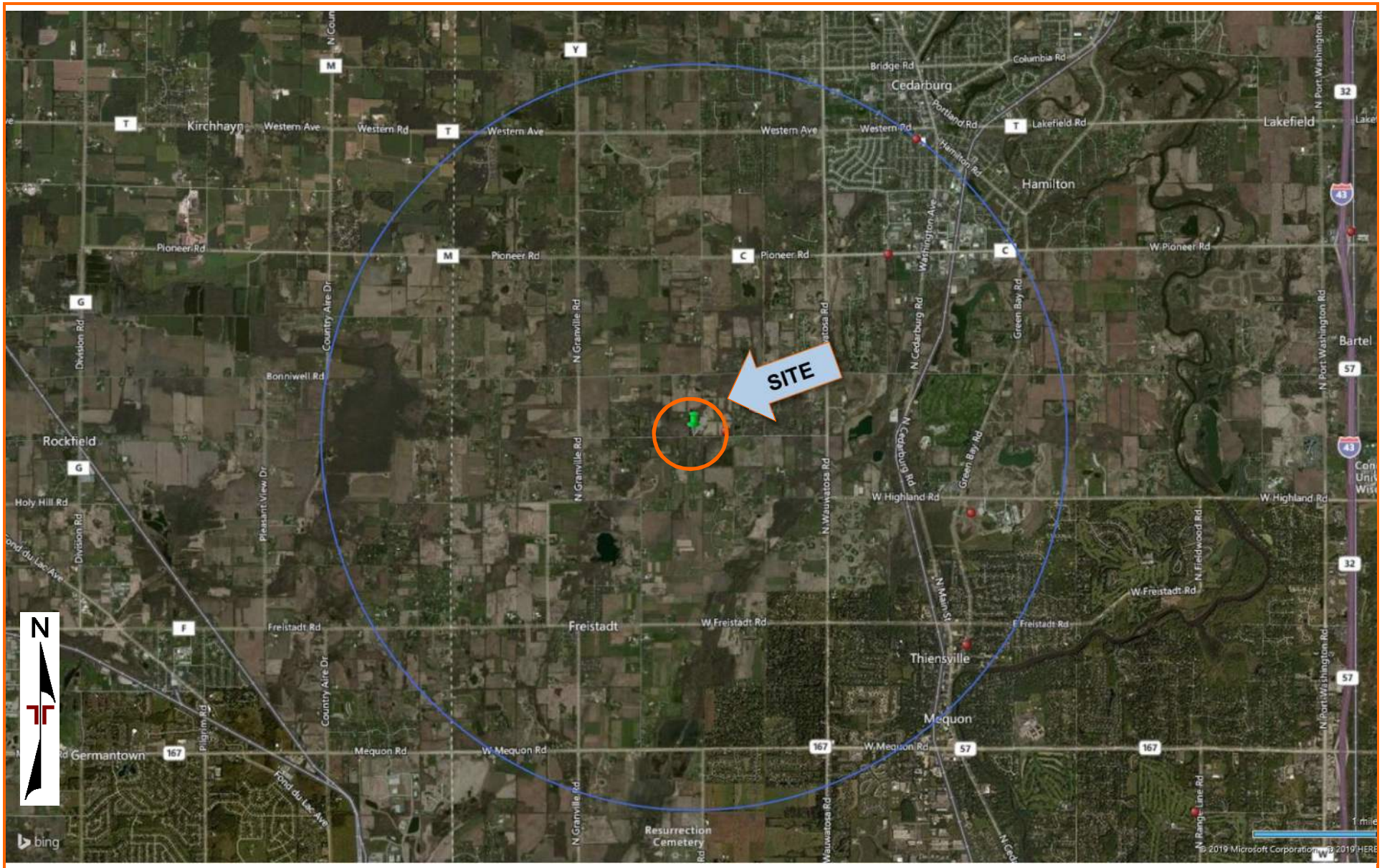


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

EXPLORATION RESULTS

BORING LOG NO. B-1

PROJECT: Rustic Road - Mequon

CLIENT: RA Smith Inc
Cedarburg, WI

SITE: Hawthorne Road
Mequon, WI

LOCATION See Exploration Plan

Latitude: 43.2577° Longitude: -88.0409°

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)
	0.4								
	ASPHALT, (5" thick)								
	FILL - CRUSHED ASPHALT				X	14	3-4-5 N=9	4.5 (HP)	26
	2.5								
	FILL - LEAN CLAY, trace organics, trace sand and gravel, dark brown and black								
				▽	X	4	3-3-2 N=5		26
	6.0		5						
	SANDY LEAN CLAY (CL), trace gravel, brown mottled gray, medium stiff				X	18	2-2-2 N=4	0.75 (HP)	13
	8.5								
	LEAN CLAY (CL), trace sand and gravel, brown mottled gray, hard				X	18	4-8-12 N=20	5.0 (HP)	12
	10.0		10						
	Boring Terminated at 10 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" HSA

Abandonment Method:
Boring backfilled with Auger Cuttings and Bentonite Chips

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 5 feet while drilling.*

Terracon
9856 S 57th St
Franklin, WI

Boring Started: 07-01-2019 | Boring Completed: 07-01-2019

Drill Rig: 7822DT | Driller: DH

Project No.: 58195078

BORING LOG NO. B-2

PROJECT: Rustic Road - Mequon

CLIENT: RA Smith Inc
Cedarburg, WI

SITE: Hawthorne Road
Mequon, WI

LOCATION See Exploration Plan

Latitude: 43.2577° Longitude: -88.0357°

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)
	0.5								
		ASPHALT, (6" thick)							
		LEAN CLAY (CL), trace sand and gravel, dark brown, hard, POSSIBLE FILL				6	3-5-4 N=9	4.0 (HP)	12
	3.5								
	3.9	**LEAN CLAY (CL)**, trace sand and gravel, brown, hard, PUSHED A ROCK					50/4" N= 50/4"		18
		Auger Refusal at 3.9 feet on possible boulders at 3.9 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" HSA

Abandonment Method:
Boring backfilled with Auger Cuttings and Bentonite Chips

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No water observed while drilling.

Terracon
9856 S 57th St
Franklin, WI

Boring Started: 07-01-2019 | Boring Completed: 07-01-2019

Drill Rig: 7822DT | Driller: DH

Project No.: 58195078

BORING LOG NO. B-3

PROJECT: Rustic Road - Mequon

CLIENT: RA Smith Inc
Cedarburg, WI

SITE: Hawthorne Road
Mequon, WI

LOCATION See Exploration Plan

Latitude: 43.2578° Longitude: -88.0305°

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)
					X	10	17-13-6 N=19		5
				▽	X	12	4-4-6 N=10		30
			5						
					X	18	5-5-6 N=11		21
					X	18	8-7-7 N=14		17
			10						

FILL - SILTY SAND WITH GRAVEL

3.5

SANDY SILT (ML), brown, wet, medium dense

8.5

SANDY LEAN CLAY (CL), brown, stiff

10.0

Boring Terminated at 10 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" HSA

Abandonment Method:
Boring backfilled with Auger Cuttings and Bentonite Chips

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 4.5 feet while drilling.*

Terracon
9856 S 57th St
Franklin, WI

Boring Started: 06-06-2019 | Boring Completed: 06-06-2019

Drill Rig: 7822DT | Driller: DH

Project No.: 58195078

BORING LOG NO. B-4

PROJECT: Rustic Road - Mequon

CLIENT: RA Smith Inc
Cedarburg, WI

SITE: Hawthorne Road
Mequon, WI

LOCATION See Exploration Plan

Latitude: 43.2578° Longitude: -88.0277°

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)
			FILL - SILTY SAND WITH GRAVEL							
						X	10	17-15-9 N=24		4
2.5										
			FILL - CRUSHED LIMESTONE, gray							
						X	0	5-5-4 N=9		
				5						
6.0										
6.5			**BURIED TOPSOIL**							
						X	5	5-6-50/3" N= 50/3"		29
7.3			**SILTY SAND WITH GRAVEL (SM)**, gray with rust mottling							
			Auger Refusal at 7.25 feet on possible boulders at 7.25 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" HSA

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No water observed while drilling.

Terracon
9856 S 57th St
Franklin, WI

Boring Started: 06-06-2019 | Boring Completed: 06-06-2019

Drill Rig: 7822DT | Driller: DH

Project No.: 58195078

BORING LOG NO. B-5

PROJECT: Rustic Road - Mequon

CLIENT: RA Smith Inc
Cedarburg, WI

SITE: Hawthorne Road
Mequon, WI

LOCATION See Exploration Plan

Latitude: 43.2579° Longitude: -88.0248°

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)
	FILL - SILTY SAND WITH GRAVEL 1.0							
	LEAN CLAY (CL), trace sand and gravel, dark brown to brown, very stiff to hard			X	7	12-5-3 N=8	2.5 (HP)	20
				X	18	2-2-6 N=8	2.0 (HP)	13
		5		X	16	7-8-12 N=20	4.5+ (HP)	14
	10.0			X	18	24-22-19 N=41	4.5+ (HP)	19
	Boring Terminated at 10 Feet	10						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" HSA

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No water observed while drilling.

Terracon
9856 S 57th St
Franklin, WI

Boring Started: 06-06-2019 | Boring Completed: 06-06-2019

Drill Rig: 7822DT | Driller: DH

Project No.: 58195078

BORING LOG NO. B-6

PROJECT: Rustic Road - Mequon

CLIENT: RA Smith Inc
Cedarburg, WI

SITE: Hawthorne Road
Mequon, WI

LOCATION See Exploration Plan

Latitude: 43.2579° Longitude: -88.022°

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)
					X	6	22-10-5 N=15		4
	3.5								
					X	18	5-6-6 N=12		19
			5						
				▽	X	18	5-5-8 N=13		20
					X	18	8-11-16 N=27		14
	10.0		10						

FILL - SILTY SAND WITH GRAVEL, medium grained, brown, moist

SAND (SP), trace silt, fine grained, brown to gray, wet to moist, medium dense

Boring Terminated at 10 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" HSA

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 7 feet while drilling.*

Terracon
9856 S 57th St
Franklin, WI

Boring Started: 06-05-2019 | Boring Completed: 06-05-2019

Drill Rig: 7822DT | Driller: DH

Project No.: 58195078

BORING LOG NO. B-7

PROJECT: Rustic Road - Mequon

CLIENT: RA Smith Inc
Cedarburg, WI

SITE: Hawthorne Road
Mequon, WI

LOCATION See Exploration Plan

Latitude: 43.258° Longitude: -88.0191°

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)
1.5					X	6	2-1-2 N=3		15
4.0									
					X	16	14-12-11 N=23		15
6.0			5						
					X	8	14-14-9 N=23		6
10.0									
					X	14	28-18-13 N=31		6
			10						

FILL - SILTY SAND WITH GRAVEL

FILL - SANDY LEAN CLAY, mixed with silty sand with gravel, fine to medium grained, dark brown, moist

LEAN CLAY (CL), dark brown, very stiff

SILTY SAND WITH GRAVEL (SM), medium grained, brown, moist, medium dense to dense

Boring Terminated at 10 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" HSA

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No water observed while drilling.

Terracon
9856 S 57th St
Franklin, WI

Boring Started: 06-05-2019 | Boring Completed: 06-05-2019

Drill Rig: 7822DT | Driller: DH

Project No.: 58195078

BORING LOG NO. B-8

PROJECT: Rustic Road - Mequon

CLIENT: RA Smith Inc
Cedarburg, WI

SITE: Hawthorne Road
Mequon, WI

LOCATION See Exploration Plan

Latitude: 43.258° Longitude: -88.0162°

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)
		FILL - SILTY SAND WITH GRAVEL, dark brown							
	1.8				X	10	8-3-2 N=5		7
	2.5	**FILL - SANDY LEAN CLAY**							
	3.5	**FILL - LEAN CLAY MIXED WITH ORGANICS**							
	4.0	**FILL - CRUSHED LIMESTONE**, gray			X	8	3-4-8 N=12		19
		SANDY LEAN CLAY (CL), trace gravel, stiff	5						
	6.0								
		LEAN CLAY (CL), trace sand and gravel, brown, stiff to very stiff			X	6	10-7-10 N=17		21
					X	15	13-11-10 N=21	1.5 (HP)	12
	10.0		10						
		Boring Terminated at 10 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" HSA

Abandonment Method:
Boring backfilled with Auger Cuttings and Bentonite Chips

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No water observed while drilling.

Terracon
9856 S 57th St
Franklin, WI

Boring Started: 06-04-2019 | Boring Completed: 06-04-2019

Drill Rig: 7822DT | Driller: DH

Project No.: 58195078

BORING LOG NO. B-9

PROJECT: Rustic Road - Mequon

CLIENT: RA Smith Inc
Cedarburg, WI

SITE: Hawthorne Road
Mequon, WI

LOCATION See Exploration Plan

Latitude: 43.258° Longitude: -88.0134°

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)
		FILL - SILTY SAND WITH GRAVEL, medium grained, brown, moist							
	2.0				X	9	13-5-5 N=10		10
	2.5	**BURIED TOPSOIL**, dark brown							
		LEAN CLAY (CL), trace sand and gravel, dark brown, hard							
					X	8	7-8-8 N=16		19
	6.0		5						
		SANDY LEAN CLAY (CL), trace gravel, dark brown, stiff			X	11	8-5-5 N=10	1.0 (HP)	36
	8.5								
		SILTY SAND (SM), trace gravel, fine grained, brown, moist, medium dense		▽	X	12	2-4-18 N=22		21
	10.0		10						
		Boring Terminated at 10 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" HSA

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 9 feet while drilling.*

Terracon
9856 S 57th St
Franklin, WI

Boring Started: 06-04-2019 | Boring Completed: 06-04-2019

Drill Rig: 7822DT | Driller: DH

Project No.: 58195078

BORING LOG NO. B-10

PROJECT: Rustic Road - Mequon

CLIENT: RA Smith Inc
Cedarburg, WI

SITE: Hawthorne Road
Mequon, WI

LOCATION See Exploration Plan

Latitude: 43.258° Longitude: -88.0105°

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)
					X	9	25-19-8 N=27		5
3.5									
LEAN CLAY (CL), trace sand and gravel, dark brown, very stiff					X	4	7-6-6 N=12	2.5 (HP)	19
6.0			5						
SILT (ML), trace sand, clay, and gravel, brown, very moist				▽	X	12	4-5-5 N=10		17
8.5									
LEAN CLAY (CL), trace sand and gravel, brown, stiff					X	18	7-8-10 N=18		11
10.0			10						
Boring Terminated at 10 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" HSA

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 7 feet while drilling.*

Terracon
9856 S 57th St
Franklin, WI

Boring Started: 06-04-2019 | Boring Completed: 06-04-2019

Drill Rig: 7822DT | Driller: DH

Project No.: 58195078

BORING LOG NO. B-11

PROJECT: Rustic Road - Mequon

CLIENT: RA Smith Inc
Cedarburg, WI

SITE: Hawthorne Road
Mequon, WI

LOCATION See Exploration Plan

Latitude: 43.258° Longitude: -88.0077°

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)
		FILL - SILTY SAND WITH GRAVEL, medium grained, brown, moist							
					X	10	31-31-17 N=48		5
	3.5								
		LEAN CLAY (CL), trace sand and gravel, dark brown, very stiff			X	10	5-4-3 N=7	2.5 (HP)	16
			5						
					X	8	12-9-7 N=16		14
					X	4	7-7-9 N=16		19
	10.0		10						
		Boring Terminated at 10 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" HSA

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No water observed while drilling.

Terracon
9856 S 57th St
Franklin, WI

Boring Started: 06-04-2019 | Boring Completed: 06-04-2019

Drill Rig: 7822DT | Driller: DH

Project No.: 58195078

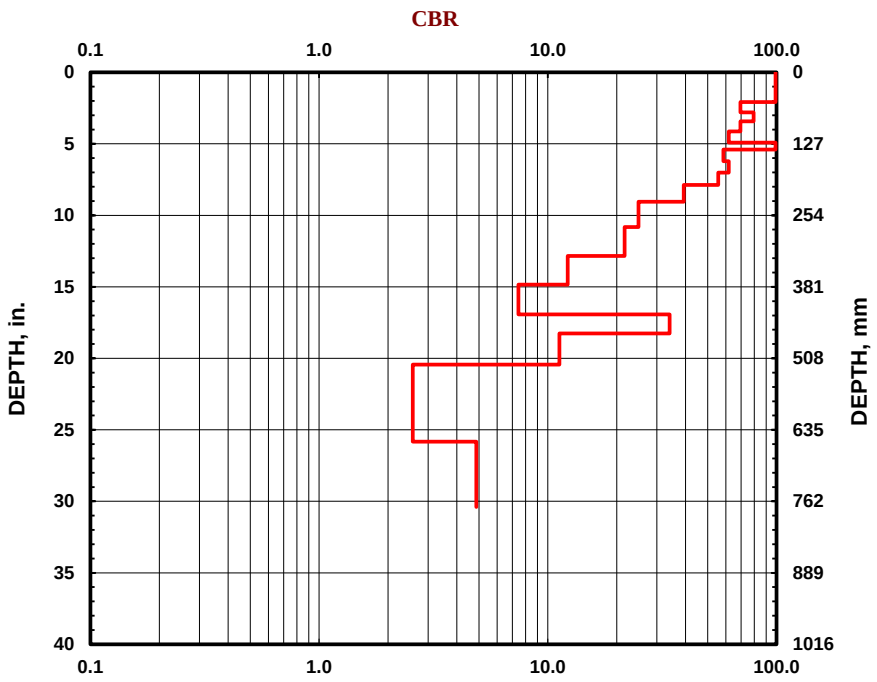
DCP #1 TEST DATA

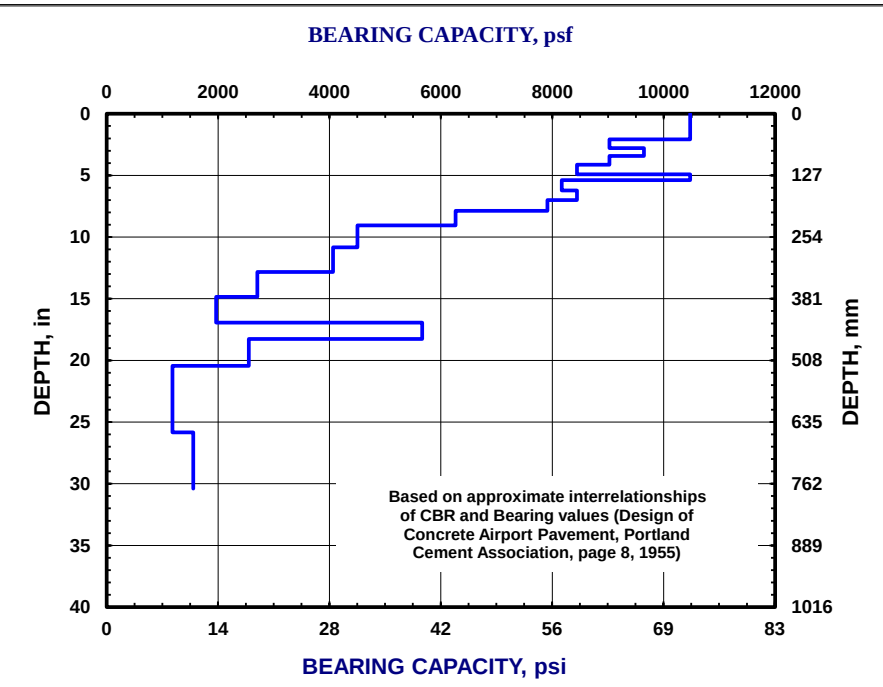
Project: *58195078- Hawthorne Road* **Date:** 1-Jul-19
Location: Mequon, WI **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ○ 17.6 lbs.
- ◉ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	0	1
2	5	1
3	11	1
3	17	1
5	29	1
5	42	1
5	53	1
5	71	1
5	87	1
5	105	1
5	125	1
5	137	1
5	158	1
5	178	1
5	200	1
5	230	1
5	275	1
5	326	1
3	377	1
2	430	1
5	430	1
5	464	1
3	519	1
2	656	1
3	772	1





DCP #2 TEST DATA

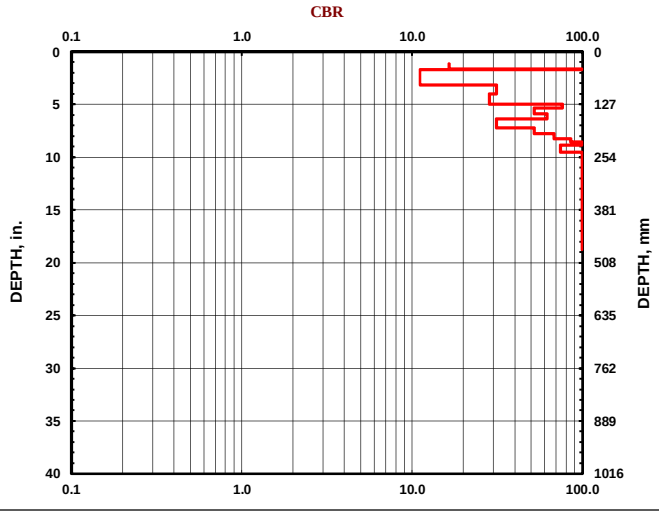
Project: *58195078- Hawthorne Road* **Date:** 5-Jun-19

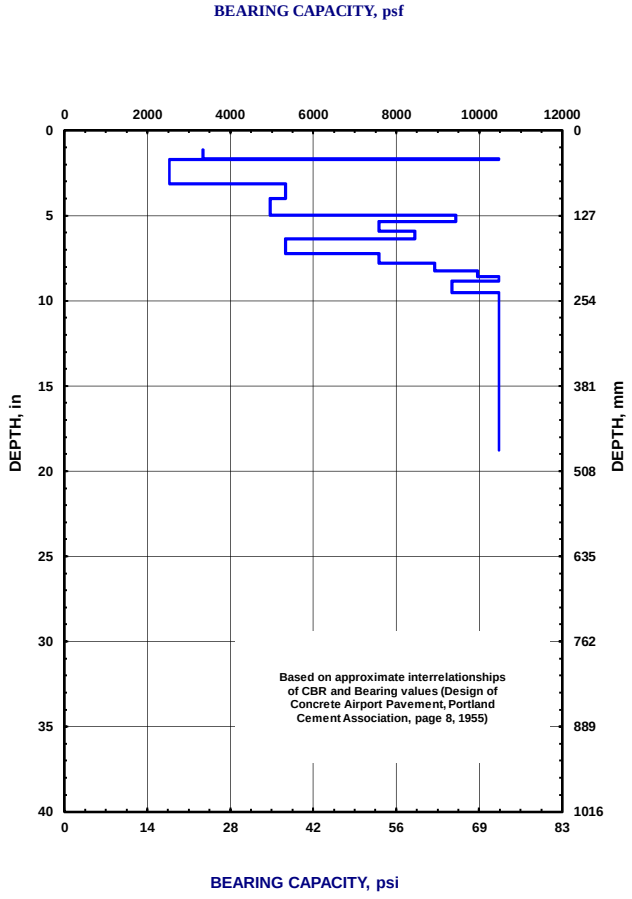
Location: Mequon, WI **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ○ 17.6 lbs.
- ● Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	29	1
1	42	1
2	43	1
2	80	1
3	102	1
3	126	1
3	136	1
3	150	1
3	162	1
3	184	1
3	198	1
3	209	1
3	218	1
3	225	1
5	242	1
5	248	1
5	260	1
5	269	1
5	278	1
5	283	1
5	287	1
5	291	1
5	293	1
5	295	1
5	301	1
5	308	1
5	318	1
5	331	1
5	343	1
5	355	1
5	367	1
5	377	1
5	387	1
5	395	1
5	405	1
5	413	1
5	421	1
5	432	1
5	443	1
5	454	1
5	465	1
5	477	1
5	487	1
5	498	1
5	507	1
5	517	1
5	529	1
5	540	1
5	549	1
5	561	1
5	571	1
5	582	1
5	593	1
5	604	1
5	615	1
5	627	1
5	640	1
5	652	1
5	663	1
5	679	1
5	692	1
5	706	1





DCP #3 TEST DATA

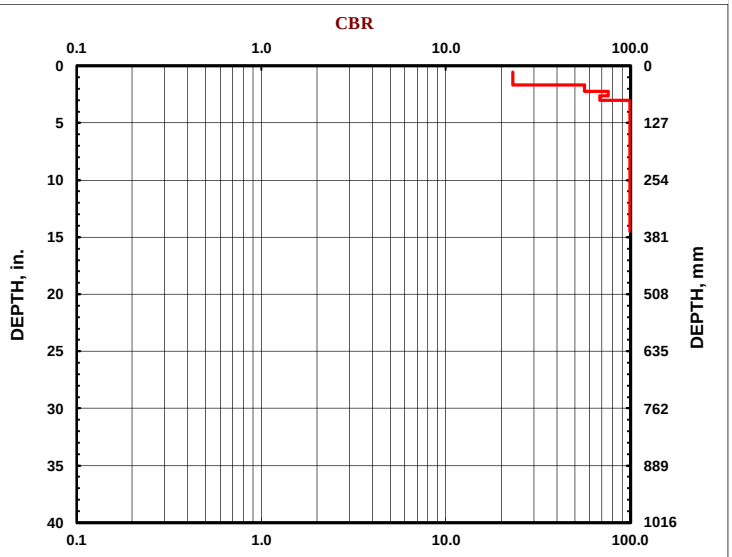
Project: *58195078- Hawthorne Road* **Date:** 5-Jun-19

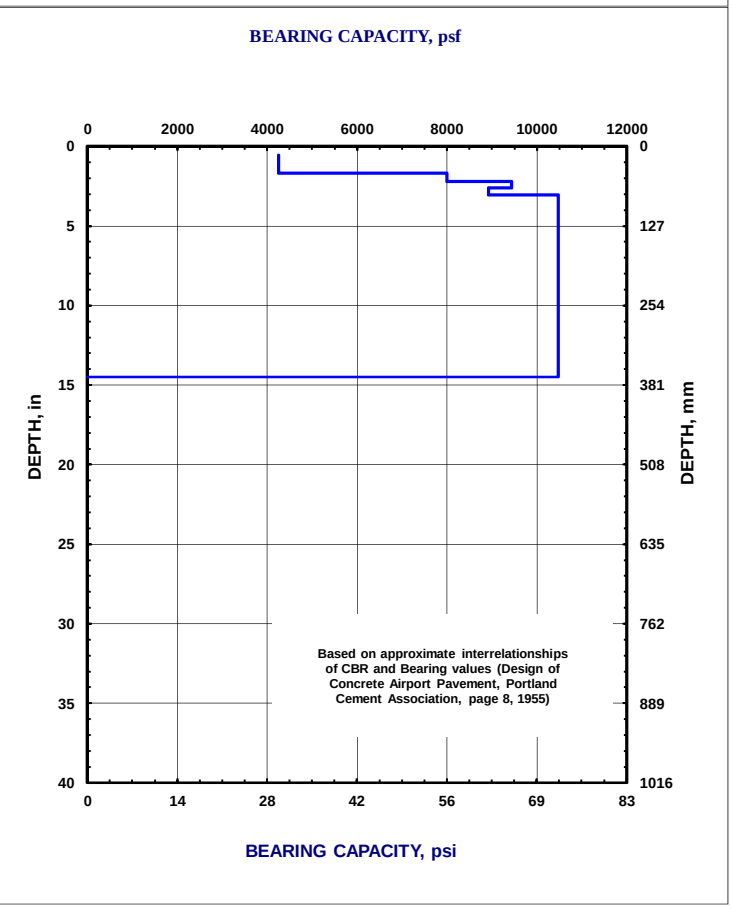
Location: Mequon, WI **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ○ 17.6 lbs.
- ● Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	14	1
3	43	1
3	56	1
3	66	1
3	77	1
3	82	1
5	91	1
5	104	1
5	116	1
5	124	1
5	133	1
5	143	1
5	146	1
5	159	1
5	166	1
5	173	1
5	177	1
5	186	1
5	195	1
5	205	1
5	213	1
5	217	1
5	224	1
5	233	1
5	245	1
5	250	1
5	258	1
5	264	1
5	271	1
5	273	1
5	284	1
5	288	1
5	296	1
5	303	1
5	312	1
5	321	1
5	330	1
5	336	1
5	341	1
5	350	1
5	359	1
5	368	1
5	376	1
5	385	1
5	396	1
5	407	1
5	420	1
5	434	1
5	449	1
5	470	1
3	504	1
3	537	1
3	601	1
3	646	1
1	693	1
1	713	1
5	722	1





