A G E N D A
CITY OF WAUPUN BOARD OF PUBLIC WORKS
Waupun City Hall – 201 E. Main Street, Waupun WI
Tuesday, January 22, 2019 at 4:45 PM

CALL TO ORDER

ROLL CALL

PERSONS WISHING TO ADDRESS THE BOARD OF PUBLIC WORKS--*State name, address, and subject of comments. (2 Minutes)*

No Public Participation after this point.

FUTURE MEETINGS AND GATHERING INVOLVING THE BOARD OF PUBLIC WORKS

CONSIDERATION - ACTION

1. Approve Minutes of the January 8, 2019 meeting.
2. Discuss / Approve pavement for the Madison Street project.

ADJOURNMENT

Upon reasonable notice, efforts will be made to accommodate disabled individuals through appropriate aids and services. For additional information, contact the City Clerk at 920-324-7915.

CITY OF WAUPUN CITY CLERK-D. TREASURER
Waupun City Hall – 201 E. Main Street, Waupun WI
P: 920-324-7915 * F: 920-324-3980
www.cityofwaupun.org

Waupun Board of Public Works
DRAFT Minutes of Regular Meeting **January 8, 2019**

The Waupun Board of Public Works met in regular session on Tuesday, January 8, 2019, in the Common Council Chambers at the Waupun City Hall located at 201 E. Main Street, Waupun.

Kaczmarski calls the meeting to order at 4:30pm.

Members present at roll call are Chairman/Alderman Kaczmarski, Alderman Mielke, Alderman Matoushek, Public Works Director Daane, City Clerk Hull, and Deputy Police Chief Rasch. No members are absent.

Other City Staff in attendance: Mayor Nickel and Administrator Schlieve.

No audience is in attendance.

Mielke notes a typo in the minutes relating to the motion revising the 5 year plan. There is a 0 between" Edgewood Drive0 and Brandon".

Motion Matoushek, second by Rasch to approve the minutes from the December 11, 2018 meeting of the Board of Public Works with the corrections as noted from Mielke. Motion carried 6-0.

Daane provides the results of the request for proposals for the annual storm sewer inspections. Three proposals were received: Green Bay Pipe & TV ($0.55/ft.), Great Lakes TV Sealing Inc. ($0.51/ft.), and Northern Pipe ($0.40/ft.).

Motion Hull, second Matoushek to award the request for proposal to Northern Pipe. Motion carried 6-0.

At the November Public Works meeting, discussions of a draft ordinance to amend Ch.7.15 entitled Streets, Alleys, and Sidewalk was heard. The draft ordinance provides for the cost sharing of improvements between the city and the abutting property owners for street construction. At the November meeting, the Board of Public Works made motion to recommend to Common Council to review and consider the ordinance.

Additional information relating to this draft ordinance was provided to the Board for their review. Information provided an overview of comparable communities and their cost sharing practices.

No action was taken.

Motion Daane, second Matoushek to adjourn the meeting of the Board of Public Works at 5:02p. Motion carried 6-0.

Angela Hull, Clerk

TECHNICAL MEMORANDUM_____

Date: January 16, 2019

To: Jeff Daane, Director of Public Works
City of Waupun

From: Jeff Chvosta, PE
Project Engineer
Gremmer & Associates, Inc.

Subject: **Pavement Design**
Madison Street
Doty Street – South Branch Rock River
City of Waupun
Dodge & Fond du Lac County

This technical memo summarizes the analysis of various pavement structure designs for Madison Street, located in the City of Waupun, Dodge County and Fond du Lac County. This project is an urban reconstruction of Madison Street beginning at the intersection of Doty Street and extending north 0.98 miles to the bridge crossing the South Branch of the Rock River. The adjacent land use is residential and commercial. The terrain is rolling and the horizontal alignment is north/south. The project is classified as a reconstruction.

We evaluated the pavement structures using WisPave Pavement Design Software, utilizing pavement design parameters given in the soils report provided by Intertek PSI (Exhibit 1) and 2014 traffic count data from the Wisconsin Department of Transportation online traffic count map (Exhibit 2) assuming a 1% growth rate over 20 years. Truck classifications and percentages are assumed based on similar previous projects with the understanding that the City of Waupun has recently approved a resolution to remove the designated truck route from Madison Street.

Pavement Alternatives

The City of Waupun lies within Wisconsin Department of Transportation Standard Inclusion Area for use of select materials in subgrades (Exhibit 3). The standard on past projects within the City of Waupun and Dodge County has included the use of 12-inches of select crushed material over geogrid to improve the roadway subgrade. The pavement design parameters have been adjusted to reflect the improved subgrade.

It is understood that the City of Waupun would prefer to utilize concrete pavement. The following summarizes the HMA and Concrete pavement alternatives.

The minimum concrete pavement design meeting the required structural number for the roadway consists of 7-inch Concrete Pavement (doweled) over 6-inches of base aggregate dense (1 ¼-inch). However, based on previous discussions with the City of Waupun and adjacent projects, the preferred alternative is an 8-inch Concrete Pavement (doweled) over 6-inches of base aggregate dense (1 ¼-inch).

The minimum asphaltic pavement design meeting the required structural number for the roadway consists of 5-inch HMA Pavement over 10-inches of base aggregate dense (1 ¼-inch). The HMA Pavement shall be constructed in two layers. The upper layers shall be 2-inch thick MT 58-28 S with a 12.5 mm nominal size aggregate gradation. The lower layer shall be 3-inch thick MT 58-28 S with a 19.0 mm nominal size aggregate gradation.

The initial construction cost for the 8-inch concrete pavement alternative is approximately $500,000 more than the asphaltic pavement alternative. This does not include life cycle costs.

See Exhibit 4 for the WisPave results detailing the pavement structure alternatives.

