BLACK CREEK CONSOLIDATED DRAIN
DIVISION IV

PROJECT MANUAL
ISSUED FOR BID

Prepared For:
MUSKEGON COUNTY DRAIN COMMISSIONER
141 E. Apple Avenue
Muskegon, MI 49442

Prepared By:
Land & Resource Engineering
Project No. 17-036
June 29, 2020

LRE
ENGINEERS & SURVEYORS
2121 3 Mile Rd. NW
Walker, MI 49544
Ph: 616-301-7888
www.LREMI.com

Table of Contents

Construction Drawings:

BID SOLICITATION

The Muskegon County Drain Commissioner is soliciting sealed proposals for the Black Creek Consolidated Drain – Division IV. Major items of work include 2,018 linear feet of open channel excavation 8-foot bottom width, 29,037 linear feet of open channel excavation 4-foot bottom width, 1,300 linear feet of open channel excavation 2-foot bottom width, 1,750 square yards of riprap, 670 square yards of bioengineering bank stabilization, 56 linear feet of 142-inch by 91-inch CMP Arch culvert, 126 linear feet of 72-inch CMP culvert, 110 linear feet of 60-inch CMP culvert, 36 linear feet of 48-inch CMP culvert, removal of 6 culverts and all related work/restoration.

Sealed proposals will be received by the Muskegon County Drain Commissioner at the Muskegon County Accounting/Budget/Purchasing Office, 141 E. Apple Ave. Muskegon, MI 49442 until **12:30 PM local time**, **Monday July 20th, 2020.** at which time they will be publicly opened and read aloud through online audio conferencing via Zoom. Participants can access the electronic meeting through the following link: https://us02web.zoom.us/j/81104094147. If prompted the **Meeting ID is 811 0409 4147**. For those seeking to participate via telephone, please call **+1 312 626 6799**. Participants may use any device that supports the Zoom app, which includes many smartphones, computers, laptops and tablets. For those that choose to access through the Zoom app, you will be prompted to download the Zoom app to participate. Additionally, users on a computer or laptop will be given the option to join the meeting through a web browser without downloading the Zoom app to participate. It is recommended that participants seeking to download the Zoom app do so well in advance to a scheduled meeting start time so that technical advice can be obtained prior to the scheduled meeting, if necessary.

Contract Documents may be obtained beginning at on **Monday, June 29, 2020,** at the Muskegon County Drain Commissioner's Office, 141 E. Apple Avenue, Muskegon, MI 49442; Telephone (231)-724-6219 or online at https://www.co.muskegon.mi.us/492/Drain-Commissioner. A non-refundable payment of Forty Dollars ($40.00) will be required for each set of hard copy Contract Documents. An additional charge of $10 will be required for sending out Bidding documents.

A pre-bid meeting will be held at **10:00 AM local time** on **Thursday, July 9th, 2020** through remote electronic conferencing. Participants can access the electronic meeting through the following link: https://us02web.zoom.us/j/81104094147. If prompted, the **Meeting ID:** 811 0409 4147. For those seeking to participate via telephone, please call **+1 312 626 6799**. The OWNER and ENGINEER will be present to discuss the project.

Contractors shall direct all questions to the project engineer, Andrew Stoffel, of Land & Resource Engineering, (616)-301-7888 ext. 106.

Each proposal shall be accompanied by a certified check or bid bond by a recognized surety in the amount of five percent (5%) of the total of the base price made out to Black Creek Consolidated Drain Drainage District.

After the time of opening, no bid may be withdrawn for a period of one hundred twenty (120) days.

The Muskegon County Drain Commissioner reserves the right to accept any bid, reject any or all bids, to waive informalities and make the award in any manner deemed in the best interest of the Black Creek Consolidated Drain Drainage District.

Muskegon County Drain Commissioner
BY ORDER OF:

Brenda M. Moore
Muskegon County Drain Commissioner

SECTION 00200 INSTRUCTIONS TO BIDDERS

ARTICLE 1 – BASIS OF PROPOSAL

1.1 The Bid is based on unit and lump sum prices as stipulated in the Bid Form. The totals of the extensions of unit and lump sum prices will be used as a basis for determining the total bid price.

1.2 All work necessary for completion of the Contract, but not specifically listed as a pay item, will be considered to be covered under one or more of the Bid items.

1.3 Where the Bid consists of separate sections of work, each section may be awarded separately or together with other section(s), whichever will be in the best interests of the OWNER. BIDDERS may bid any or all sections.

ARTICLE 2 - QUALIFICATIONS OF BIDDERS

Bids are solicited only from responsible BIDDERS skilled and regularly engaged in work of similar character and magnitude.

ARTICLE 3 – EXAMINATION OF CONTRACT DOCUMENTS AND SITE

3.1 Before submitting a Bid, each BIDDER shall:

A. Examine the Contract Documents thoroughly;

B. Visit the Site to become familiar with local conditions that may in any manner affect cost, progress, performance or timely completion of the Work;

C. Become familiar with all laws, rules and regulations that may in any manner affect cost, progress, performance or timely completion of the Work; and

D. Study and carefully correlate BIDDER's observations with the Contract Documents.

3.2 Surveys, investigations, and reports of subsurface or latent physical conditions at the Site which have been relied upon by ENGINEER in preparing the Drawings and Specifications are not guaranteed as to accuracy or completeness. Each BIDDER shall, at his own expense, make additional surveys and investigations as necessary to determine his Bid for the performance of the Work.

ARTICLE 4 - INTERPRETATION

Questions about the meaning or intent of the Contract Documents shall be submitted to the ENGINEER not less than seven (7) days prior to date of opening of Bids. Replies will be issued by Addenda mailed or delivered to Planholders of Record not less than three (3) days before Bids are due. ENGINEER may issue other Addenda at any time prior to opening of Bids. Only answers given by Addenda shall be binding. Oral and other interpretations or clarifications shall be without legal effect.

ARTICLE 5 – BID SECURITY

5.1 Each proposal shall be accompanied by a certified check or bid bond by a recognized surety in the amount of five percent (5%) of the total of the bid price made out to the Black Creek Consolidated Drain Drainage District. Bid Security from each BIDDER on the Work shall be by a single Surety.

5.2 A Bid Bond when used as Bid Security, shall be issued by a Surety named in U.S. Treasury Circular 570 licensed to conduct business in the state in which the Work is located.

5.3 The Bid Security of the successful BIDDER will be retained until the executed Agreement, Bonds, insurance certificates and other required information is delivered by the BIDDER to the OWNER.

5.4 Failure of the successful BIDDER to execute and deliver the Agreement, Bonds, insurance certificates and other required information within ten (10) days of the Notice of Award shall be just cause for OWNER to annul the Notice of Award and declare the Bid and Bid Security forfeited.

5.5 The Bid Security of any BIDDER whom OWNER believes to have a reasonable chance of receiving the award may be retained by OWNER until either the executed Agreement, Bonds, insurance certificates and other required information are delivered by the successful BIDDER to the OWNER or the expiration of the time limit specified for the Bid Hold Period, whichever occurs first.

5.6 Unless specifically requested, Bid Bond will not be returned to BIDDER.

ARTICLE 6 – CONTRACT TIME

The time(s) for completion of the Work shall be as stipulated in the Agreement. If the time requirement(s) cannot be met, the BIDDER is requested to stipulate in the Bid Form his schedule for performance of the Work. Consideration will be given to time in evaluating Bids.

ARTICLE 7 - LIQUIDATED DAMAGES AND EXPENSES

Provisions for liquidated damages and expenses for failure to complete on time are set forth in the Agreement.

ARTICLE 8 – BID PREPARATION

8.1 Submit the Bid on the separate Proposal and Bid Form with Bid Security and other required documents. The bound copy is for BIDDER's records.

8.2 No change shall be made in the wording of the form or in any of the items. Bids should be typed or filled out legibly in ink.

8.3 All names must be printed or typed below the signature.

8.4 The Proposal shall contain an acknowledgement of receipt of all Addenda.

8.5 Bid by partnership shall be executed in the partnership name and signed by a partner. Partner's title must appear under signature.

8.6 Bid submitted by two or more firms will not be considered (i.e. no joint bids).

8.7 Bid by corporation must be executed in the corporate name by a corporate officer accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be listed.

8.8 Agreement will be on the basis of material and equipment described in the Contract Documents without consideration of substitute or "or-equal" items; except for alternates which may be offered by the BIDDER in the Bid Form and accepted by the OWNER prior to execution of the Agreement. Applications for substitutions will be considered only after the Agreement has been executed. The procedure for substitutions is set forth in the General Conditions.

8.9 On unit price Bids, BIDDERS shall show the unit price for each item listed, the total price for the quantity of each item, and the total price for all items. If ENGINEER finds any errors in the Bidder's computations, ENGINEER reserves the right to make corrections.

ARTICLE 9 – SUBMISSION OF BIDS

9.1 Bids, Bid Security and other required documents shall be submitted prior to the time and at the place indicated in the Bid Solicitation.

9.2 Submit Bid Documents, in a sealed envelope, properly identified.

9.3 If the Bid Documents are sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face thereof.

9.4 Bid documents may not be sent by facsimile. Bids must be submitted in a sealed envelope as stated in part 9.2

9.5 A pre-bid meeting will be held at 1:00 PM on Thursday, the 9th day of July 2020 through remote electronic conferencing via Zoom. Meeting ID: 811 0409 4147. Call In #: +1 312 626 6799. The OWNER and ENGINEER will be present to discuss the project. All bidders must sign in by name of attendee and business represented.

ARTICLE 10 – MODIFICATION AND WITHDRAWAL OF BIDS

10.1 Bids may be modified or withdrawn by an appropriate document duly executed and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

10.2 If, within 24 hours after Bids are opened, any BIDDER files a duly signed notice with OWNER and promptly thereafter demonstrates to the reasonable satisfaction of OWNER that there was a material and substantial mistake in the preparation of Bid, that BIDDER may withdraw its Bid, and the Bid Security will be returned by OWNER.

ARTICLE 11 – OPENING OF BIDS

The Bid opening location and time will be as indicated in the Bid Solicitation/Notice of Letting.

ARTICLE 12 - BID HOLD PERIOD

All bids shall remain firm, after the day of the Bid opening, for the period stipulated in the Notice of Letting.

ARTICLE 13 – AWARD OF CONTRACT(S)

13.1 BIDDER will be required to complete Bid documentation and correct irregularities as a condition of award. OWNER reserves the right to reject any and all Bids and waive any and all irregularities. OWNER further reserves the right to accept or reject nonconforming, qualified, alternate or conditional Bids.

13.2 In evaluating Bids, OWNER will consider the qualifications of the BIDDERS, whether or not the Bids comply with the prescribed requirements and include completed alternates and unit prices if requested in the Bid Form. OWNER may conduct investigations to establish the responsibility, qualifications and financial ability of the BIDDERS and proposed Subcontractors to do the Work within the prescribed time. OWNER reserves the right to reject the Bid of any BIDDER who does not pass such evaluation to OWNER's satisfaction.

13.3 Subject to the rights reserved by the OWNER, it is intended that a contract will be awarded to a responsible, responsive BIDDER whose evaluation indicates to OWNER that such award will be in the best interests of the OWNER.

13.4 Prior to the Notice of Award, ENGINEER will notify the apparent successful BIDDER if OWNER, after due investigation, has reasonable objection to any listed Subcontractor(s), where such listing is requested in the Bid Form. Failure of OWNER to make objection prior to Notice of Award will constitute acceptance of the listed Subcontractor(s), but not a waiver of any right of OWNER to reject defective work, material or equipment, or material and equipment not in conformance with the requirements of the Contract Documents.

13.5 If, prior to the Notice of Award, OWNER refuses to accept any listed Subcontractor(s), the apparent successful BIDDER may:

A. Submit an acceptable substitute without an increase in bid price; or

B. Withdraw Bid and Bid Security.

13.6 If, after Notice of Award, OWNER refuses to accept any Subcontractor, CONTRACTOR shall submit an acceptable substitute and the Contract Price will be adjusted by the difference in cost occasioned by such substitution.

13.7 Concurrently with execution and delivery of Agreement, CONTRACTOR shall deliver to OWNER the Bonds, insurance certificates and other information as required by the Contract Documents.

13.8 If Bidder is a business entity (i.e., corporation, partnership, joint venture, etc.) organized under the laws of a state other than the state of the location of the Work, Bidder must provide evidence of proper registration to do business in the state of the location of the Work as a condition to execution of the Agreement.

13.9 The Agreement and such other documents as required will be signed by OWNER and CONTRACTOR within 25 days of the Notice of Award. OWNER will sign Agreement within 10 days of receipt of required Bonds, insurance certificates, other required information, and CONTRACTOR executed Agreement. OWNER, CONTRACTOR, SURETY and ENGINEER will each receive an executed copy of the Agreement.

Brenda M. Moore
Muskegon County Drain Commissioner
141 E. Apple Ave, Muskegon, MI 49442

ARTICLE 1-CONTRACT PRICE

Having carefully examined the site of the proposed Work; being fully informed of the conditions to be met in the prosecution and completion of the Work; having read and examined the Contract Documents applicable to this Work and agreeing to be bound thereby; the undersigned proposes to perform all services, and furnish all necessary labor, materials, tools, and equipment to complete the Work described in the Contract Documents for the amounts set forth in the accompanying Bid Form.

ARTICLE 2-CONTRACT TIME

If awarded a Contract, undersigned agrees to prosecute the Work regularly and diligently to ensure full completion within the Contract Time(s) indicated in the Agreement.

ARTICLE 3-LIQUIDATED DAMAGES

The undersigned agrees that liquidated damages, in the amount stipulated in the Agreement, shall be assessed for each day that expires after the completion time(s), stipulated in the Agreement, until the Work is complete.

ARTICLE 4 -BIDDER'S QUALIFICATIONS

The undersigned agrees to furnish, upon request, a list of projects of a similar nature completed in the last 3 years.

ARTICLE 5-WAIVER

The undersigned certifies the price(s) entered in the Bid Form are correct and complete and that all information given or furnished in connection therewith is correct, complete and submitted as intended. The undersigned waives any right to:

5.1 Claims he may now have or which may accrue to him,

5.2 Refuse to execute the Contract if awarded to him,

5.3 Demand the return of the Bid Security,

5.4 Be relieved from any obligation by reason of any errors, mistakes or omissions, subject to right of withdrawal of Bid as provided in the Instructions to Bidders.

ARTICLE 6-BID NON-COLLUSIVE

The undersigned certifies that this Proposal is fair, genuine and not collusive or sham, and has not in any manner, directly or indirectly, agreed or colluded with any other person, firm or association to submit a sham Bid, to refrain from bidding, or in any way to fix the amount of this Bid or that of any other BIDDER, or to secure any advantage against the OWNER. The undersigned further certifies that no officer or employee of the OWNER is personally or financially interested, directly or indirectly, in this Bid or in the undersigned.

ARTICLE 7-BID SECURITY

The undersigned encloses a Bid Security in the form and amount stipulated in the Instructions to Bidders. The undersigned agrees to contract for the Work and to furnish the necessary Bonds, Insurance Certificates and other information, as stipulated in the Instructions to Bidders. If this Proposal shall be accepted by the OWNER and the undersigned shall fail to contract as aforesaid and to furnish the required Bonds, Insurance Certificates and other information, then the undersigned shall be considered to have abandoned the Contract and the Bid Security accompanying this Proposal shall become due and payable to the OWNER.

ARTICLE 8-OWNERS' RIGHTS

In submitting this Bid, it is understood that the right is reserved by the OWNER to accept any Bid, or reject any or all Bids, or to waive irregularities and/or informalities in any Bid and to make the award in any manner deemed in the best interest of the OWNER. By submission of this bid, undersigned agrees to provide sufficient additional information to allow the OWNER to deduce the qualifications and capabilities of the undersigned to perform the

WORK and to waive any claim that it has, or may have, against the OWNER, any of its agents, or employees, arising out of, or in connection with, the administration, evaluation or recommendation of any PROPOSAL.

ARTICLE 9-RECEIPT OF ADDENDA

Receipt of Addenda _____ through _____ is acknowledged.

SIGNED THIS _____ DAY OF _____, 20___.

_____ (Firm Name)

_____ (Signature)

_____ (Street Address)

_____ (Name Printed)

_____ (City, State and Zip)

_____ (Title)

_____ (Telephone No.)

LEGAL STATUS OF BIDDER: (Fill out appropriate form and cross out others.)

*A Corporation, duly organized in good standing and doing business under the laws of the state of _____, for whom _____ bearing the office title of _____ whose signature is affixed to this proposal, is duly authorized to execute contracts. If a foreign corporation, the BIDDER states this corporation is qualified to and will register in state in which project Work is located.

*A Partnership, all members of which with address are:

_____ _____

_____ _____

_____ _____

_____ _____

*An Individual whose name with address is:

_____ _____

ARTICLE 1-SCHEDULE OF PRICES

Having reviewed the site and being fully informed of the conditions and having thoroughly examined the plans and specifications pertaining to this work, the undersigned proposes to furnish all labor, materials (unless otherwise noted), tools and equipment for the specified work within the Contract Time and accepts the provisions for Liquidated Damages as described in Article 3 of the Agreement for the **Black Creek Consolidated Drain - Division IV.**

Item	Description	Unit	Qty.	Price	Amount
1	Mobilization (10% Max)	LS	1		
2	Traffic Control	LS	1		
3	Sediment Sump	EA	4		
4	Open Channel Excavation (8' Bottom Width)	LF	2,018		
5	Open Channel Excavation (4' Bottom Width)	LF	29,037		
6	Open Channel Excavation (2' Bottom Width)	LF	1,300		
7	142"x91" CMP Arch	LF	56		
8	72" CMP	LF	126		
9	60" CMP	LF	110		
10	48" CMP	LF	36		
11	Remove Culvert	EA	6		
12	Goebel Road Restoration	LS	1		
13	Private Crossing Restoration	EA	6		
14	Bioengineering Stabilization	SY	670		
15	Riprap	SY	1,750		
16	Mulch Blanket	SY	59,300		
17	Open Channel Seeding	LF	32,355		

Total = _____

SECTION 00450

GEOTECHNICAL DATA

A geotechnical evaluation of the Black Creek Consolidated Drain county road culvert replacements was conducted by Soil and Materials Engineering, Inc. (SME) in April 2020.