DCP #4 TEST DATA

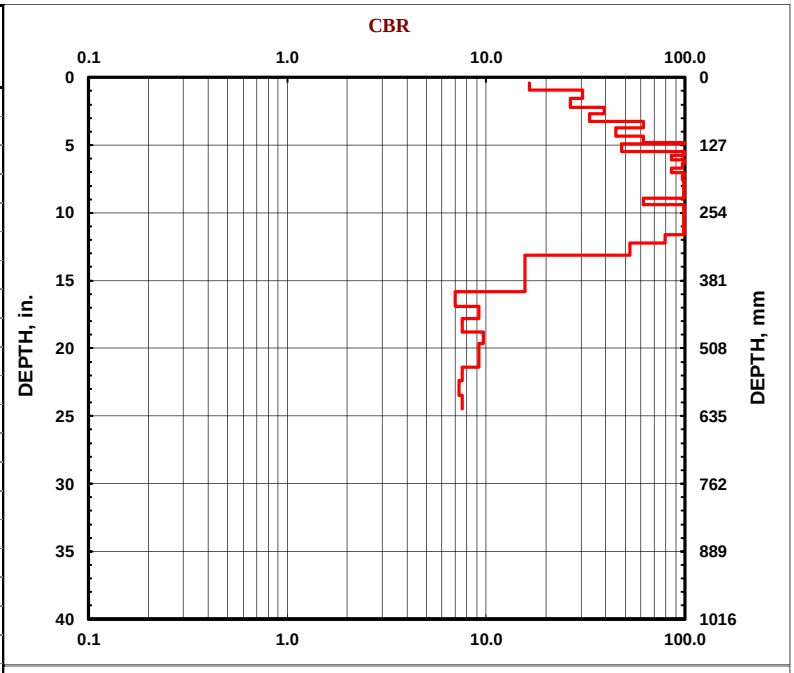
Project: *58195078- Hawthorne Road* **Date:** 5-Jun-19

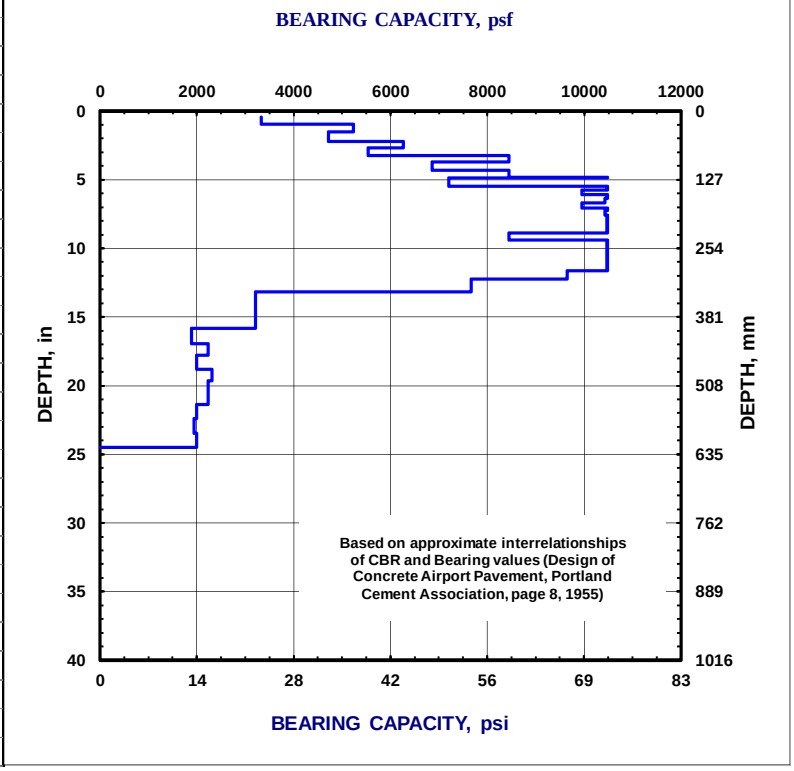
Location: Mequon, WI **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ○ 17.6 lbs.
- ● Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	11	1
1	24	1
2	39	1
2	56	1
2	68	1
2	82	1
3	94	1
3	110	1
3	122	1
3	124	1
3	139	1
3	146	1
3	155	1
3	162	1
3	170	1
3	179	1
3	184	1
3	192	1
3	199	1
3	206	1
3	213	1
3	220	1
3	226	1
3	226	1
3	238	1
5	249	1
5	260	1
5	272	1
5	285	1
5	295	1
5	311	1
5	334	1
5	402	1
1	430	1
1	452	1
1	478	1
1	499	1
1	521	1
1	543	1
1	569	1
1	596	1
1	622	1
1	648	1
1	670	1
1	692	1
1	713	1
1	724	1





DCP #5 TEST DATA

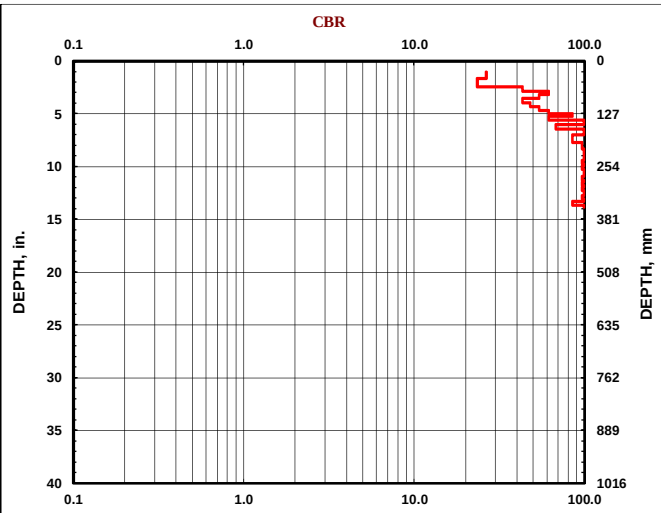
Project: *58195078- Hawthorne Road* **Date:** 5-Jun-19

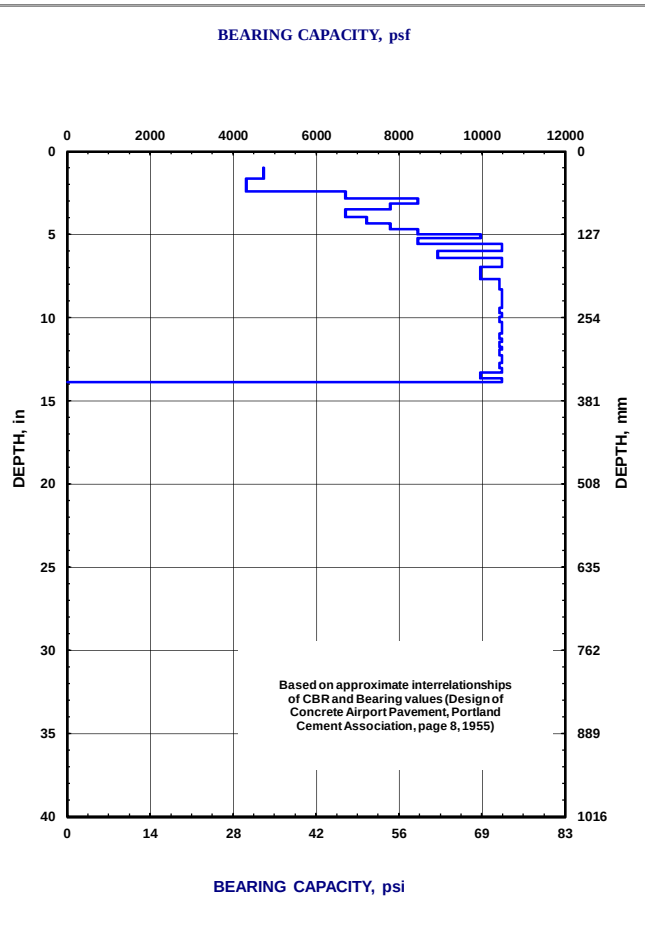
Location: Mequon, WI **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ○ 17.6 lbs.
- ● Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
2	25	1
2	42	1
2	61	1
2	72	1
2	80	1
2	89	1
2	100	1
2	110	1
2	119	1
2	127	1
2	133	1
2	141	1
2	145	1
3	152	1
3	163	1
3	170	1
3	177	1
3	186	1
3	195	1
3	203	1
3	211	1
3	218	1
3	225	1
3	232	1
3	239	1
3	247	1
3	253	1
3	261	1
3	266	1
3	273	1
3	278	1
3	286	1
3	291	1
3	299	1
3	303	1
3	311	1
3	316	1
3	323	1
3	331	1
3	338	1
3	347	1
3	352	1
3	360	1
3	366	1
3	370	1
3	382	1
3	389	1
3	396	1
3	402	1
3	410	1
3	415	1
5	427	1
5	439	1
5	450	1
5	466	1
5	481	1
5	496	1
5	517	1
5	542	1
3	567	1
3	617	1
2	705	1





DCP #6 TEST DATA

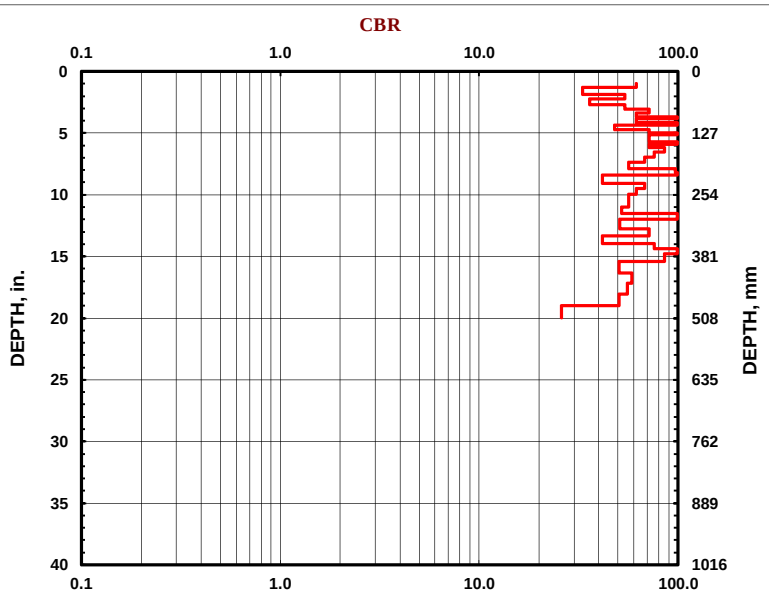
Project: *58195078- Hawthorne Road* **Date:** 5-Jun-19

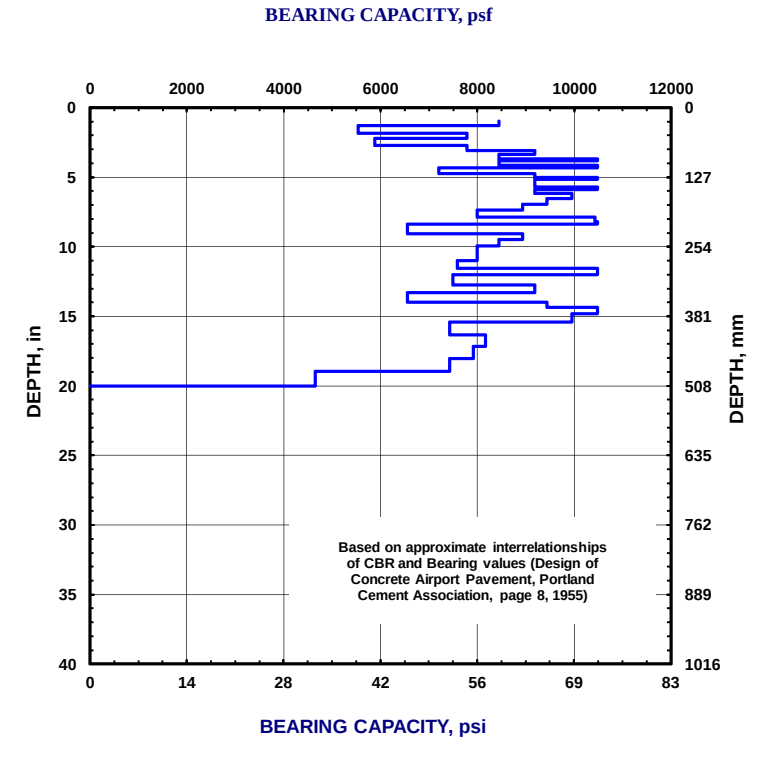
Location: Mequon, WI **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ○ 17.6 lbs.
- ● Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	25	1
2	33	1
2	47	1
2	56	1
2	69	1
2	78	1
2	85	1
2	93	1
2	97	1
2	105	1
2	110	1
2	120	1
2	127	1
2	131	1
2	138	1
2	145	1
2	150	1
2	157	1
3	166	1
3	176	1
3	187	1
3	200	1
3	208	1
3	213	1
3	230	1
3	241	1
3	253	1
3	266	1
3	279	1
3	293	1
5	305	1
4	324	1
4	338	1
3	355	1
3	365	1
5	376	1
5	391	1
5	415	1
5	436	1
5	458	1
5	482	1
3	508	1
3	527	1
3	548	1
3	571	1
3	596	1
3	622	1
3	653	1
3	684	1
2	710	1





DCP #7 TEST DATA

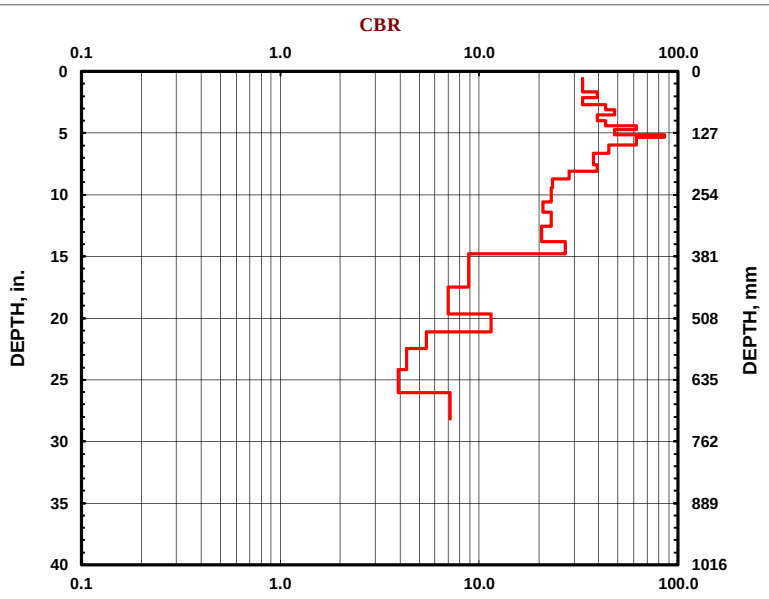
Project: *58195078- Hawthorne Road* **Date:** 5-Jun-19

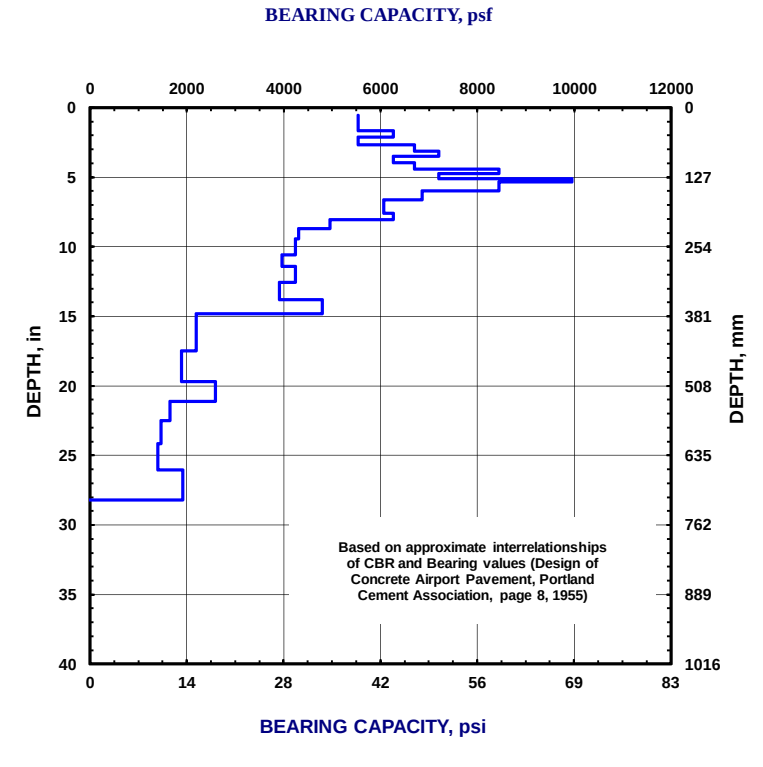
Location: Mequon, WI **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ○ 17.6 lbs.
- ● Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	14	1
2	28	1
2	42	1
2	54	1
2	68	1
2	79	1
2	89	1
2	101	1
2	112	1
2	120	1
2	130	1
2	136	1
2	144	1
2	152	1
3	168	1
4	193	1
2	205	1
2	221	1
2	240	1
3	269	1
2	290	1
3	319	1
3	351	1
3	376	1
3	444	1
2	500	1
2	536	1
1	571	1
1	614	1
1	661	1
2	716	1





DCP #8 TEST DATA

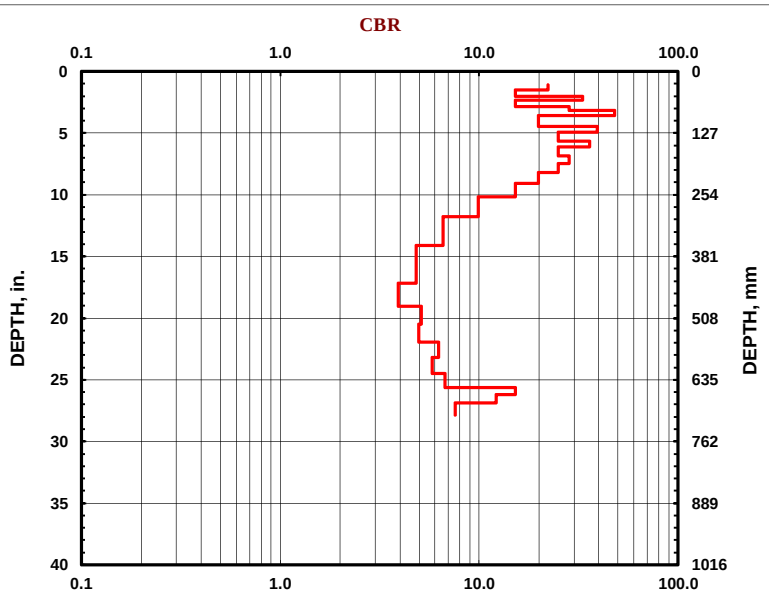
Project: *58195078- Hawthorne Road* **Date:** 4-Jun-19

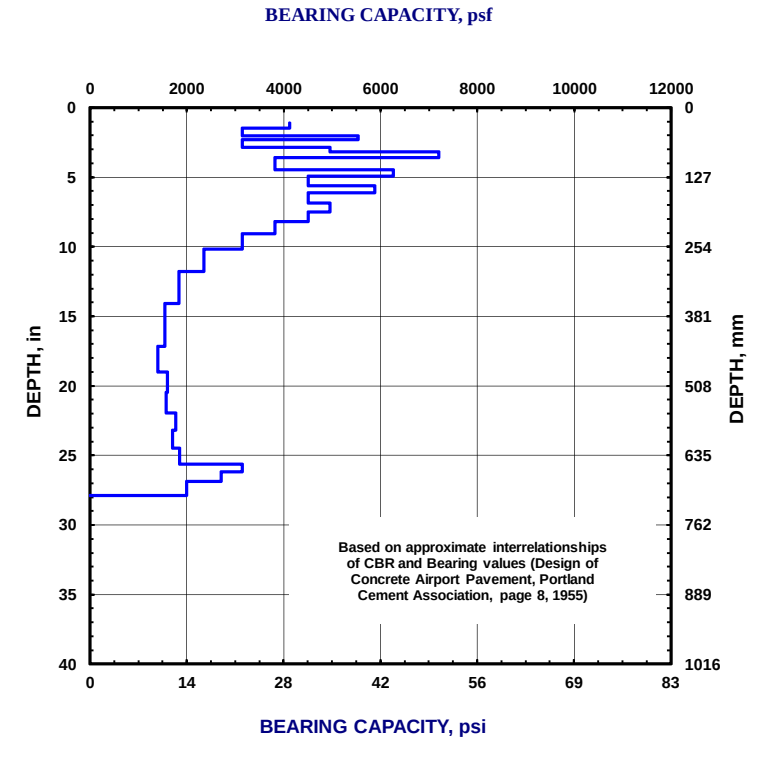
Location: Mequon, WI **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ○ 17.6 lbs.
- ● Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	28	1
1	38	1
1	52	1
1	59	1
1	73	1
1	81	1
2	91	1
2	113	1
2	125	1
2	143	1
2	156	1
2	174	1
2	190	1
2	208	1
2	230	1
2	258	1
2	299	1
2	358	1
2	436	1
1	483	1
1	520	1
1	558	1
1	589	1
1	622	1
1	651	1
1	665	1
1	682	1
1	708	1





DCP #11 TEST DATA

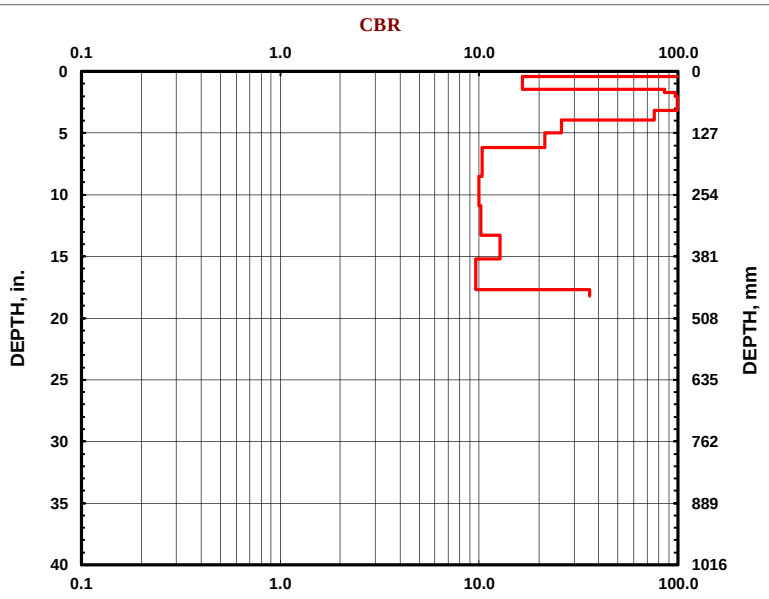
Project: *58195078- Hawthorne Road* **Date:** 4-Jun-19

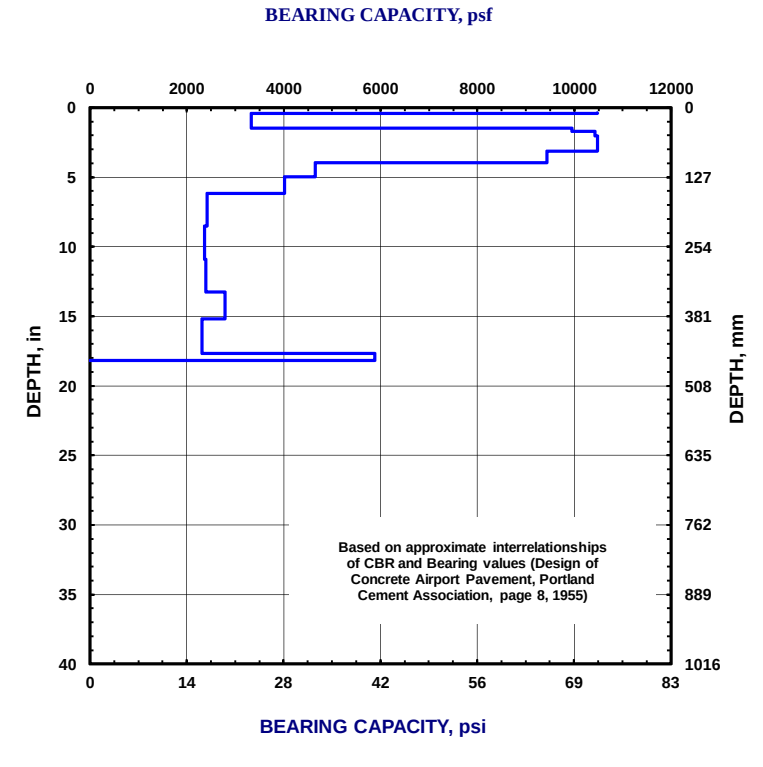
Location: Mequon, WI **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ○ 17.6 lbs.
- ● Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	10	1
1	11	1
2	37	1
2	43	1
3	51	1
4	61	1
5	69	1
5	80	1
6	100	1
3	126	1
3	157	1
3	216	1
3	277	1
3	337	1
3	386	1
3	449	1
2	462	1





DCP #9 TEST DATA

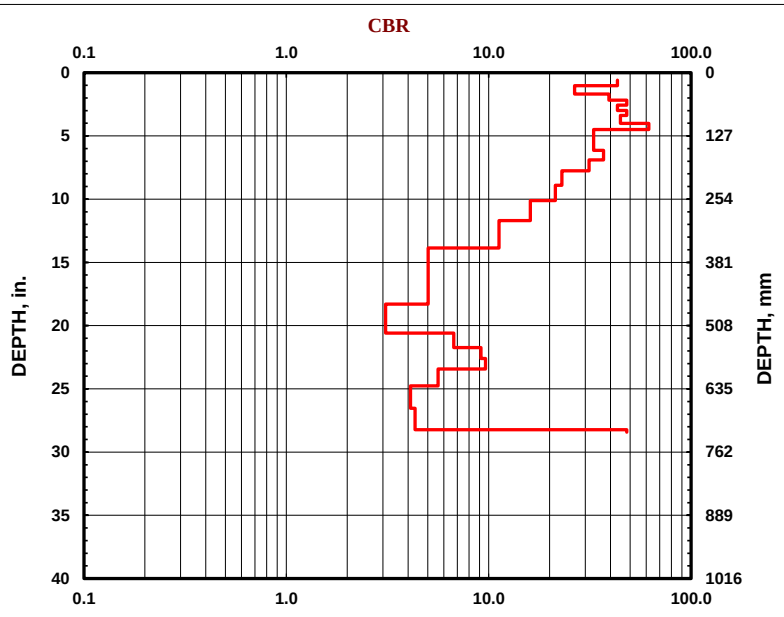
Project: *58195078- Hawthorne Road* **Date:** 4-Jun-19