Exhibit 1

Pavement Design Parameters from Soils Report

Ripon Office
608 North Stanton Street
Ripon, Wisconsin 54971

January 9, 2019

Mr. Thomas Lanser
Gremmer and Associates
93 South Pioneer Road, Suite 300
Fond du Lac, Wisconsin 54935

Re: Subsurface Exploration and Subgrade Evaluation
Madison Street Reconstruction
North and South Madison Street
Waupun, Wisconsin
PSI Project No. 00921240

Dear Mr. Lanser,

The subsurface exploration and subgrade evaluation for the above referenced project has been completed, the results of which are included herein. A copy has been provided electronically. After you have had the opportunity of reading the report, please call at any time with any questions or comments you may have. Professional Service Industries, Inc. (PSI), the opportunity to be of service on this project, and looks forward to continuing as your geotechnical consultant during the design and construction phases, as well as your upcoming projects.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Hanna Dolinski
Staff Geologist

Jeffery Fischer
Branch Manager

James M. Becco, P.E.
Vice President

SUBSURFACE EXPLORATION AND SUBGRADE EVALUATION

Madison Street Reconstruction
North and South Madison Street
Waupun, Wisconsin

Hanna Dolinski
Staff Geologist

Prepared for

Mr. Thomas Lanser
Gremmer and Associates
93 South Pioneer Road, Suite 300
Fond du Lac, Wisconsin 54935

Jeffrey Fischer
Branch Manager

Prepared by

Professional Service Industries, Inc.
608 North Stanton Street
Ripon, Wisconsin 54971

James M. Becco, P.E.
Vice President

Date: January 9, 2019

PSI Project: 00921240

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INTRODUCTION

General

This report presents the results of the subsurface exploration and subgrade evaluation for the proposed Madison Street Reconstruction in Waupun, Wisconsin. The work was performed for Gremmer and Associates, at the request of Mr. Thomas Lanser.

Purpose

The purpose of this study was to evaluate the subsurface conditions at specific boring locations along the roadway, and to establish parameters for use by the design engineers and architects in preparing the subgrade and pavement designs for the proposed project.

Scope

The scope of services included a site reconnaissance, the subsurface exploration, a determination of soil characteristics by field and laboratory testing, and an evaluation and analysis of the data obtained. The scope of the field exploration program, including the number, depth, and location of the borings, was determined by the client. An evaluation of utilities, stormwater designs, or other below grade structures was not requested or performed.

Authorization

The description of services and authorization to perform this subsurface exploration and subgrade evaluation were in the form of a signed acceptance copy of PSI Proposal No. 0092-243609, dated November 28, 2018. The general conditions for the performance of the work were referenced in the proposal. This report has been prepared on behalf of, and exclusively for the use of Gremmer and Associates. The information contained in this report may not be relied upon by any other parties without the express written consent of PSI, and acceptance by such parties of PSI' General Conditions.

SITE AND PROJECT DESCRIPTION

Site Features

The project area is located along an approximate one mile section of North and South Madison Street between the intersection of Doty Street and Monroe Street, extending about 300 feet north of Monroe Street, in Waupun, Wisconsin. At the time of exploration, the project area consisted of the existing South and North Madison Street with sidewalks bordering the east and west sides of the road. Based upon aerial photography viewed on

Google Earth, it appears that the project area has remained a paved road in each of the available photographs dating back to 1992.

The topography of the site is generally hilly, sloping down towards the north, with an elevation difference of about 44 feet between the borings. The surface of the site was firm at the time of the exploration and the drill rig experienced no difficulty in moving around. The surrounding parcels consist of South Madison Street to the south; Rock River and North Madison Street to the north; residential and commercial properties to the east and west.

Project Description

From the information provided by the client, it is understood that the proposed project will consist of the complete reconstruction of a portion of South and North Madison Street. The proposed road reconstruction will consist of a 48-foot-wide (Doty to Jefferson Street) to 46-foot-wide (Jefferson Street to Rock River) roadway, with a concrete curb, extending for a length of about one mile, from Doty Street to about 300 feet north of Monroe Street. At the time of this report it, it had not been determined whether the reconstruction will consist of concrete or asphalt pavement. Only minor grade changes are anticipated for the roadway. Design traffic loads were not provided to PSI for use in this evaluation. It is estimated that the proposed roadway will be subjected to relatively moderate automobile traffic, with traffic volumes ranging from about 2,500 vehicles per day to 4,200 vehicles per day, according to the WisDOT Traffic Count Map, according to the client.

EXPLORATION AND LABORATORY PROCEDURES

Scope Summary

The field and laboratory data utilized in the evaluation and analysis of the subsurface materials was obtained by drilling exploratory test borings, securing soil samples by the split-spoon sampling method, and subjecting the samples to laboratory testing.

Field Exploration

Six (6) soil test borings to a depth of about 11.5 feet were proposed for this project. However, auger refusal was experienced at B-1, B-2, and B-4 at depths ranging from about 5.5 to 7.5 feet (EL. 895.5 to EL. 914.5) on cobbles, boulders, or possible bedrock. At the request of the client, the borings were not offset for redrilling after initial refusal was encountered. The number, depth, and approximate location of the soil borings was provided by the client. The borings were located in the field by the drill crew utilizing conventional taping procedures referenced to existing site features and apparent property lines. They are estimated to be accurate to within several feet.

The surface elevations shown on the logs were estimated by interpolation of a Plan and Profile Map provided by the client. The elevations are estimated to be accurate to within about 1 foot.

The soil test borings were performed with a truck-mounted rotary drilling rig utilizing continuous flight hollow stem augers to advance the holes. Representative samples were obtained by the Standard Penetration Test (SPT) method using split-spoon sampling procedures in general accordance with ASTM D-1586 procedures. Samples were collected at 2.5 foot intervals to 10 feet, and then at 5 foot intervals thereafter to the end of the borings. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling thirty (30) inches, required to advance the split-spoon sampler one (1) foot into the soil. The sampler is lowered to the bottom of the drill hole and the number of blows recorded for each of the three (3) successive increments of six (6) inches penetration. The “N” value is obtained by adding the second and third incremental numbers. The SPT provides a means of estimating the relative density of granular soils and comparative consistency of cohesive soils, thereby providing a method of evaluating the relative strength and compressibility characteristics of the subsoils.