The report and soil borings by SME are included herein.

882 40th Street SE
Grand Rapids, MI 49508
T (616) 406-1756

www.sme-usa.com

May 20, 2020

Mr. Daniel Fredricks, PE
Vice President
Land & Resource Engineering
2121 3 Mile Road NW
Walker, Michigan 49544

Via Email: fredricks@lremi.com

RE: Geotechnical Engineering Report
Muskegon County Drain Commission Culvert Replacements
Egelston and Moorland Townships, Mecosta County, Michigan
SME Project No. 084059.00

Dear Mr. Fredricks:

This report presents the results of our geotechnical engineering evaluation for the proposed culvert replacements in Egelston and Moorland Townships, Muskegon County, Michigan. SME performed our services for this project in accordance with the scope of services outlined in SME Proposal No. P01152.20 dated April 10, 2020. Land & Resource Engineering (LRE) authorized our services.

As input into this evaluation, LRE provided SME with preliminary plan sheets titled “Roadway Crossing Details” for the “Black Creek Consolidated Drain” project dated June 23, 2017 and prepared by LRE for the following crossings.

- Former Smith & Mulder Drain at Barnes Road
- Former Smith & Mulder Drain at Sullivan Road
- Former JTB&S Drain at Bailey Road
- Former Daley Drain at White Road
- Former Daley Drain at Bailey Road
- Former Bell Drain at Ravenna Road
- Former Little Drain at Hall Road
- Former Daley Drain at Bossett Road
- Former Bell Drain at White Road

LRE also provided drawings titled “Plan & Profile” for the “Black Creek Consolidated Drain” project with a latest revision date for the following drains.

- Former Little Drain (Sheet No. C34)
- Former Porter Drain (Sheet No. C35)
- Former Muskegon / Newaygo Branch 1 (Sheet No. C13)
- Former Smith & Mulder No. 2 Drain (Sheet No. C43)

SITE CONDITIONS AND PROJECT DESCRIPTION

The project site is located along tributaries to Black Creek in the above-referenced Townships. The crossing locations and the specific boring locations are depicted on the attached Boring Location Diagrams (Figure Nos. 1 through 3).

The project consists of culvert and bridge replacements at 14 road crossings. We understand final grades will remain approximately unchanged at the new culvert crossings and the existing roadways are not proposed to be widened.

LRE provided SME with the information regarding the existing culvert and estimated depths of new culverts in Table No. 1, below.

TABLE NO. 1: EXISTING CULVERT INFORMATION AND PROPOSED CULVERT DEPTHS

BRANCH	ROAD	MCRC ID	SIZE	MATERIAL / SHAPE	PROPOSED SIZE / MATERIAL	ESTIMATED DEPTH (FEET)	BORING
Muskegon-Newaygo	Barnes Rd	C11-019	26' x 4'	wood/box (5 spans)	Not Determined	No Survey	B1 & B2
Smith & Mulder	Barnes Rd	C11-027	dual 72"	CMP/circular	Not Determined	10 +/-	B3 & B4
Smith & Mulder	Sullivan Rd	C11-029	17' x 5.5'	concrete bridge	Not Determined	9 +/-	B5 & B6
JTB&S	Bossett Rd	7681	20' x 8'	concrete bridge	Not Determined	8 +/-	B7 & B8
JTB&S-Slater	Bailey Rd	C12-007	14' x 2.5'	CIP concrete/box	Not Determined	7 +/-	B13 & B14
Daley	White Rd	C12-025	54"	galv CMP/circular	Not Determined	6 +/-	B9 & B10
Daley	Bossett Rd	C12-022	6' x 2.5'	wood/box	Not Determined	5 +/-	B11 & B12
Daley	Bailey Rd	C12-008	36"	galv CMP/circular	Not Determined	4 +/-	B23 & B24
Bell	White Rd	C12-030	24"	RCP/circular	Not Determined	6 +/-	B27 & B28
Bell	Ravenna Rd	C12-028	24"	RCP/circular	Not Determined	6 +/-	B25 & B26
Musk / New Branch 1	Goebel Road	C12-041	71" x 47"	CMP Arch	72" CMP Circular	10 +/-	B21 & B22
Little	Hall Rd	C12-059	dual 36"	galv CMP/circular	57"x38" CMP Arch	8 +/-	B15 & B16
Porter	Moorland Road	C12-101	71" x 47"	CMP Arch	10'x5' Reinforced Concrete Box	8 +/-	B17 & B18
Smith & Mulder No. 2	Moorland Road	C12-116	66" x 51"	CMP Arch	10'x6' Reinforced Concrete Box	9 +/-	B19 & B20

The existing structures vary in type and size, and the bottom of the drainage structures are located between about 4 and 10 feet below the adjacent roadways. The proposed replacement structures at crossings have not yet been determined, but the referenced preliminary plans, and information summarized in Table No. 1 indicate the invert elevation of proposed structures will not substantially vary from the existing invert elevations. We understand the new structures could include reinforced concrete boxes, corrugate metal pipes and arches, and/or reinforced concrete arches.

EVALUATION PROCEDURES

FIELD EXPLORATION

SME drilled 28 borings between April 20 and April 27, 2020. Two borings were located near each subject crossing, and each boring extended 25 feet beneath the existing ground surface. The approximate locations of the borings are depicted on Figure Nos. 1 through 3.

Best Barricading, Inc. provided traffic control services for SME during drilling activities.

LRE determined the planned locations and depth of the borings. SME staked the borings in the field by referencing existing site features. The ground surface elevations at boring locations B3 through B28 were estimated to the nearest 1-foot using the pavement elevation at the centerline of road crossing depicted on the referenced plans. Ground surface elevations at borings B1 and B2 were not determined as a topographic survey at the crossing was not provided to SME.

The borings were drilled using a truck-mounted rotary drill rig, and advanced to the sampling depths using continuous-flight, hollow-stem augers. The borings included soil sampling based upon the Split-barrel Sampling Procedure. Recovered split-barrel samples were sealed in glass jars by the driller.

Groundwater measurements were recorded during drilling activities. Drilling slurry was added to the annulus of the augers to combat sand heave during drilling. Therefore, an accurate water level was unable to be obtained upon completion of drilling activities. After drilling, the boreholes were backfilled with auger cuttings. Borings located in existing pavement areas were topped with asphalt cold patch.

Soil samples recovered from the field exploration were returned to the SME laboratory for further observation and testing.

LABORATORY TESTING

The laboratory testing program consisted of performing visual soil classification on recovered samples in accordance with ASTM D-2488. Moisture content and hand penetrometer tests were performed on portions of a cohesive sample obtained. Also, moisture contents tests were performed on portions of organic soil samples obtained.

The Laboratory Testing Procedures attached to this report provides descriptions of the laboratory tests. Based on the visual engineering classifications and laboratory testing, we assigned a group symbol to the various soil strata encountered based on the Unified Soil Classification System (USCS).

Upon completion of the laboratory testing, boring logs were prepared and include the soil descriptions, penetration resistances, pertinent field observations, coordinates, offsets, and the results of the laboratory testing. Each log also includes the estimated existing ground surface elevation, where determined. The boring logs are attached to this report. Explanations of symbols and terms used on the boring logs are provided on the attached Boring Log Terminology sheet.

Soil samples retained over a long time, even in sealed jars or containers, are subject to moisture loss and are no longer representative of the conditions initially encountered in the field. Therefore, soil samples

are normally retained in our laboratory for 60 days after completion of SME's report, and are then disposed of, unless instructed otherwise.

SUBSURFACE CONDITIONS

Tabular generalized descriptions of the subsurface conditions encountered at each boring location are presented in Table No. 2 below. Please refer to the boring logs for detailed subsurface information at each boring location.

TABLE NO. 2: SUMMARY OF SUBSURFACE CONDITIONS

LOCATION & MCDC ID	ESTIMATED CULVERT INVERT ELEVATION +/- (FEET)	BORING	GROUNDWATER ELEVATION +/- (FEET) DURING DRILLING [1]	GENERAL SOIL CONDITIONS BENEATH PAVEMENT & AGGREGATE BASE [2,3]
B1 & B2 Barnes Road C11-019	Unknown	B1	Elevation was not estimated; however, groundwater was encountered about 3.5 feet below existing road centerline	Loose Sand Fill to 3.5' over Very Loose to Medium Dense Sand to 25'.
		B2		
B3&B4 Barnes Road C11-027	660	B3	661.5	Loose Sand Fill to 8.5' over Loose to Medium Dense Sand to 25'.
		B4	663	Loose Sand Fill to 6' over Loose to Medium Dense Sand to 25'.
B5&B6 Sullivan Road C11-029	663	B5	665	Loose to Medium Dense Sand Fill to 8.5' over Loose to Medium Dense Sand to 25'.
		B6	664.5	Medium Dense Sand Fill to 6' over Loose to Medium Dense Sand to 25'.
B7 & B8 Bossett Road 7681	688	B7	689	Very Loose to Medium Dense Sand Fill to 8.5' over Medium Dense to Dense Sand to 25'.
		B8	688	
B9& B10 White Road C12-025	697	B9	698	Loose Sand Fill to 5' over Loose to Dense Sand to 25'.
		B10		
B11 & B12 Bossett Road C12-022	691	B11	690	Very Loose to Loose Sand Fill to 6' over Very Loose to Medium Dense Sand to 23.5' over Clayey Silt to 25'.
		B12		Loose Sand Fill to 3.5' over Loose to Medium Dense Sand to 25'.
B13 & B14 Bailey Road C12-007	701	B13	702	Loose Sand Fill to 6' over Loose to Medium Dense Sand to 13.5' over Stiff Clayey Silt to 18.5' over Loose Sandy Silt to 24' over Loose Sand to 25'.

LOCATION & MCDC ID	ESTIMATED CULVERT INVERT ELEVATION +/- (FEET)	BORING	GROUNDWATER ELEVATION +/- (FEET) DURING DRILLING [1]	GENERAL SOIL CONDITIONS BENEATH PAVEMENT & AGGREGATE BASE [2,3]
		B14	703	Loose Sand fill to 5' over Loose to Medium Dense Sand to 13.5' over Very Stiff Silty Clay 23.5' over Medium Dense Sand to 25'.
B15 & B16 Hall Road C12-059	685	B15	687	Very Loose Sand Fill to 6' over Loose to Dense Sand to 23.5' over Hard Lean Clay to 25'
		B16	687.5	Loose Sand Fill to 3.5' over Loose to Medium Dense Sand to 25'.
B17 & B18 Moorland Road C12-101	680	B17	680	Medium Dense Sand Fill to 3.5' over Loose to Medium Dense Sand to 25'.
		B18	679.5	Loose Sand Fill to 3.5' over Loose to Medium Dense Sand to 25'.
B19 & B20 Moorland Road C12-116	680	B19	681.5	Loose Sand Fill to 6' over Medium Dense Sand to 25'.
		B20	682.5	Loose Sand Fill to 6' over Peat to 8.5' over Loose to Medium Dense Sand to 25'.
B21 & B22 Goebel Road C12-041	697	B21	698.5	Loose Sand Fill to 6' over Very Stiff Lean Clay to 8.5' over Loose to Medium Dense Sand to 18.5' over Stiff Lean Clay to 25'.
		B22		Very Loose to Loose Sand Fill to 6' over Very Stiff Lean Clay to 8.5' over Medium Dense Sand to 18.5' over Stiff Lean Clay to 25'.
B23 & B24 Bailey Road C12-008	703	B23	702	Loose Sand Fill to 5' over Loose to Medium Dense Sand to 25'.
		B24	702	
B25 & B26 Ravenna Road C12-028	696	B25	696	Loose Sand Fill to 6' over Loose to Medium Dense Sand to 25'.
		B26	695	Medium Dense Sand Fill to 8.5' over Loose to Medium Dense Sand to 25'.
B27 & B28 White Road C12-030	695	B27	695	Loose Sand Fill to 3.5' over Loose to Medium Dense Sand to 25'.
		B28	695.5	Very Loose Sand Fill to 3.5' over Loose to Medium Dense Sand to 25'.

NOTES:

1) Groundwater elevation as encountered during drilling activities and estimated within about 1-foot. Drilling mud was added to the annulus of the augers to combat sand heave. Therefore, an accurate water level was unable to be obtained upon completion of drilling activities. The groundwater observations indicated on the boring logs represent conditions at the time the readings were taken. The actual groundwater levels at the time of construction and afterward may vary from those conditions noted on the boring logs. Groundwater levels and the elevations and volumes of perched groundwater encountered in excavations, should be expected to fluctuate throughout the year, based on variations in precipitation, evaporation, run-off, and other factors.

2) It is sometimes difficult to distinguish between fill and natural soils based on samples and cuttings from small-diameter boreholes, especially when portions of the fill do not contain man-made materials, debris, topsoil, or organic layers, and when the fill appears similar in composition to the local natural soils. Therefore, the delineation of fill described above and presented on the boring logs should be considered approximate only.

3) The soil profiles described above and included on the attached boring logs are generalized descriptions of the conditions encountered at the boring locations. The stratification depths shown on the boring logs are intended to indicate a zone of

transition from one soil type to another. They are not intended to show exact depths of change from one soil type to another. The soil descriptions are based on visual classification of the soils encountered. Soil conditions may vary between or away from the boring locations from those conditions noted on the logs. Please refer to the boring logs for the soil conditions at the specific boring locations.

ANALYSIS AND RECOMMENDATIONS

SCOUR CONSIDERATIONS

The design of culverts at water crossings requires an understanding of potential watercourse scour (erosion) that could affect the structure. We anticipate LRE will design scour countermeasures to be constructed to protect the culverts from undermining during flood events. If gradation analyses are required for use in scour design, please contact SME within 30 days.

GLOBAL STABILITY

SME does not judge a slope stability analysis to be required for the road embankments since the existing roadways are not being widened, the final grades will match the existing grades, and assuming the crossing structures will be installed with embankment slopes not proposed to be steeper than 3H:1V. If design or conditions change please contact us.

DEWATERING CONSIDERATIONS

Based on the proposed invert depths and groundwater levels encountered during drilling, we anticipate excavations for new structures will extend near and/or below the site groundwater levels. Therefore, the water from the drains will need to be controlled during construction. We anticipate the drain will be diverted around the construction area using culverts, berms, and ditches.

Based on the borings and the proposed invert elevations of the culverts, the subgrade will generally consist of sand soils. For excavations that extend more than about 1-foot below the groundwater level in sands, the contractor should consider the use of a fully-enclosed, sheet pile type cofferdam to limit the size of the excavations and control groundwater seepage into the excavation during construction. At most crossings, a relatively impermeable stratum into which the bottom of the sheeting could be sealed to cut-off the flow of groundwater to the inside of the cofferdam was not encountered. Therefore, utilizing either tremie poured concrete seals or dewatering inside the cofferdam and constructing the foundations by conventional methods will be required for construction of the footings for new arch culvert and headwalls and wingwalls. The cofferdam would need to extend deep enough to prevent piping of the excavation during dewatering and rigorous dewatering may be required if the tremie concrete seal method is not used.

If sheet piles are used, we recommend all sheeting located within 10 feet of the culvert ends be left in place. Extraction of sheeting could adversely affect the end sections. We expect the internal culvert segments and joints should be less resistant to damage from removal of adjacent sheeting, but the end segments and headers may be more easily damaged from removal of sheeting. It may be feasible for sheeting that remains in-place to be used to counteract scour (if needed). A licensed Professional Engineer working in conjunction with the contractor should design cofferdams, if used.

The contractor and the sheeting designer should be provided with historical information for the sites, such as locations of previous and existing structures and utilities that may affect the construction and design of the sheeting or the installation of the new structure. If sheeting is used, care should be exercised during removal so as not to disturb the subsoil around and below the culvert. The contractor is responsible for the means and methods of construction according to the plans and MDOT Standard Specifications for Construction. Care should be taken during sheeting installation as vibrations could lead to settlement of nearby structures and roads.

We recommend lowering the groundwater level to a minimum of 2 feet below the anticipated excavation bottom to provide stable conditions for construction. The specific dewatering operations will depend on the rate and volume of groundwater flow and determined in the field by the dewatering contractor. The final design of the dewatering system is typically the responsibility of the contractor and their geotechnical engineer. We would be pleased to assist you in the development of a performance-based specification for this portion of the project.

Wet subgrades will be sensitive to disturbance. Therefore, the subgrade may need to be undercut or improved. We recommend an SME representative be on-site during construction and provide field recommendations to limit subgrade disturbance while establishing an adequate subgrade for culvert and wall foundation support.

BOX AND PIPE CULVERT SUBGRADE PREPARATION AND BEDDING

Soils that are suitable for support of box and pipe culverts were encountered at the approximate depths and elevations included in Table No. 3 below.