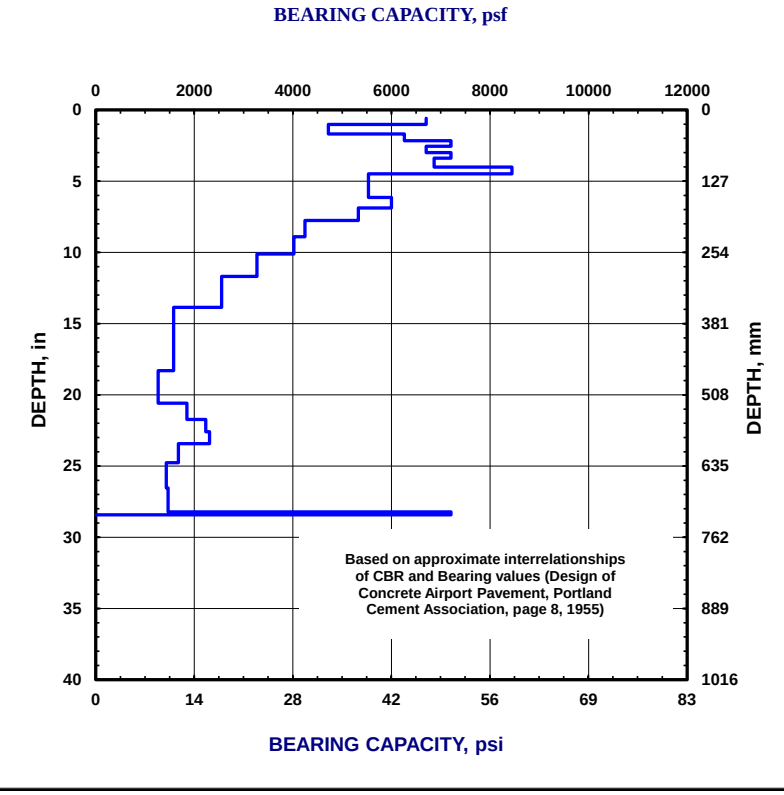
Location: Mequon, WI **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ○ 17.6 lbs.
- ◉ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	15	1
2	26	1
2	43	1
2	55	1
2	65	1
2	76	1
2	86	1
3	102	1
3	114	1
3	135	1
3	156	1
3	175	1
3	197	1
3	226	1
3	257	1
3	297	1
3	352	1
3	465	1
1	523	1
1	552	1
1	574	1
1	595	1
1	629	1
1	674	1
1	717	1
1	722	1





DCP #10 TEST DATA

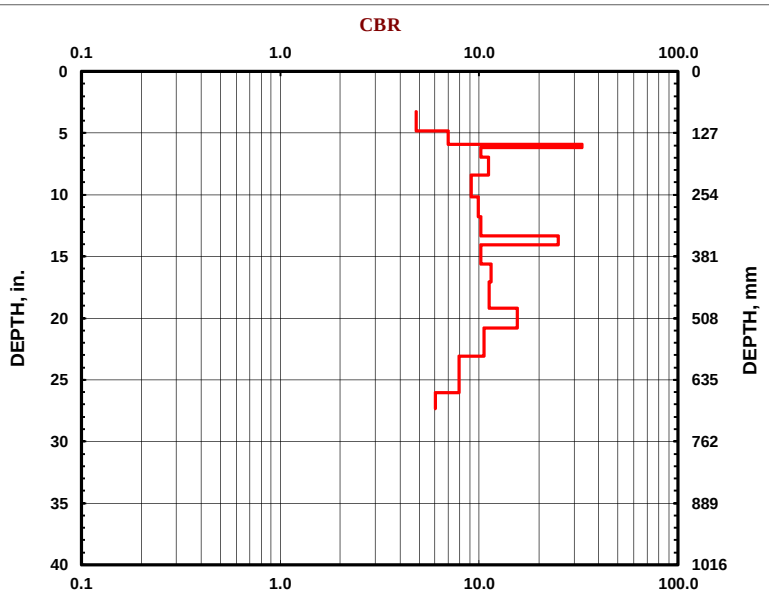
Project: *58195078- Hawthorne Road* **Date:** 4-Jun-19

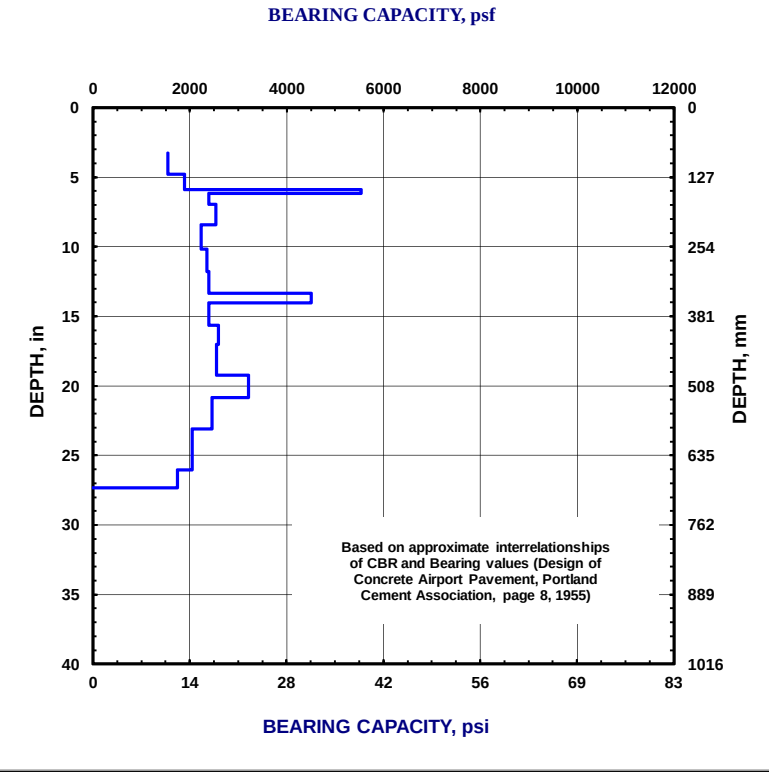
Location: Mequon, WI **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ○ 17.6 lbs.
- ● Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	83	1
1	122	1
1	150	1
1	157	1
1	177	1
2	214	1
2	258	1
2	299	1
2	339	1
2	357	1
2	397	1
2	433	1
3	488	1
3	529	1
3	587	1
3	662	1
1	694	1





APPENDIX B

LABORATORY TESTING

Laboratory Testing

The soil samples obtained from the borings were tested in the laboratory to measure their natural water contents. A pocket penetrometer was used to help estimate the consistency of cohesive samples. The test results are provided on the boring logs in Appendix A.

The soil samples were classified in the laboratory based on visual observation, texture, plasticity, and the limited laboratory testing described above. The soil descriptions presented on the boring logs are in general accordance with the enclosed General Notes (Appendix C) and Unified Soil Classification System (USCS). The estimated USCS group symbols for native soils are shown on the boring logs, and a brief description of the USCS is included in this report (Appendix C).

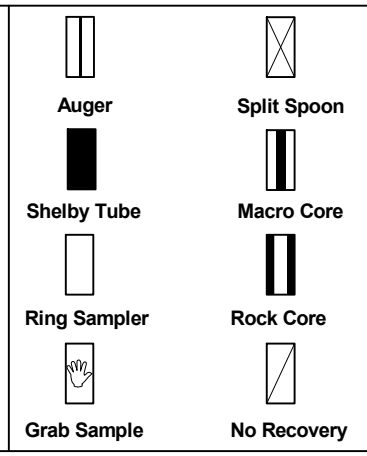
APPENDIX C

SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING



WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

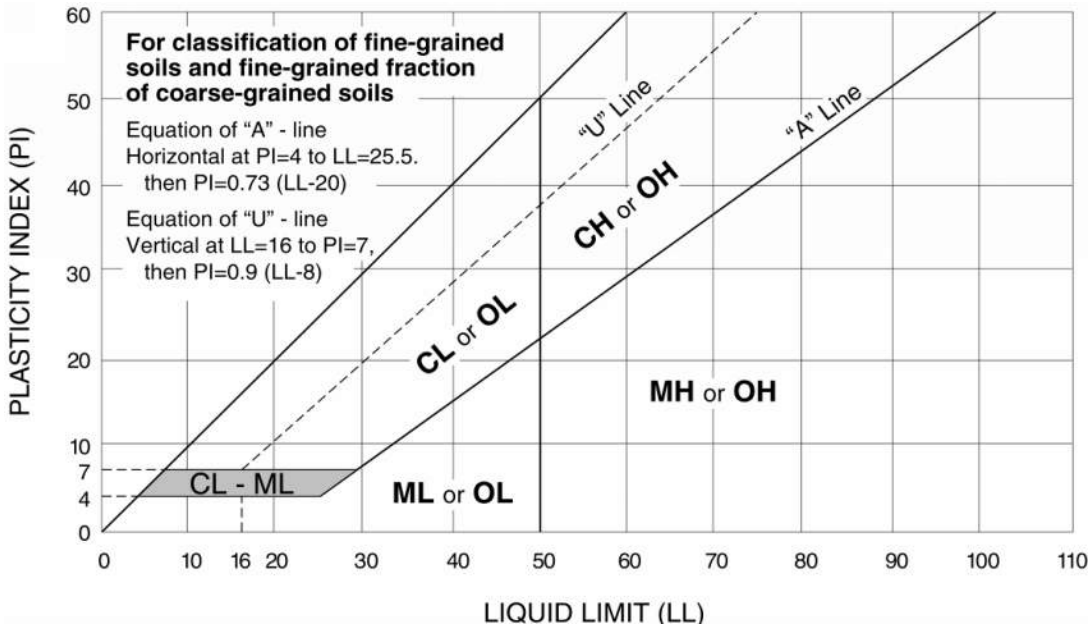
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



APPENDIX D

WISPAVE ANALYSIS AND GEOGRID DESIGN

Pavement Design General Information

Project ID:	0000-00-00	Designer's Name:	Michael Gasper
Design Name:	Hawthorne Road-Mequon	Design Date:	07/16/2019
Roadway Name:	Hawthorne Road	Type:	Local
Project Termini:	N Granville Rd - STH 181	Status:	Draft
Highway Name:	Local Road	Design Source:	WisPave
Comments:			

Region	County
SE	Ozaukee

Soil Parameters

Design Group Index (DGI):	13
Subgrade Improvement:	Yes
Subgrade Soil Support Value (SSV):	4.2
Subgrade Modulus of Subgrade Reaction (K):	100

Traffic Parameters

Construction Year:	2019	Design Year:	2039
Construction Year AADT:	526	Design Year AADT:	581
Directional Factor (DF):	0.50	Lane Distribution Factor (LDF):	0.60

Truck Classification	% of AADT
2D	13.7
3SU	4.6
2S-1,-2	2.5
3S-2	1.1
2-S1-2	0.0
Total % Truck Traffic	**21.9**

Concrete Pavement Design

Truck Type	% of AADT	DLT	# of Trucks	ESAL Load Factor	ESALs
2D	13.7	166	23	0.3	7
3SU	4.6	166	8	1.2	9
2S-1,-2	2.5	166	4	0.6	2
3S-2	1.1	166	2	1.6	3
2-S1-2	0.0	166	0	2.1	0

Design Lane Daily ESALs: 21

Design Lane Total Life ESALs: 156,201 Rounded to: 160,000

Soil Parameters

Subgrade Improvement Flag Selected: Yes

K: 100

Design Calculation

Calculated Pavement Thickness 5.0

Pavement Thickness (ALT# 1): 6.0

Pavement Thickness (ALT# 2): 0.0

HMA Pavement Design

Truck Type	% of AADT	DLT	# of Trucks	ESAL Load Factor	ESALs
2D	13.7	166	23	0.3	7
3SU	4.6	166	8	0.8	6
2S-1,-2	2.5	166	4	0.5	2
3S-2	1.1	166	2	0.9	2
2-S1-2	0.0	166	0	2.0	0

Design Lane Daily ESALs: 17

Design Lane Total Life ESALs: 124,100 Rounded to: 130,000

Soil Parameters

DGI: 13

Subgrade Improvement Flag Selected: Yes

SSV: 4.2

Design Calculation

Calculated Required SN: 2.84

HMA ALT#1 Layer Thickness Design

Title: 2:1

Layers	Existing Pavement	Uppermost Base Agg.	Other	Material Type	Unit Type	Layer Coefficient	Thickness in.	Structural Number
1	N	N	N	4 LT 58-28 H	-----	0.44	2.25	0.99
2	N	N	N	3 LT 58-28 S	-----	0.44	2.25	0.99
3	N	Y	N	Base Aggregate Dense 1 1/4-inch	-----	0.1	9.00	0.9

Note: You can add only 10 layers (including 'Other' layers)

No.of Layers: 3 No.of Other Layers: 0 Total SN: 2.88

Required SN: 2.84

HMA ALT#2 Layer Thickness Design

Title: 3:1

Layers	Existing Pavement	Uppermost Base Agg.	Other	Material Type	Unit Type	Layer Coefficient	Thickness in.	Structural Number
1	N	N	N	4 LT 58-28 H	-----	0.44	1.75	0.77
2	N	N	N	3 LT 58-28 S	-----	0.44	2.25	0.99
3	N	Y	N	Base Aggregate Dense 1 1/4-inch	-----	0.1	11.00	1.1

Note: You can add only 10 layers (including 'Other' layers)

No.of Layers: 3 No.of Other Layers: 0 Total SN: 2.86

Required SN: 2.84

HMA ALT#3 Layer Thickness Design

Title: Aggregate

Layers	Existing Pavement	Uppermost Base Agg.	Other	Material Type	Unit Type	Layer Coefficient	Thickness in.	Structural Number
1	N	N	N	3 LT 58-28 S	-----	0.44	.25	0.11
2	N	Y	N	Base Aggregate Dense 3/4-inch	-----	0.1	4.00	0.4
3	N	N	N	Base Aggregate Dense 1 1/4-inch	-----	0.1	25.00	2.5

Note: You can add only 10 layers (including 'Other' layers)

No.of Layers: 3 No.of Other Layers: 0 Total SN: 3.01

Required SN: 2.84

SpectraPave™
Subgrade Stabilization Design Analysis

DESIGN PARAMETERS

DESIGN REQUIREMENTS

Property	Value
Axle Load (kips)	18
Tire Pressure (psi)	80
Axle Passes (Each)	1200
Maximum Rut Depth (in)	1.5

PAVEMENT SOIL PROPERTIES

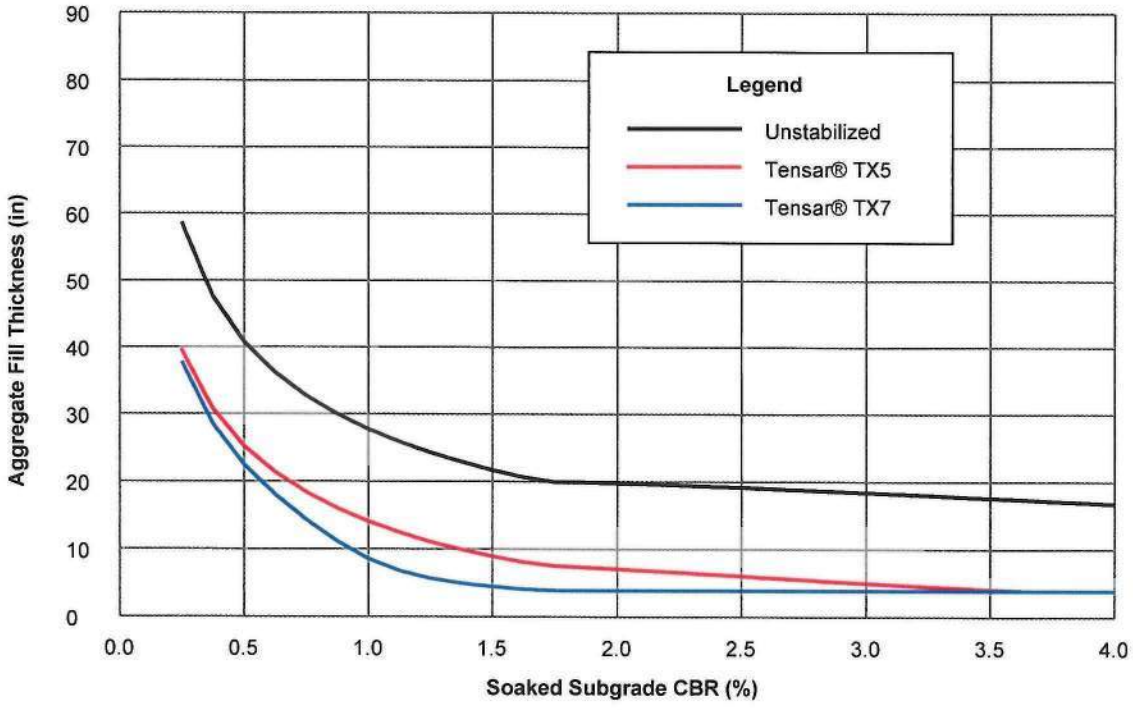
Property	Value
Aggregate Fill CBR (%)	20
Soaked Subgrade CBR (%)	0.8

Aggregate fill shall conform to following requirement:

D50 <= 27mm

RESULTS

Geosynthetic	Aggregate Fill Thickness (in)		Aggregate Fill Thickness Savings (in)	
	Calculated	Required	(in)	(%)
Unstabilized	31.5	32	N/A	N/A
TX5	17.5	18	14	44
TX7	13.0	13	19	59



LIMITATIONS OF THE REPORT

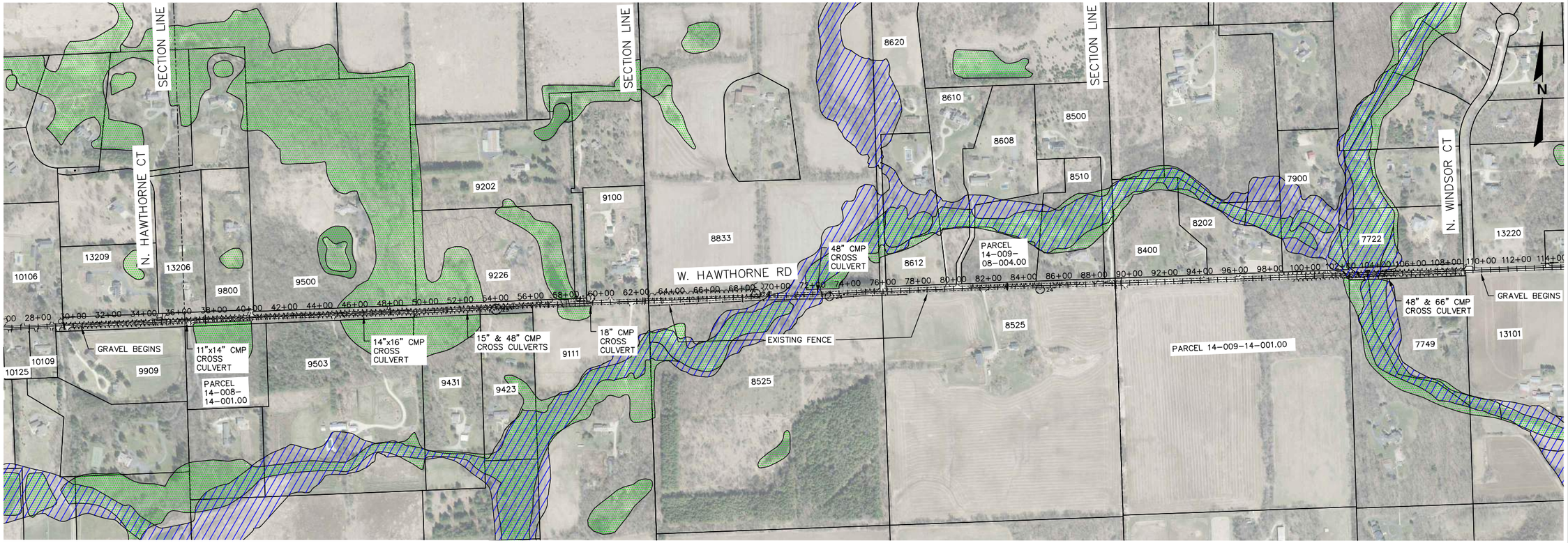
The designs, illustrations, information and other content included in this report are necessarily general and conceptual in nature, and do not constitute engineering advice or any design intended for actual construction. Specific design recommendations can be provided as the project develops.

Project Name	N/A		
Company Name	Tensar		
Designer	N/A	Date	N/A

APPENDIX E

PLAN & PROFILE AND DRAINAGE EXHIBITS

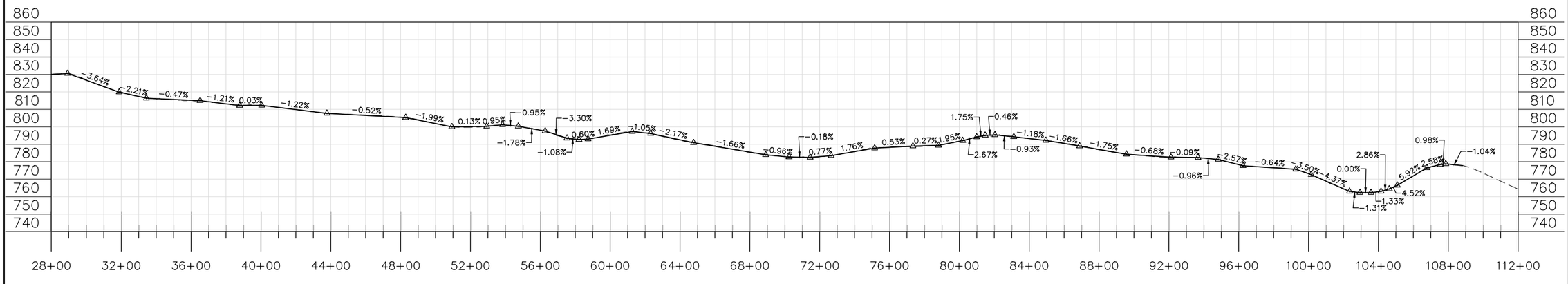
AERIAL MAP OVERVIEW EXHIBIT



LEGEND

FLOODPLAIN AREA

WETLAND AREA



City of Mequon

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CREATIVITY BEYOND ENGINEERING

CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
PLAN & PROFILE OVERVIEW

DATE: **8-5-19**

SCALE: **1" = 300'**

JOB NO. **1190486**

PROJECT MANAGER:
TROY T. HARTJES, P.E.

DESIGNED BY: **MJG**

CHECKED BY: **TTH**

SHEET NUMBER
1

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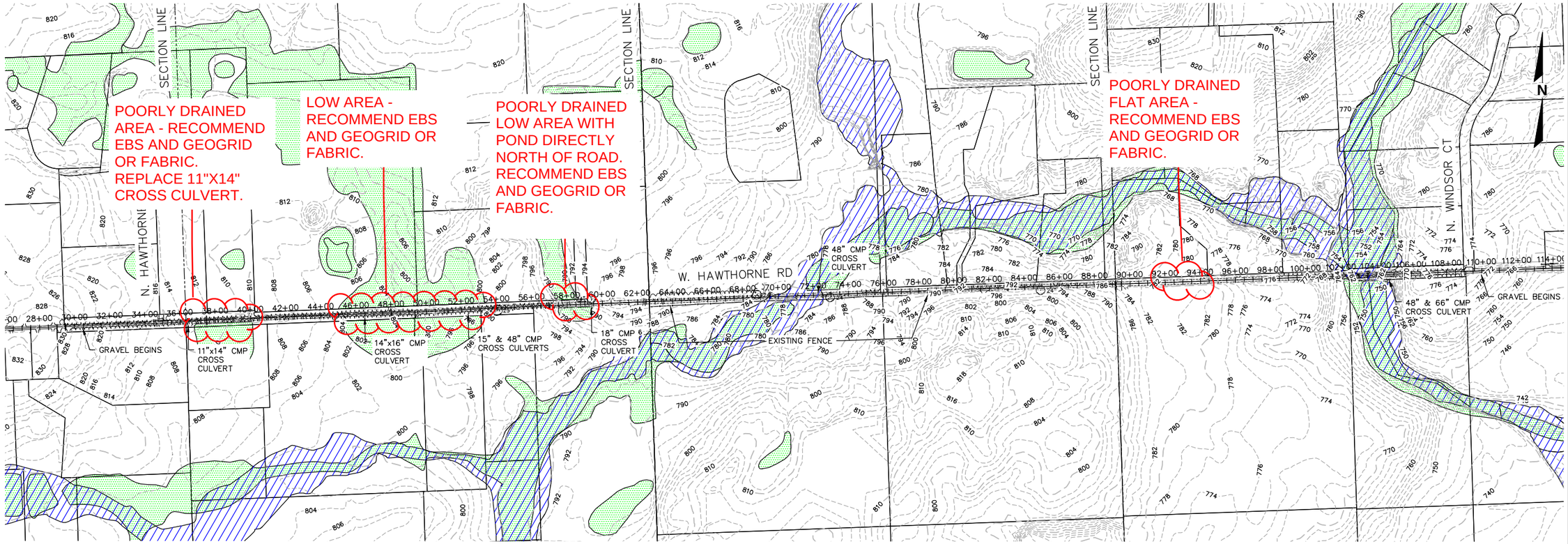
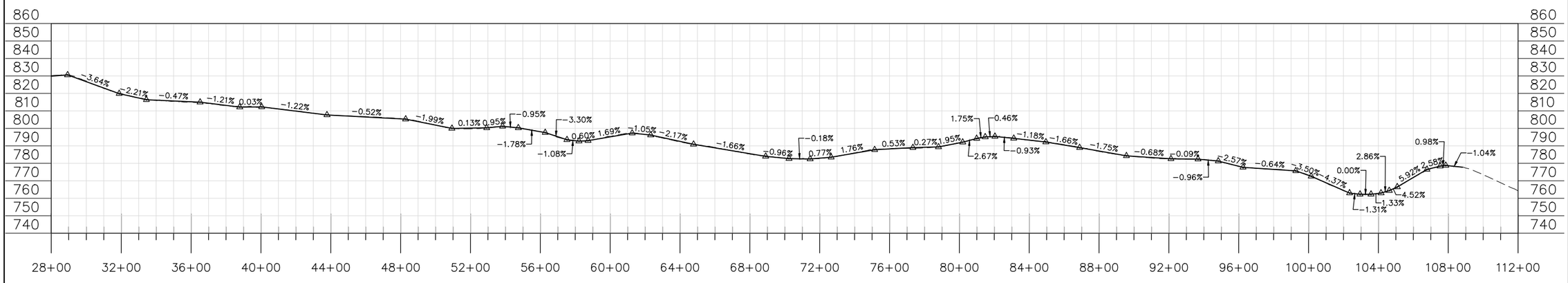
CONTOUR MAP OVERVIEW EXHIBIT



LEGEND

FLOODPLAIN AREA

WETLAND AREA



CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
PLAN & PROFILE OVERVIEW

DATE: 8-5-19

SCALE: 1" = 300'

JOB NO. 1190486

PROJECT MANAGER:
TROY T. HARTJES, P.E.