The SPT samples were transferred into clean glass jars immediately after retrieval and returned to the laboratory upon completion of the field operations. Samples will be discarded unless other instructions are received. All soil samples were visually classified by a soil engineer in general accordance with the Unified Soil Classification System (ASTM D- 2488-75). A description of the subsurface conditions encountered at each boring location is shown on the enclosed Soil Boring Logs. After completion of the borings, the auger holes were backfilled to the ground surface with bentonite chips in borings greater than 10 feet.

A copy of the Soil Boring Logs and Boring Location Plan (Figure 1) are enclosed in the Appendix. The soil stratification shown on the logs represents the approximate soil conditions in the actual boring locations at the time of the exploration. The terms and symbols used on the logs are described in the General Notes found in the Appendix.

Laboratory Physical Testing

Soil samples obtained from the exploration were visually classified in the laboratory, and subjected to testing, which included moisture content determinations. The laboratory testing was performed in general accordance with the respective ASTM methods, as applicable, and the results are shown on the boring logs in the Appendix.

DESCRIPTION OF SUBSURFACE CONDITIONS

General

A description of the subsurface conditions encountered at the test boring locations is shown on the Soil Boring Logs. The lines of demarcation shown on the logs represent approximate boundaries between the various soil classifications. It must be recognized that the soil descriptions are considered representative for the specific test hole location, but that variations may occur between and beyond the sampling intervals and boring locations. Soil depths, topsoil and layer thicknesses, and demarcation lines utilized for preconstruction planning should not be expected to yield exact and final quantities. A summary of the major soil profile components is described in the following paragraphs.

Soil Conditions

The surface materials encountered at the borings consisted of about 5 to 6.5 inches of asphalt followed by about 3.5 to 6 inches of concrete, with the exception of B-1 and B-6. Beneath the asphalt at B-1 was about 2 feet (EL. 916.5) of light brown gravelly sand with silt, classified as base course. At B-6, the surface materials were underlain by about 4 inches of dark brown gravelly sand with silt, classified as base course followed by about 4 inches of concrete.

The underlying soils at the borings consisted of dark brown to brown sand and/or clay with silt and varying amounts of gravel classified as fill to depths of about 1.5 to 7.5 feet (EL. 917.5 to EL. 874). Beneath the fill, the underlying natural soils at each boring predominantly consisted of dark brown to gray clay, sand, and/or silt with varying amounts of gravel and cobbles to the maximum depth explored by the borings.

The granular fill soils were in a dense to very dense condition, with Standard Penetration Resistances (N-values) between 30 blows per foot of penetration (bpf) and 50 blows per 5 inches of penetration. The cohesive fill soils were medium stiff to hard in consistency with unconfined compressive strengths ranging from about 0.5 to 4.0 tsf. The natural granular soils were in a dense to very dense condition, with N-values typically between 15 bpf and 50 blows per 2 inches of penetration. The natural cohesive soils were stiff in consistency with unconfined compressive strengths ranging from about 1.0 to 1.5 tsf.

It should be noted that auger refusal was experienced at B-1, B-2, and B-4 at depths ranging from about 5.5 to 7.5 feet (EL. 895.5 to EL. 914.5) on cobbles, boulders, or possible bedrock. Refusal depths are outlined below:

Boring No.	Approximate Refusal Elevation	Approximate Refusal Depth (Feet)
B-1	911	7.5
B-2	914.5	5.5
B-4	895.5	5.5

The fill materials were classified as such based on their varied visual characteristics and composition. However, it must be recognized that in the absence of foreign substances and/or debris within the soil samples obtained, it is difficult to distinguish between natural soils and clean soil fill.

The foregoing discussion of soil conditions on this site represents a generalized soil profile as determined at the test boring locations. A more detailed description and supporting data for each test location can be found on the individual Soil Boring Logs.

Groundwater Observations

Groundwater observations were made during the drilling operations, and in the open boreholes upon completion. Groundwater was not encountered in the borings at the time of auger advancement or upon completion. All of the holes caved to varying depths upon withdrawal of the auger; therefore, observations could not be made below the caved depth.

The groundwater observations reported herein are considered approximate. It must be recognized that groundwater levels fluctuate with time due to variations in seasonal precipitation, lateral drainage conditions, and soil permeability characteristics. Longer term monitoring would be required to better evaluate groundwater levels on this site.

EVALUATION AND RECOMMENDATIONS

Pavement Subgrade Analysis

On the basis of the data obtained in the exploration, the subgrade soils encountered along the project route generally consisted of clay fill, which have been assigned an estimated visual classification of A-6 by the AASHTO soil classification method. They are generally rated as poor in applications for pavement subgrade. These soils are also generally poorly drained, can exhibit low bearing support when wet, have moderate to high shrink-swell potential, and high frost susceptibility.

Analysis of the visual soil classifications and laboratory testing information has been made in determining pertinent engineering properties of the subgrade soils. Based on the engineering properties determined from the subgrade soils tested, and with proper subgrade preparation and drainage, the following pavement subgrade design coefficients are recommended for pavement section thickness design along the entire roadway alignment. These values are representative of the support conditions exhibited by the anticipated clay subgrade materials. All fill used to raise grades or replace unsuitable materials must have equal or greater support characteristics.

PAVEMENT SUBGRADE DESIGN COEFFICIENTS

AASHTO Soil Classification	A-6
Design Frost Index	F-3 to F-4
Design Group Index	13
Soil Support Value	4
Estimated Subgrade Modulus (k)	175 pci

Selective Subgrade Removal and Replacement

The soils encountered in the borings can generally be used as the pavement subgrade, provided the soils are evaluated and prepared as discussed in this report. However, zones of unsuitable soils may be encountered. Therefore, some removal and replacement may be required, and may become extensive, at least in isolated areas. In addition, the majority of the soils along the project route are highly moisture sensitive and subject to substantial instability in the presence of water, especially when exposed to construction traffic. During wet and/or cool weather, softened subgrade soils may develop over large areas. This can result in the need for substantial drying times; significant reworking, drying, discing; and/or the necessity for removal and replacement with crushed stone or compacted structural fill.