TABLE NO. 3: SUMMARY OF SUITABLE SOILS

LOCATION & MCDC ID	ESTIMATED CULVERT INVERT ELEVATION +/- (FEET)	BORING	DEPTH / ELEVATION (+/-) TO SUITABLE SOILS (FEET)
B1 & B2 Barnes Road C11-019	Unknown	B1	3.5 / Unknown
		B2	3.5 / Unknown
B3&B4 Barnes Road C11-027	660	B3	8.5 / 661.5
		B4	6 / 664
B5&B6 Sullivan Road C11-029	663	B5	8.5 / 663.5
		B6	6 / 666
B7 & B8 Bossett Road 7681	688	B7	8.5 / 687.5
		B8	8.5 / 687.5
B9& B10 White Road C12-025	697	B9	5 / 698
		B10	5 / 698
B11 & B12 Bossett Road C12-022	691	B11	6 / 690
		B12	3.5 / 692.5
B13 & B14 Bailey Road C12-007	701	B13	6 / 702
		B14	5 / 703
B15 & B16 Hall Road C12-059	685	B15	6 / 687
		B16	3.5 / 689.5
B17 & B18 Moorland Road C12-101	680	B17	3.5 / 684.5
		B18	3.5 / 684.5
B19 & B20	680	B19	6 / 683

LOCATION & MCDC ID	ESTIMATED CULVERT INVERT ELEVATION +/- (FEET)	BORING	DEPTH / ELEVATION (+/-) TO SUITABLE SOILS (FEET)
Moorland Road C12-116		B20	8.5 / 680.5
B21 & B22 Goebel Road C12-041	697	B21	6 / 701
		B22	6 / 701
B23 & B24 Bailey Road C12-008	703	B23	5 / 702
		B24	5 / 702
B25 & B26 Ravenna Road C12-028	696	B25	6 / 696
		B26	8.5 / 693.5
B27 & B28 White Road C12-030	695	B27	3.5 / 697.5
		B28	3.5 / 697.5

After dewatering the excavations as necessary, the upper exposed bearing soils will likely be disturbed. In accordance with the MDOT 2012 Standard Specifications for Construction 406.03.G.2, unstable/disturbed subsoils or obstructions other than bedrock should be undercut (removed) and replaced with, or stabilized using a layer of MDOT 6A coarse aggregate modified with 80 percent crushed coarse aggregate. We anticipated these soils can likely be stabilized by using a layer of MDOT 6A coarse aggregate modified with 80 percent crushed coarse aggregate. This layer should be placed with a minimum thickness of 12 inches, but may need to be thicker to stabilize and protect the soil depending on the field conditions. The modified MDOT 6A coarse aggregate should be used as backfill in deeper excavations or placed over the entire unstable area. Undercuts that extend beyond the outer edges of the culvert should be extended laterally based on a 1:1 slope descending from the outside bottom edge of the culvert to the base of the undercut. The MDOT 6A coarse aggregate should be placed in lifts not exceeding 12 inches and should be compacted or tamped/charged into the unstable subgrade with the backhoe bucket until the subgrade is sufficiently stable.

We have assumed that culvert Structure Backfill (MDOT Class II, Class III or Class IIIA sand) placed to typical dimensions will be used adjacent to the culverts per the 2012 MDOT Standard Specifications for Construction Section 206.03. Place and compact Structure Backfill on opposite sides of the culvert at the same time, so the backfill levels on opposite sides do not vary by more than 2 feet. Backfill should be hand compacted within 1-foot of the walls. For compacted Class II Structure backfill, we recommend Rankine Lateral Earth Pressure Coefficients for an effective angle of internal friction of 32 degrees be used for design.

The sands encountered at the borings are subject to sloughing and caving. Therefore, we anticipate relatively large temporary excavations will be required to install the new culverts if temporary earth retention (e.g. sheeting) is not used.

BOX CULVERT BEDDING

After stabilization of the bearing surfaces with the modified MDOT 6A aggregate, the final surface of the aggregate should be covered with 3 inches of MDOT 34R aggregate. However, if more than about 12 inches of modified MDOT 6A coarse aggregate is used to backfill undercuts, the top of the modified MDOT 6A should be covered by a suitable non-woven geotextile fabric to prevent migration of the MDOT 34R aggregate. The culvert bedding should extend at least 1 foot beyond the outside edges and ends of

the culvert. The depth of the excavation for the culvert should allow for the recommended bedding layer and stabilization layer.

CMP CULVERT BEDDING

After improving the subgrade, we recommend the upper culvert bedding (per MDOT 2012 Standard Specifications for Construction 401.03.A) consist of a minimum of 10 inches of MDOT Class IIIA sand. Layers of the MDOT Class IIIA sand should be no greater than 10 inches thick and compacted to at least 95 percent of the maximum unit weight. The culvert bedding should extend at least 1 foot beyond the outside edges and ends of the CMPA culverts.

ARCH CULVERT, HEADWALL, AND WINGWALL FOUNDATIONS

The exposed bearing soils will likely become disturbed due to the construction activities. Prior to placement of reinforcing steel and concrete or installing precast foundation elements, MDOT 6A coarse aggregate should be placed in lifts not exceeding 12 inches and should be tamped/charged into the unstable subgrade with the backhoe bucket until the subgrade is sufficiently stable. If more than about 12 inches of modified MDOT 6A coarse aggregate is used for stabilization, the top of the modified MDOT 6A should be choked with a dense graded MDOT 21AA aggregate or covered by a suitable non-woven geotextile fabric prior to the placement of concrete.

As previously mentioned, we recommend that the groundwater level be lowered a minimum of 2 feet below the planned subgrade depth to allow for adequate subgrade preparation. If the wall foundations extend deeper than the bottom of the culverts, it would be necessary to lower the groundwater even further.

Plans depicting the proposed structures were not provided. SME should review the culvert plans to verify are assumptions made in determining the maximum factored bearing resistances are valid. Based on the subsurface conditions, depth and elevation to suitable bearing soil and recommended factored bearing resistances are provided in Table No. 4 below.

TABLE NO. 4: SUMMARY OF SUITABLE SOILS AND FACTORED BEARING RESISTANCES

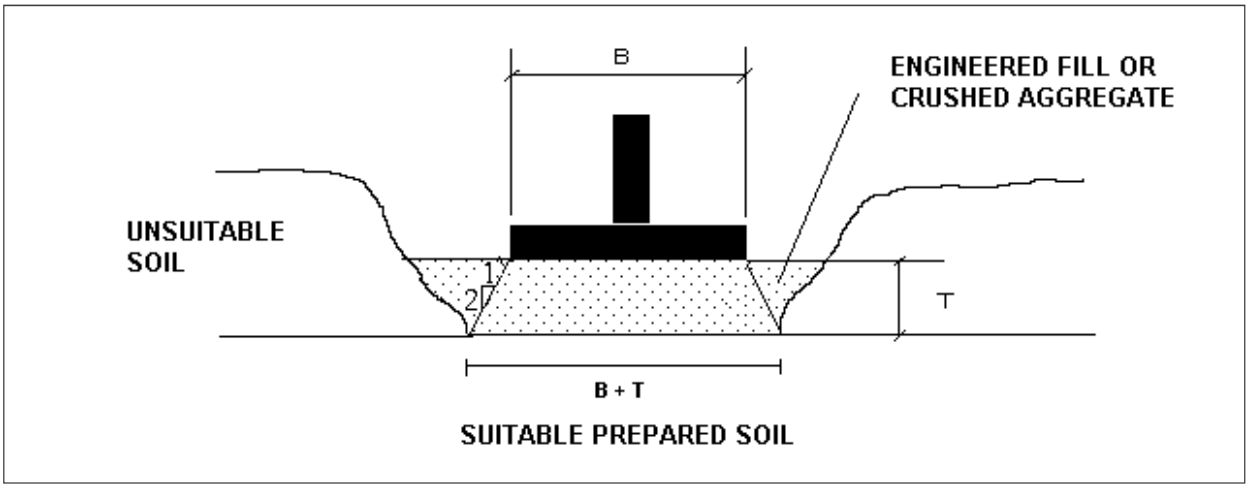
LOCATION & MCDC ID	ESTIMATED CULVERT INVERT ELEVATION +/- (FEET)	BORING	DEPTH / ELEVATION (+/-) TO SUITABLE BEARING SOILS (FEET)	RECOMMENDED MAXIMUM FACTORED BEARING RESISTANCE (PSF)
B1 & B2 Barnes Road C11-019	Unknown	B1	3.5 / Unknown	2,000
		B2	3.5 / Unknown	
B3&B4 Barnes Road C11-027	660	B3	8.5 / 661.5	3,000
		B4	6 / 664	
B5&B6 Sullivan Road C11-029	663	B5	8.5 / 663.5	2,000
		B6	6 / 666	
B7 & B8	688	B7	8.5 / 687.5	3,000

LOCATION & MCDC ID	ESTIMATED CULVERT INVERT ELEVATION +/- (FEET)	BORING	DEPTH / ELEVATION (+/-) TO SUITABLE BEARING SOILS (FEET)	RECOMMENDED MAXIMUM FACTORED BEARING RESISTANCE (PSF)
Bossett Road 7681		B8	8.5 / 687.5	
B9& B10 White Road C12-025	697	B9	5 / 698	2,000
		B10	5 / 698	
B11 & B12 Bossett Road C12-022	691	B11	6 / 690	2,000
		B12	3.5 / 692.5	
B13 & B14 Bailey Road C12-007	701	B13	6 / 702	3,000
		B14	5 / 703	
B15 & B16 Hall Road C12-059	685	B15	6 / 687	2,000
		B16	3.5 / 689.5	
B17 & B18 Moorland Road C12-101	680	B17	3.5 / 684.5	3,000
		B18	3.5 / 684.5	
B19 & B20 Moorland Road C12-116	680	B19	6 / 683	3,000
		B20	8.5 / 680.5	
B21 & B22 Goebel Road C12-041	697	B21	6 / 701	2,000
		B22	6 / 701	
B23 & B24 Bailey Road C12-008	703	B23	5 / 702	3,000
		B24	5 / 702	
B25 & B26 Ravenna Road C12-028	696	B25	6 / 696	3,000
		B26	8.5 / 693.5	
B27 & B28 White Road C12-030	695	B27	3.5 / 697.5	2,000
		B28	3.5 / 697.5	

The final footing design must consider the eccentricity caused by moments and lateral shear loads applied to the footings from the proposed wing walls and shear keys that transfer load from the structures to the footings. We recommend that the resultant eccentricity be kept within the middle third of the footing

width (i.e., a zero uplift condition for the footing edges). A bearing resistance factor (φ_b) of 0.45 was used to determine the factored bearing resistance allowed for the strength limit state.

We recommend SME evaluate foundation subgrades during construction to verify that the design soil bearing pressure is achieved. If the subsurface soils cannot be stabilized using MDOT 6A, then unstable/disturbed subsoils should be undercut (removed) and replaced with MDOT 6A coarse aggregate modified with 80 percent crushed coarse aggregate. Foundation undercuts should be oversized laterally and backfilled with the coarse crushed aggregate to reestablish the design bearing level. Please refer to the following Typical Foundation Undercutting Diagram.



Shallow foundations must be situated a minimum of 42 inches below final site grades for protection against frost action during normal winters. The foundations and proposed bearing soils should be protected from freezing during construction if work occurs in the winter months. The predominately sandy soils are prone to sloughing and caving. We recommend sloping back the foundation excavation sides prior to installing the precast foundations and wall elements or constructing cast-in-place foundations, and removing any caved soils from the design bearing surface.

WALLS AND DRAINAGE – LATERAL PRESSURES AND SLIDING

Head walls and wing walls are essentially retaining walls. The lateral earth pressure coefficients and sliding resistances should be established using the AASHTO & MDOT LRFD equations and procedures for bridge design. We have assumed that Structure Backfill (MDOT Class II) placed to typical dimensions will be used behind the walls per the 2012 MDOT Standard Specifications for Construction Section 206.03. Care should be exercised during compaction of the wall backfill to avoid overstressing the wall. Backfill should be hand compacted within 1 foot of the walls.

Lateral earth pressure coefficients can be calculated based on saturated (moist) unit weight of 120 pounds per cubic-foot (pcf) and an effective angle of internal friction of 32 degrees (assumed for typical MDOT Class II placed as Structure Backfill). Sliding resistances can be computed using a sliding resistance factor of 0.85 for concrete placed on sand or clay or MDOT 6A tamped into disturbed sand or clay.

Wall designs should incorporate anticipated surcharge loadings (such as traffic, construction equipment, and sloped ground conditions) and the design surcharge loading should not be exceeded during construction. The decision to use the active earth pressure or earth pressure at rest coefficient for wall designs will depend on the apparent flexibility of the proposed wall design. A rigid wall and footing with lateral resistance available should be designed using an at-rest coefficient, while a more flexible wall system that moves more significantly as a result of backfilling can use an active earth pressure coefficient. Regarding whether or not to include passive soil resistance provided by drained soils present

in front of the proposed walls in designs is typically the design engineer's choice. Typically, MDOT does not rely upon passive soil resistance even with the use of scour countermeasures for bridge structures.

To reduce the potential for the build-up of hydrostatic pressure behind the walls, we recommend permanent drains be installed on the heel side of the walls. The drains should consist of a minimum 6-inch-diameter perforated plastic drain pipe, wrapped with a filter fabric, and surrounded by 6 inches of a filter material, such as pea gravel (MDOT 34G or 34R). The drains should be discharged to a gravity drainage outlet. We recommend the design include provisions for access to the drains for cleaning and maintenance. It may be desirable to install the drains just above the drain water level and to design the lower portion of the wall to resist soil and hydrostatic groundwater pressures. Alternatively, the wing walls can be designed to resist both soil and hydrostatic groundwater pressures for the entire height.

In addition to checking sliding stability of the wing walls, the resistance factor for overturning, location of the resultant force at the base, mass stability, and contact pressure at the base should also be evaluated. If desired, SME can assist the project team in the design of the wing walls incorporating these considerations. However, such analyses go beyond the current scope of this evaluation.

CONSTRUCTION CONSIDERATIONS

We recommend the bid documents request prospective contractors include unit prices for removing unsuitable subgrade (e.g., debris-laden fill, buried organics and topsoil, overly loose soils, and disturbed soils) and replacing it with suitable engineered fill or stabilizing crushed aggregates. Also, we recommend establishing a contingency in the construction budget for this work. The actual quantity of unsuitable soils that may be encountered during construction could be estimated from the borings but may vary based on the actual conditions. The suitability of subgrades can be impacted by the contractor's means-and-methods (e.g., equipment and/or effort), time of year, groundwater levels, variable subsurface conditions, and other factors. Actual undercut quantities can be determined during construction by measuring excavation volumes, counting truckloads, or a combination of methods.

The contractor may encounter old foundations, and possibly boulders and cobbles during construction. Consider providing a contract pay item for removal of cobbles or obstructions. New foundations should not be placed where previous foundations will obstruct the construction, or adversely affect the long-term performance of the new substructures.

We recommend temporary construction slopes be graded in accordance with MI-OHSA requirements for the soil conditions encountered. Monitor the condition of any temporary slope utilized during construction for stability. In roadway widening areas (if any), depending on the specific conditions encountered during construction, require flatter slopes if needed. Since it is difficult to backfill on sloping ground, cut benches into the slope and place Structure Backfill in level horizontal lifts not exceeding 9 inches in loose thickness. Backfill soils and compaction requirements should meet the specifications for structure embankments provided by MDOT or Muskegon County Road Commission.

All excavations should be sloped, shored, or braced in accordance with MI-OSHA requirements. The contractor should provide an adequately constructed and braced shoring system for employees working in an excavation that may expose employees to the danger of moving ground. If material is stored or heavy equipment is operated near an excavation, stronger shoring must be used to resist the increased pressure due to the superimposed loads. The contractor should take precautions to protect adjacent utilities, roadways, and structures during construction.

Handling, transportation, and disposal of excavated materials and groundwater will need to be performed in accordance with applicable environmental regulations.

We appreciate the opportunity to be of service. If you have questions regarding this report or if you require additional information, please contact us.