DESIGNED BY: MJG

CHECKED BY: TTH

SHEET NUMBER
1

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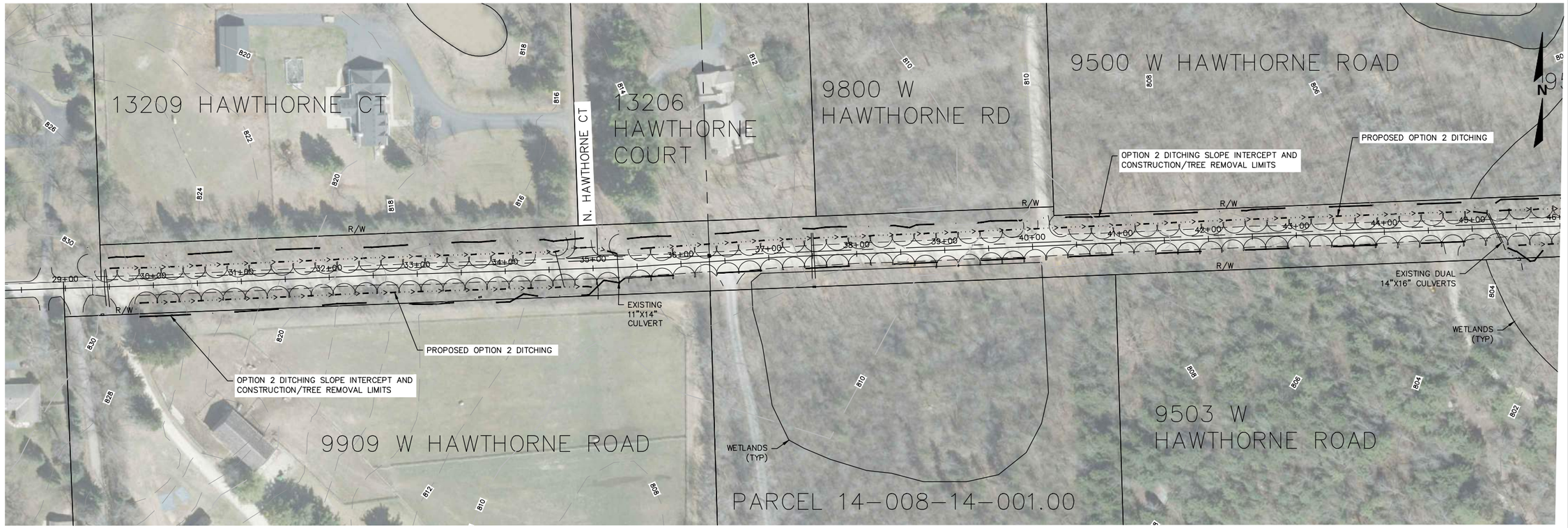

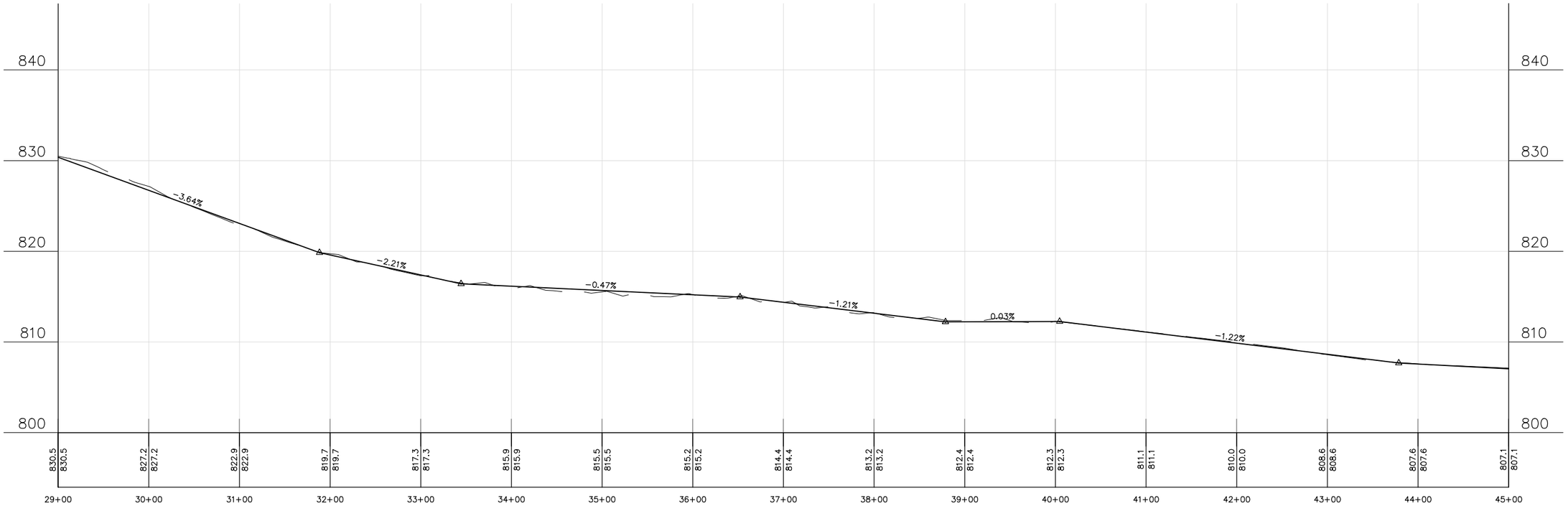

City of Mequon

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CREATIVITY BEYOND ENGINEERING

CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
PLAN & PROFILE

DATE: **7-23-19**

SCALE: **1" = 60'**

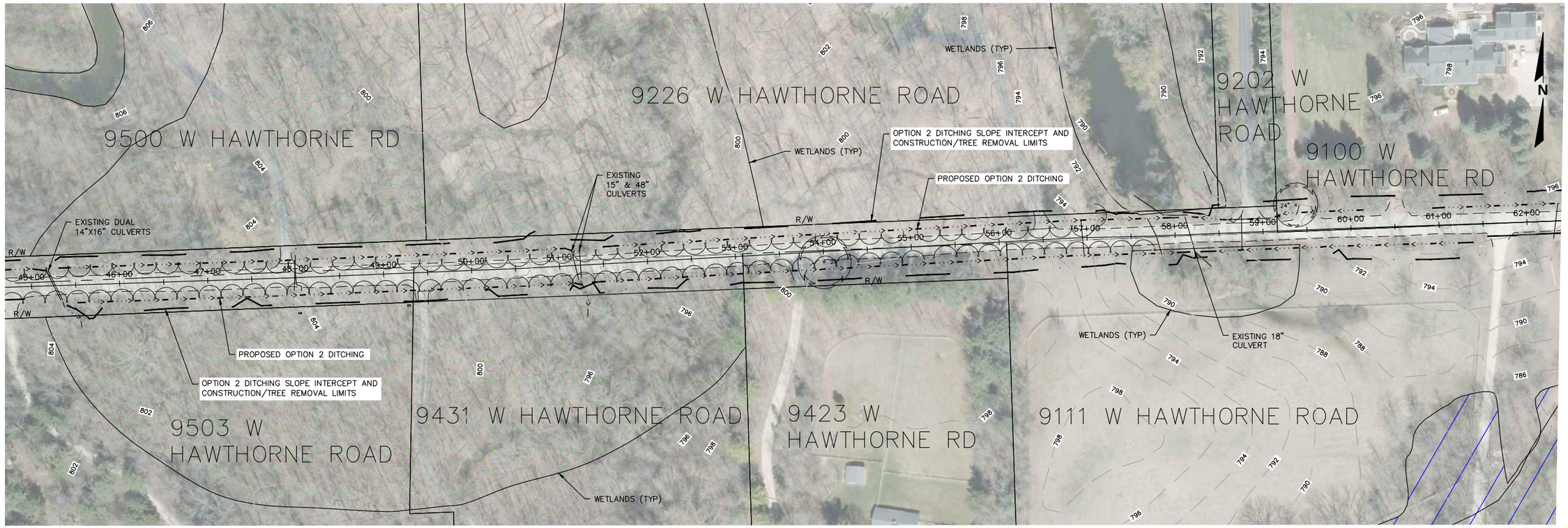
JOB NO. **1190486**

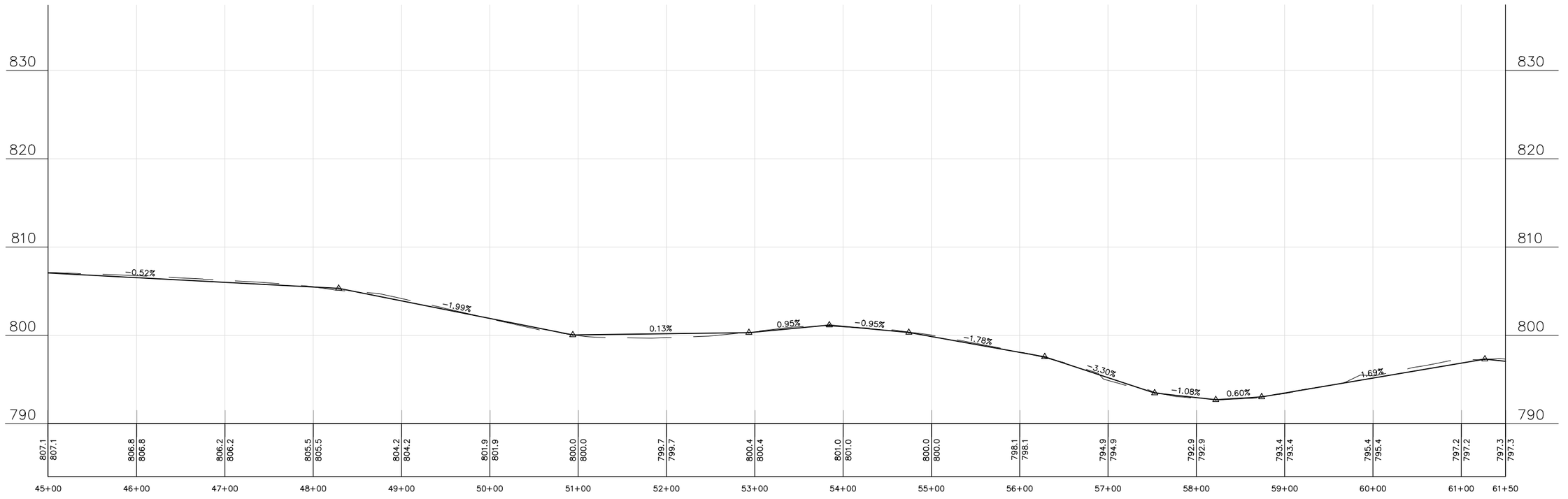
PROJECT MANAGER:
TROY T. HARTJES, P.E.

DESIGNED BY: **MJG**

CHECKED BY: **TTH**

SHEET NUMBER
1





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CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
PLAN & PROFILE

DATE: **7-23-19**

SCALE: **1" = 60'**

JOB NO. **1190486**

PROJECT MANAGER:
TROY T. HARTJES, P.E.

DESIGNED BY: **MJG**

CHECKED BY: **TTH**

SHEET NUMBER
2

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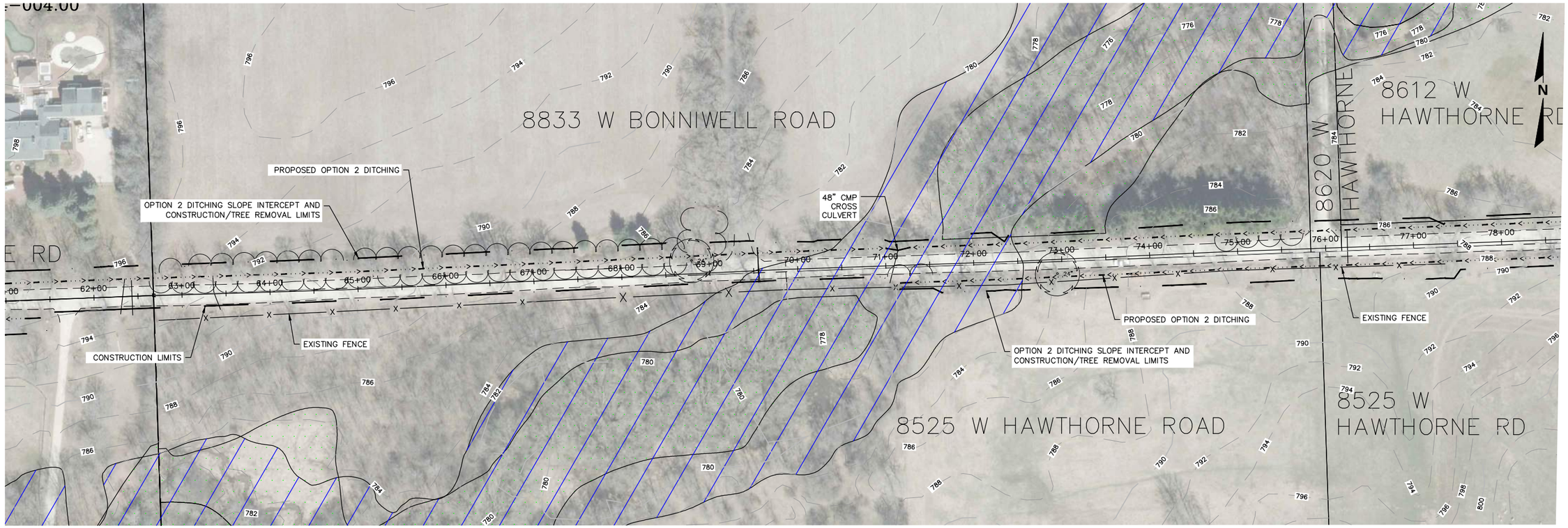

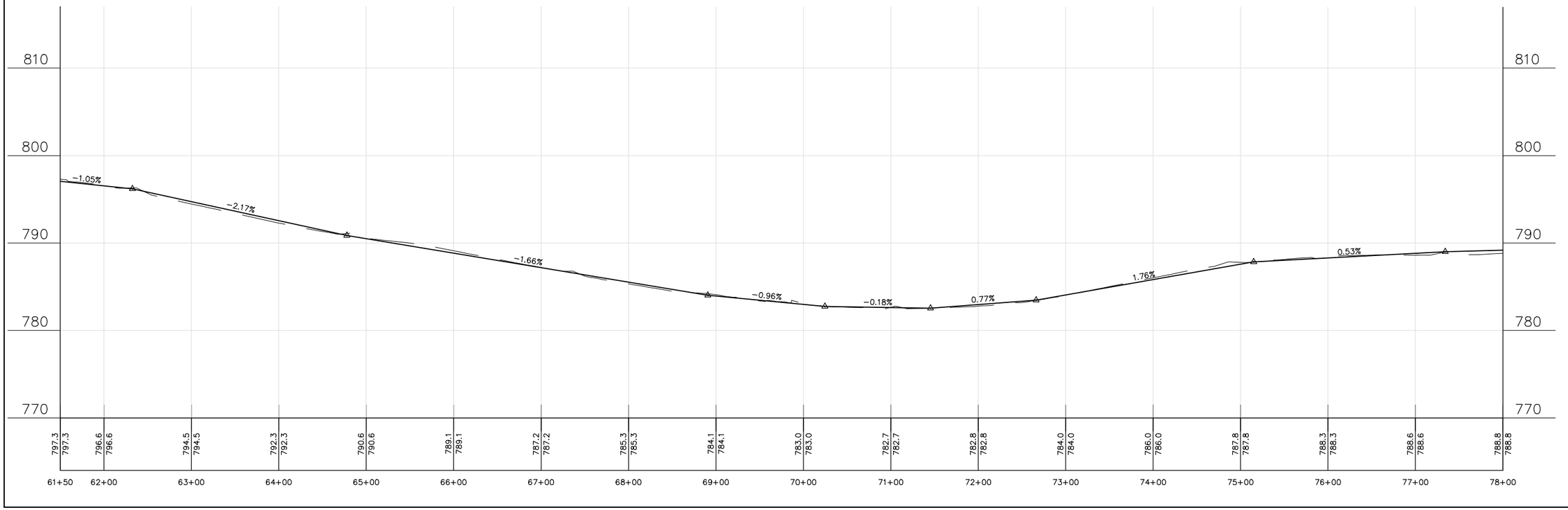

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CREATIVITY BEYOND ENGINEERING

CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
PLAN & PROFILE

DATE: **7-23-19**

SCALE: **1" = 60'**

JOB NO. **1190486**

PROJECT MANAGER:
TROY T. HARTJES, P.E.

DESIGNED BY: **MJG**

CHECKED BY: **TTH**

SHEET NUMBER
3

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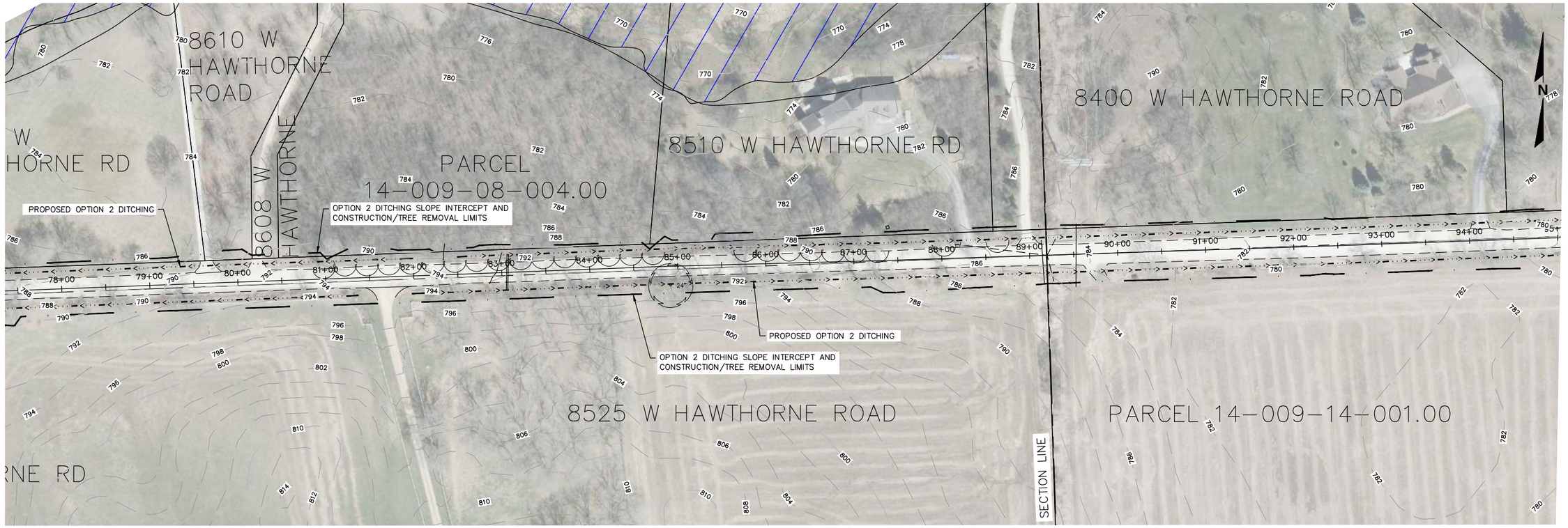

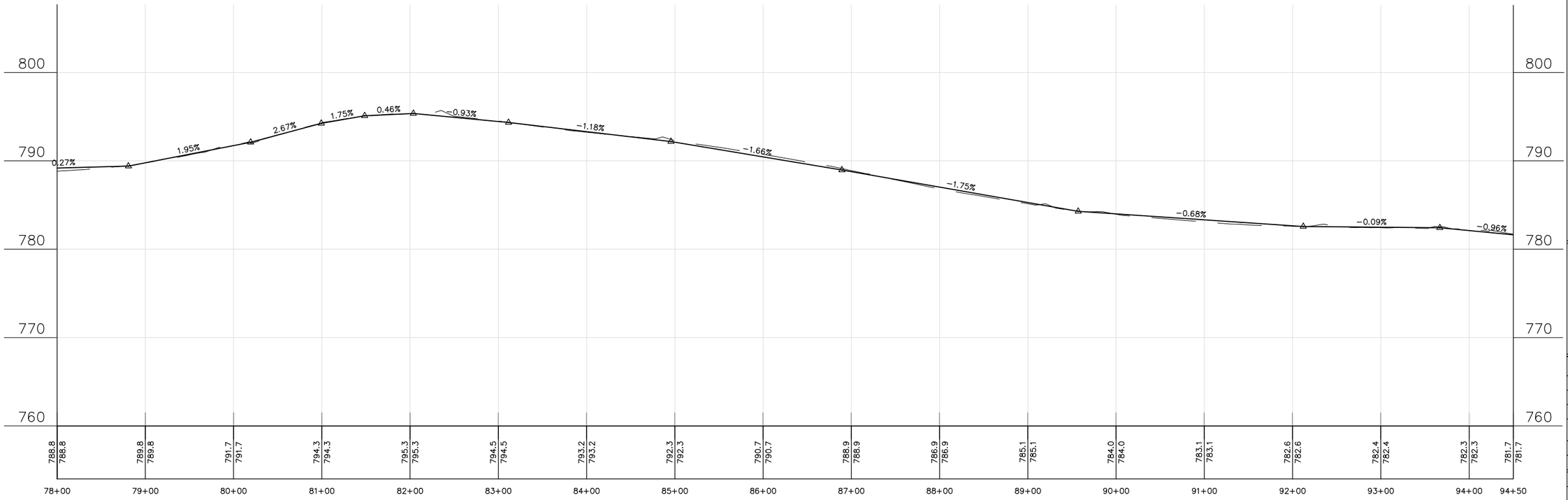

City of Mequon

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CREATIVITY BEYOND ENGINEERING

CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
PLAN & PROFILE

DATE: **7-23-19**

SCALE: **1" = 60'**

JOB NO. **1190486**

PROJECT MANAGER:
TROY T. HARTJES, P.E.

DESIGNED BY: **MJG**

CHECKED BY: **TTH**

SHEET NUMBER
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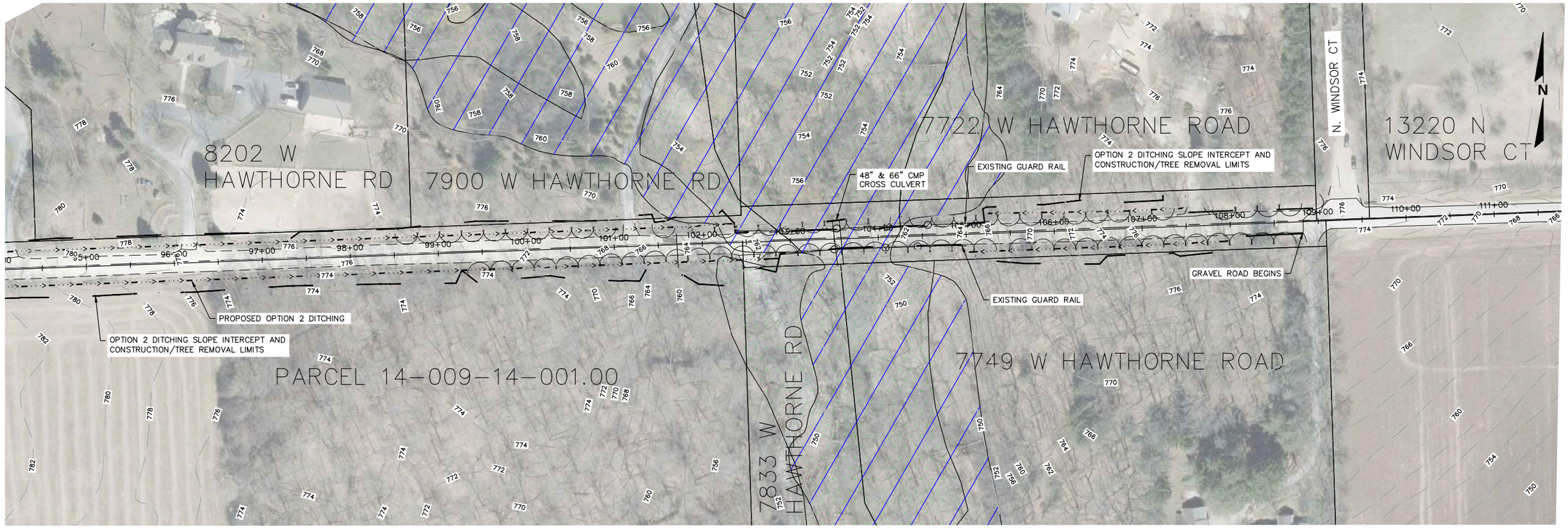

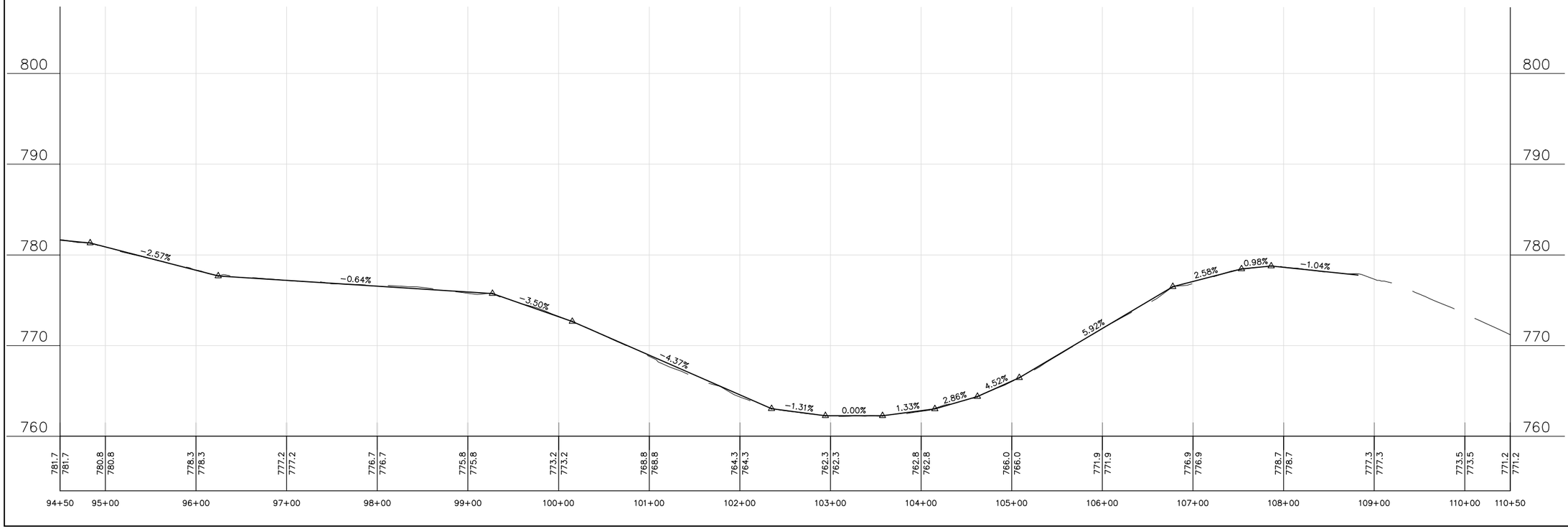

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CREATIVITY BEYOND ENGINEERING

CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
PLAN & PROFILE

DATE: **7-23-19**

SCALE: **1" = 60'**

JOB NO. **1190486**

PROJECT MANAGER:
TROY T. HARTJES, P.E.