Site Drainage

In general, the subgrade soils encountered in the borings are considered to be poorly drained. Drainage action of the subgrade is dependent on the amount of fines (silt and clay) present. The presence of fines decreases the drainability of a soil, and therefore, increases its sensitivity to moisture and frost, which can result in increased instability. In addition, the proposed project is located in an area that experiences annual freezing cycles and the subgrade soils encountered have been classified as moderately to highly susceptible to frost action when free water is present.

The detrimental effects of frost action within frost susceptible subgrade materials are manifested by non-uniform heave of pavements during winter months and/or the loss of strength of the subgrade during thawing periods. In order to maintain a relatively dry subgrade condition and reduce the potential for frost action, it will be necessary to control surface runoff and water seepage, since complete removal and replacement of the frost susceptible subgrade soils is may not be economically feasible. Adequate longitudinal slope must be provided to maintain runoff below the top of the pavement subgrade, and proper base course drainage must be provided.

CONSTRUCTION CONSIDERATIONS

Pavement Subgrade Preparation

All vegetation and topsoil, and the existing pavement must be removed throughout the proposed roadway. The exposed subgrade should then be prepared as outlined in Section 211 of the WisDOT Standard Specifications. The subgrade should be thoroughly proofrolled to detect unstable, yielding or unsuitable soils, which must be removed or improved by appropriate preparation and compaction techniques. Scarification and drying of unsuitable soils, or removal and replacement with suitable fill, are two methods, which can be considered. This should be determined at the time of construction by a qualified soils engineer. Low areas may then be raised to the planned grades with suitable properly compacted fill where necessary. Substantial areas of soft, wet, or otherwise unsuitable soils, requiring undercutting and removal, may be encountered.

In areas where organic, wet, soft or yielding subgrade conditions are encountered during subgrade preparation or a stable subgrade cannot be obtained, selective excavation below subgrade (EBS) and replacement may be required for proper support of new fills, or pavement reconstruction. Excavation below subgrade (EBS) should be performed as outlined in Section 205 of the WisDOT Standard Specifications. The necessity and ultimate extent of undercutting will be dependent upon the soil type encountered, moisture condition, and stability of the exposed subgrade at the time of construction. In areas of EBS, limited excavation below subgrade to a depth of 2 feet and replacement with granular fill, such as those specified in Section 305 of the WisDOT Standard Specification for ¾-inch or 1¼-inch materials, can generally be used to improve the stability of the subgrade. It must be recognized that soil stability is dependent on such factors as soil type and moisture content, weather conditions at the time of construction, and also construction disturbance. Thus, the necessity of EBS generally must be determined in the field at the time of construction, based upon observations made during subgrade preparation.

If relatively wet or unstable soils are encountered below EBS, it may be necessary to use an SAS (Subgrade Aggregate Separation) geotextile fabric and/or a select crushed material for stabilization (such as that specified in Section 312 of the WisDOT Standard Specifications) before placing backfill soils. The SAS geotextile fabric used in this application should meet the physical requirements identified in Section 645 of the WisDOT Standard Specifications and shown in the following table.

Test	Units	Values
Grab Tensile Strength	N	750 min.
Puncture Strength	N	300 min.
Apparent Opening Size	um	212 max.
Permittivity	s^{-1}	0.35 min.

The clay soils present within the subgrade are considered to be highly sensitive to moisture and construction activity; therefore, every effort should be made to prevent ponding during construction operations and maintain a relatively dry and stable working subgrade. If the soils become disturbed, removal and replacement may be required, and may become extensive.

Borrow Material

Generally, granular material with low fines contents is recommended for use in regrading, or to replace unsuitable soils, such as those specified in Section 305 of the WisDOT Standard Specification for ¾-inch or 1¼-inch materials. Clayey and silty soils, organic materials, and wet granular soils are not considered suitable for such purposes. All fill used must have subgrade design coefficients equal to or greater than those previously specified. Importing of suitable granular fill may be necessary.

Fill Placement and Compaction

Fill should be placed in layers of not more than 9 inches in loose thickness before compaction. As an exception, when the fill consists of well-graded granular material and the compaction equipment is adequate for such purpose, the loose layer thickness may be increased to a maximum of 12 inches. Each lift must be compacted to a density of at least 95 percent of the maximum dry density as determined by the Standard Proctor method, ASTM designation D-698.

Proper moisture control is essential to reduce the amount of compactive effort necessary to achieve the desired densities. This is especially true of silty and clayey soils, where scarification and aeration may be required to achieve near-optimum moisture levels prior to compaction. It is recommended the fill soils be placed at moisture contents within a few percent of their optimum moisture content. Depending upon seasonal moisture conditions, some drying and/or reworking of these fine-grained soils may be necessary prior to placement.

The selection of fill materials for various applications should be done in consultation with the soils engineer. Similarly, the evaluation of the subgrade preparation, and placement and compaction of fill for structural application should be monitored and tested by a qualified representative of the soils engineer.

Proper compaction testing is necessary so that the pavement subgrade materials develop the subgrade design coefficients previously specified for adequate pavement section thickness design. Compaction should be performed with equipment suitable for such purpose, such as a sheepsfoot roller for clayey soils, and a vibratory smooth drum roller for granular material. Monitoring and testing must be performed during fill placement.

Groundwater Control

Because no groundwater was encountered in the upper levels of the boreholes during the exploration, no major difficulties during excavation and construction of the proposed road reconstruction is anticipated. A gravity drainage system and filtered sump pumps or other conventional dewatering procedures, may be adequate to control perched water if encountered. However, for deeper excavations, or for substantial perched zones, if encountered, prolonged dewatering with a series of sumps or well points and high capacity sump pumps, or other more comprehensive means may be necessary to facilitate construction.

While little or no groundwater was encountered at the time the borings were drilled, seasonal variations in precipitation and site drainage conditions can cause groundwater to be present in the upper soils.

Excavations and Site Drainage

Sloping, shoring or bracing of the excavation sidewalls may be necessary. Excavation may be difficult due to the instability of vertical slopes, and will therefore require a flattening of trench sides, or some other means of protection, to facilitate construction and to protect life and property. The degree of excavation instability problems is dependent upon the depth and length of time that excavations remain open, excavation bank slopes, water levels and the effectiveness of any dewatering systems. All excavation work must be performed in accordance with OSHA and local building code requirements.