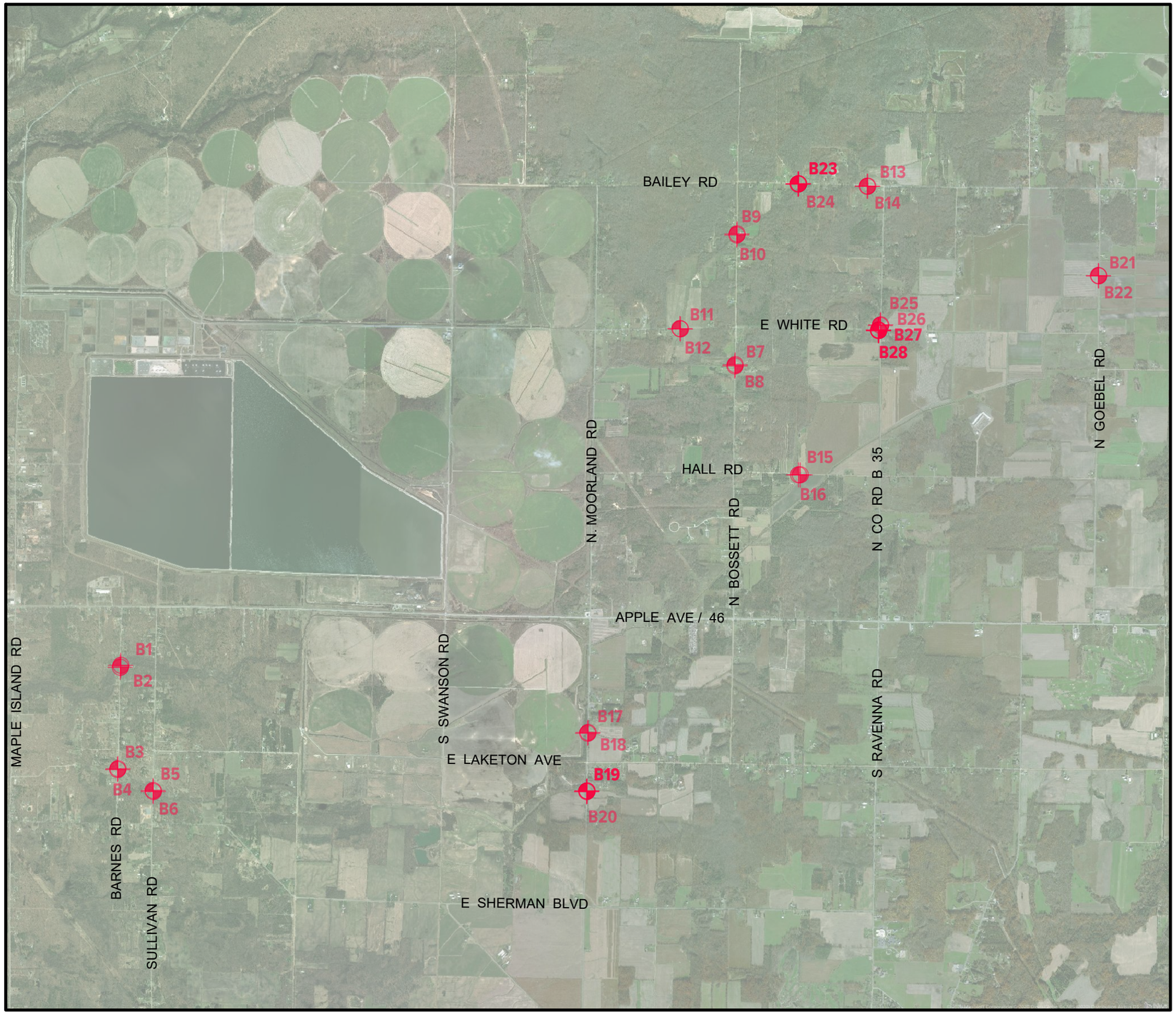
Sincerely,

SME

Paul E. Anderson, PE
Senior Project Engineer

Andrew T. Bolton, PE
Senior Consultant

Attachments: Boring Location Diagrams (Figures Nos. 1 through 3)
Boring Log Terminology
Boring Logs (B1 through B28)
Important Information about your Geotechnical Engineering Report
General Comments
Laboratory Testing Procedures



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W E

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0' 4000' 8000'

GRAPHIC SCALE: 1" = 4000'

LEGEND

APPROXIMATE BORING LOCATION

NOTE:
BASE DRAWING INFORMATION TAKEN FROM GOOGLE EARTH PRO AND BING ONLINE MAPS.

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Project
MCDC DRAIN CULVERT REPLACEMENTS

Project Location
EGELSTON AND MOORLAND TOWNSHIPS, MUSKEGON COUNTY, MICHIGAN

Sheet Name
BORING LOCATION DIAGRAM

No.	Revision Date

Date 5-13-2020
CADD JAB
Designer PEA
Scale AS NOTED
Project 084059.00
Figure No. 1

PLOT DATE: May 12, 2020 - 3:59pm - jblake
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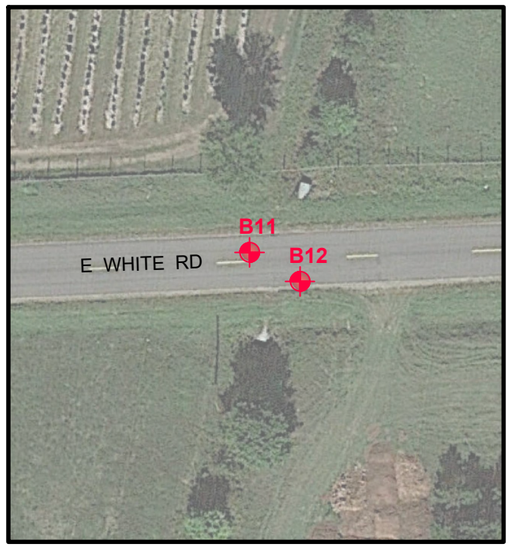
MUSKEGON-NEWAYGO DRAIN
MCRD ID: C11-019

SMITH & MULDER DRAIN
MCRD ID: C11-027

SMITH & MULDER DRAIN
MCRD ID: C11-029

JTB&S DRAIN
MCRD ID: 7681

DALEY DRAIN
MCRD ID: C12-025



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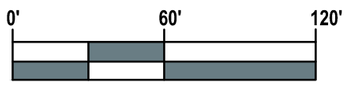

GRAPHIC SCALE: 1" = 60'

LEGEND

APPROXIMATE BORING LOCATION

NOTE:
BASE DRAWING INFORMATION TAKEN FROM GOOGLE EARTH PRO AND BING ONLINE MAPS.

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Project
MCDC DRAIN CULVERT REPLACEMENTS

Project Location
EGELSTON AND MOORLAND TOWNSHIPS, MUSKEGON COUNTY, MICHIGAN

Sheet Name
BORING LOCATION DIAGRAM -
BORINGS B1 THROUGH B12

No.	Revision Date

Date	5-13-2020
CADD	JAB
Designer	PEA
Scale	AS NOTED
Project	084059.00
Figure No.	2

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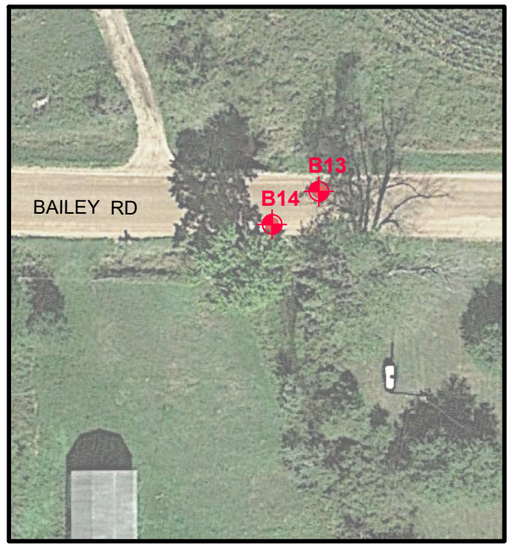
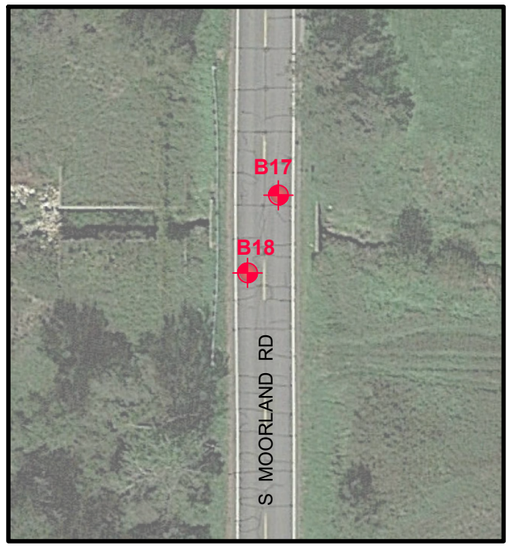


JTB&S - SLATER DRAIN
MCRD ID: C12-007

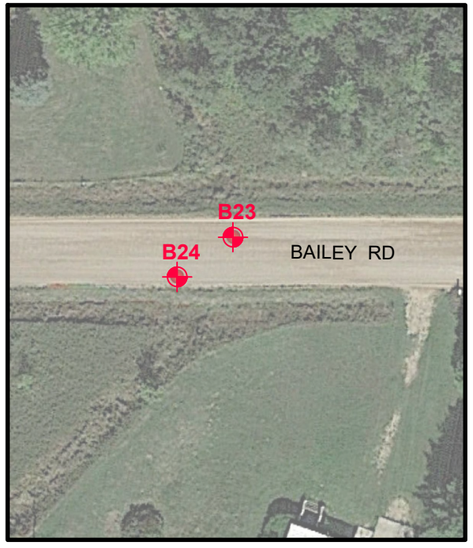
LITTLE DRAIN
MCRD ID: C12-059



PORTER DRAIN
MCRD ID: C12-101

SMITH & MULDER NO. 2 DRAIN
MCRD ID: C12-116

MUSKEGON-NEWAYGO DRAIN
MCRD ID: C12-041



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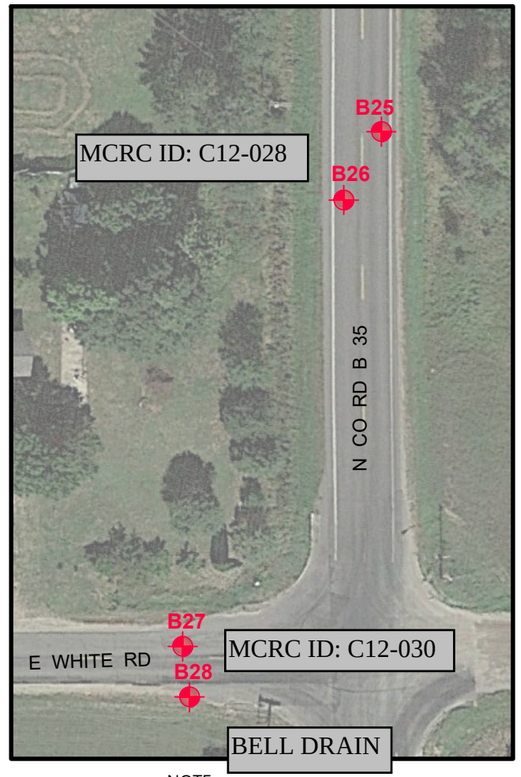

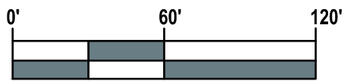

GRAPHIC SCALE: 1" = 60'

LEGEND

APPROXIMATE BORING LOCATION

NOTE:
BASE DRAWING INFORMATION TAKEN FROM GOOGLE EARTH PRO AND BING ONLINE MAPS.

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Project
MCDC DRAIN CULVERT REPLACEMENTS

Project Location
EGELSTON AND MOORLAND TOWNSHIPS, MUSKEGON COUNTY, MICHIGAN

Sheet Name
BORING LOCATION DIAGRAM - BORINGS B13 THROUGH B28

No.	Revision Date

Date: 5-13-2020
CADD: JAB
Designer: PEA
Scale: AS NOTED
Project: 084059.00
Figure No.: 3

PLOT DATE: May 12, 2020 - 3:57pm - jblake
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BORING LOG TERMINOLOGY

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOIL (more than 50% of material is larger than No. 200 sieve size.)			
GRAVEL More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravel (Less than 5% fines)	GW	Well-graded gravel; gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravel; gravel-sand mixtures, little or no fines
	Gravel with fines (More than 12% fines)	GM	Silty gravel; gravel-sand-silt mixtures
		GC	Clayey gravel; gravel-sand-clay mixtures
SAND 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sand (Less than 5% fines)	SW	Well-graded sand; sand-gravel mixtures, little or no fines
		SP	Poorly graded sand; sand-gravel mixtures, little or no fines
	Sand with fines (More than 12% fines)	SM	Silty sand; sand-silt-gravel mixtures
		SC	Clayey sand; sand–clay-gravel mixtures
FINE-GRAINED SOIL (50% or more of material is smaller than No. 200 sieve size)			
SILT AND CLAY Liquid limit less than 50%		ML	Inorganic silt; sandy silt or gravelly silt with slight plasticity
		CL	Inorganic clay of low plasticity; lean clay, sandy clay, gravelly clay
		OL	Organic silt and organic clay of low plasticity
SILT AND CLAY Liquid limit 50% or greater		MH	Inorganic silt of high plasticity, elastic silt
		CH	Inorganic clay of high plasticity, fat clay
		OH	Organic silt and organic clay of high plasticity
HIGHLY ORGANIC SOIL		PT	Peat and other highly organic soil

OTHER MATERIAL SYMBOLS

Topsoil, Void, Sandstone, Asphalt, Glacial Till, Siltstone, Base, Coal, Limestone, Concrete, Shale, Fill

LABORATORY CLASSIFICATION CRITERIA

GW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with PI greater than 7	
SW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for SW	
SM	Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
SC	Atterberg limits above "A" line with PI greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent……GW, GP, SW, SP
More than 12 percent……GM, GC, SM, SC
5 to 12 percent……Cases requiring dual symbols

- SP-SM or SW-SM (SAND with Silt or SAND with Silt and Gravel)
- SP-SC or SW-SC (SAND with Clay or SAND with Clay and Gravel)
- GP-GM or GW-GM (GRAVEL with Silt or GRAVEL with Silt and Sand)
- GP-GC or GW-GC (GRAVEL with Clay or GRAVEL with Clay and Sand)

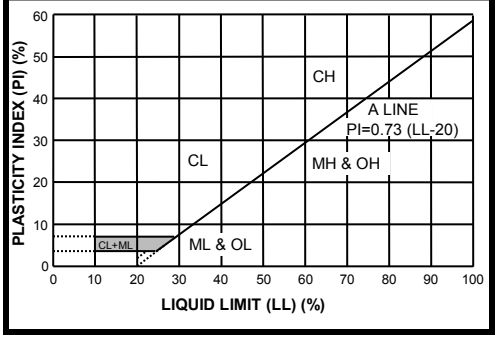
If the fines are CL-ML:

- SC-SM (SILTY CLAYEY SAND or SILTY CLAYEY SAND with Gravel)
- SM-SC (CLAYEY SILTY SAND or CLAYEY SILTY SAND with Gravel)
- GC-GM (SILTY CLAYEY GRAVEL or SILTY CLAYEY GRAVEL with Sand)
- GM-GC (CLAYEY SILTY GRAVEL or CLAYEY SILTY GRAVEL with Sand)

PARTICLE SIZES

Boulders	-	Greater than 12 inches
Cobbles	-	3 inches to 12 inches
Gravel- Coarse	-	3/4 inches to 3 inches
Fine	-	No. 4 to 3/4 inches
Sand- Coarse	-	No. 10 to No. 4
Medium	-	No. 40 to No. 10
Fine	-	No. 200 to No. 40
Silt and Clay	-	Less than (0.0074 mm)

PLASTICITY CHART



VISUAL MANUAL PROCEDURE

When laboratory tests are not performed to confirm the classification of soils exhibiting borderline classifications, the two possible classifications would be separated with a slash, as follows:

For soils where it is difficult to distinguish if it is a coarse or fine-grained soil:

- SC/CL (CLAYEY SAND to Sandy LEAN CLAY)
- SM/ML (SILTY SAND to SANDY SILT)
- GC/CL (CLAYEY GRAVEL to Gravelly LEAN CLAY)
- GM/ML (SILTY GRAVEL to Gravelly SILT)

For soils where it is difficult to distinguish if it is sand or gravel, poorly or well-graded sand or gravel; silt or clay; or plastic or non-plastic silt or clay:

- SP/GP or SW/GW (SAND with Gravel to GRAVEL with Sand)
- SC/GC (CLAYEY SAND with Gravel to CLAYEY GRAVEL with Sand)
- SM/GM (SILTY SAND with Gravel to SILTY GRAVEL with Sand)
- SW/SP (SAND or SAND with Gravel)
- GP/GW (GRAVEL or GRAVEL with Sand)
- SC/SM (CLAYEY to SILTY SAND)
- GM/GC (SILTY to CLAYEY GRAVEL)
- CL/ML (SILTY CLAY)
- ML/CL (CLAYEY SILT)
- CH/MH (FAT CLAY to ELASTIC SILT)
- CL/CH (LEAN to FAT CLAY)
- MH/ML (ELASTIC SILT to SILT)
- OL/OH (ORGANIC SILT or ORGANIC CLAY)

DRILLING AND SAMPLING ABBREVIATIONS

2ST	–	Shelby Tube – 2" O.D.
3ST	–	Shelby Tube – 3" O.D.
AS	–	Auger Sample
GS	–	Grab Sample
LS	–	Liner Sample
NR	–	No Recovery
PM	–	Pressure Meter
RC	–	Rock Core diamond bit. NX size, except where noted
SB	–	Split Barrel Sample 1-3/8" I.D., 2" O.D., except where noted
VS	–	Vane Shear
WS	–	Wash Sample

OTHER ABBREVIATIONS

WOH	–	Weight of Hammer
WOR	–	Weight of Rods
SP	–	Soil Probe
PID	–	Photo Ionization Device
FID	–	Flame Ionization Device

DEPOSITIONAL FEATURES

Parting	–	as much as 1/16 inch thick
Seam	–	1/16 inch to 1/2 inch thick
Layer	–	1/2 inch to 12 inches thick
Stratum	–	greater than 12 inches thick
Pocket	–	deposit of limited lateral extent
Lens	–	lenticular deposit
Hardpan/Till	–	an unstratified, consolidated or cemented mixture of clay, silt, sand and/or gravel, the size/shape of the constituents vary widely
Lacustrine	–	soil deposited by lake water
Mottled	–	soil irregularly marked with spots of different colors that vary in number and size
Varved	–	alternating partings or seams of silt and/or clay
Occasional	–	one or less per foot of thickness
Frequent	–	more than one per foot of thickness
Interbedded	–	strata of soil or beds of rock lying between or alternating with other strata of a different nature

CLASSIFICATION TERMINOLOGY AND CORRELATIONS

Cohesionless Soils

Relative Density	N-Value (Blows per foot)
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	50 to 80
Extremely Dense	Over 80