DESIGNED BY: **MJG**

CHECKED BY: **TTH**

SHEET NUMBER
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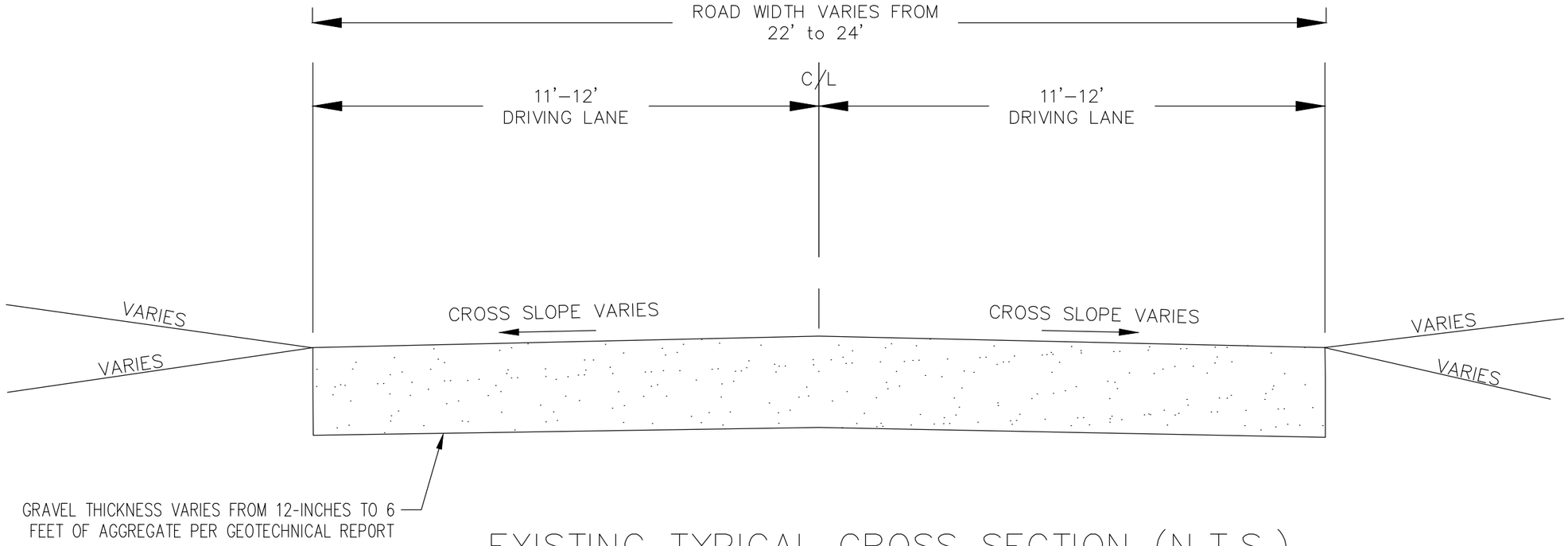
APPENDIX F

Typical Sections of Road Improvement Options



EXISTING TYPICAL CROSS SECTION (N.T.S.)

W. HAWTHORNE ROAD FROM 670' WEST OF WAUWATOSA RD TO 1920' EAST OF GRANVILLE RD

OPTION 1 SUMMARY:

1. EXISTING GRAVEL TO REMAIN. THE ROAD WIDTH AND LAYOUT WILL NOT CHANGE.
2. MAINTENANCE REQUIRED AFTER RAIN EVENTS TO MAINTAIN QUALITY OF RIDE.
3. THE SURROUNDING TREES WILL NOT BE IMPACTED UNLESS THE DRAINAGE IMPROVEMENT OPTION IS PERFORMED.

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CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
OPTION 1 - MAINTAIN EXISTING GRAVEL

DATE: 6-21-19
SCALE: 1" = 50'
JOB NO. 1190486
PROJECT MANAGER: TROY T. HARTJES, P.E.
DESIGNED BY: MJG
CHECKED BY: TTH

SHEET NUMBER
1

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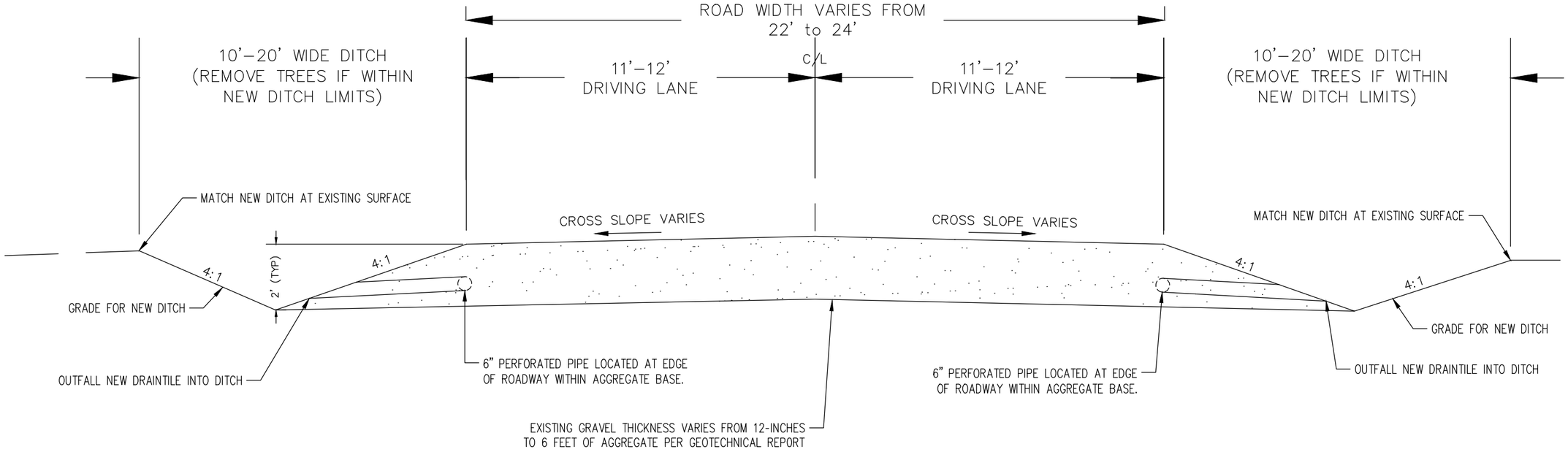

TYPICAL CROSS SECTION
OPTION 2 – DRAINAGE IMPROVEMENTS

OPTION 2 SUMMARY:

1. EXCAVATE AND GRADE A DITCH DEEP ENOUGH TO DRAIN THE ROAD BASE DURING RAIN EVENTS. DITCH WILL NEED TO BE A MINIMUM 2' DEEP TO DRAIN THE ROAD BASE. IF THE SIDE SLOPES OF THE DITCH ARE 4:1 THEN THE DITCH WOULD NEED TO BE APPROXIMATELY 16' WIDE DEPENDING ON THE MATCH POINT TO THE EXISTING GROUND.
2. THE SURROUNDING TREES WILL BE IMPACTED IF WITHIN 10' TO 20' OF THE EDGE OF ROADWAY.
3. ANY BOULDERS LOCATED WITHIN 10' TO 20' OF THE EDGE OF ROADWAY WILL NEED TO BE REMOVED FOR THE DITCH.
4. THE DITCH WILL ONLY BE INSTALLED WHERE THE SLOPE OF THE EXISTING ROADWAY ALLOWS. MINIMUM LONGITUDINAL SLOPE FOR A DITCH IS 1.0% TO PREVENT STANDING WATER.
5. A DRAINTILE WILL BE CUT–IN UNDER THE EDGE OF ROADWAY TO HELP DRAIN THE ROAD BASE. DRAINING THE ROAD BASE WILL HELP REDUCE AND PREVENT THE ROADWAY FROM RUTTING AND FORMING POT HOLES.
6. THIS OPTION WORKS BEST IF COMBINED WITH OTHER OPTIONS.

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CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
OPTION 2 - DRAINAGE IMPROVEMENTS

DATE: **6-21-19**
SCALE: **1" = 50'**
JOB NO. **1190486**
PROJECT MANAGER: **TROY T. HARTJES, P.E.**
DESIGNED BY: **MJG**
CHECKED BY: **TTH**

SHEET NUMBER
1

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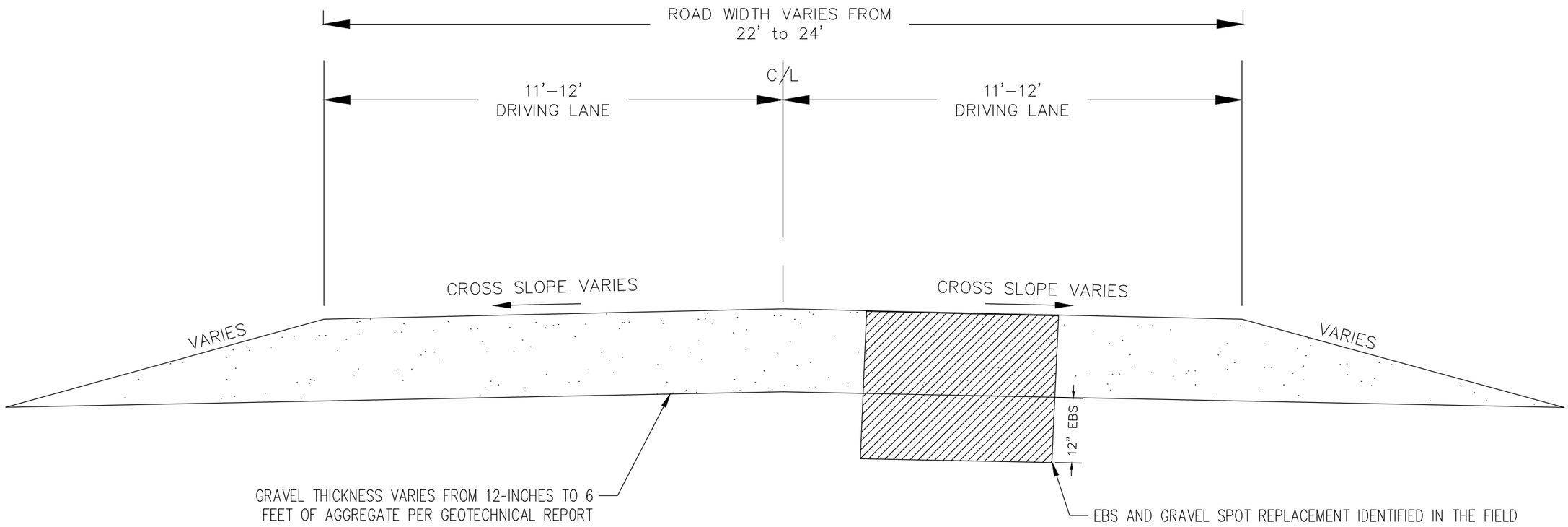

TYPICAL CROSS SECTION
OPTION 3 – CHEMICAL STABILIZER

OPTION 3 SUMMARY:

1. CHEMICALLY STABILIZE TOP 12–INCHES BY USING PORTLAND CEMENT OR LIME KILN DUST TO CREATE IMPERVIOUS STRUCTURAL LAYER.
2. MAINTENANCE REQUIRED TO MAINTAIN THE QUALITY OF RIDE AND EXTEND LIFE EXPECTANCY.
3. THE ROAD WILL HAVE AN APPEARANCE SIMILAR TO GRAVEL.
4. THE EXISTING ROAD WIDTH AND LAYOUT WILL REMAIN THE SAME.
5. THE SURROUNDING TREES WILL NOT BE IMPACTED UNLESS THE DRAINAGE IMPROVEMENT OPTION IS PERFORMED.

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CREATIVITY BEYOND ENGINEERING

CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
OPTION 3 - CHEMICAL STABILIZER

DATE: **6-21-19**
SCALE: **1" = 50'**
JOB NO. **1190486**
PROJECT MANAGER: **TROY T. HARTJES, P.E.**
DESIGNED BY: **MJG**
CHECKED BY: **TTH**

SHEET NUMBER
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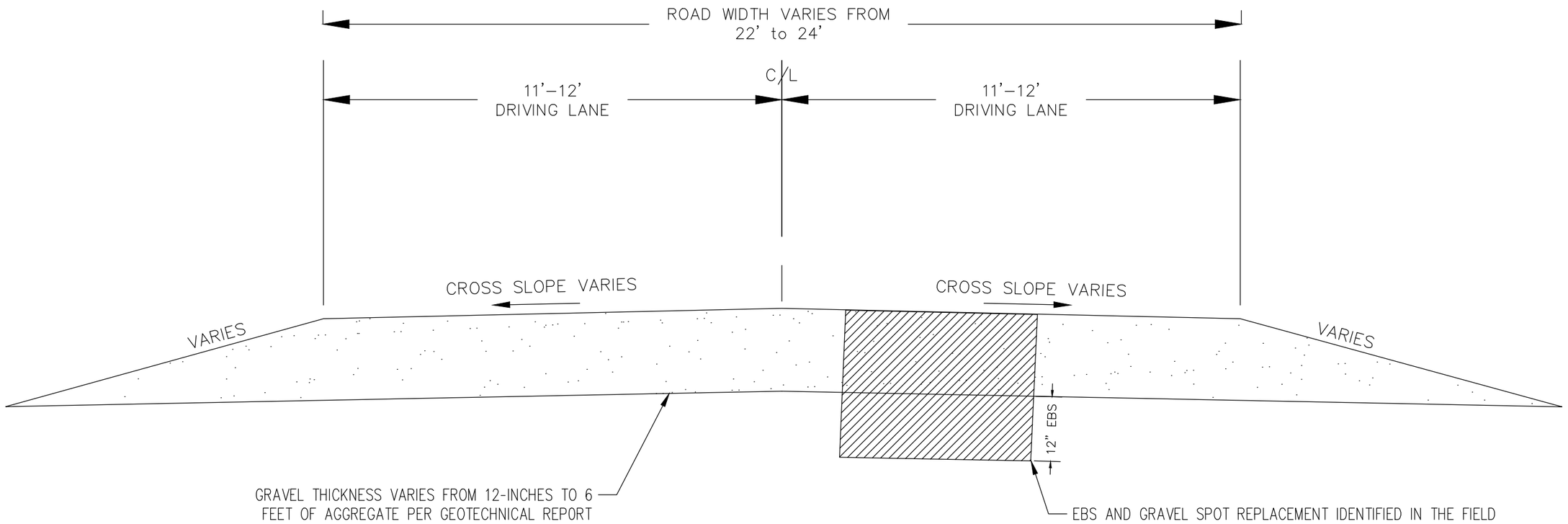

TYPICAL CROSS SECTION
OPTION 4 – BASE PATCH/GRAVEL SPOT REPLACEMENT

OPTION 4 SUMMARY:

1. IDENTIFY AREAS OF POOR SOILS AND BASE COURSE TO BE REMOVED AND REPLACE WITH NEW STONE.
2. THE EXISTING ROAD WIDTH AND LAYOUT WILL REMAIN THE SAME.
3. THE SURROUNDING TREES WILL NOT BE IMPACTED UNLESS THE DRAINAGE IMPROVEMENT OPTION IS PERFORMED.

City of Mequon

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CREATIVITY BEYOND ENGINEERING

CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
OPTION 4 - BASE PATCH/SPOT REPAIR

DATE: 6-21-19
SCALE: 1" = 50'
JOB NO. 1190486
PROJECT MANAGER: TROY T. HARTJES, P.E.
DESIGNED BY: MJG
CHECKED BY: TTH

SHEET NUMBER
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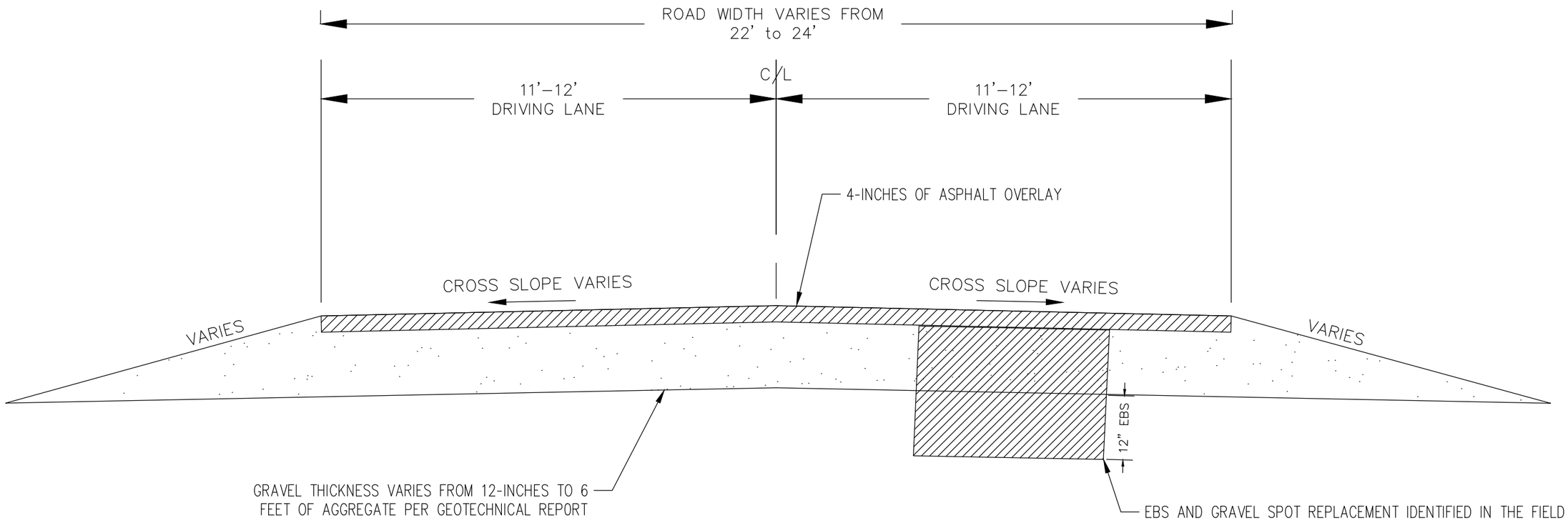

TYPICAL CROSS SECTION
OPTION 5 – ASPHALT OVERLAY OVER EXISTING GRAVEL

OPTION 5 SUMMARY:

1. EXISTING GRAVEL TO STAY IN PLACE.
2. PLACE NEW ASPHALT ON TOP OF EXISTING GRAVEL TO PREVENT WATER INFILTRATION INTO GRAVEL.
3. THE SURROUNDING TREES WILL NOT BE IMPACTED UNLESS THE DRAINAGE IMPROVEMENT OPTION IS PERFORMED.

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CREATIVITY BEYOND ENGINEERING

CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
OPTION 5 - ASPHALT OVERLAY

DATE: **6-21-19**
SCALE: **1" = 50'**
JOB NO. **1190486**
PROJECT MANAGER: **TROY T. HARTJES, P.E.**
DESIGNED BY: **MJG**
CHECKED BY: **TTH**

SHEET NUMBER
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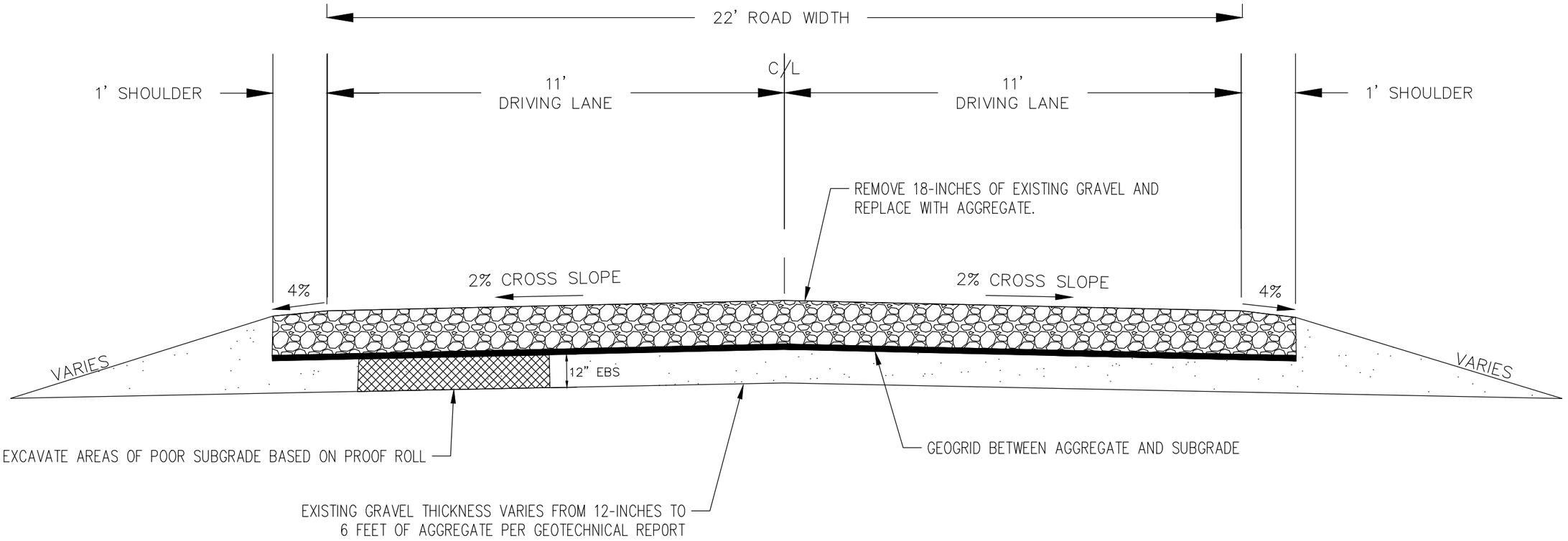

TYPICAL CROSS SECTION
OPTION 6 – GRAVEL RECONSTRUCTION

OPTION 6 SUMMARY:

1. REMOVE EXISTING GRAVEL TO A DEPTH OF 18–INCHES AND REPLACE WITH NEW AGGREGATE.
2. EXCAVATE SUBGRADE AS REQUIRED TO REMOVE POOR SOILS BASED ON PROOF ROLL.
3. PLACE NEW AGGREGATE ON GEOGRID OR FABRIC TO HELP STABILIZE AGGREGATE.
4. THE SURROUNDING TREES WILL NOT BE IMPACTED UNLESS THE DRAINAGE IMPROVEMENT OPTION IS PERFORMED.

City of Mequon

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CREATIVITY BEYOND ENGINEERING

CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
OPTION 6 - GRAVEL RECONSTRUCTION

DATE: 6-21-19
SCALE: 1" = 50'
JOB NO. 1190486
PROJECT MANAGER: TROY T. HARTJES, P.E.
DESIGNED BY: MJG
CHECKED BY: TTH

SHEET NUMBER
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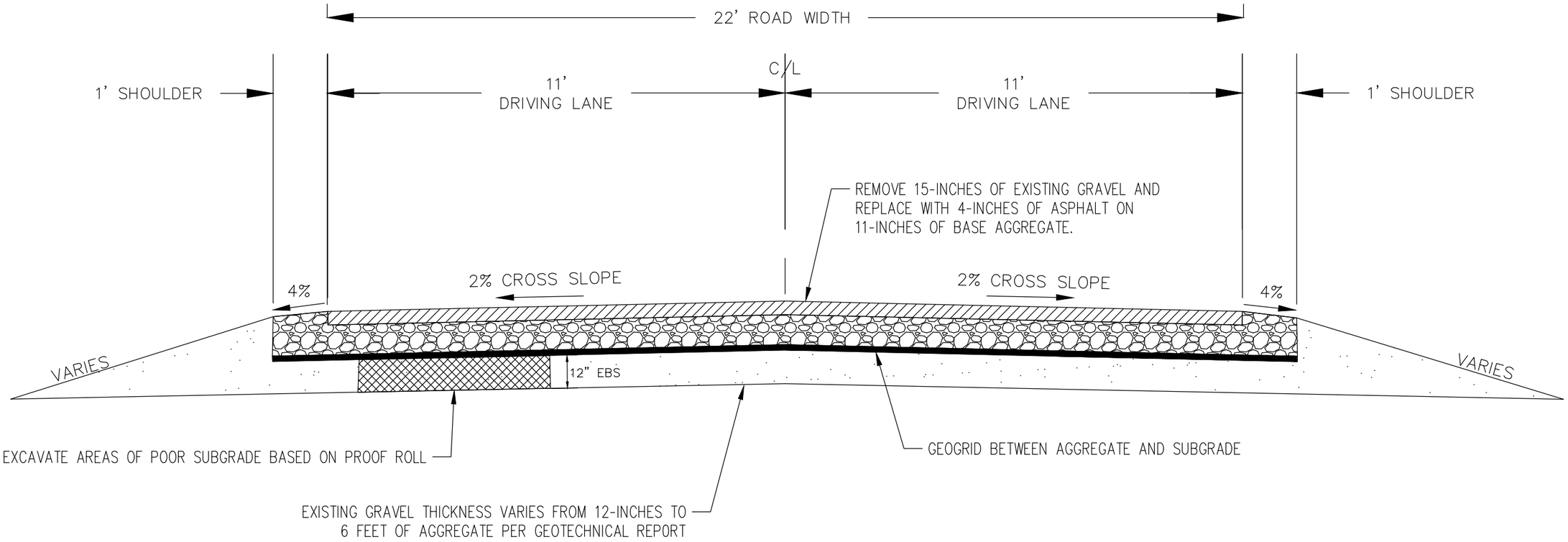

TYPICAL CROSS SECTION
OPTION 7 – ASPHALT PAVEMENT RECONSTRUCTION

OPTION 7 SUMMARY:

1. REMOVE EXISTING GRAVEL TO A DEPTH OF 15–INCHES AND REPLACE WITH NEW AGGREGATE BASE AND ASPHALT SURFACE.
2. EXCAVATE SUBGRADE AS REQUIRED TO REMOVE POOR SOILS BASED ON PROOF ROLL.
3. PLACE NEW AGGREGATE ON GEOGRID TO HELP STABILIZE AGGREGATE.
4. THE SURROUNDING TREES WILL NOT BE IMPACTED UNLESS THE DRAINAGE IMPROVEMENT OPTION IS PERFORMED.