All excavations must be performed with caution and utilize methods which will prevent undermining or destabilization of buildings, utilities, pavements, sidewalks or other structures. The use of a properly designed shoring and bracing, sheet piling, or underpinning system must be utilized as necessary to adequately protect buildings, utilities, pavements, and other structures. This must be performed by an experienced specialty contractor. Additionally, extreme care must be used during the installation of any bracing system, especially those using driven or vibratory methods, in order to avoid damaging existing buildings, utilities, and other structures. Consideration should be given to the performance of video and/or photographic documentation of the condition of nearby buildings, utilities, and other structures prior to installation.

Auger refusal on cobbles, boulders, or possible bedrock was encountered at B-1, B-2, and B-4 at depths ranging from about 5.5 to 7.5 feet (EL. 895.5 to EL. 914.5) below existing grade at the test boring locations. Some difficulty digging and longer excavation times may be experienced with increasing depth. It is generally estimated that excavations for roadway construction with only nominal grade changes will remain above the refusal depths. However, should deeper than typical excavations be desired or required, and they will encroach upon or extend below the refusal depths, additional

subsurface exploration with backhoe test pits is recommended as part of design planning to further evaluate refusal depths, and the type and excavatability of the materials.

It is mandated that excavations, whether they be for utility trenches, basement excavations or footing excavations, be constructed in accordance with current Occupational Safety and Health Administration (OSHA) guidelines to protect workers and others during construction. PSI recommends that these regulations be strictly enforced; otherwise, workers could be in danger and the owner(s) and the contractor(s) could be liable for substantial penalties. The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. PSI is providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

Since the subgrade soils are generally sensitive to moisture, every effort should be made to provide adequate drainage across the site during construction, and to prevent ponding of runoff on the subgrade. These soils are also subject to erosion caused by runoff, and erosion control measures should be implemented where needed or required by local ordinances.

Subgrade Frost Action

The proposed road extension project is located in an area that experiences annual freezing cycles and the subgrade soils encountered have been classified as moderate to highly susceptible to frost action when free water is present. Therefore, some frost movement may be experienced.

GENERAL COMMENTS

This geotechnical exploration and foundation analysis has been prepared to aid in the evaluation of the foundation conditions on this site. The recommendations presented herein are based on the available soil information and the design information provided. Any changes in the design information or building locations should be brought to the attention of PSI to determine if modifications in the recommendations are required. The final design plans and specifications should also be reviewed by PSI to determine that the recommendations presented herein have been interpreted and implemented as intended.

This geotechnical study has been conducted in a manner consistent with that level of care ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. The findings, recommendations and opinions contained herein have been promulgated in accordance with generally accepted practice in the fields of foundation engineering, soils mechanics, and engineering geology. No other representations expressed or implied, and no warranty or guarantee is included or intended in this report.

It is recommended that the earthwork and foundation operations be monitored by the soils engineer, to test and evaluate the bearing capacities, and the selection, placement and compaction of controlled fills.

SOUTH MAP

NORTH MAP

intertek psi *Geotechnical Services* 608 N. Stanton St. Ripon, WI 54971 (920) 745-2200 Phone (920) 745-2222 Fax	*APPROXIMATE BORING LOCATIONS PLAN* Madison Street Reconstruction North and South Madison Street Waupun, Wisconsin	Scale: 1"= 700' Date: 1/4/2019 Project Number: 00921240

SOIL BORING LOG: B - 1

Project: Madison Street - Waupun **Project No.:** 00921240

Location: Waupun, Wisconsin **Drill Date:** December 19, 2018

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 918.5	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
	5" ASPHALT						
1 / 917.5	18" Light brown gravelly SAND with silt, moist (BASE COURSE)	1-SS	30			4	
2 / 916.5	Dark brown CLAY with silt, very moist (FILL)						
3 / 915.5		2-SS	6	1.75		26	
4 / 914.5							⊥
5 / 913.5							
6 / 912.5	Dark brown to Light brown SAND with silt and gravel, very moist to damp	3-SS	50/3"			14	
7 / 911.5							
8 / 910.5	**AUGER REFUSAL @ 7.5 FEET DUE TO COBBLES, BOULDERS, OR POSSIBLE BEDROCK**						

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: None Encountered ▽

Water Level $_{\text{upon completion}}$: None Encountered ▼

Caved at $_{\text{upon completion}}$: 4± feet below ground surface (EL. 914.5±) ⊥

Delay Time: N/A

Water Level $_{\text{delayed}}$: N/A ¥

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual. Dashed lines are indicative of potentially erratic or unknown transitions, such as fill-to-natural soil zone transitions.

SOIL BORING LOG: B - 2

Project: Madison Street - Waupun **Project No.:** 00921240

Location: Waupun, Wisconsin **Drill Date:** December 19, 2018

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 920	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
	5" ASPHALT					17	
	5" CONCRETE						
1 919.0	Dark brown to Brown CLAY with silt and gravel, moist (FILL)	1-SS	50/5"	4.0		9	
2 918.0	Brown SAND with gravel, trace silt, moist (FILL)						
3 917.0	Tan SAND with silt, gravel, and cobbles, moist	2-SS	50/2"				
4 916.0							
5 915.0		3-SS	50/1"			2	
6 914.0	**AUGER REFUSAL @ 5.5 FEET DUE TO COBBLES, BOULDERS, OR POSSIBLE BEDROCK**						
7 913.0							
8 912.0							

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: None Encountered

Water Level $_{\text{upon completion}}$: None Encountered

Caved at $_{\text{upon completion}}$: N/A

Delay Time: N/A

Water Level $_{\text{delayed}}$: N/A

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual. Dashed lines are indicative of potentially erratic or unknown transitions, such as fill-to-natural soil zone transitions.