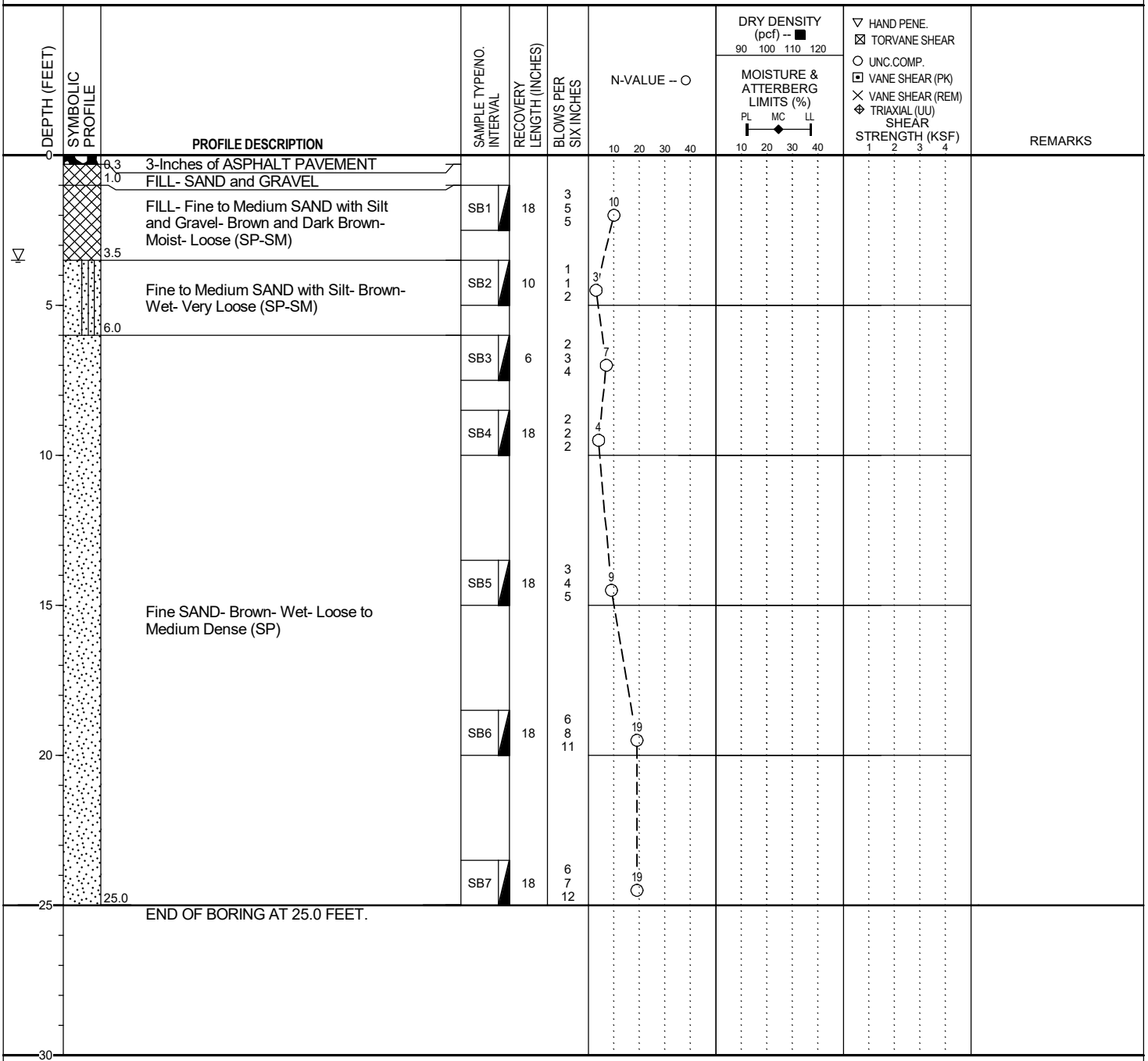
Cohesive Soils

Consistency	N-Value (Blows per foot)	Undrained Shear Strength (kips/ft^2)
Very Soft	0 - 2	0.25 or less
Soft	2 - 4	0.25 to 0.50
Medium	4 - 8	0.50 to 1.0
Stiff	8 - 15	1.0 to 2.0
Very Stiff	15 - 30	2.0 to 4.0
Hard	> 30	4.0 or greater

Standard Penetration 'N-Value' = Blows per foot of a 140-pound hammer falling 30 inches on a 2-inch O.D. split barrel sampler, except where noted.

BORING B 1

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/21/20 **COMPLETED:** 4/21/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)
▽ DURING BORING:	3.5
▼ AT END OF BORING:	Note 2

CAVE-IN OF BOREHOLE AT: 5.0

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 6 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B 2

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/21/20 **COMPLETED:** 4/21/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB

DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	N-VALUE -- ○ (10 20 30 40)	DRY DENSITY (pcf) -- ■ (90 100 110 120) / MOISTURE & ATTERBERG LIMITS (%) PL MC LL (10 20 30 40)	▽ HAND PENE. ⊠ TORVANE SHEAR ○ UNC.COMP. ⊡ VANE SHEAR (PK) × VANE SHEAR (REM) ◈ TRIAXIAL (UU) SHEAR STRENGTH (KSF) (1 2 3 4)	REMARKS
0	0.4 4 1/2-Inches of ASPHALT PAVEMENT							
	0.8 FILL- SAND and GRAVEL							
	FILL- Fine SAND with Silt- Few Gravel- Brown and Dark Brown- Moist- Loose (SP-SM)	SB1	18	6 5 5	10			
▽	3.5							
5	Fine to Medium SAND with Silt- Brown- Wet- Very Loose (SP-SM)	SB2	18	2 2 2	4'			
	6.0							
	Fine to Medium SAND with Silt- Occasional Roots- Brown- Wet- Very Loose (SP-SM)	SB3	18	2 2 2	4			
	9.0	SB4	18	2 2 4	6			
10								
		SB5	18	2 3 4	7			
15	Fine SAND- Brown- Wet- Loose to Medium Dense (SP)							
		SB6	18	3 5 6	11			
20								
		SB7	18	5 5 6	11			
25	25.0							
	END OF BORING AT 25.0 FEET.							
30								

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)
▽ **DURING BORING:**	3.5
▼ **AT END OF BORING:**	Note 2

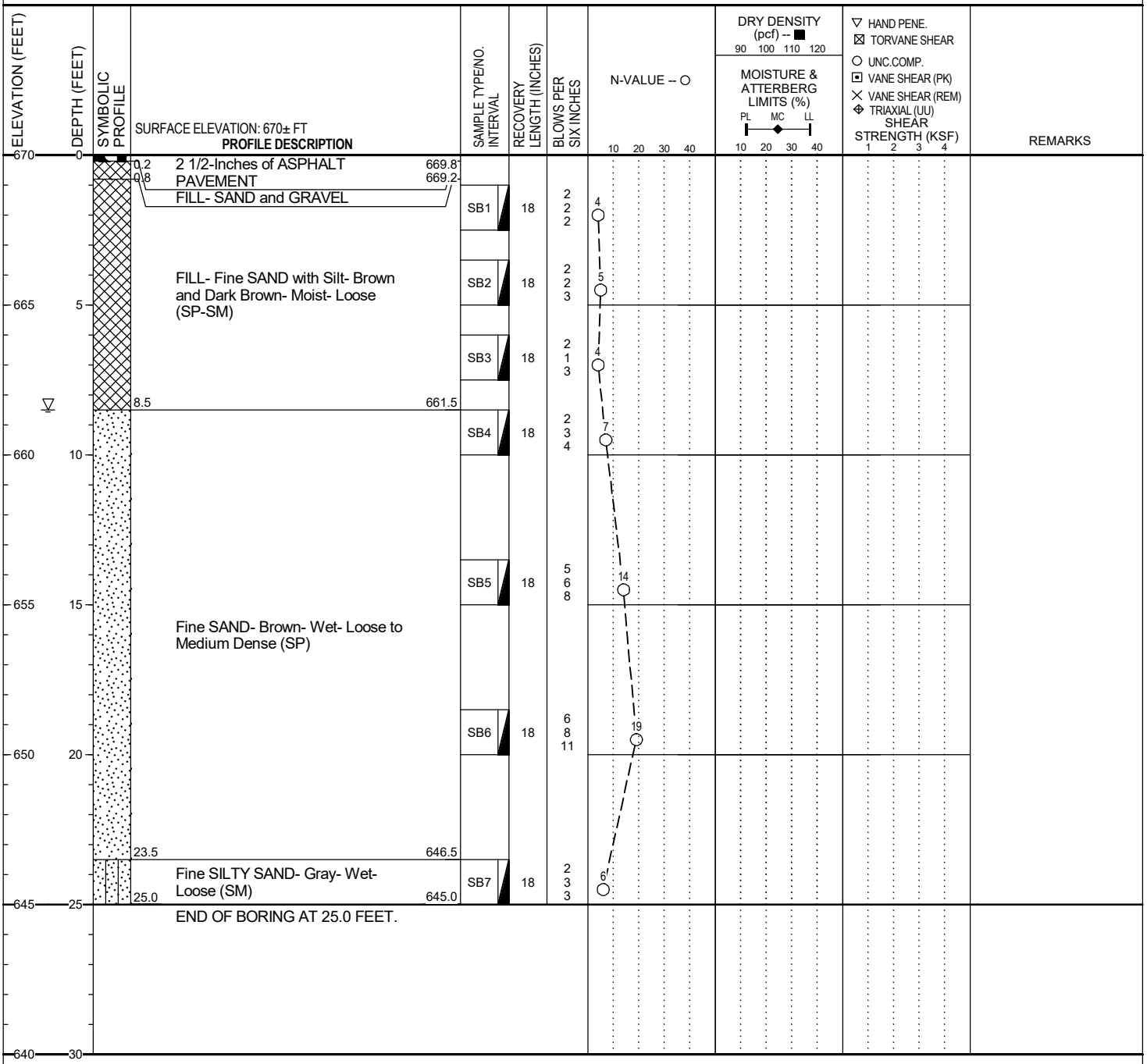
CAVE-IN OF BOREHOLE AT: 4.0

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 6 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B 3

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/21/20 **COMPLETED:** 4/21/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	8.5	661.5
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	8.0	662.0

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B 4

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/21/20 **COMPLETED:** 4/21/20 **BORING METHOD:** Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55 **LOGGED BY:** GBS **CHECKED BY:** ATB

SURFACE ELEVATION: 670± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES
670	0	0.3 3-Inches of ASPHALT PAVEMENT 669.7			
		1.2 FILL- Fine to Coarse SAND with Gravel- Brown- Moist (SP) 668.8	SB1	18	5 4 3
		FILL- Fine SAND with Silt- Brown and Dark Brown- Moist- Loose (SP-SM)	SB2	18	2 2 4
665	5	6.0 664.0	SB3	18	2 3 5
			SB4	18	3 4 6
660	10	Fine SAND- Brown- Moist to Wet- Loose to Medium Dense (SP)	SB5	18	4 6 7
655	15		SB6	18	4 5 6
650	20	23.5 646.5			
		Fine SAND- Occasional Clay Layers- Brown- Wet- Medium Dense (SP) 25.0 645.0	SB7	18	4 5 9
645	25	END OF BORING AT 25.0 FEET.			
640	30				

N-VALUE -- ○ (10 20 30 40)

DRY DENSITY (pcf) -- ■ (90 100 110 120)

MOISTURE & ATTERBERG LIMITS (%) PL MC LL (10 20 30 40)

▽ HAND PENE.
⊠ TORVANE SHEAR
○ UNC.COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
◈ TRIAXIAL (UU)
SHEAR STRENGTH (KSF) (1 2 3 4)

REMARKS

GROUNDWATER & BACKFILL INFORMATION

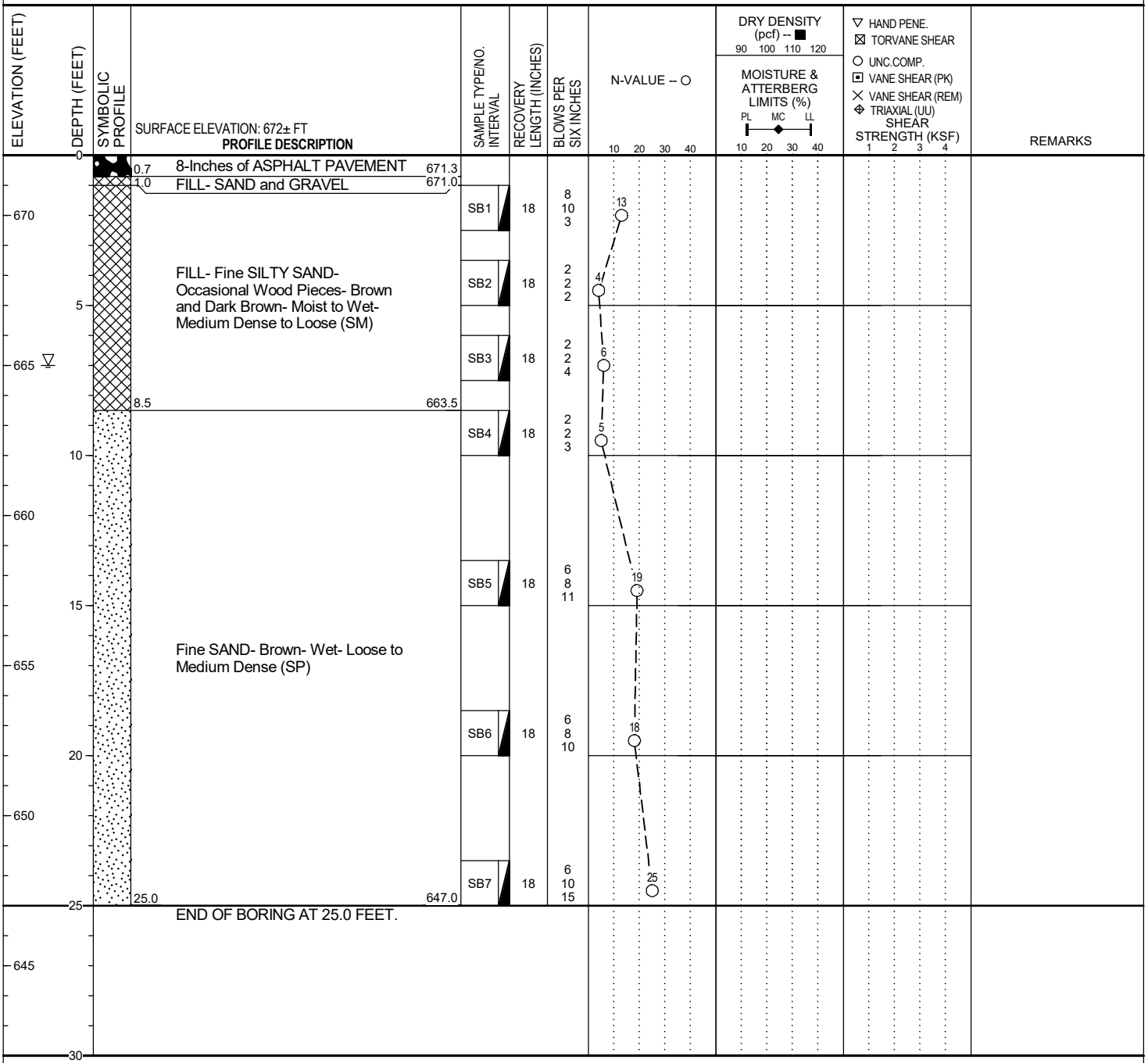
	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	7.0	663.0
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	6.5	663.5

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B 5

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/21/20 **COMPLETED:** 4/21/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

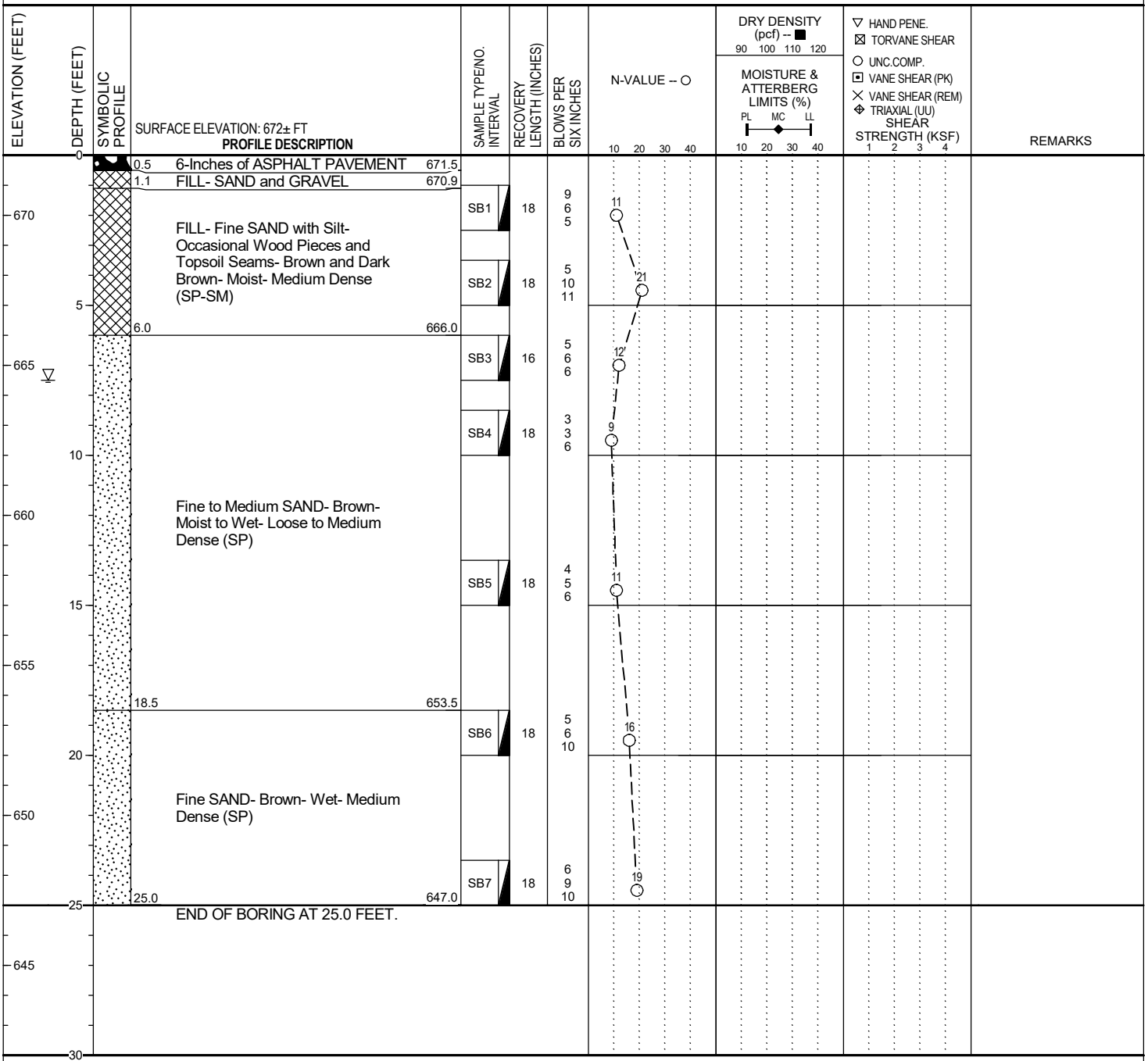
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	7.0	665.0
▼ AT END OF BORING:	Note 2	
CAVE-IN OF BOREHOLE AT:	6.0	666.0