City of Mequon

R.A. Smith CREATIVITY BEYOND ENGINEERING

CITY OF MEQUON
OZAUKEE COUNTY, WISCONSIN

HAWTHORNE ROAD EXHIBIT
OPTION 7 - ASPHALT RECONSTRUCTION

DATE: **6-21-19**
SCALE: **1" = 50'**
JOB NO. **1190486**
PROJECT MANAGER: **TROY T. HARTJES, P.E.**
DESIGNED BY: **MJG**
CHECKED BY: **TTH**
SHEET NUMBER
1

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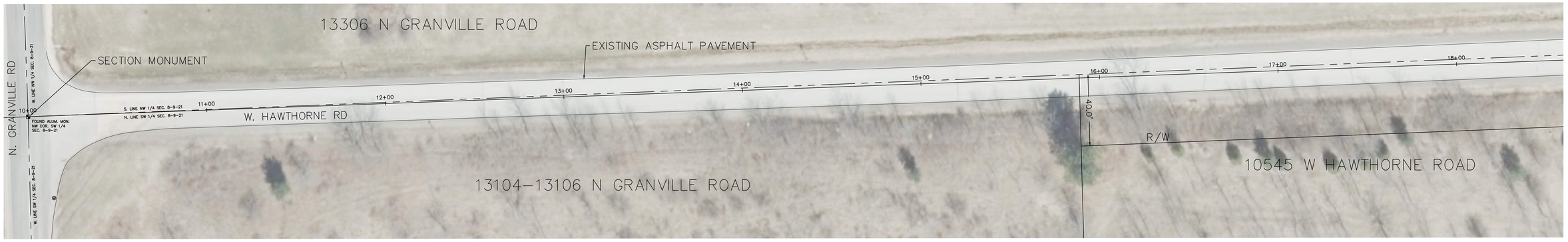
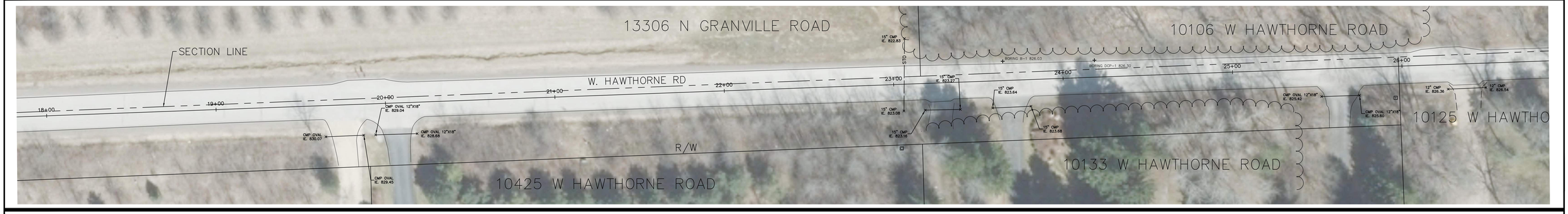
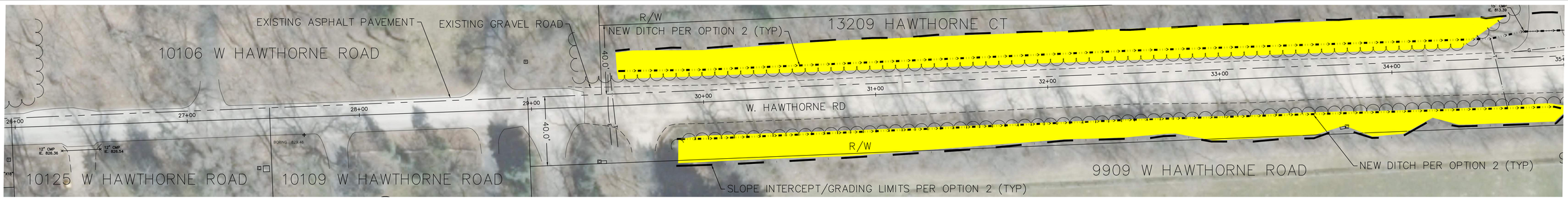
APPENDIX G

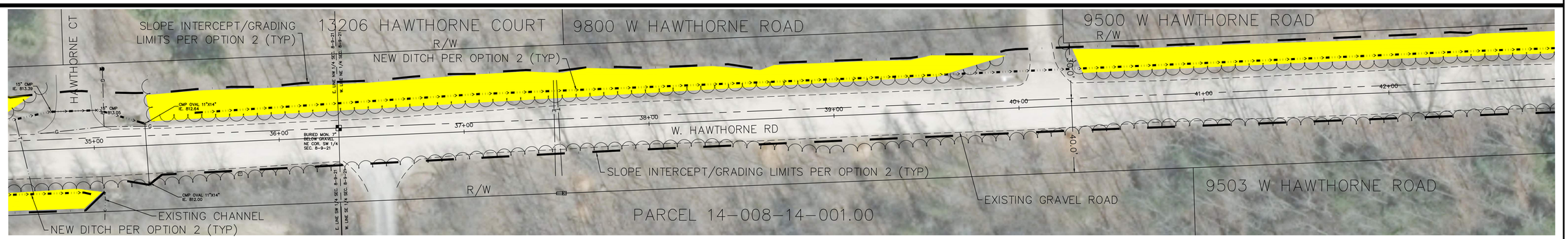
Topographic Exhibit

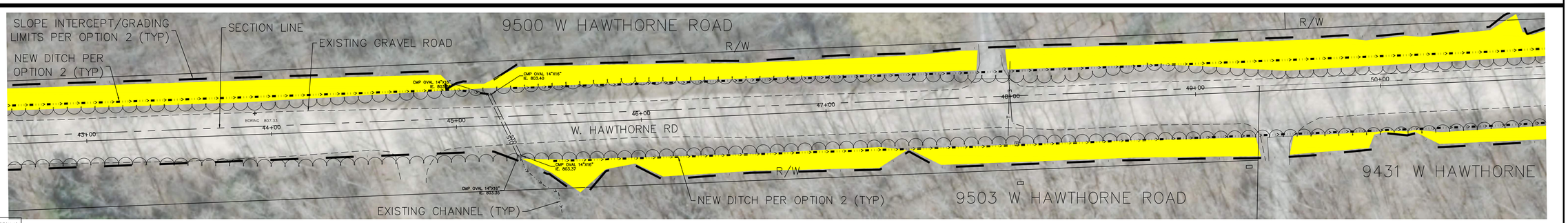
TOPOGRAPHIC MAP











GRAPHIC SCALE
10 0 10 20 40
(IN FEET)

LEGEND

- BOLLARD
- SOIL BORING/MONITORING WELL
- FLAGPOLE
- MAILBOX
- SIGN
- AIR CONDITIONER
- CONTROL BOX
- TRAFFIC SIGNAL
- CABLE PEDESTAL
- POWER POLE
- GUY POLE
- GUY WIRE
- LIGHT POLE
- SPOT/YARD/PEDESTAL LIGHT
- HANDICAPPED PARKING
- ELECTRIC MANHOLE
- ELECTRIC PEDESTAL
- ELECTRIC METER
- ELECTRIC TRANSFORMER
- TELEPHONE MANHOLE
- TELEPHONE PEDESTAL
- UTILITY VAULT
- GAS VALVE
- GAS METER
- GAS WARNING SIGN
- STORM MANHOLE
- ROUND INLET
- SQUARE INLET
- STORM SEWER END SECTION
- SANITARY MANHOLE
- SANITARY CLEANOUT OR SEPTIC VENT
- SANITARY INTERCEPTOR MANHOLE
- MISCELLANEOUS MANHOLE
- IRRIGATION CONTROL BOX
- WATER VALVE
- HYDRANT
- WATER SERVICE CURB STOP
- WATER MANHOLE
- WELL
- WATER SURFACE
- WETLANDS FLAG
- MARSH
- CONIFEROUS TREE
- DECIDUOUS TREE
- SHRUB
- ~EDGE OF TREES
- S-SANITARY SEWER
- STO-STORM SEWER
- W-WATERMAIN
- G-MARKED GAS MAIN
- E-MARKED ELECTRIC
- OHW-OVERHEAD WIRES
- B-BUREAU ELEC. SERV.
- T-MARKED TELEPHONE
- TV-MARKED CABLE TV LINE
- FO-MARKED FIBER OPTIC
- 780 INDICATES EXISTING CONTOUR ELEVATION
- × 780.55 INDICATES EXISTING SPOT ELEVATION

DIGGERS HOTLINE TICKET NO. 20192311879-1885

THE UNDERGROUND UTILITY INFORMATION AS SHOWN HEREON IS BASED, IN PART, UPON INFORMATION FURNISHED BY UTILITY COMPANIES AND THE LOCAL MUNICIPALITY. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, ITS ACCURACY AND COMPLETENESS CANNOT BE GUARANTEED NOR CERTIFIED TO.

(P) INDICATES PIPE SIZES PER RECORD PLANS. OTHER PIPE SIZES ARE ESTIMATED. NO PIPE SIZES SHOULD BE RELIED UPON WITHOUT FURTHER VERIFICATION.

NOTE: TREES WITHIN SLOPE INTERCEPT/GRADING LIMITS WOULD BE REMOVED FOR OPTION 2 DITCHING AND DRAINAGE IMPROVEMENTS.

OPTION 2 DITCHING
TREE REMOVAL AREA

raSmith
CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com

J:\1190486\Dwg\56789ENG.dwg \ HAWTHORNE RD (SHEET 1)

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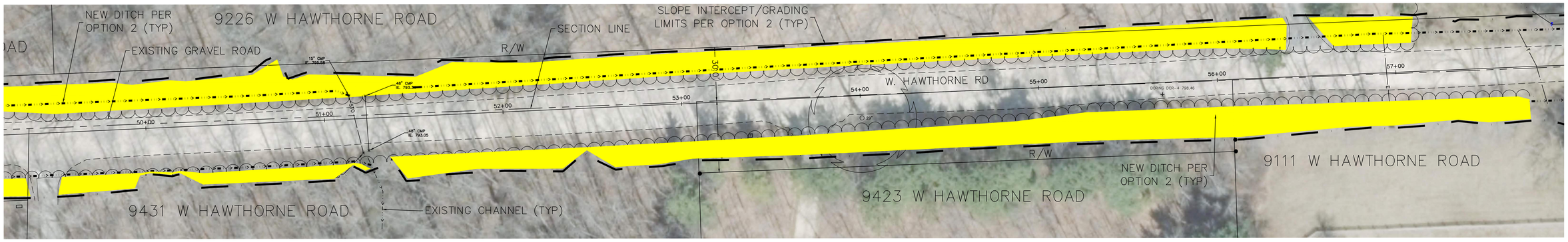
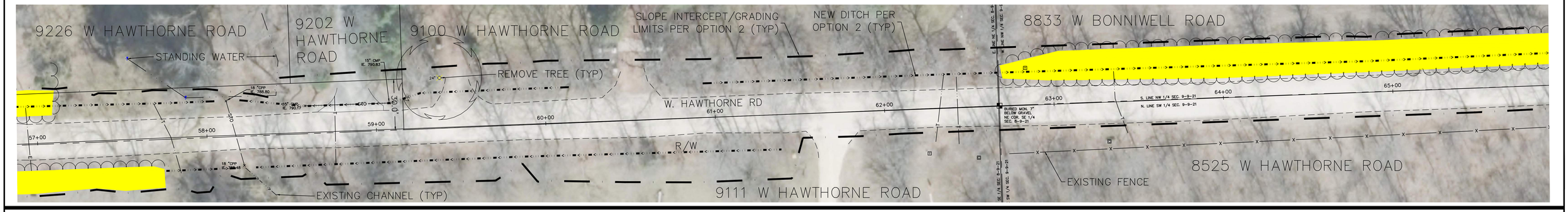
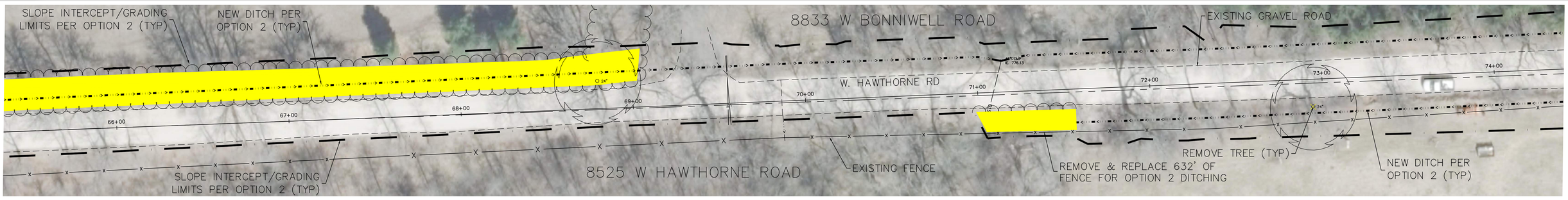
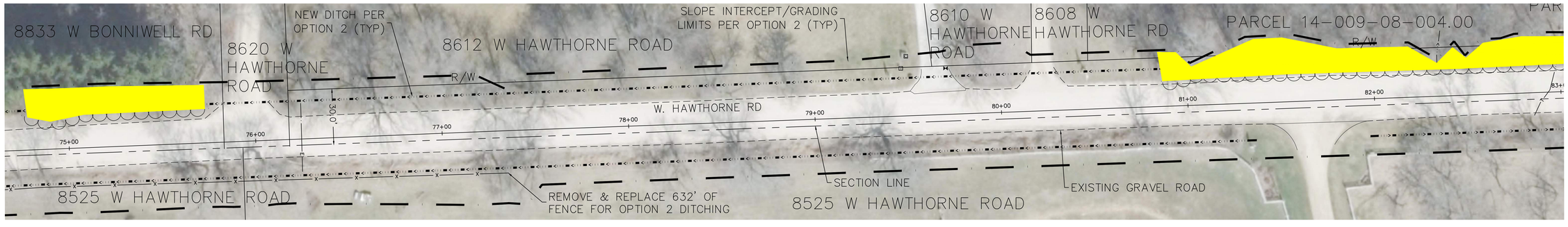
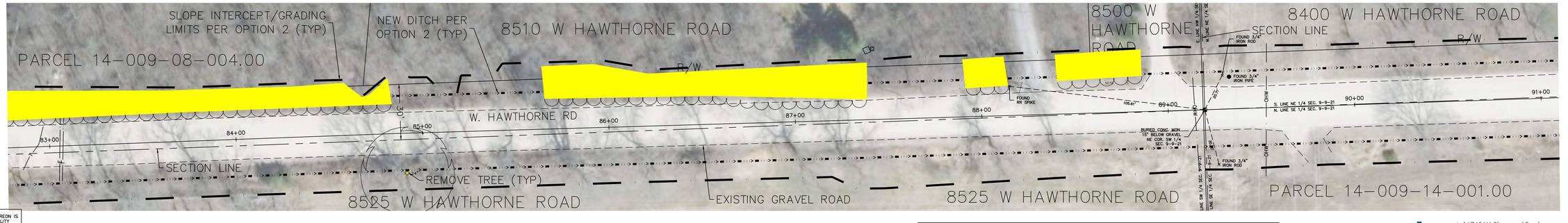
TOPOGRAPHIC MAP











GRAPHIC SCALE
10 0 10 20 40
(IN FEET)

LEGEND

- BOLLARD
- SOIL BORING/MONITORING WELL
- FLAGPOLE
- MAILBOX
- SIGN
- AIR CONDITIONER
- CONTROL BOX
- TRAFFIC SIGNAL
- CABLE PEDESTAL
- POWER POLE
- GUY POLE
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- LIGHT POLE
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- ELECTRIC METER
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- STORM MANHOLE
- ROUND INLET
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- SANITARY MANHOLE
- SANITARY CLEANOUT OR SEPTIC VENT
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- MISCELLANEOUS MANHOLE
- IRRIGATION CONTROL BOX
- WATER VALVE
- HYDRANT
- WATER SERVICE CURB STOP
- WATER MANHOLE
- WELL
- WATER SURFACE
- WETLANDS FLAG
- MARSH
- CONIFEROUS TREE
- DECIDUOUS TREE
- SHRUB
- EDGE OF TREES
- s —SANITARY SEWER
- sto —STORM SEWER
- w —WATERMAIN
- g —MARKED GAS MAIN
- e —MARKED ELECTRIC
- ohw —OVERHEAD WIRES
- b —BUREAU ELEC. SERV.
- t —MARKED TELEPHONE
- tv —MARKED CABLE TV LINE
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- 780' INDICATES EXISTING CONTOUR ELEVATION
- × 780.00 INDICATES EXISTING SPOT ELEVATION

DIGGERS HOTLINE TICKET NO. 20192311879-1885

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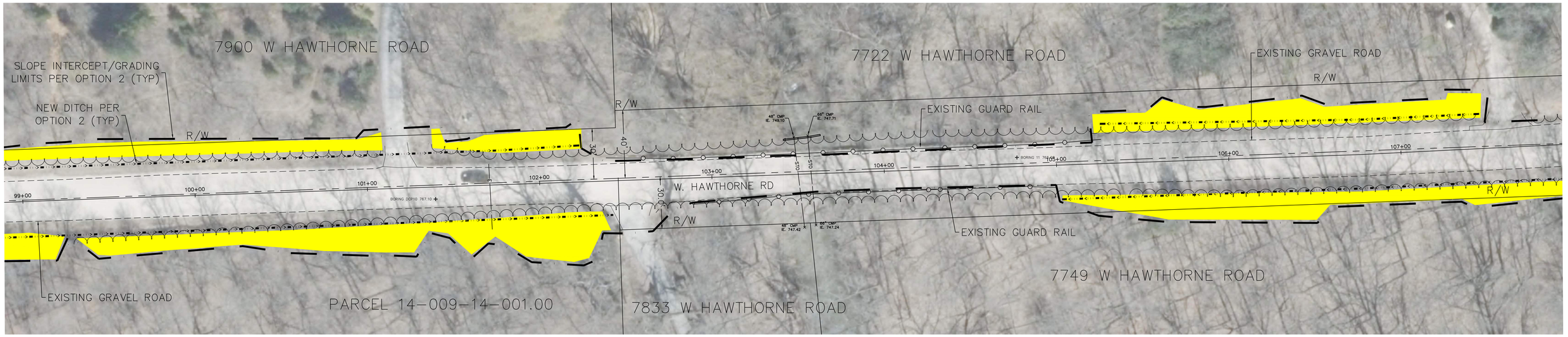
NOTE: TREES WITHIN SLOPE INTERCEPT/GRADING LIMITS WOULD BE REMOVED FOR OPTION 2 DITCHING AND DRAINAGE IMPROVEMENTS.

OPTION 2 DITCHING TREE REMOVAL AREA

raSmith
CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com

TOPOGRAPHIC MAP



GRAPHIC SCALE

10 0 10 20 40

(IN FEET)