SOIL BORING LOG: B - 3

Project: Madison Street Waupun **Project No.:** 00921240

Location: Waupun, Wisconsin **Drill Date:** December 19, 2018

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 914.8	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
0 / 913.8	6.5" ASPHALT 3.5" CONCRETE	1-SS	11			21	
1 / 913.8	Dark brown to Brown CLAY with silt and gravel, very moist (FILL)					10	
2 / 912.8	Tan SAND with silt, trace gravel, very moist	2-SS	15			11	
3 / 911.8							
4 / 910.8							
5 / 909.8	Tan SAND with silt, gravel, and cobbles, moist	3-SS	27			6	⊥
6 / 908.8							
7 / 907.8	Brown SILT with sand and gravel, trace clay, moist	4-SS	51			8	
8 / 906.8							
9 / 905.8							
10 / 904.8	Brown SAND with silt and gravel, moist	5-SS	50/5"			12	
11 / 903.8							
12 / 902.8	**END OF BORING @ 11.5 FEET**						

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: None Encountered ▽

Water Level $_{\text{upon completion}}$: None Encountered ▼

Caved at $_{\text{upon completion}}$: 6± feet below ground surface (EL. 908.8±) ⊥

Delay Time: N/A

Water Level $_{\text{delayed}}$: N/A

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

SOIL BORING LOG: B - 4

Project: Madison Street - Waupun **Project No.:** 00921240

Location: Waupun, Wisconsin **Drill Date:** December 19, 2018

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 901	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
	5" ASPHALT					13	
1 900.0	5" CONCRETE	1-SS	4				
				1.0		26	
2 899.0							
3 898.0	Dark brown to Black CLAY with silt, trace sand and gravel, moist (FILL)	2-SS	4	0.5		29	
4 897.0							
5 896.0							
	Light brown SAND with silt, trace clay and gravel, moist	3-SS	50/2"			19	
	AUGER REFUSAL @ 5.5 FEET DUE TO COBBLES, BOULDERS, OR POSSIBLE BEDROCK						
6 895.0							
7 894.0							
8 893.0							

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: None Encountered ▽

Water Level $_{\text{upon completion}}$: None Encountered ▼

Caved at $_{\text{upon completion}}$: N/A ⊥

Delay Time: N/A

Water Level $_{\text{delayed}}$: N/A ¥

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an **approximate** boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual. Dashed lines are indicative of potentially erratic or unknown transitions, such as fill-to-natural soil zone transitions.

SOIL BORING LOG: B - 5

Project: Madison Street Waupun **Project No.:** 00921240

Location: Waupun, Wisconsin **Drill Date:** December 19, 2018

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 887	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
	5" ASPHALT					13	
1 886.0	6" CONCRETE	1-SS	5				
2 885.0	Dark brown to Black CLAY with silt, trace gravel, moist (FILL)					22	
3 884.0		2-SS	4	1.0		21	
4 883.0							
5 882.0	Dark brown to Brown CLAY with silt, trace sand and gravel, moist (FILL)						
6 881.0		3-SS	5	1.5		20	
7 880.0							
8 879.0		4-SS	19			9	
9 878.0							
10 877.0	Brown SAND with silt, gravel, and cobbles, moist						
11 876.0		5-SS	29			9	
12 875.0	**END OF BORING @ 11.5 FEET**						

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: None Encountered

Water Level $_{\text{upon completion}}$: None Encountered

Caved at $_{\text{upon completion}}$: N/A

Delay Time: N/A

Water Level $_{\text{delayed}}$: N/A

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

SOIL BORING LOG: B - 6

Project: Madison Street Waupun **Project No.:** 00921240

Location: Waupun, Wisconsin **Drill Date:** December 19, 2018

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 876	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
	5" ASPHALT						
	4" Dark brown gravelly SAND, trace silt and clay, moist (BASE COURSE)	1-SS	9			9	
1 875.0	4" CONCRETE						
	Brown CLAY with silt, moist (FILL)					23	
2 874.0							
3 873.0	Brown CLAY with silt, sand, and gravel, moist	2-SS	5			18	
4 872.0							
5 871.0							
		3-SS	7			29	
6 870.0							
7 869.0	Light brown to Gray CLAY with silt, moist						
		4-SS	9			29	
8 868.0							
9 867.0							
10 866.0							
11 865.0	Gray SILT, moist	5-SS	16			4	
12 864.0	**END OF BORING @ 11.5 FEET**						

FIELD OBSERVATIONS:

Water Level $_{\text{during drilling}}$: None Encountered ▽

Water Level $_{\text{upon completion}}$: None Encountered ▼

Caved at $_{\text{upon completion}}$: N/A ⊥

Delay Time: N/A

Water Level $_{\text{delayed}}$: N/A ▽

Caved at $_{\text{delayed}}$: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between s[illegible] Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

GENERAL NOTES

SAMPLE IDENTIFICATION

Visual soil classifications are made in general accordance with the Unified Soil Classification System on the basis of textural and particle size categorization, and various soil behavior characteristics. Visual classifications should be substantiated by appropriate laboratory testing when a more exact soil identification is required to satisfy specific project applications criteria.

PARTICLE SIZE ±

Boulders: 8 inches	Coarse Sand: 2 to 4mm	Silt: 0.005 to 0.074mm
Cobbles: 3 to 8 inches	Medium Sand: 0.42 to 2mm	Clay: -0.005mm
Gravel: 5mm to 3 inches	Fine Sand: 0.074 to 0.42mm	

DRILLING & SAMPLING SYMBOLS

SS: Split-spoon, 2" O.D. by 1 3/8" I.D.
ST: Shelby Tube, 2" O.D. or 3" O.D., as noted in text
AU: Auger Sample
DB: Diamond Bit
CB: Carbide Bit
RB: Roller Bit
WS: Wash Sample
BS: Bag Sample
HA: Hand Auger

SOIL PROPERTY SYMBOLS

N: Standard penetration count, indicating number of blows of a 140 lb. Hammer with a 30 inch drop, required to advance a split-spoon sampler one foot.
Qu: Unconfined compressive strength, tons per square foot (tsf)
Qp: Calibrated hand penetrometer resistance, tsf
MC: Moisture Content, %
LL: Liquid Limit PL: Plastic Limit PI: Plasticity Index
Dd: Dry Density, pounds per cubic foot (pcf)
PID: Photoionization Detector (Hnu meter) volatile vapor level, ppm