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B 6

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/21/20 **COMPLETED:** 4/21/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

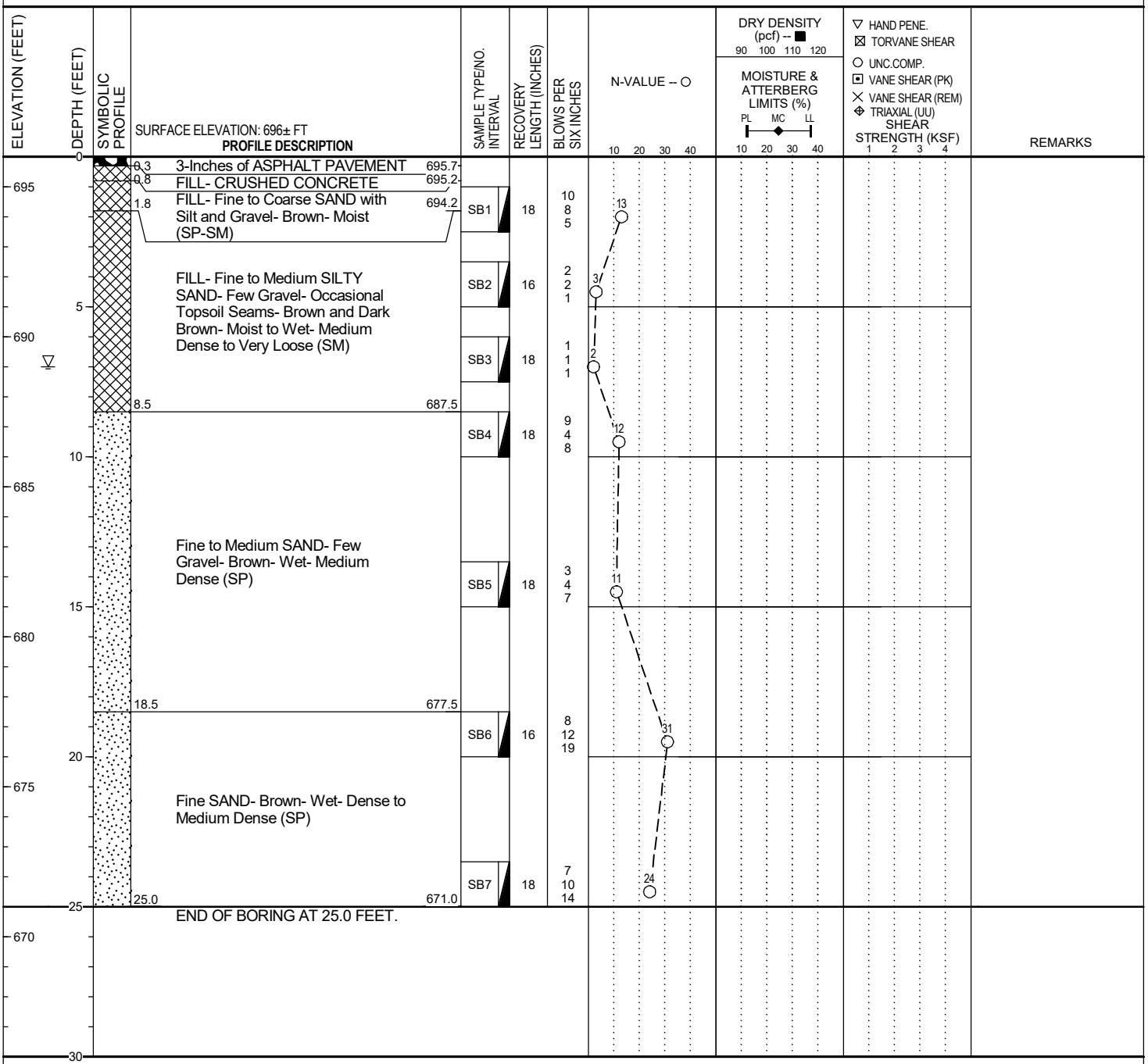
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	7.5	664.5
▼ AT END OF BORING:	Note 2	
CAVE-IN OF BOREHOLE AT:	6.5	665.5

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B 7

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/23/20 **COMPLETED:** 4/23/20 **BORING METHOD:** Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55 **LOGGED BY:** GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	7.0	689.0
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	8.0	688.0

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B 8

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/23/20 **COMPLETED:** 4/23/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB

SURFACE ELEVATION: 696± FT

ELEV (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	N-VALUE
695	0	0.3 3-Inches of ASPHALT PAVEMENT (695.7)				
		0.9 FILL- CRUSHED CONCRETE (695.1)				
		1.5 FILL- Fine to Coarse SAND with Silt and Gravel- Brown- Moist (SP-SM) (694.5)	SB1	18	12 8 6	14
	5	FILL- Fine to Medium SILTY SAND- Occasional Topsoil Seams- Brown and Dark Brown- Moist to Wet- Medium Dense to Very Loose (SM)	SB2	18	2 1 2	3
690			SB3	18	2 1 4	5
		8.5 (687.5)	SB4	18	5 5 5	10
	10	Fine to Medium SAND- Few Gravel- Brown- Wet- Medium Dense (SP)	SB5	18	5 7 8	15
680		18.5 (677.5)	SB6	18	7 9 14	23
	20	Fine SAND- Brown- Wet- Medium Dense to Dense (SP)	SB7	18	7 14 27	41
675		25.0 (671.0)				
	25	END OF BORING AT 25.0 FEET.				
670						
	30					

DRY DENSITY (pcf) -- ■ (90 100 110 120)
MOISTURE & ATTERBERG LIMITS (%) PL MC LL (10 20 30 40)
▽ HAND PENE. ☒ TORVANE SHEAR ○ UNC.COMP. ⊡ VANE SHEAR (PK) × VANE SHEAR (REM) ◈ TRIAXIAL (UU)
SHEAR STRENGTH (KSF) (1 2 3 4)

REMARKS

GROUNDWATER & BACKFILL INFORMATION

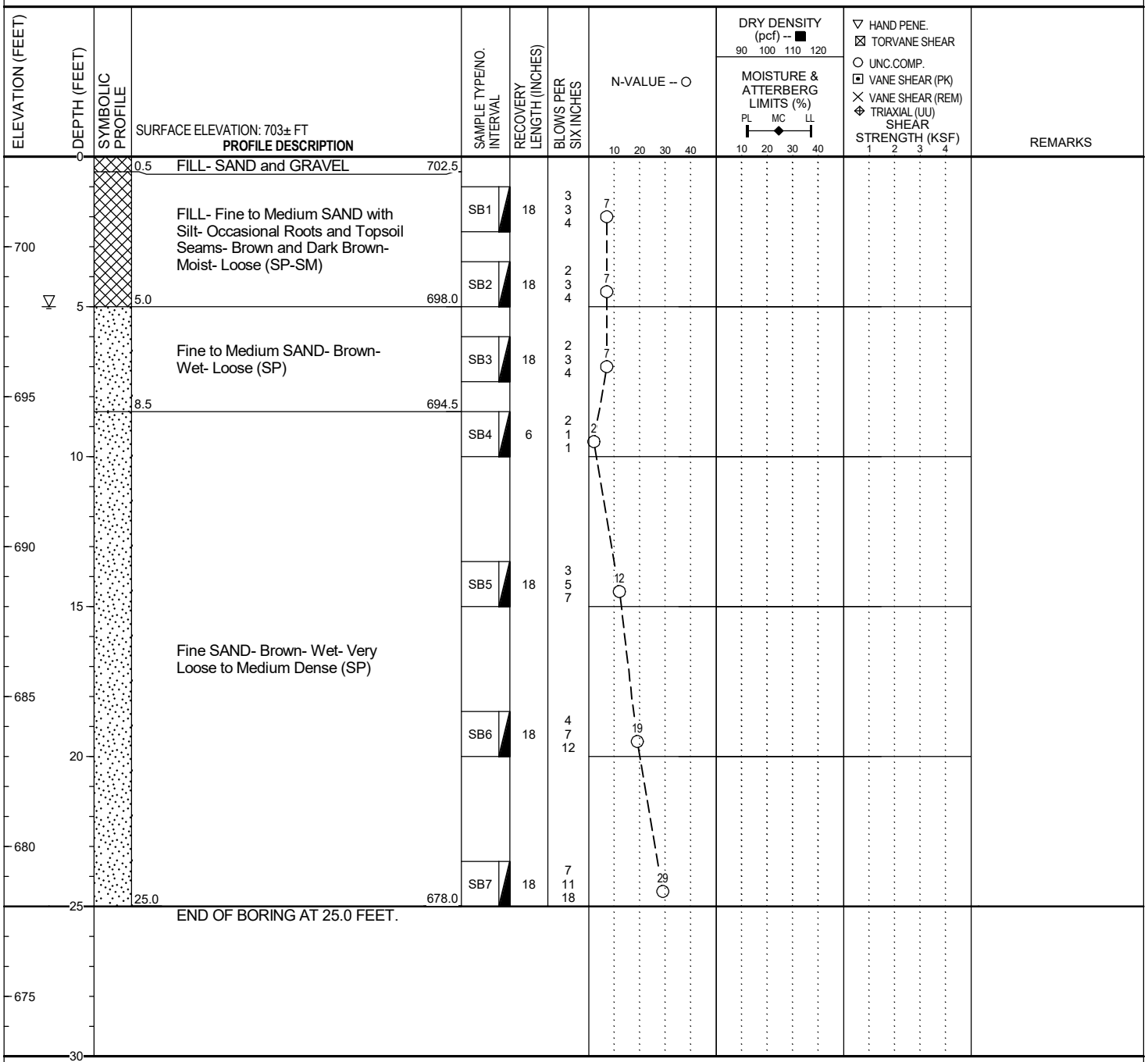
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	8.0	688.0
▼ AT END OF BORING:	Note 2	

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B 9

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/23/20 **COMPLETED:** 4/23/20 **BORING METHOD:** Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55 **LOGGED BY:** GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

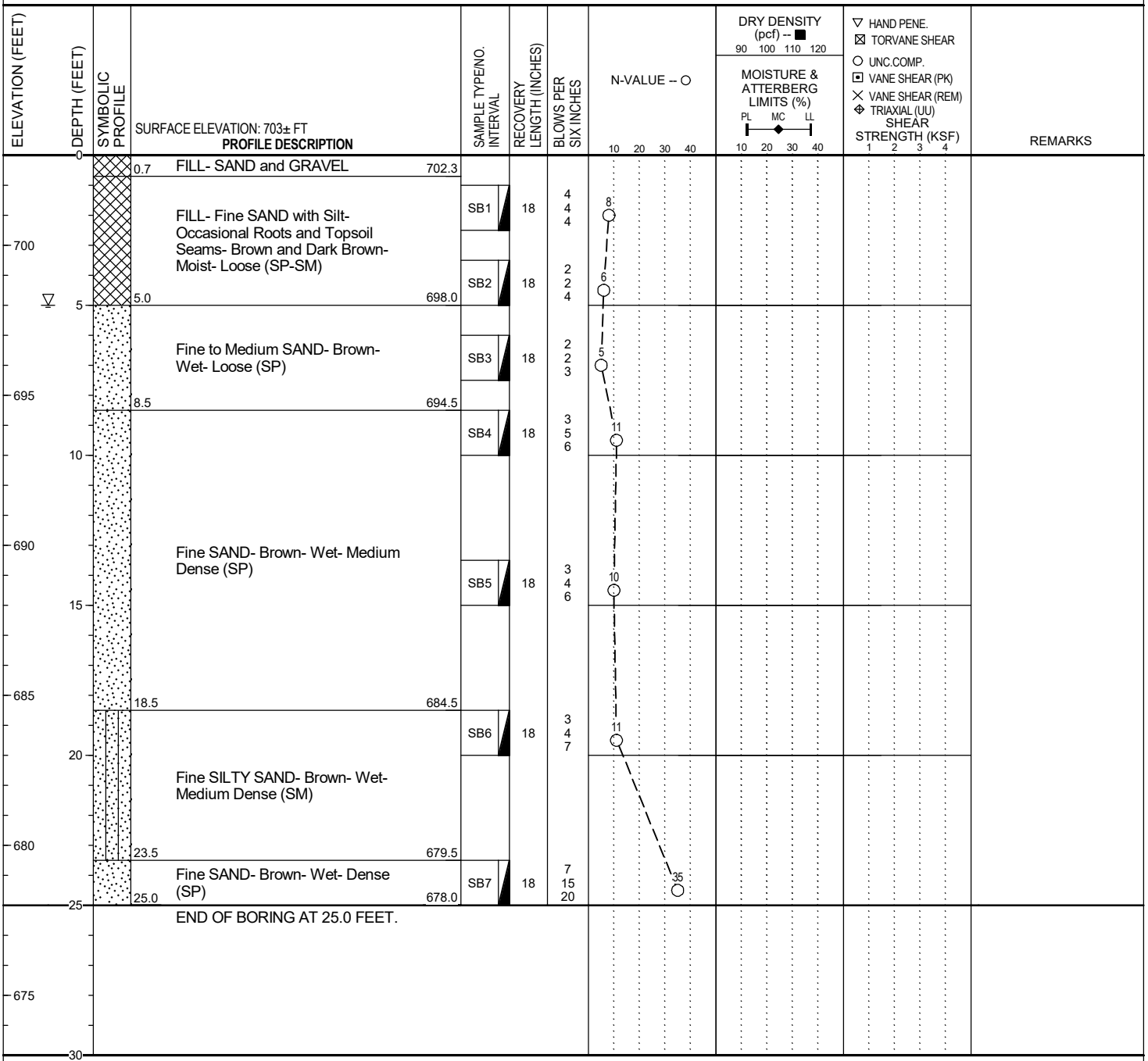
	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	5.0	698.0
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	5.0	698.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 8 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.