LEGEND

- BOLLARD
- SOIL BORING/MONITORING WELL
- FLAGPOLE
- MAILBOX
- SIGN
- AIR CONDITIONER
- CONTROL BOX
- TRAFFIC SIGNAL
- CABLE PEDESTAL
- POWER POLE
- GUY POLE
- GUY WIRE
- LIGHT POLE
- SPOT/YARD/PEDESTAL LIGHT
- HANDICAPPED PARKING
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- ELECTRIC METER
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- SANITARY CLEANOUT OR SEPTIC VENT
- SANITARY INTERCEPTOR MANHOLE
- MISCELLANEOUS MANHOLE
- IRRIGATION CONTROL BOX
- WATER VALVE
- HYDRANT
- WATER SERVICE CURB STOP
- WATER MANHOLE
- WELL
- WATER SURFACE
- WETLANDS FLAG
- MARSH
- CONIFEROUS TREE
- DECIDUOUS TREE
- SHRUB
- ~~~~~ —EDGE OF TREES
- ——— S—SANITARY SEWER
- ——— STO—STORM SEWER
- ——— W—WATERMAIN
- ——— G—MARKED GAS MAIN
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- ——— OHW—OVERHEAD WIRES
- ——— B—BUREAU ELEC. SERV.
- ——— T—MARKED TELEPHONE
- ——— TV—MARKED CABLE TV LINE
- ——— FO—MARKED FIBER OPTIC
- 780 — INDICATES EXISTING CONTOUR ELEVATION
- × 780.55 INDICATES EXISTING SPOT ELEVATION

DIGGERS HOTLINE TICKET NO. 20192311879-1885

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OPTION 2 DITCHING TREE REMOVAL AREA

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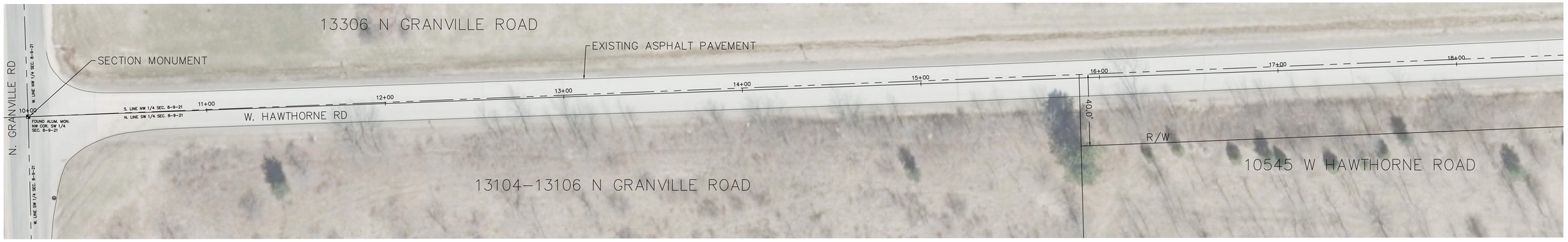
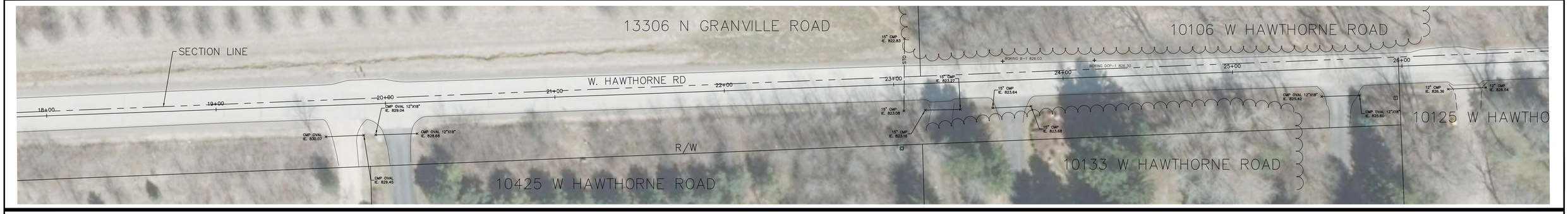
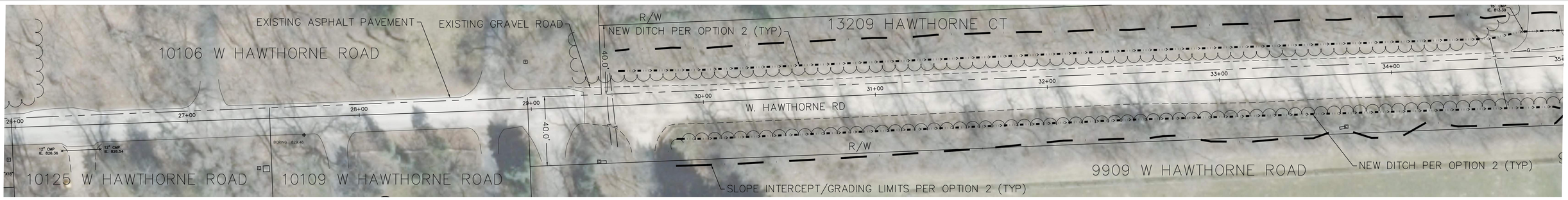
J:\1190486\Dwg\Survey\1679398ENG.dwg, HAWTHORNE RD (SHEET 3), 8/20/2019 10:19:35 AM, mjk

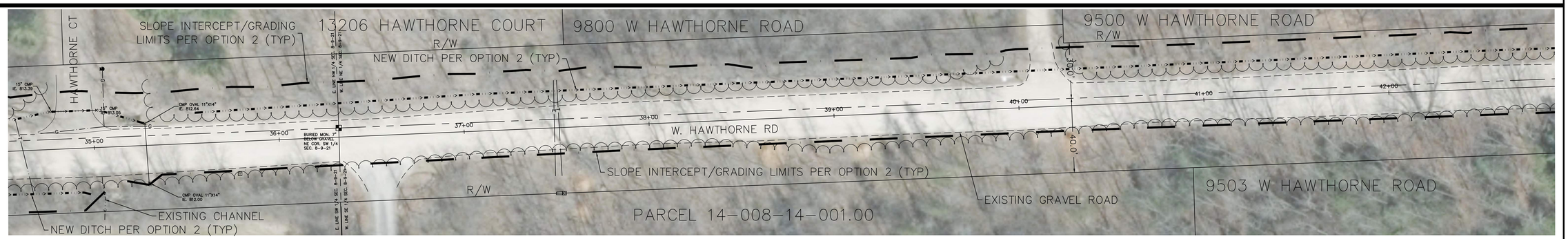
J:\1190486\Dwg\Survey\1679398ENG.dwg \ HAWTHORNE RD (SHEET 3)

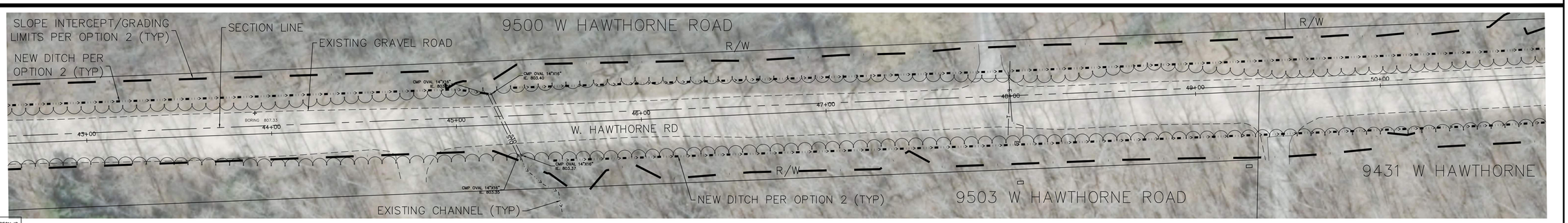
TOPOGRAPHIC MAP











GRAPHIC SCALE
10 0 10 20 40
(IN FEET)

LEGEND

- BOLLARD
- SOIL BORING/MONITORING WELL
- FLAGPOLE
- MAILBOX
- SIGN
- AIR CONDITIONER
- CONTROL BOX
- TRAFFIC SIGNAL
- CABLE PEDESTAL
- POWER POLE
- GUY POLE
- GUY WIRE
- LIGHT POLE
- SPOT/YARD/PEDESTAL LIGHT
- HANDICAPPED PARKING
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- 780' INDICATES EXISTING CONTOUR ELEVATION
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DIGGERS HOTLINE TICKET NO. 20192311879-1885

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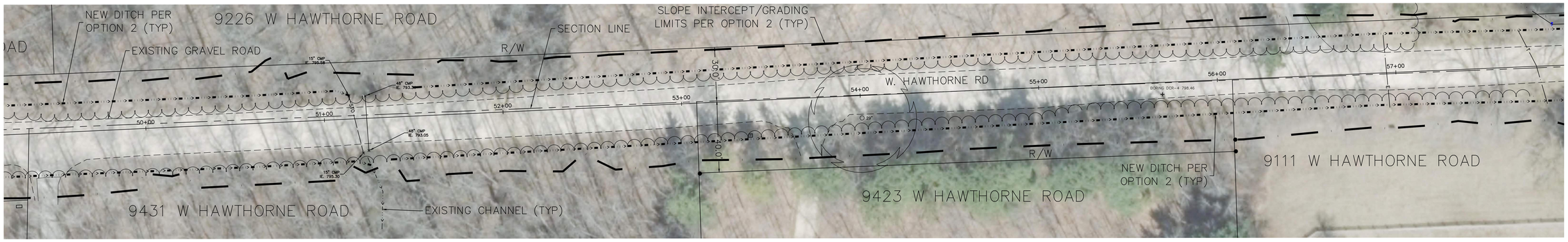
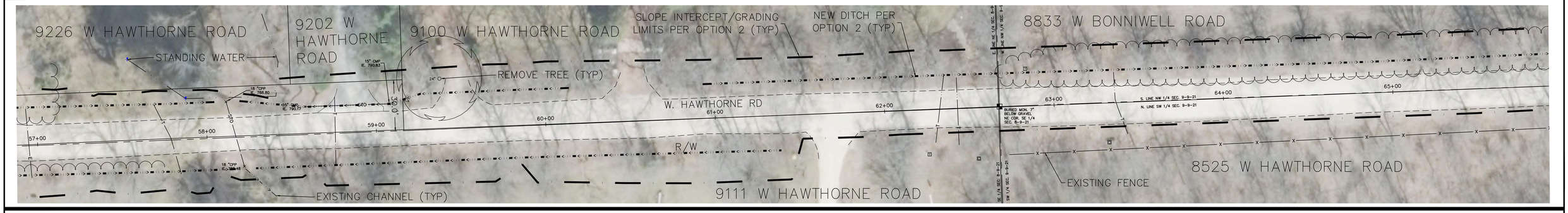
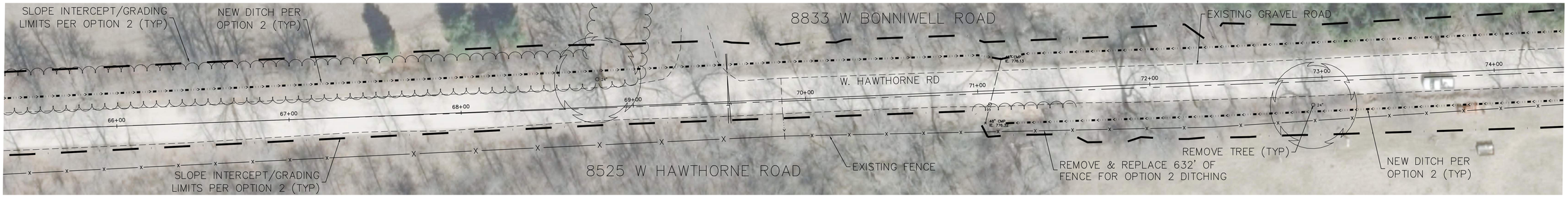
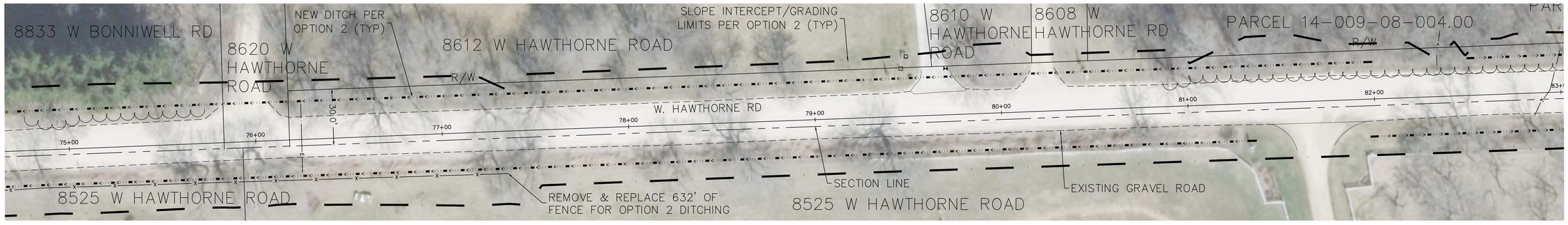
TOPOGRAPHIC MAP









GRAPHIC SCALE

10 0 10 20 40

(IN FEET)

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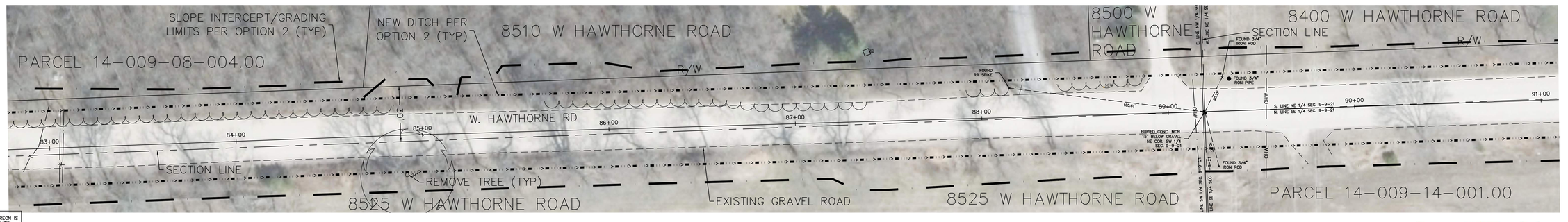

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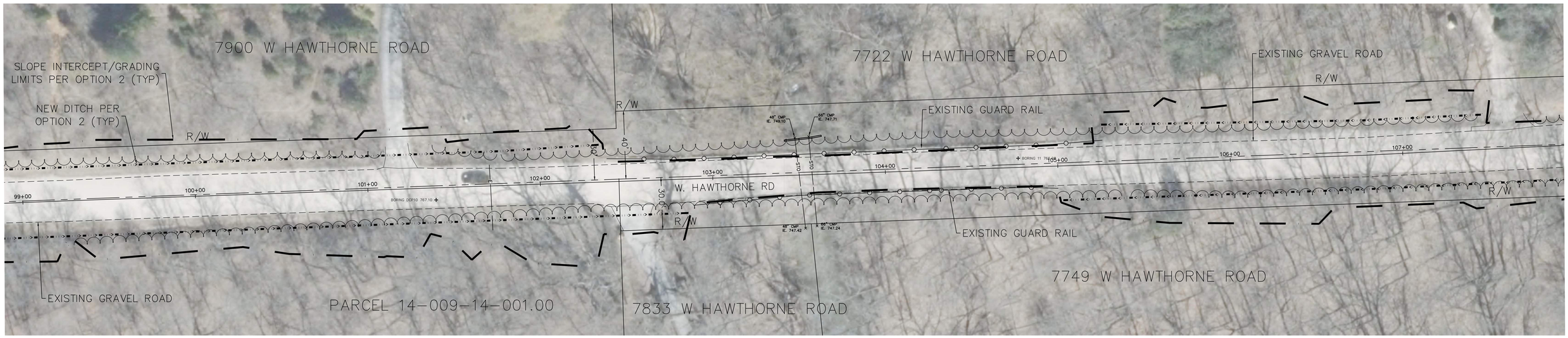
TOPOGRAPHIC MAP



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- B – BUREAU ELEC. SERV.
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APPENDIX H

Cost Estimates

Construction Cost Estimate
Option 2 - Drainage Improvements

Proj Name: Hawthorne Road Improvememts **Project No.:** 1190486
Client: City of Mequon **Date:** 8/20/2019

Number	Item	Unit	Quantity	Unit Price	Cost
	Option 2 - Ditching with Draintile				
1	Traffic Control	LS	1	$5,000.00	$5,000
2	6" PVC Draintile	LF	15,900	$40.00	$636,000
3	Ditching and Grading	LF	13,000	$12.00	$156,000
4	Tree Removal	LF	7,320	$15.00	$109,800
5	15" Driveway Culverts (15)	LF	540	$100.00	$54,000
6	Lawn Restoration	SY	28,500	$8.00	$228,000
7	Silt Fence	LF	13,000	$1.00	$13,000
				Subtotal:	$1,201,800
				20% Contingencies:	$240,360
				Total:	**$1,442,160**

Number	Item	Unit	Quantity	Unit Price	Cost
	Option 2A - Ditching Only				
1	Traffic Control	LS	1	$5,000.00	$5,000
2	Ditching and Grading	LF	13,000	$12.00	$156,000
3	Tree Removal	LF	7,320	$15.00	$109,800
4	15" Driveway Culverts (15)	LF	540	$100.00	$54,000
5	Lawn Restoration	SY	28,500	$8.00	$228,000
6	Silt Fence	LF	13,000	$1.00	$13,000
				Subtotal:	$565,800
				20% Contingencies:	$113,160
				Total:	**$678,960**

	Option 2B - Draintile Only				
1	Traffic Control	LS	1	$5,000.00	$5,000
2	6" PVC Draintile	LF	15,900	$40.00	$636,000
3	24" Storm Sewer	LF	180	$120.00	$21,600
4	48" Storm Sewer	LF	122	$180.00	$21,960
5	Erosion Control	LS	1	$15,000	$15,000
				Subtotal:	$699,560
				20% Contingencies:	$139,912
				Total:	**$839,472**

Since the roadway is several feet above the surrounding ground elevation it is assumed that the draintile by the existing 48" & 66" dual culverts will discharge out the side of the raised roadway onto an erosion control device such as turf reinforcement mat to avoid connecting the draintile into the existing culverts.

Construction Cost Estimate
Option 3 - Chemical Stabilizer

Proj Name: Hawthorne Road Improvememts **Project No.:** 1190486

Client: City of Mequon **Date:** 8/20/2019

Number	Item	Unit	Quantity	Unit Price	Cost
	Section 1 - Project Costs				
1	Mobilization	LS	1	$2,500.00	$2,500
2	Traffic Control	LS	1	$5,000.00	$5,000
3	Road Preparation and Grading	LS	1	$165,000.00	$165,000
4	Chemical Stabilizer (Portland Cement)	SF	190,800	$1.00	$190,800
5	Gravel Surface Course (2-inch Depth)	TON	1,500	$20	$30,000
				Subtotal:	$393,300
				20% Contingencies:	$78,660
				Total:	**$471,960**

Construction Cost Estimate

Option 4 - Base Patch/Gravel Spot Replacement

Proj Name: Hawthorne Road Improvememts **Project No.:** 1190486

Client: City of Mequon **Date:** 8/20/2019

Number	Item	Unit	Quantity	Unit Price	Cost
	Section 1 - Project Costs				
1	Traffic Control	LS	1	$2,500.00	$2,500
2	Mobilization	LS	1	$2,500.00	$2,500
3	Base Patch (50% of Roadway)	SY	10,600	$50.00	$530,000
4	Excavation Below Subgrade (50% of Roadway)	CY	3,535	$17.00	$60,095
5	Crushed Aggregate, 3-inch (EBS)	TON	7,070	$22.00	$155,540
6	Geogrid	SY	10,600	$6.00	$63,600
				Subtotal:	$750,635
				20% Contingencies:	$150,127
				Total:	**$900,762**

Construction Cost Estimate

Option 4A - Base Patch/Gravel Spot Replacement with Drainage Improvements

Proj Name: Hawthorne Road Improvememts **Project No.:** 1190486

Client: City of Mequon **Date:** 11/1/2019

Number	Item	Unit	Quantity	Unit Price	Cost
	Section 1 - Project Costs				
1	Traffic Control	LS	1	$2,500.00	$7,500
2	Mobilization	LS	1	$2,500.00	$2,500
3	Base Patch (50% of Roadway)	SY	10,600	$50.00	$530,000
4	Excavation Below Subgrade (50% of Roadway)	CY	3,535	$17.00	$60,095
5	Crushed Aggregate, 3-inch (EBS)	TON	7,070	$22.00	$155,540
6	Geogrid	SY	10,600	$6.00	$63,600
7	6" PVC Draintile	LF	15,900	$40.00	$636,000
8	Ditching and Grading	LF	13,000	$12.00	$156,000
9	Tree Removal	LF	7,320	$15.00	$109,800
10	15" Driveway Culverts (15)	LF	540	$100.00	$54,000
11	Lawn Restoration	SY	28,500	$8.00	$228,000
12	Silt Fence	LF	13,000	$1.00	$13,000
				Subtotal:	$2,016,035
				20% Contingencies:	$403,207
				Total:	**$2,419,242**

Construction Cost Estimate

Option 5 - Asphalt Overlay Over Existing Gravel Roadway

Proj Name: Hawthorne Road Improvememts **Project No.:** 1190486

Client: City of Mequon **Date:** 8/20/2019

Number	Item	Unit	Quantity	Unit Price	Cost
	Section 1 - Project Costs				
1	Mobilization	LS	1	$2,500.00	$2,500
2	Traffic Control	LS	1	$2,500.00	$2,500
3	Road Preparation	LS	1	$10,000.00	$10,000
4	2.25" HMA Pavement Binder Course (3 LT 58-28 S)	TON	2,900	$65.00	$188,500
5	1.75" HMA Pavement Surface Course (4 LT 58-28 H)	TON	2,300	$70.00	$161,000
				Subtotal:	$364,500
				20% Contingencies:	$72,900
				Total:	**$437,400**

Construction Cost Estimate

Option 5A - Asphalt Overlay Over Existing Gravel Roadway with Base Patch

Proj Name: Hawthorne Road Improvememts **Project No.:** 1190486

Client: City of Mequon **Date:** 8/20/2019

Number	Item	Unit	Quantity	Unit Price	Cost
	Section 1 - Project Costs				
1	Mobilization	LS	1	$2,500.00	$2,500
2	Traffic Control	LS	1	$2,500.00	$2,500
3	Road Preparation	LS	1	$10,000.00	$10,000
4	2.25" HMA Pavement Binder Course (3 LT 58-28 S)	TON	2,900	$65.00	$188,500
5	1.75" HMA Pavement Surface Course (4 LT 58-28 H)	TON	2,300	$70.00	$161,000
6	Traffic Control	LS	1	$2,500.00	$2,500
7	Mobilization	LS	1	$2,500.00	$2,500
8	Base Patch (50% of Roadway)	SY	10,600	$50.00	$530,000
9	Excavation Below Subgrade (50% of Roadway)	CY	3,535	$17.00	$60,095
10	Crushed Aggregate, 3-inch (EBS)	TON	7,070	$22.00	$155,540
11	Geogrid	SY	10,600	$6.00	$63,600

Subtotal:	$1,178,735
20% Contingencies:	$235,747
Total:	**$1,414,482**

Construction Cost Estimate
Option 6 - Gravel Reconstruction

Proj Name: Hawthorne Road Improvememts **Project No.:** 1190486
Client: City of Mequon **Date:** 8/20/2019

Number	Item	Unit	Quantity	Unit Price	Cost
	Section 1 - Project Costs				
1	Traffic Control	LS	1	$5,000.00	$5,000
2	Common Excavation	LS	1	$100,000.00	$100,000
3	Excavation Below Subgrade	CY	3,550	$17.00	$60,350
4	Crushed Aggregate, 3-inch (EBS)	TON	7,100	$22.00	$156,200
5	12-inch Crushed Aggregate Base, 1 1/4-inch	TON	7,100	$20.00	$142,000
6	6-inch Crushed Aggregate Surface, 3/4-inch	TON	3,600	$18.00	$64,800
7	Geogrid	SY	21,205	$6.00	$127,230
				Subtotal:	$655,580
				20% Contingencies:	$131,116
				Total:	**$786,696**

Construction Cost Estimate

Option 6A - Gravel Reconstruction with Drainage Improvements

Proj Name: Hawthorne Road Improvememts **Project No.:** 1190486

Client: City of Mequon **Date:** 8/20/2019

Number	Item	Unit	Quantity	Unit Price	Cost
	Section 1 - Project Costs				
1	Traffic Control	LS	1	$5,000.00	$5,000
2	Common Excavation	LS	1	$100,000.00	$100,000
3	Excavation Below Subgrade	CY	3,550	$17.00	$60,350
4	Crushed Aggregate, 3-inch (EBS)	TON	7,100	$22.00	$156,200
5	12-inch Crushed Aggregate Base, 1 1/4-inch	TON	7,100	$20.00	$142,000
6	6-inch Crushed Aggregate Surface, 3/4-inch	TON	3,600	$18.00	$64,800
7	Geogrid	SY	21,205	$6.00	$127,230
8	Traffic Control	LS	1	$5,000.00	$5,000
9	6" PVC Draintile	LF	15,900	$40.00	$636,000
10	Ditching and Grading	LF	13,000	$12.00	$156,000
11	Tree Removal	LF	7,320	$15.00	$109,800
12	15" Driveway Culverts (15)	LF	540	$100.00	$54,000
13	Lawn Restoration	SY	28,500	$8.00	$228,000
14	Silt Fence	LF	13,000	$1.00	$13,000
				Subtotal:	$1,857,380
				20% Contingencies:	$371,476
				Total:	**$2,228,856**

Construction Cost Estimate

Option 7 - Asphalt Pavement Reconstruction

Proj Name: Hawthorne Road Improvememts **Project No.:** 1190486

Client: City of Mequon **Date:** 11/1/2019

Number	Item	Unit	Quantity	Unit Price	Cost
	Section 1 - Project Costs				
1	Traffic Control	LS	1	$5,000.00	$5,000
2	Common Excavation	LS	1	$100,000.00	$100,000
3	Excavation Below Subgrade	CY	9,000	$17.00	$153,000
4	Crushed Aggregate, 3-inch (EBS)	TON	7,100	$22.00	$156,200
5	Crushed Aggregate, 1 1/4-inch	TON	6,500	$20.00	$130,000
6	2.25" HMA Pavement Binder Course (3 LT 58-28 S)	TON	2,900	$65.00	$188,500
7	1.75" HMA Pavement Surface Course (4 LT 58-28 H)	TON	2,300	$70.00	$161,000
8	Geogrid	SY	21,205	$6.00	$127,230
				Subtotal:	$1,020,930
				20% Contingencies:	$204,186
				Total:	**$1,225,116**

Construction Cost Estimate

Option 7A - Asphalt Pavement Reconstruction

Proj Name: Hawthorne Road Improvememts **Project No.:** 1190486

Client: City of Mequon **Date:** 8/20/2019

Number	Item	Unit	Quantity	Unit Price	Cost
	Section 1 - Project Costs				
1	Traffic Control	LS	1	$5,000.00	$5,000
2	Common Excavation	LS	1	$100,000.00	$100,000
3	Excavation Below Subgrade	CY	3,550	$17.00	$60,350
4	Crushed Aggregate, 3-inch (EBS)	TON	7,100	$22.00	$156,200
5	Crushed Aggregate, 1 1/4-inch	TON	6,500	$20.00	$130,000
6	2.25" HMA Pavement Binder Course (3 LT 58-28 S)	TON	2,900	$65.00	$188,500
7	1.75" HMA Pavement Surface Course (4 LT 58-28 H)	TON	2,300	$70.00	$161,000
8	Geogrid	SY	21,205	$6.00	$127,230
9	Traffic Control	LS	1	$5,000.00	$5,000
10	6" PVC Draintile	LF	15,900	$40.00	$636,000
11	Ditching and Grading	LF	13,000	$12.00	$156,000
12	Tree Removal	LF	7,320	$15.00	$109,800
13	15" Driveway Culverts (15)	LF	540	$100.00	$54,000
14	Lawn Restoration	SY	28,500	$8.00	$228,000
15	Silt Fence	LF	13,000	$1.00	$13,000

Subtotal:	$2,130,080
20% Contingencies:	$426,016
Total:	**$2,556,096**

APPENDIX I

CULVERT INSPECTION REPORTS

CULVERT INSPECTION FORM

Date 8-15-19 **Inspector** Matt Garon

Location STA 35+28
HSE 13206/9909 Hawthorne Ct/Rd

Pipe Size 11" x 14" L = 32'

Pipe Material CMP

Pipe Condition Pipe is in poor condition. Bottom may be rusted-out. Pipe is half full of sediment.

11” x 14” Culvert Inspection @ Station 35+28 - Houses 13206 and 9909 Hawthorne Ct & Rd

11” x 14” Culvert Inspection @ Station 35+28 - Houses 13206 and 9909 Hawthorne Ct & Rd

CULVERT INSPECTION FORM

Date 8-15-19 **Inspector** Matt Garon

Location STA 45+26
HSE 9500/9503 Hawthorne Rd

Pipe Size Dual 14" x 16" L = 37' & 37'

Pipe Material CMP

Pipe Condition Pipes are in fair condition with a rusty bottom. Not much sediment in bottom of pipes. Culverts are raised above ground 3-inches.

Dual 14” x 16” Culvert Inspection @ Station 45+26 - Houses 9500 and 9503 Hawthorne Rd

Dual 14” x 16” Culvert Inspection @ Station 45+26 - Houses 9500 and 9503 Hawthorne Rd

CULVERT INSPECTION FORM

Date 8-15-19 **Inspector** Matt Garon

Location STA 51+20
HSE 9226/9431 Hawthorne Rd

Pipe Size 15" and 48"
33' of 15"
31' of 48"

Pipe Material CMP

Pipe Condition Pipes are in fair condition. The 48" CMP is half submerged and the 15" invert elevation is 2.3' above the 48" invert elevation. There is some sediment in the 15" CMP.

48” & 15” Culvert Inspection @ Station 51+20 - Houses 9226 and 9431 Hawthorne Rd

48” & 15” Culvert Inspection @ Station 51+20 - Houses 9226 and 9431 Hawthorne Rd

CULVERT INSPECTION FORM

Date 8-15-19 **Inspector** Matt Garon

Location STA 58+17
HSE 9226/9111 Hawthorne Rd

Pipe Size 18" L=40'

Pipe Material HDPE

Pipe Condition Pipe condition is good.
Pipe is clean with no debris or sediment.

18” Culvert Inspection @ Station 58+17 - Houses 9226 and 9111 Hawthorne Rd

CULVERT INSPECTION FORM

Date 8-15-19 **Inspector** Matt Garon

Location STA 71+10
HSE 8833/8525 Hawthorne Rd

Pipe Size 48" L = 38'

Pipe Material CMP

Pipe Condition Pipe is in good condition.

48” Culvert Inspection @ Station 71+10 - Houses 8833 and 8525 Hawthorne Rd

48” Culvert Inspection @ Station 103+50 - 71+10 - Houses 8833 and 8525 Hawthorne Rd

CULVERT INSPECTION FORM

Date 8-15-19 **Inspector** Matt Garon

Location STA 103+50
HSE 7722/7749 Hawthorne Rd

Pipe Size 48" and 66"
53' of 48"
52' of 66"

Pipe Material CMP

Pipe Condition Both Pipes are in good condition. Recommend removing debris at end of culverts.

48” & 66” Culvert Inspection @ Station 103+50 - Houses 7722 and 7749 Hawthorne Rd

48” & 66” Culvert Inspection @ Station 103+50 - Houses 7722 and 7749 Hawthorne Rd

APPENDIX J

TRAFFIC DATA

MetroCount Traffic Executive
Class Speed Matrix

ClassMatrix-6 -- English (ENU)

Datasets:

Site:	**[Hawthorne Road East] On SLOW DOWN PASSING HORSES sign**
Attribute:	
Direction:	4 - West bound, A trigger first. **Lane:** 0
Survey Duration:	13:11 Tuesday, May 28, 2019 => 12:55 Thursday, June 6, 2019,
Zone:	
File:	Hawthorne Road East 0 2019-06-06 1255.EC0 (Plus)
Identifier:	DJ07CD2H MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.06)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, May 30, 2019 => 0:00 Thursday, June 6, 2019 (7)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range:	5 - 100 mph.
Direction:	North, East, South, West (bound), P = West
Separation:	Headway > 0 sec, Span 0 - 300 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)
In profile:	Vehicles = 2102 / 2788 (75.39%)

Class Speed Matrix

ClassMatrix-6
Site: Hawthorne Road East.0.0W
Description: **On SLOW DOWN PASSING HORSES sign**
Filter time: **0:00 Thursday, May 30, 2019 => 0:00 Thursday, June 6, 2019**
Scheme: Vehicle classification (Scheme F)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12 13) Dir(NESW) Sp(5,100) Headway(>0) Span(0 - 300)

Speed (mph)	Class													Speed Totals	
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13		
	1	2	3	4	5	6	7	8	9	10	11	12	13		
5 - 10	.	2	1	.	.	.	.	.	.	.	.	.	.	3	0.1%
10 - 15	.	10	2	.	1	.	.	.	.	.	.	.	.	13	0.6%
15 - 20	3	56	15	3	1	1	2	.	1	.	.	.	.	82	3.9%
20 - 25	.	196	121	12	1	2	.	.	1	.	.	.	.	333	15.8%
25 - 30	1	500	268	7	3	3	.	2	.	.	.	.	.	784	37.3%
30 - 35	.	481	165	1	.	1	.	1	.	.	.	.	.	649	30.9%
35 - 40	1	140	57	.	.	.	.	.	.	.	.	.	.	198	9.4%
40 - 45	.	25	6	.	1	.	.	.	.	.	.	.	.	32	1.5%
45 - 50	.	3	2	.	.	.	.	.	.	.	.	.	.	5	0.2%
50 - 55	1	2	.	.	.	.	.	.	.	.	.	.	.	3	0.1%
55 - 60	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
60 - 65	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
65 - 70	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
70 - 75	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
75 - 80	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
Class Totals	6	1415	637	23	7	7	2	3	2	0	0	0	0	2102	
	0.3%	67.3%	30.3%	1.1%	0.3%	0.3%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%		

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-4 -- English (ENU)

Datasets:

Site:	**[Hawthorne Road East] On SLOW DOWN PASSING HORSES sign**
Attribute:	
Direction:	4 - West bound, A trigger first. **Lane:** 0
Survey Duration:	13:11 Tuesday, May 28, 2019 => 12:55 Thursday, June 6, 2019,
Zone:	
File:	Hawthorne Road East 0 2019-06-06 1255.EC0 (Plus)
Identifier:	DJ07CD2H MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.06)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, May 30, 2019 => 0:00 Thursday, June 6, 2019 (7)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range:	5 - 100 mph.
Direction:	North, East, South, West (bound), P = West
Separation:	Headway > 0 sec, Span 0 - 300 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)
In profile:	Vehicles = 2102 / 2788 (75.39%)

* Thursday, May 30, 2019 - Total=305, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**1**	**0**	**3**	**5**	**23**	**25**	**21**	**15**	**16**	**18**	**17**	**26**	**25**	**31**	**29**	**22**	**13**	**6**	**6**	**0**	**3**	
0	0	0	0	0	1	1	4	5	**5**	2	6	5	3	10	3	**7**	8	6	9	3	2	0	0	1
0	0	0	0	0	1	1	7	3	**5**	3	3	6	7	6	6	**11**	6	6	1	1	1	0	1	0
0	0	0	1	0	0	1	5	**6**	6	4	1	3	3	5	**6**	5	7	6	2	1	3	0	1	0
0	0	0	0	0	1	2	7	**11**	5	6	6	4	4	5	**10**	8	8	4	1	1	0	0	1	0

AM Peak 0830 - 0930 (27), AM PHF=0.61 PM Peak 1530 - 1630 (34), PM PHF=0.77

* Friday, May 31, 2019 - Total=348, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**0**	**0**	**1**	**0**	**1**	**6**	**23**	**20**	**16**	**24**	**22**	**17**	**26**	**23**	**34**	**32**	**24**	**21**	**10**	**13**	**18**	**14**	**2**	