SOIL RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

NON-COHESIVE SOILS		COHESIVE SOILS		
Classifier	N-Value Range	Classifier	Qu Range (tsf)	N-Value Range
Very loose	0 - 3	Very soft	0 – 0.25	0 - 2
Loose	3 - 7	Soft	0.25 – 0.5	2 – 5
Medium dense	7 - 15	Medium stiff	0.5 – 1.0	5 – 10
Dense	15 - 38	Stiff	1.0 – 2.0	10 - 14
Very dense	38 +	Very stiff	2.0 – 4.0	14 - 32
		Hard	4.0 +	32 +

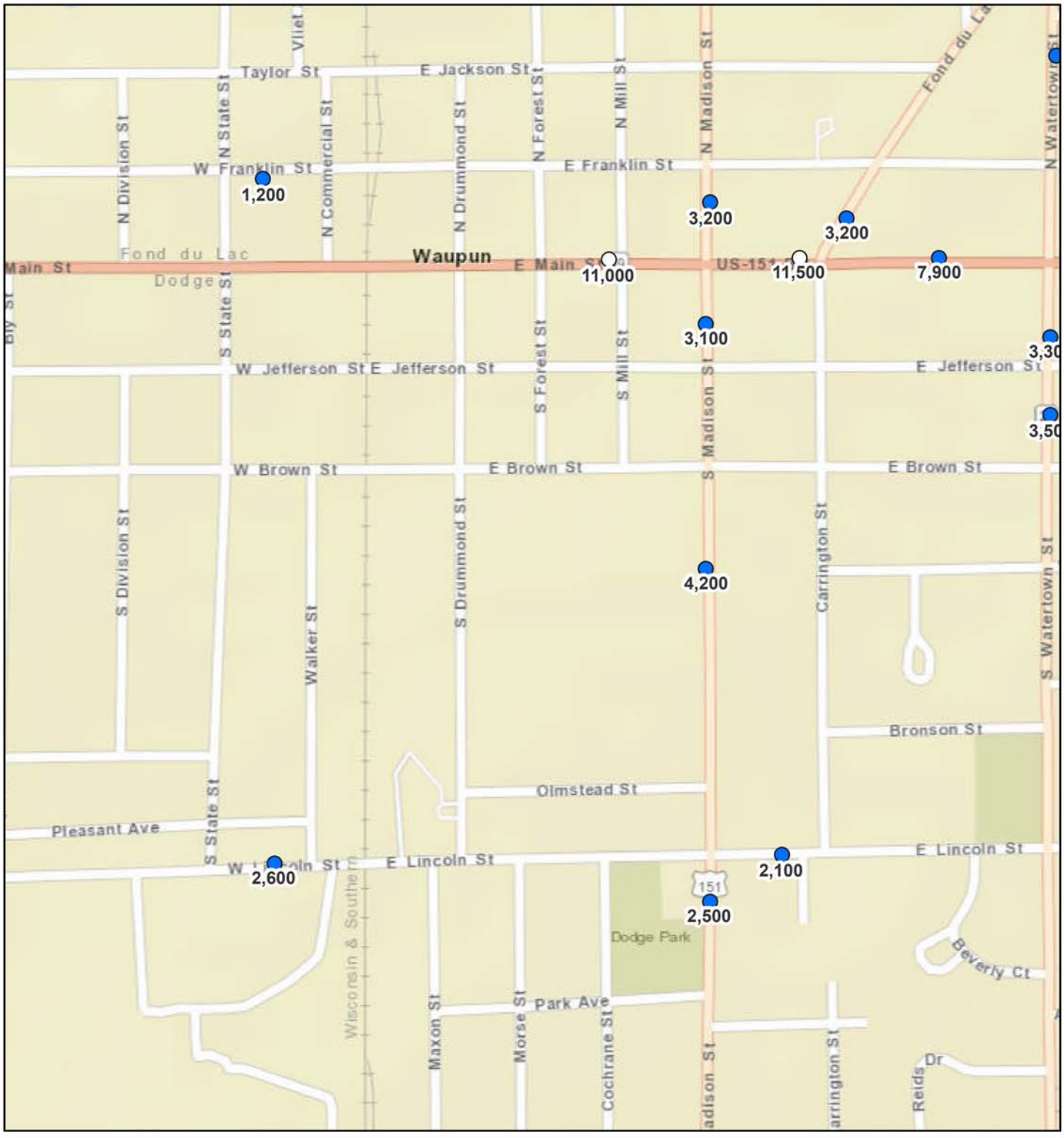
GROUNDWATER

Approximate Groundwater level at time noted on soil boring log, measured in open bore hole unless otherwise noted. Groundwater levels often vary with time, and are affected by soil permeability characteristics, weather conditions, and lateral damage conditions.