BORING B10

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/23/20 **COMPLETED:** 4/23/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

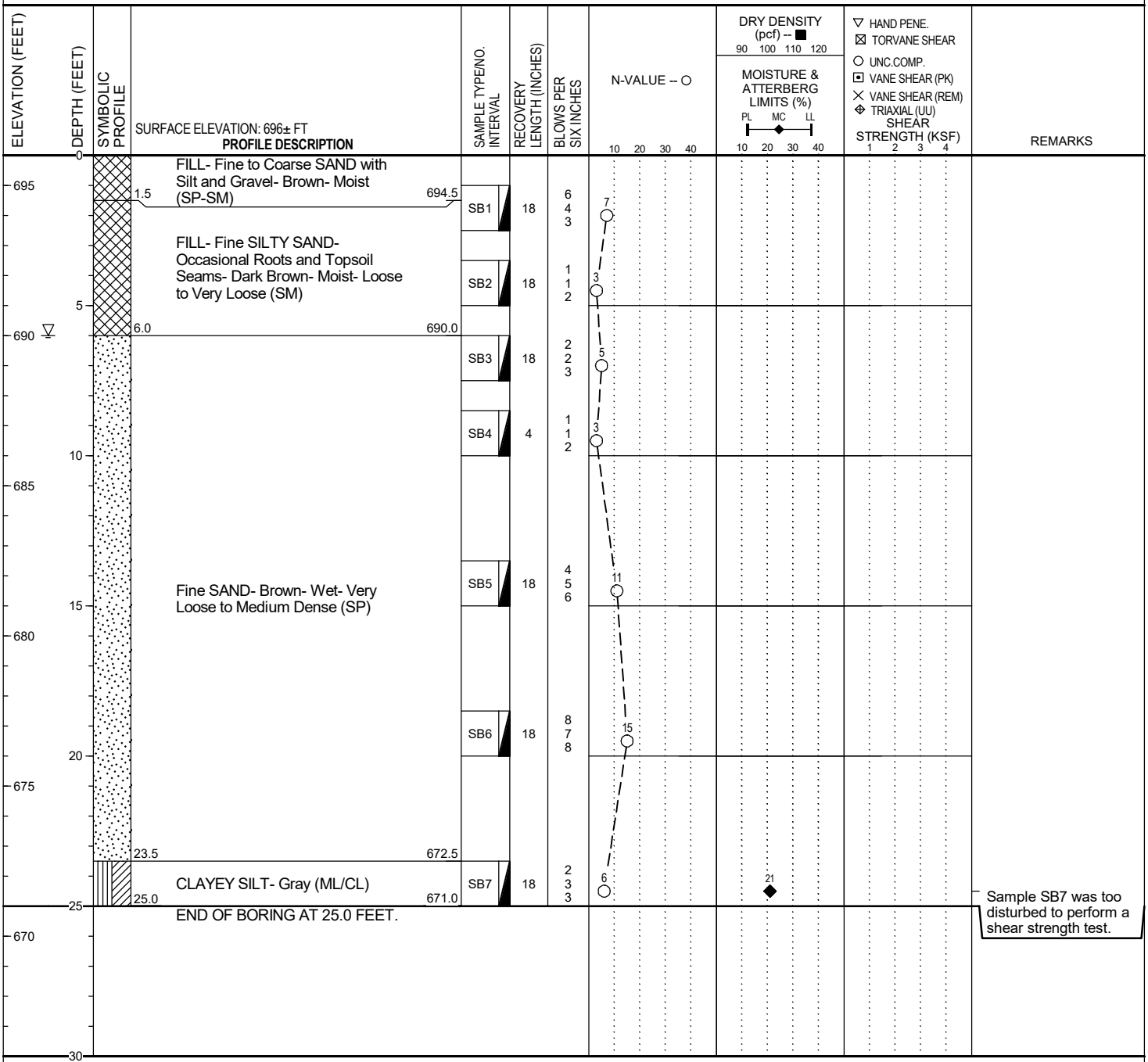
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	5.0	698.0
▼ AT END OF BORING:	Note 2	
CAVE-IN OF BOREHOLE AT:	5.0	698.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 6 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.

BORING B11

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/24/20 **COMPLETED:** 4/24/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

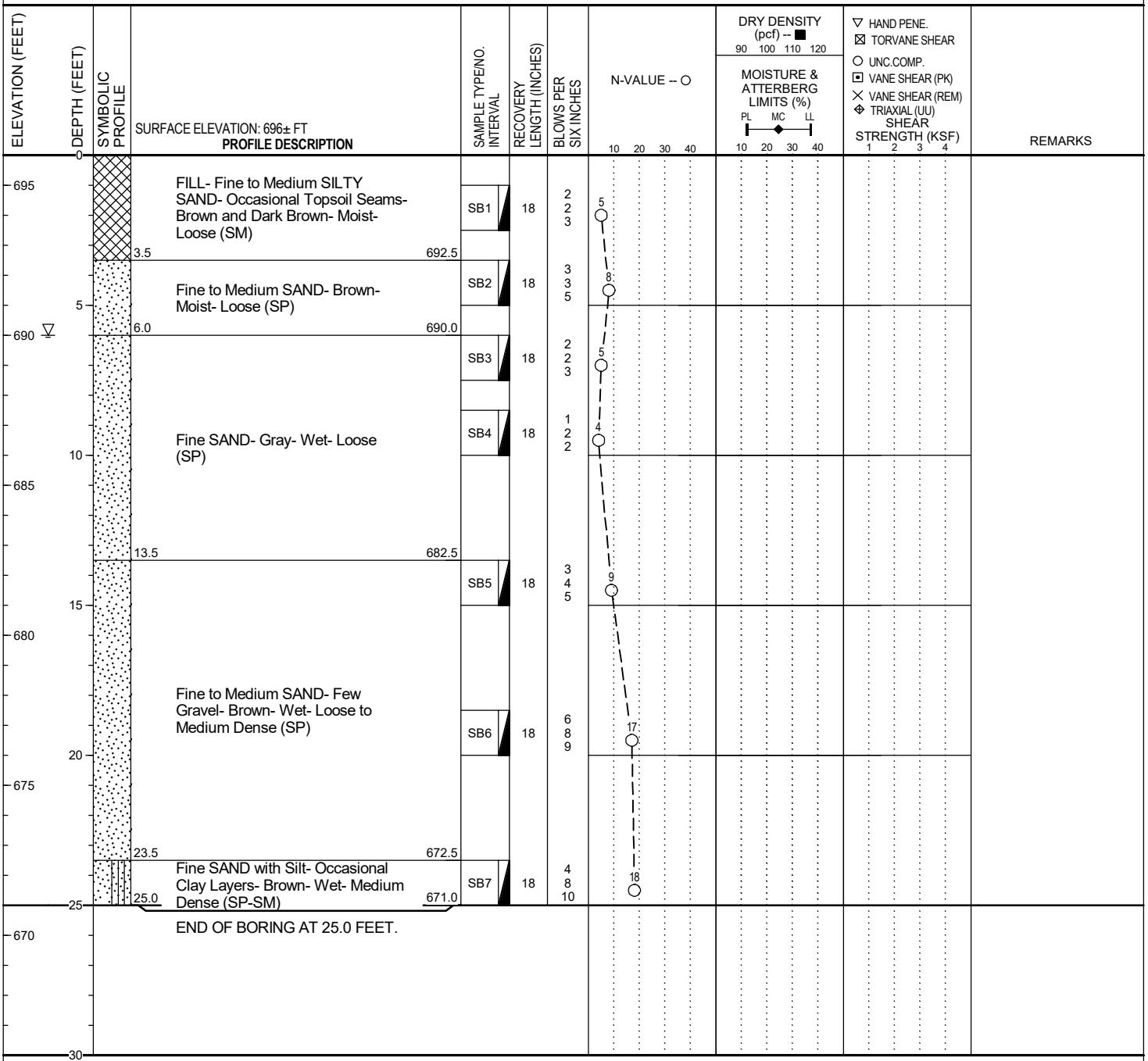
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	6.0	690.0
▼ AT END OF BORING:	Note 2	
CAVE-IN OF BOREHOLE AT:	5.0	691.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 6 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.

BORING B12

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/24/20 **COMPLETED:** 4/24/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

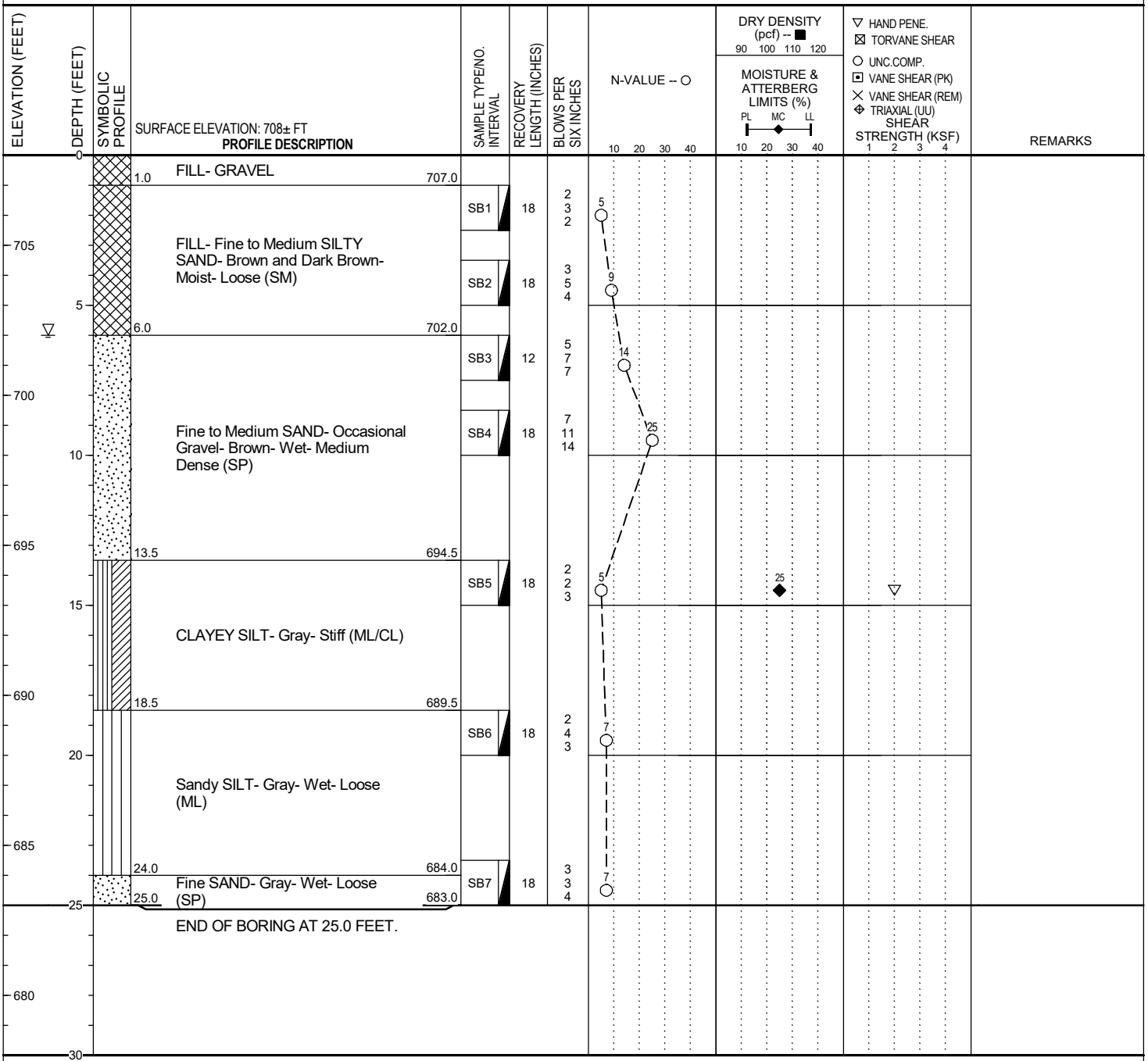
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	6.0	690.0
▼ AT END OF BORING:	Note 2	
CAVE-IN OF BOREHOLE AT:	5.0	691.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 6 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.

BORING B13

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/27/20 **COMPLETED:** 4/27/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

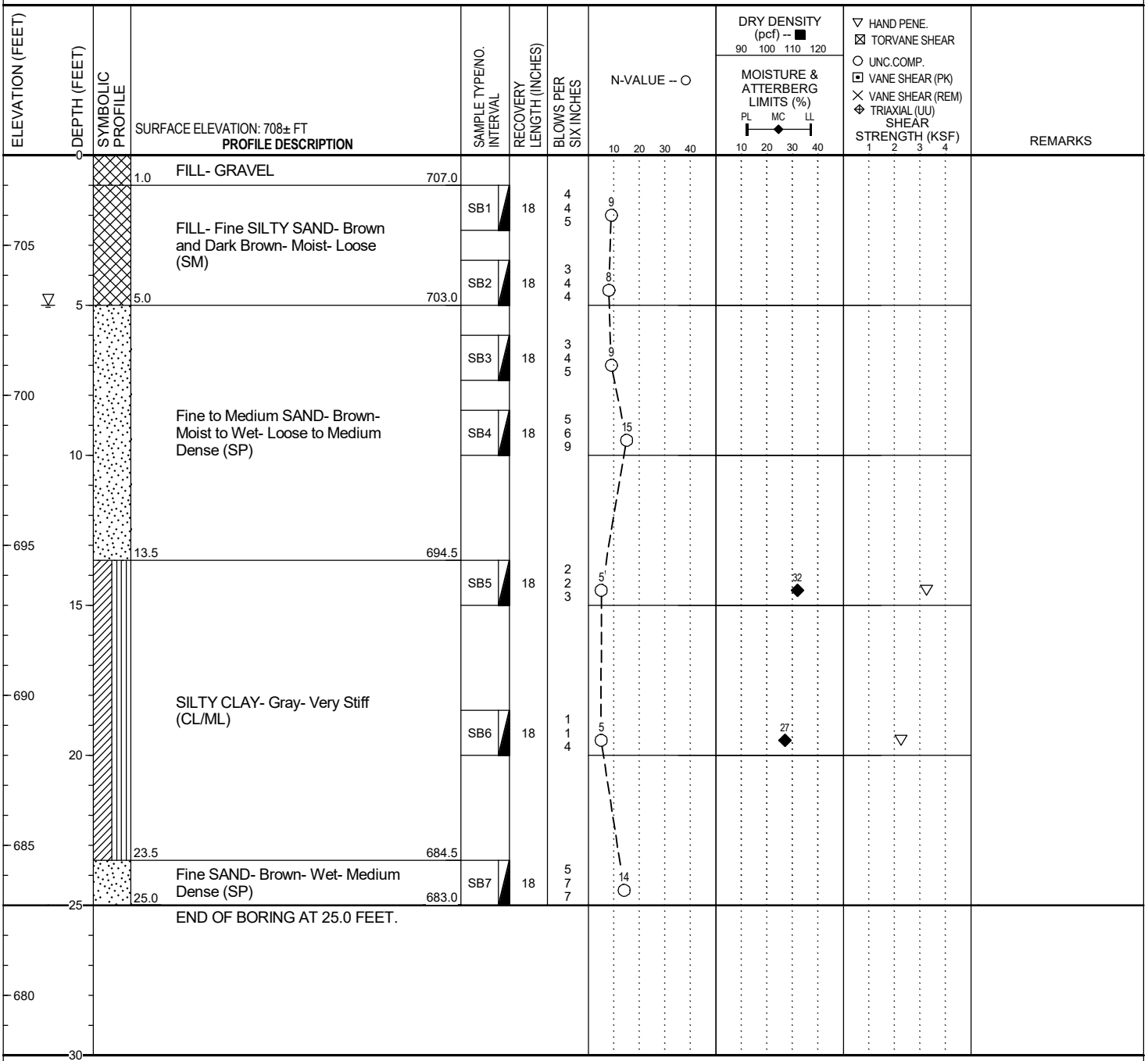
	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	6.0	702.0
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	5.0	703.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 6 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.

BORING B14

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/27/20 **COMPLETED:** 4/27/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

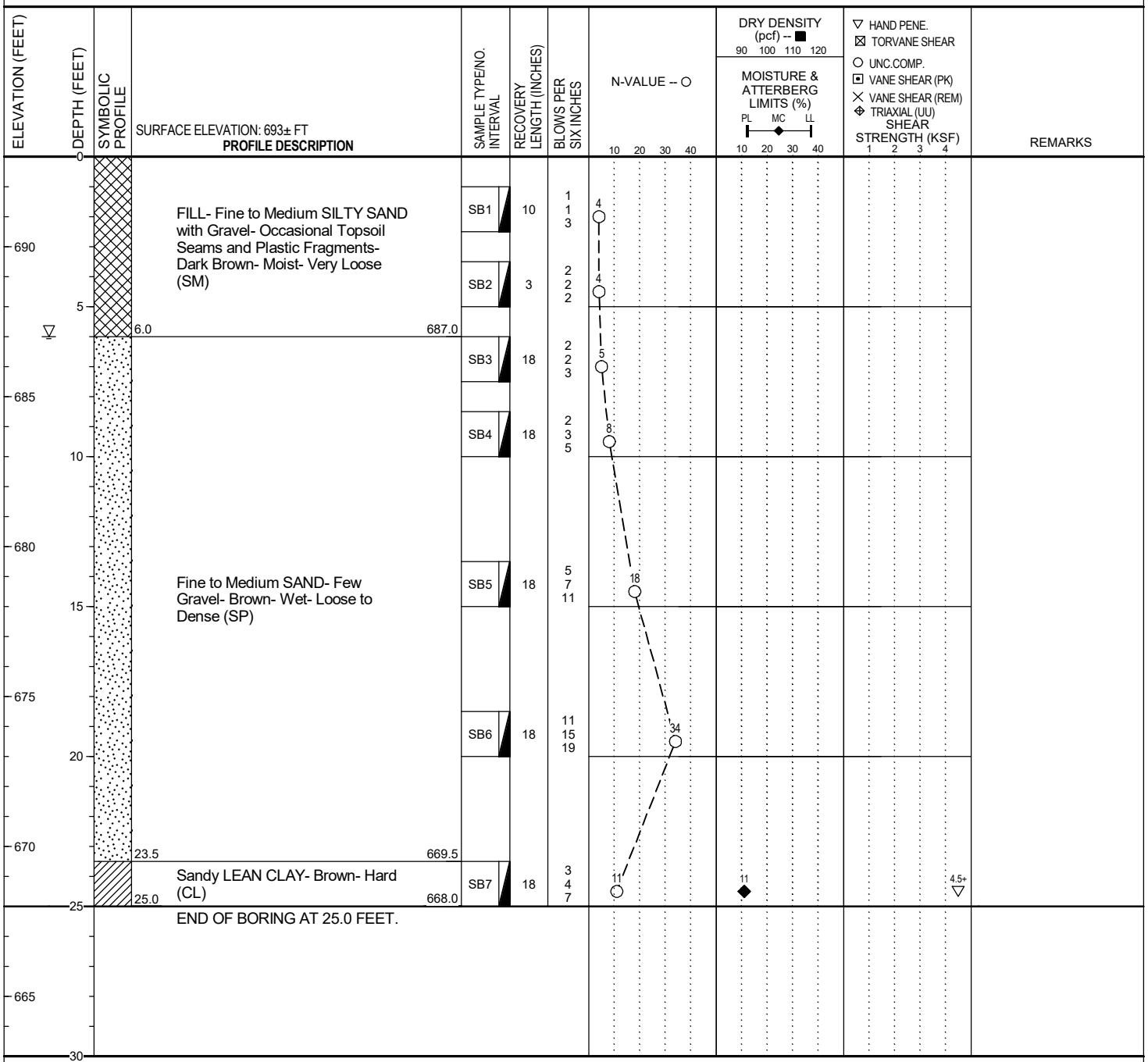
	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	5.0	703.0
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	5.0	703.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 6 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.