1	0	0	0	0	0	1	4	1	5	3	**5**	3	7	6	6	**6**	6	8	4	2	6	2	2	0
0	0	0	0	0	1	2	9	7	3	**9**	5	4	6	5	6	**12**	3	5	0	1	4	2	0	0
0	0	0	1	0	0	1	5	8	5	**7**	6	4	9	7	**13**	8	7	5	4	9	4	2	0	0
0	0	0	0	0	0	2	5	4	3	**5**	6	6	4	5	**9**	6	8	3	2	1	4	8	0	0

AM Peak 1015 - 1115 (26), AM PHF=0.72 PM Peak 1530 - 1630 (40), PM PHF=0.77

* Saturday, June 1, 2019 - Total=289, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**2**	**0**	**1**	**0**	**0**	**4**	**11**	**19**	**26**	**15**	**25**	**22**	**32**	**24**	**18**	**15**	**23**	**14**	**11**	**11**	**7**	**6**	**3**	
0	1	0	0	0	0	1	3	1	**5**	2	3	3	**7**	4	2	2	7	3	4	1	1	3	1	1
0	0	0	0	0	0	1	1	4	**7**	3	11	7	**8**	8	5	5	9	2	3	4	1	1	1	1
0	1	0	1	0	0	1	3	5	**8**	3	5	8	**8**	8	4	6	3	4	1	3	2	1	0	0
0	0	0	0	0	0	1	4	**9**	6	7	6	4	**9**	4	7	2	4	5	3	3	3	1	1	0

AM Peak 0845 - 0945 (29), AM PHF=0.81 PM Peak 1300 - 1400 (32), PM PHF=0.89

* Sunday, June 2, 2019 - Total=208, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**1**	**0**	**0**	**0**	**0**	**6**	**6**	**12**	**12**	**18**	**20**	**14**	**7**	**20**	**18**	**20**	**16**	**13**	**8**	**7**	**7**	**1**	**0**	
1	0	0	0	0	0	2	1	7	2	2	**6**	2	3	5	6	5	**5**	5	3	1	4	1	0	0
1	0	0	0	0	0	2	1	0	5	**4**	3	3	1	10	8	6	**8**	1	3	3	1	0	0	0
0	1	0	0	0	0	2	1	1	4	**6**	5	3	1	1	1	2	**3**	3	0	1	0	0	0	0
0	0	0	0	0	0	0	3	4	1	**6**	6	6	2	4	3	**7**	0	4	2	2	2	0	0	0

AM Peak 1015 - 1115 (22), AM PHF=0.92 PM Peak 1645 - 1745 (23), PM PHF=0.72

* Monday, June 3, 2019 - Total=313, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**0**	**1**	**0**	**3**	**7**	**23**	**19**	**21**	**26**	**19**	**18**	**11**	**18**	**29**	**30**	**33**	**17**	**15**	**16**	**3**	**1**	**3**	
0	0	0	0	0	1	1	3	**7**	6	8	5	3	3	5	9	**8**	10	5	3	5	2	1	0	1
0	0	0	0	0	1	0	**8**	1	7	7	5	2	5	4	4	**7**	9	4	2	5	0	0	0	1
0	0	0	1	0	0	5	**2**	3	5	5	6	5	3	2	5	**9**	6	6	4	3	0	0	2	0
0	0	0	0	0	1	1	**10**	8	3	6	3	8	0	7	**11**	6	8	2	6	3	1	0	1	0

AM Peak 0715 - 0815 (27), AM PHF=0.68 PM Peak 1545 - 1645 (35), PM PHF=0.80

* Tuesday, June 4, 2019 - Total=327, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**0**	**0**	**1**	**0**	**1**	**6**	**31**	**20**	**22**	**19**	**25**	**23**	**24**	**20**	**28**	**25**	**28**	**22**	**14**	**9**	**5**	**1**	**1**	
1	0	0	0	0	0	2	6	**7**	3	7	1	6	6	4	6	5	**6**	7	5	3	3	0	1	1
1	0	0	0	0	1	0	**8**	5	4	4	8	10	6	4	10	5	**8**	8	5	3	0	0	0	0
0	0	0	1	0	0	3	**5**	4	7	2	8	4	8	7	6	**8**	6	1	2	2	1	0	0	0
0	0	0	0	0	0	1	**12**	4	8	6	8	3	4	5	6	**7**	8	6	2	1	1	1	0	0

AM Peak 0715 - 0815 (32), AM PHF=0.67 PM Peak 1630 - 1730 (29), PM PHF=0.91

* Wednesday, June 5, 2019 - Total=312, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**0**	**1**	**0**	**0**	**2**	**8**	**22**	**25**	**18**	**23**	**20**	**15**	**14**	**28**	**24**	**30**	**26**	**23**	**14**	**10**	**6**	**2**	**0**	
1	0	1	0	0	1	2	2	**5**	4	4	3	3	3	6	4	7	9	5	3	1	3	0	0	-
0	0	0	0	0	1	1	**7**	5	4	5	8	3	1	7	9	9	6	7	2	4	1	1	0	-
0	0	0	0	0	0	3	**7**	7	4	6	6	5	6	9	6	5	5	5	3	4	2	1	0	-
0	0	0	0	0	0	2	**6**	8	6	8	3	4	4	6	5	9	6	6	6	1	0	0	0	-

AM Peak 0715 - 0815 (25), AM PHF=0.89

MetroCount Traffic Executive
Weekly Vehicle Counts

WeeklyVehicle-5 -- English (ENU)

Datasets:

Site:	**[Hawthorne Road East] On SLOW DOWN PASSING HORSES sign**
Attribute:	
Direction:	4 - West bound, A trigger first. **Lane:** 0
Survey Duration:	13:11 Tuesday, May 28, 2019 => 12:55 Thursday, June 6, 2019,
Zone:	
File:	Hawthorne Road East 0 2019-06-06 1255.EC0 (Plus)
Identifier:	DJ07CD2H MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.06)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, May 30, 2019 => 0:00 Thursday, June 6, 2019 (7)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range:	5 - 100 mph.
Direction:	North, East, South, West (bound), P = West
Separation:	Headway > 0 sec, Span 0 - 300 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)
In profile:	Vehicles = 2102 / 2788 (75.39%)

Weekly Vehicle Counts

WeeklyVehicle-5
Site: Hawthorne Road East.0.0W
Description: **On SLOW DOWN PASSING HORSES sign**
Filter time: **0:00 Thursday, May 30, 2019 => 0:00 Thursday, June 6, 2019**
Scheme: Vehicle classification (Scheme F)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12 13) Dir(NESW) Sp(5,100) Headway(>0) Span(0 - 300)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	27 May	28 May	29 May	30 May	31 May	01 Jun	02 Jun	1 - 5	1 - 7
Hour									
0000-0100	*	*	*	0	1	0	2	0.5	0.8
0100-0200	*	*	*	0	0	2	1	0.0	0.8
0200-0300	*	*	*	0	0	0	0	0.0	0.0
0300-0400	*	*	*	1	1	1	0	1.0	0.8
0400-0500	*	*	*	0	0	0	0	0.0	0.0
0500-0600	*	*	*	3	1	0	0	2.0	1.0
0600-0700	*	*	*	5	6	4	6	5.5	5.3
0700-0800	*	*	*	23	23	11	6	**23.0**	15.8
0800-0900	*	*	*	**25**	20	19	12	22.5	19.0
0900-1000	*	*	*	21	16	**26**	12	18.5	18.8
1000-1100	*	*	*	15	**24**	15	18	19.5	18.0
1100-1200	*	*	*	16	22	25	**20**	19.0	**20.8**
1200-1300	*	*	*	18	17	22	14	17.5	17.8
1300-1400	*	*	*	17	26	**32**	7	21.5	20.5
1400-1500	*	*	*	26	23	24	20	24.5	23.3
1500-1600	*	*	*	25	**34**	18	18	29.5	23.8
1600-1700	*	*	*	**31**	32	15	**20**	**31.5**	**24.5**
1700-1800	*	*	*	29	24	23	16	26.5	23.0
1800-1900	*	*	*	22	21	14	13	21.5	17.5
1900-2000	*	*	*	13	10	11	8	11.5	10.5
2000-2100	*	*	*	6	13	11	7	9.5	9.3
2100-2200	*	*	*	6	18	7	7	12.0	9.5
2200-2300	*	*	*	0	14	6	1	7.0	5.3
2300-2400	*	*	*	3	2	3	0	2.5	2.0
Totals									
0700-1900	*	*	*	268	282	244	176	275.0	242.5
0600-2200	*	*	*	298	329	277	204	313.5	277.0
0600-0000	*	*	*	301	345	286	205	323.0	284.3
0000-0000	*	*	*	305	348	289	208	326.5	287.5
AM Peak	*	*	*	0800	1000	0900	1100		
	*	*	*	25	24	26	20		
PM Peak	*	*	*	1600	1500	1300	1600		
	*	*	*	31	34	32	20		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-5
Site: Hawthorne Road East.0.0W
Description: **On SLOW DOWN PASSING HORSES sign**
Filter time: **0:00 Thursday, May 30, 2019 => 0:00 Thursday, June 6, 2019**
Scheme: Vehicle classification (Scheme F)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12 13) Dir(NESW) Sp(5,100) Headway(>0) Span(0 - 300)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	03 Jun	04 Jun	05 Jun	06 Jun	07 Jun	08 Jun	09 Jun	1 - 5	1 - 7
Hour									
0000-0100	0	2	1	*	*	*	*	1.0	1.0
0100-0200	0	0	0	*	*	*	*	0.0	0.0
0200-0300	0	0	1	*	*	*	*	0.3	0.3
0300-0400	1	1	0	*	*	*	*	0.7	0.7
0400-0500	0	0	0	*	*	*	*	0.0	0.0
0500-0600	3	1	2	*	*	*	*	2.0	2.0
0600-0700	7	6	8	*	*	*	*	7.0	7.0
0700-0800	23	**31**	22	*	*	*	*	**25.3**	**25.3**
0800-0900	19	20	**25**	*	*	*	*	21.3	21.3
0900-1000	21	22	18	*	*	*	*	20.3	20.3
1000-1100	**26**	19	23	*	*	*	*	22.7	22.7
1100-1200	19	25	20	*	*	*	*	21.3	21.3
1200-1300	18	23	15	*	*	*	*	18.7	18.7
1300-1400	11	24	14	*	*	*	*	16.3	16.3
1400-1500	18	20	28	*	*	*	*	22.0	22.0
1500-1600	29	28	24	*	*	*	*	27.0	27.0
1600-1700	30	25	**30**	*	*	*	*	28.3	28.3
1700-1800	**33**	**28**	26	*	*	*	*	**29.0**	**29.0**
1800-1900	17	22	23	*	*	*	*	20.7	20.7
1900-2000	15	14	14	*	*	*	*	14.3	14.3
2000-2100	16	9	10	*	*	*	*	11.7	11.7
2100-2200	3	5	6	*	*	*	*	4.7	4.7
2200-2300	1	1	2	*	*	*	*	1.3	1.3
2300-2400	3	1	0	*	*	*	*	1.3	1.3
Totals									
0700-1900	264	287	268	*	*	*	*	273.0	273.0
0600-2200	305	321	306	*	*	*	*	310.7	310.7
0600-0000	309	323	308	*	*	*	*	313.3	313.3
0000-0000	313	327	312	*	*	*	*	317.3	317.3
AM Peak	1000	0700	0800	*	*	*	*		
	26	31	25	*	*	*	*		
PM Peak	1700	1700	1600	*	*	*	*		
	33	28	30	*	*	*	*		

*** - No data.**

MetroCount Traffic Executive
Class Speed Matrix

ClassMatrix-9 -- English (ENU)

Datasets:

Site:	**[Hawthorne Road West] Neighborhood Watch Sign**
Attribute:	
Direction:	2 - East bound, A trigger first. **Lane:** 0
Survey Duration:	13:42 Tuesday, May 28, 2019 => 13:10 Thursday, June 6, 2019,
Zone:	
File:	Hawthorne Road West 0 2019-06-06 1311.EC0 (Regular)
Identifier:	E962A3GE MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.06)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, May 30, 2019 => 0:00 Thursday, June 6, 2019 (7)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range:	5 - 100 mph.
Direction:	North, East, South, West (bound), P = East
Separation:	Headway > 0 sec, Span 0 - 300 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)
In profile:	Vehicles = 1522 / 1963 (77.53%)

Class Speed Matrix

ClassMatrix-9
Site: Hawthorne Road West.0.0E
Description: **Neighborhood Watch Sign**
Filter time: **0:00 Thursday, May 30, 2019 => 0:00 Thursday, June 6, 2019**
Scheme: Vehicle classification (Scheme F)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12 13) Dir(NESW) Sp(5,100) Headway(>0) Span(0 - 300)

Speed (mph)	Class													Speed Totals	
	F1 1	F2 2	F3 3	F4 4	F5 5	F6 6	F7 7	F8 8	F9 9	F10 10	F11 11	F12 12	F13 13		
5 - 10	.	1	.	.	.	.	.	.	.	.	.	.	.	1	0.1%
10 - 15	.	3	9	.	.	.	.	.	.	.	.	.	.	12	0.8%
15 - 20	2	20	18	.	2	3	1	.	.	.	.	.	.	46	3.0%
20 - 25	5	79	75	.	1	.	.	.	.	.	.	.	.	160	10.5%
25 - 30	1	215	104	3	3	4	2	2	1	.	.	.	.	335	22.0%
30 - 35	1	300	165	11	6	3	1	4	1	.	.	.	.	492	32.3%
35 - 40	2	196	120	6	3	.	1	3	2	.	.	.	.	333	21.9%
40 - 45	.	57	47	.	1	.	.	1	.	.	.	.	.	106	7.0%
45 - 50	.	12	9	.	2	.	.	.	.	.	.	.	.	23	1.5%
50 - 55	.	4	4	1	1	.	.	.	.	.	.	.	.	10	0.7%
55 - 60	.	1	1	.	1	.	.	.	.	.	.	.	.	3	0.2%
60 - 65	.	.	.	.	1	.	.	.	.	.	.	.	.	1	0.1%
65 - 70	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
70 - 75	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
75 - 80	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0.0%
Class Totals	11	888	552	21	21	10	5	10	4	0	0	0	0	1522	
	0.7%	58.3%	36.3%	1.4%	1.4%	0.7%	0.3%	0.7%	0.3%	0.0%	0.0%	0.0%	0.0%		

MetroCount Traffic Executive
Vehicle Counts

VehicleCount-7 -- English (ENU)

Datasets:

Site:	**[Hawthorne Road West] Neighborhood Watch Sign**
Attribute:	
Direction:	2 - East bound, A trigger first. **Lane:** 0
Survey Duration:	13:42 Tuesday, May 28, 2019 => 13:10 Thursday, June 6, 2019,
Zone:	
File:	Hawthorne Road West 0 2019-06-06 1311.EC0 (Regular)
Identifier:	E962A3GE MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.06)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, May 30, 2019 => 0:00 Thursday, June 6, 2019 (7)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range:	5 - 100 mph.
Direction:	North, East, South, West (bound), P = East
Separation:	Headway > 0 sec, Span 0 - 300 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)
In profile:	Vehicles = 1522 / 1963 (77.53%)

* Thursday, May 30, 2019 - Total=231, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**1**	**0**	**2**	**0**	**1**	**8**	**11**	**20**	**11**	**9**	**15**	**9**	**13**	**17**	**15**	**23**	**28**	**17**	**12**	**6**	**10**	**0**	**2**	
0	1	0	0	0	1	1	3	**6**	3	2	5	1	7	1	1	5	**10**	6	7	2	2	0	0	2
1	0	0	1	0	0	1	5	**2**	3	2	3	4	1	5	1	5	**6**	6	2	0	6	0	2	0
0	0	0	1	0	0	1	1	**9**	4	3	3	1	1	3	5	**5**	4	3	0	2	2	0	0	0
0	0	0	0	0	0	5	2	**3**	1	2	4	3	4	8	8	**8**	8	2	3	2	0	0	0	0

AM Peak 0800 - 0900 (20), AM PHF=0.56 PM Peak 1630 - 1730 (29), PM PHF=0.72

* Friday, May 31, 2019 - Total=244, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**0**	**0**	**1**	**0**	**2**	**6**	**18**	**18**	**8**	**21**	**14**	**8**	**21**	**17**	**23**	**11**	**16**	**19**	**13**	**9**	**7**	**7**	**3**	
2	0	0	0	0	1	1	5	1	1	4	**7**	3	6	2	**9**	1	5	4	3	0	2	4	0	1
0	0	0	0	0	0	1	7	5	1	**6**	2	2	6	7	**6**	4	4	6	5	3	2	1	2	1
0	0	0	1	0	1	2	0	6	3	**4**	3	1	2	3	**5**	4	0	6	2	2	2	1	1	1
0	0	0	0	0	0	2	6	6	3	**7**	2	2	7	**5**	3	2	7	3	3	4	1	1	0	1

AM Peak 1015 - 1115 (24), AM PHF=0.86 PM Peak 1445 - 1545 (25), PM PHF=0.69

* Saturday, June 1, 2019 - Total=202, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
4	**0**	**0**	**1**	**0**	**0**	**5**	**4**	**12**	**11**	**21**	**16**	**16**	**20**	**14**	**9**	**18**	**15**	**12**	**6**	**9**	**4**	**4**	**1**	
1	0	0	0	0	0	0	1	4	3	**7**	2	5	**8**	3	3	5	4	2	0	2	1	2	0	2
1	0	0	0	0	0	2	1	3	1	**3**	7	4	**3**	2	1	5	3	1	2	1	2	1	1	0
1	0	0	1	0	0	2	1	4	4	**7**	2	5	**7**	6	3	2	5	6	2	3	1	1	0	0
1	0	0	0	0	0	1	1	1	3	**4**	5	**2**	2	3	2	6	3	3	2	3	0	0	0	0

AM Peak 1000 - 1100 (21), AM PHF=0.75 PM Peak 1245 - 1345 (20), PM PHF=0.63

* Sunday, June 2, 2019 - Total=158, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
2	**2**	**0**	**1**	**0**	**0**	**1**	**3**	**4**	**10**	**12**	**9**	**14**	**11**	**15**	**17**	**12**	**13**	**9**	**10**	**7**	**4**	**0**	**2**	
2	0	0	0	0	0	0	0	0	0	4	1	**6**	2	1	**5**	3	2	4	4	1	1	0	1	0
0	1	0	0	0	0	0	1	0	4	5	1	**3**	2	6	**8**	1	4	1	2	0	2	0	0	0
0	1	0	0	0	0	1	1	3	3	1	**4**	1	3	**6**	3	3	6	1	2	3	1	0	1	0
0	0	0	1	0	0	0	1	1	3	2	**3**	4	4	**2**	1	5	1	3	2	3	0	0	0	0

AM Peak 1130 - 1230 (16), AM PHF=0.67 PM Peak 1430 - 1530 (21), PM PHF=0.66

* Monday, June 3, 2019 - Total=211, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**1**	**0**	**1**	**1**	**1**	**12**	**17**	**13**	**5**	**16**	**14**	**16**	**11**	**15**	**11**	**13**	**15**	**21**	**12**	**9**	**2**	**4**	**1**	
0	0	0	0	0	0	1	**5**	2	1	4	1	5	2	3	0	4	2	**6**	4	5	0	1	1	0
0	0	0	0	0	0	1	**7**	4	2	8	10	1	2	4	4	4	7	**5**	2	1	1	1	0	1
0	1	0	1	0	0	**4**	3	4	1	0	1	5	4	3	4	3	3	**4**	3	2	1	0	0	0
0	0	0	0	1	1	**6**	2	3	1	4	2	5	3	5	3	2	3	**6**	3	1	0	2	0	0

AM Peak 0630 - 0730 (22), AM PHF=0.79 PM Peak 1800 - 1900 (21), PM PHF=0.88

* Tuesday, June 4, 2019 - Total=249, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
1	**0**	**0**	**1**	**1**	**1**	**13**	**27**	**16**	**14**	**20**	**12**	**21**	**9**	**23**	**14**	**14**	**22**	**8**	**14**	**8**	**6**	**3**	**1**	
0	0	0	0	0	1	0	**10**	3	2	7	2	7	3	**7**	4	6	3	1	1	3	0	3	0	0
1	0	0	0	0	0	5	**8**	1	5	4	3	6	5	**4**	1	1	7	4	6	2	3	0	0	0
0	0	0	1	0	0	4	**7**	7	3	4	4	3	0	**4**	6	4	3	1	2	1	2	0	0	0
0	0	0	0	1	0	**4**	2	5	4	5	3	5	1	**8**	3	3	9	2	5	2	1	0	1	0

AM Peak 0645 - 0745 (29), AM PHF=0.72 PM Peak 1400 - 1500 (23), PM PHF=0.72

* Wednesday, June 5, 2019 - Total=227, 15 minute drops

0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
0	**0**	**1**	**0**	**1**	**1**	**14**	**17**	**10**	**14**	**9**	**17**	**10**	**19**	**10**	**20**	**12**	**19**	**20**	**20**	**9**	**4**	**0**	**0**	
0	0	1	0	0	0	4	**4**	2	6	6	5	4	3	3	8	3	4	5	9	0	0	0	0	-
0	0	0	0	0	0	2	**5**	2	5	2	4	1	5	2	5	2	8	7	6	4	2	0	0	-
0	0	0	0	0	1	2	**4**	2	0	0	4	2	4	1	1	3	4	5	3	3	0	0	0	-
0	0	0	0	1	0	**6**	4	4	3	1	4	3	7	4	6	4	3	3	2	2	2	0	0	-

AM Peak 0645 - 0745 (19), AM PHF=0.79

MetroCount Traffic Executive
Weekly Vehicle Counts

WeeklyVehicle-8 -- English (ENU)

Datasets:

Site:	**[Hawthorne Road West] Neighborhood Watch Sign**
Attribute:	
Direction:	2 - East bound, A trigger first. **Lane:** 0
Survey Duration:	13:42 Tuesday, May 28, 2019 => 13:10 Thursday, June 6, 2019,
Zone:	
File:	Hawthorne Road West 0 2019-06-06 1311.EC0 (Regular)
Identifier:	E962A3GE MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v4.06)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, May 30, 2019 => 0:00 Thursday, June 6, 2019 (7)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Speed range:	5 - 100 mph.
Direction:	North, East, South, West (bound), P = East
Separation:	Headway > 0 sec, Span 0 - 300 ft
Name:	Default Profile
Scheme:	Vehicle classification (Scheme F)
Units:	Non metric (ft, mi, ft/s, mph, lb, ton)
In profile:	Vehicles = 1522 / 1963 (77.53%)

Weekly Vehicle Counts

WeeklyVehicle-8
Site: Hawthorne Road West.0.0E
Description: **Neighborhood Watch Sign**
Filter time: **0:00 Thursday, May 30, 2019 => 0:00 Thursday, June 6, 2019**
Scheme: Vehicle classification (Scheme F)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12 13) Dir(NESW) Sp(5,100) Headway(>0) Span(0 - 300)

	Mon 27 May	Tue 28 May	Wed 29 May	Thu 30 May	Fri 31 May	Sat 01 Jun	Sun 02 Jun	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	*	*	*	1	2	4	2	1.5	2.3
0100-0200	*	*	*	1	0	0	2	0.5	0.8
0200-0300	*	*	*	0	0	0	0	0.0	0.0
0300-0400	*	*	*	2	1	1	1	1.5	1.3
0400-0500	*	*	*	0	0	0	0	0.0	0.0
0500-0600	*	*	*	1	2	0	0	1.5	0.8
0600-0700	*	*	*	8	6	5	1	7.0	5.0
0700-0800	*	*	*	11	18	4	3	14.5	9.0
0800-0900	*	*	*	**20**	18	12	4	**19.0**	13.5
0900-1000	*	*	*	11	8	11	10	9.5	10.0
1000-1100	*	*	*	9	**21**	**21**	**12**	15.0	**15.8**
1100-1200	*	*	*	15	14	16	9	14.5	13.5
1200-1300	*	*	*	9	8	16	14	8.5	11.8
1300-1400	*	*	*	13	21	**20**	11	17.0	16.3
1400-1500	*	*	*	17	17	14	15	17.0	15.8
1500-1600	*	*	*	15	**23**	9	**17**	19.0	16.0
1600-1700	*	*	*	23	11	18	12	17.0	16.0
1700-1800	*	*	*	**28**	16	15	13	**22.0**	**18.0**
1800-1900	*	*	*	17	19	12	9	18.0	14.3
1900-2000	*	*	*	12	13	6	10	12.5	10.3
2000-2100	*	*	*	6	9	9	7	7.5	7.8
2100-2200	*	*	*	10	7	4	4	8.5	6.3
2200-2300	*	*	*	0	7	4	0	3.5	2.8
2300-2400	*	*	*	2	3	1	2	2.5	2.0
Totals									
0700-1900	*	*	*	188	194	168	129	191.0	169.8
0600-2200	*	*	*	224	229	192	151	226.5	199.0
0600-0000	*	*	*	226	239	197	153	232.5	203.8
0000-0000	*	*	*	231	244	202	158	237.5	208.8
AM Peak	*	*	*	0800	1000	1000	1000		
	*	*	*	20	21	21	12		
PM Peak	*	*	*	1700	1500	1300	1500		
	*	*	*	28	23	20	17		

*** - No data.**

Weekly Vehicle Counts

WeeklyVehicle-8
Site: Hawthorne Road West.0.0E
Description: **Neighborhood Watch Sign**
Filter time: **0:00 Thursday, May 30, 2019 => 0:00 Thursday, June 6, 2019**
Scheme: Vehicle classification (Scheme F)
Filter: Cls(1 2 3 4 5 6 7 8 9 10 11 12 13) Dir(NESW) Sp(5,100) Headway(>0) Span(0 - 300)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
	03 Jun	04 Jun	05 Jun	06 Jun	07 Jun	08 Jun	09 Jun	1 - 5	1 - 7
Hour									
0000-0100	0	1	0	*	*	*	*	0.3	0.3
0100-0200	1	0	0	*	*	*	*	0.3	0.3
0200-0300	0	0	1	*	*	*	*	0.3	0.3
0300-0400	1	1	0	*	*	*	*	0.7	0.7
0400-0500	1	1	1	*	*	*	*	1.0	1.0
0500-0600	1	1	1	*	*	*	*	1.0	1.0
0600-0700	12	13	14	*	*	*	*	13.0	13.0
0700-0800	**17**	**27**	17	*	*	*	*	**20.3**	**20.3**
0800-0900	13	16	10	*	*	*	*	13.0	13.0
0900-1000	5	14	14	*	*	*	*	11.0	11.0
1000-1100	16	20	9	*	*	*	*	15.0	15.0
1100-1200	14	12	**17**	*	*	*	*	14.3	14.3
1200-1300	16	21	10	*	*	*	*	15.7	15.7
1300-1400	11	9	19	*	*	*	*	13.0	13.0
1400-1500	15	**23**	10	*	*	*	*	16.0	16.0
1500-1600	11	14	20	*	*	*	*	15.0	15.0
1600-1700	13	14	12	*	*	*	*	13.0	13.0
1700-1800	15	22	19	*	*	*	*	**18.7**	**18.7**
1800-1900	**21**	8	20	*	*	*	*	16.3	16.3
1900-2000	12	14	**20**	*	*	*	*	15.3	15.3
2000-2100	9	8	9	*	*	*	*	8.7	8.7
2100-2200	2	6	4	*	*	*	*	4.0	4.0
2200-2300	4	3	0	*	*	*	*	2.3	2.3
2300-2400	1	1	0	*	*	*	*	0.7	0.7
Totals									
0700-1900	167	200	177	*	*	*	*	181.3	181.3
0600-2200	202	241	224	*	*	*	*	222.3	222.3
0600-0000	207	245	224	*	*	*	*	225.3	225.3
0000-0000	211	249	227	*	*	*	*	229.0	229.0
AM Peak	0700	0700	1100	*	*	*	*		
	17	27	17	*	*	*	*		
PM Peak	1800	1400	1900	*	*	*	*		
	21	23	20	*	*	*	*		

*** - No data.**