Exhibit 2

Traffic Count Data

Madison Street Traffic Counts



1/15/2019, 8:50:01 AM

1:9,028

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

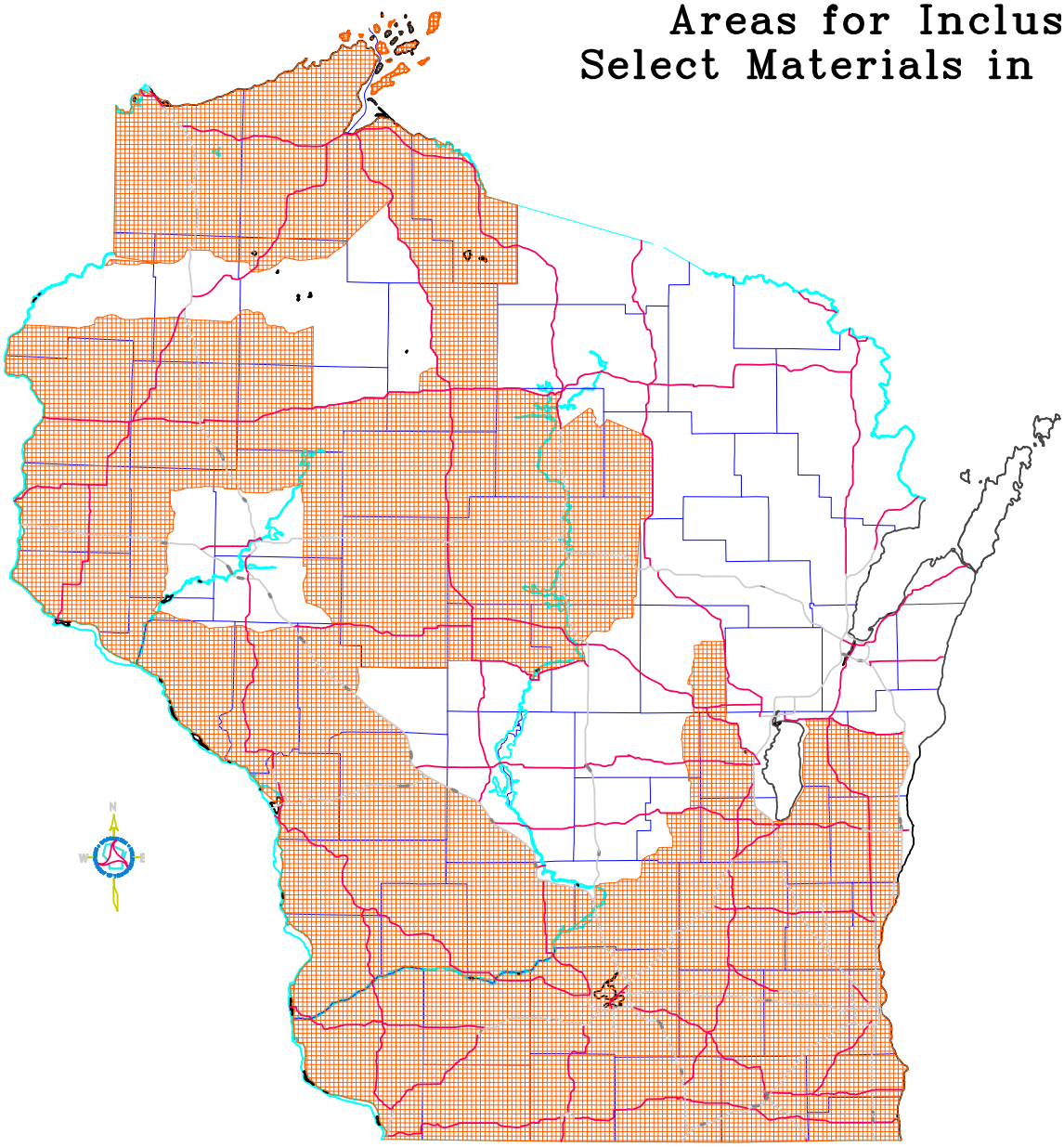
Traffic Count Sites - Short Duration

- ● > 999 – 9,999
- ○ > 9,999 – 49,999

Exhibit 3

Standard Inclusion Area

Areas for Inclusion of Select Materials in Subgrades



Standard Non-inclusion Areas

Standard Inclusion Areas

Exhibit 4

WisPave Results

Pavement Design General Information			
Project ID:	2000-00-00	Designer's Name:	Jeffrey Chvosta
Design Name:	Madison Street	Design Date:	01/09/2019
Roadway Name:	Madison Street	Type:	Local
Project Termini:	Doty Street to Rock River	Status:	Draft
Highway Name:	CTH M	Design Source:	WisPave
Comments:			

Region	County
SW	Dodge

Soil Parameters

Design Group Index (DGI):	13
Subgrade Improvement:	Yes
Subgrade Soil Support Value (SSV):	4.6
Subgrade Modulus of Subgrade Reaction (K):	375

Traffic Parameters

Construction Year:	2019	Design Year:	2039
Construction Year AADT:	4200	Design Year AADT:	5125
Directional Factor (DF):	0.5	Lane Distribution Factor (LDF):	1.0

Truck Classification	% of AADT
2D	2.0
3SU	1.5
2S-1,-2	1.5
3S-2	2.0
2-S1-2	0.0
Total % Truck Traffic	**7.0**

Concrete Pavement Design

Truck Type	% of AADT	DLT	# of Trucks	ESAL Load Factor	ESALs
2D	2.0	2,331	47	0.3	14
3SU	1.5	2,331	35	1.2	42
2S-1,-2	1.5	2,331	35	0.6	21
3S-2	2.0	2,331	47	1.6	75
2-S1-2	0.0	2,331	0	2.1	0

Design Lane Daily ESALs: 152

Design Lane Total Life ESALs: 1,106,059 Rounded to: 1,200,000

Soil Parameters

Subgrade Improvement Flag Selected: Yes

K: 375

Design Calculation

Calculated Pavement Thickness 6.3

Pavement Thickness (ALT# 1): 8.0

Pavement Thickness (ALT# 2): 0.0

HMA Pavement Design

Truck Type	% of AADT	DLT	# of Trucks	ESAL Load Factor	ESALs
2D	2.0	2331	47	0.3	14
3SU	1.5	2331	35	0.8	28
2S-1,-2	1.5	2331	35	0.5	17
3S-2	2.0	2331	47	0.9	42
2-S1-2	0.0	2331	0	2.0	0

Design Lane Daily ESALs: 101

Design Lane Total Life ESALs: 737,300 Rounded to: 740,000

Soil Parameters

DGI: 13

Subgrade Improvement Flag Selected: Yes

SSV: 4.6

Design Calculation

Calculated Required SN: 3.6

HMA ALT#1 Layer Thickness Design

Title: 5" HMA over 10" BAD

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 S	-----	0.44	2.00	0.88
2	N	N	N	3 LT 58-28 S	-----	0.44	3.00	1.32
3	N	Y	N	Base Aggregate Dense 1 1/4-inch	-----	0.14	10.00	1.4
4	N	N	N	Select Crushed Material	-----	0	12.00	0

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

No.of Layers: 4 No.of Other Layers: 0 Total SN: 3.6

Required SN: 3.6