BORING B15

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/24/20 **COMPLETED:** 4/24/20 **BORING METHOD:** Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55 **LOGGED BY:** GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

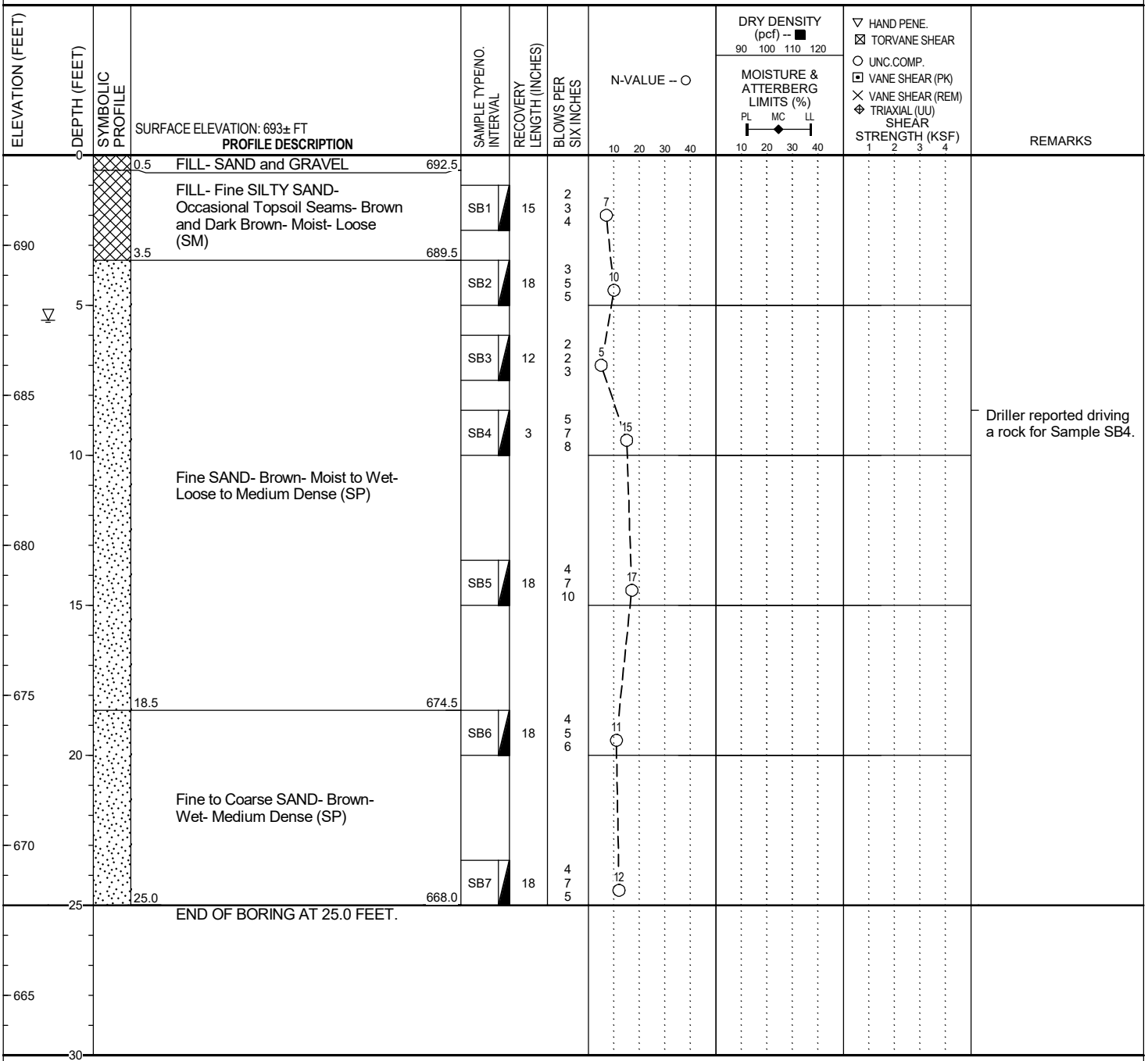
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	6.0	687.0
▼ AT END OF BORING:	Note 2	
CAVE-IN OF BOREHOLE AT:	6.0	687.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.

BORING B16

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/24/20 **COMPLETED:** 4/24/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	5.5	687.5
▼ AT END OF BORING:	Note 2	
CAVE-IN OF BOREHOLE AT:	5.0	688.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 6 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.

BORING B17

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/20/20 **COMPLETED:** 4/20/20 **BORING METHOD:** Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55 **LOGGED BY:** GBS **CHECKED BY:** ATB

SURFACE ELEVATION: 688± FT

ELEV (FT)	DEPTH (FT)	PROFILE DESCRIPTION	SAMPLE TYPE/NO.	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	N-VALUE
	0	0.4 5-Inches of ASPHALT PAVEMENT 687.6				
		0.9 FILL- SAND and GRAVEL 687.1				
		FILL- Fine SILTY SAND- Few Gravel- Occasional Topsoil Seams- Brown and Dark Brown- Moist- Medium Dense (SM)	SB1	18	9 5 6	11
685		3.5 684.5				
	5	Fine SAND- Brown- Moist- Loose (SP)	SB2	18	3 4 5	9
		6.0 682.0				
		Fine SAND- Occasional Clay Layers- Moist to Wet- Loose (SP)	SB3	18	3 3 4	7
680 ▽		8.5 679.5				
			SB4	18	3 5 6	11
	10					
675			SB5	18	3 5 7	12
	15	Fine SAND- Brown- Wet- Loose to Medium Dense (SP)				
670			SB6	16	3 4 4	8
	20					
665			SB7	18	7 9 9	18
	25	25.0 663.0				
		END OF BORING AT 25.0 FEET.				
660						
	30					

DRY DENSITY (pcf) -- ■ (90 100 110 120)
MOISTURE & ATTERBERG LIMITS (%) PL MC LL (10 20 30 40)
▽ HAND PENE. ⊠ TORVANE SHEAR ○ UNC.COMP. ⊡ VANE SHEAR (PK) × VANE SHEAR (REM) ◈ TRIAXIAL (UU)
SHEAR STRENGTH (KSF) (1 2 3 4)

REMARKS

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	8.0	680.0
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	7.0	681.0

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B18

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/20/20 **COMPLETED:** 4/20/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB

SURFACE ELEVATION: 688± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES
	0	0.5 6-Inches of ASPHALT PAVEMENT 687.5			
		0.8 FILL- SAND and GRAVEL 687.2			
		FILL- Fine SILTY SAND- Few Gravel- Occasional Topsoil Seams- Dark Brown- Moist- Loose (SM)	SB1	18	3 3 6
685		3.5 684.5			
	5		SB2	18	3 6 7
			SB3	18	3 5 6
680 ▽			SB4	18	4 5 7
	10				
675		Fine SAND- Brown- Moist to Wet- Loose to Medium Dense (SP)	SB5	9	3 4 5
	15				
670			SB6	18	3 5 6
	20				
665			SB7	18	6 12 17
	25	25.0 663.0			
		END OF BORING AT 25.0 FEET.			
660					
	30				

N-VALUE -- ○ (10 20 30 40)

DRY DENSITY (pcf) -- ■ (90 100 110 120)

MOISTURE & ATTERBERG LIMITS (%) PL MC LL (10 20 30 40)

▽ HAND PENE.
⊠ TORVANE SHEAR
○ UNC.COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
◈ TRIAXIAL (UU)
SHEAR STRENGTH (KSF) (1 2 3 4)

REMARKS

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	8.5	679.5
▼ AT END OF BORING:	Note 2	
CAVE-IN OF BOREHOLE AT:	7.0	681.0

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B19

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/20/20 **COMPLETED:** 4/20/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB

SURFACE ELEVATION: 689± FT

ELEV (FT)	DEPTH (FT)	PROFILE DESCRIPTION	SAMPLE TYPE/NO.	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES
	0	0.6 7 1/2-Inches of ASPHALT PAVEMENT 688.4			
	1	1/2 687.8 FILL- Fine to Coarse SAND with Gravel- Brown- Moist (SP)	SB1	18	6 3 3
685	5	FILL- Fine SILTY SAND- Occasional Topsoil Seams- Brown and Dark Brown- Moist- Loose (SM)	SB2	18	2 2 4
		6.0 683.0	SB3	18	4 5 6
680	10	Fine SAND- Brown- Moist to Wet- Medium Dense (SP)	SB4	18	3 4 6
		13.5 675.5	SB5	18	6 8 10
675	15	Fine SILTY SAND- Gray- Wet- Medium Dense (SM)			
		18.5 670.5	SB6	18	6 6 8
670	20	Fine SAND- Brown- Wet- Medium Dense (SP)			
665	25	25.0 664.0	SB7	18	5 6 10
		END OF BORING AT 25.0 FEET.			
660	30				

N-VALUE -- ○ (10 20 30 40)

DRY DENSITY (pcf) -- ■ (90 100 110 120)

MOISTURE & ATTERBERG LIMITS (%) PL MC LL (10 20 30 40)

▽ HAND PENE.
⊠ TORVANE SHEAR
○ UNC.COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
◈ TRIAXIAL (UU)
SHEAR STRENGTH (KSF) (1 2 3 4)

REMARKS

GROUNDWATER & BACKFILL INFORMATION

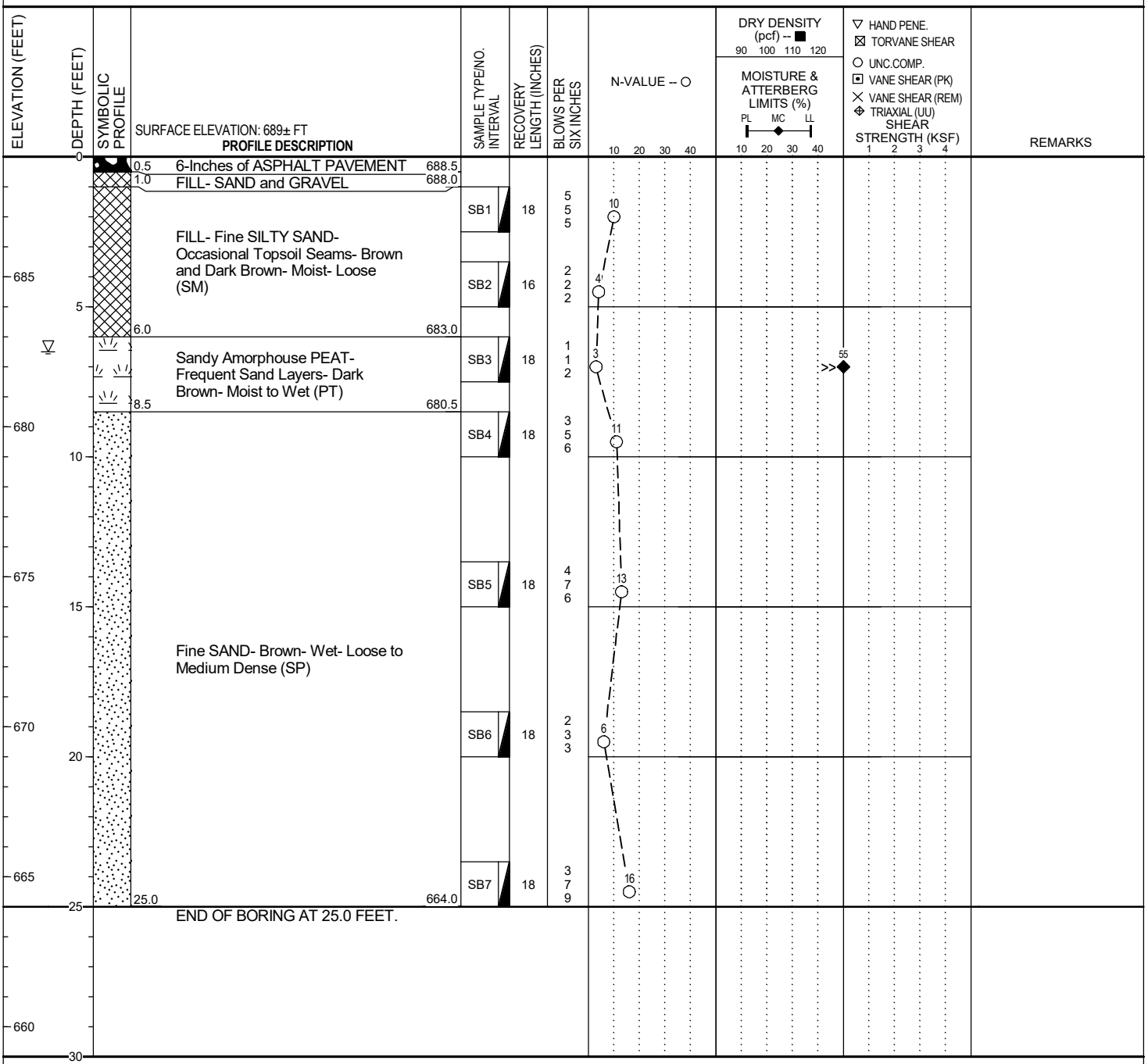
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	7.5	681.5
▼ AT END OF BORING:	Note 2	
CAVE-IN OF BOREHOLE AT:	7.5	681.5

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B20

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/20/20 **COMPLETED:** 4/20/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

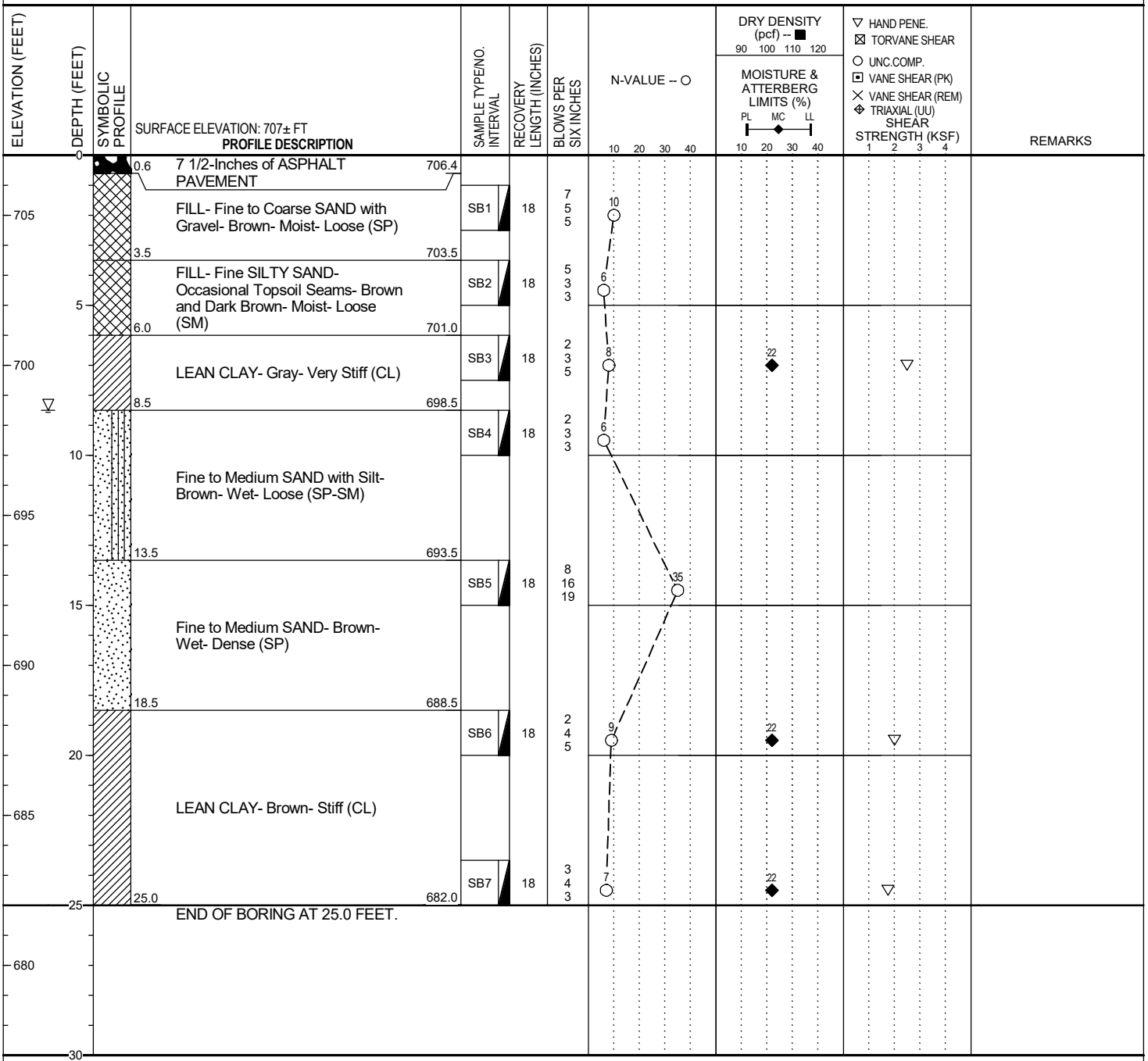
	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	6.5	682.5
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	5.0	684.0

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B21

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/22/20 **COMPLETED:** 4/22/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

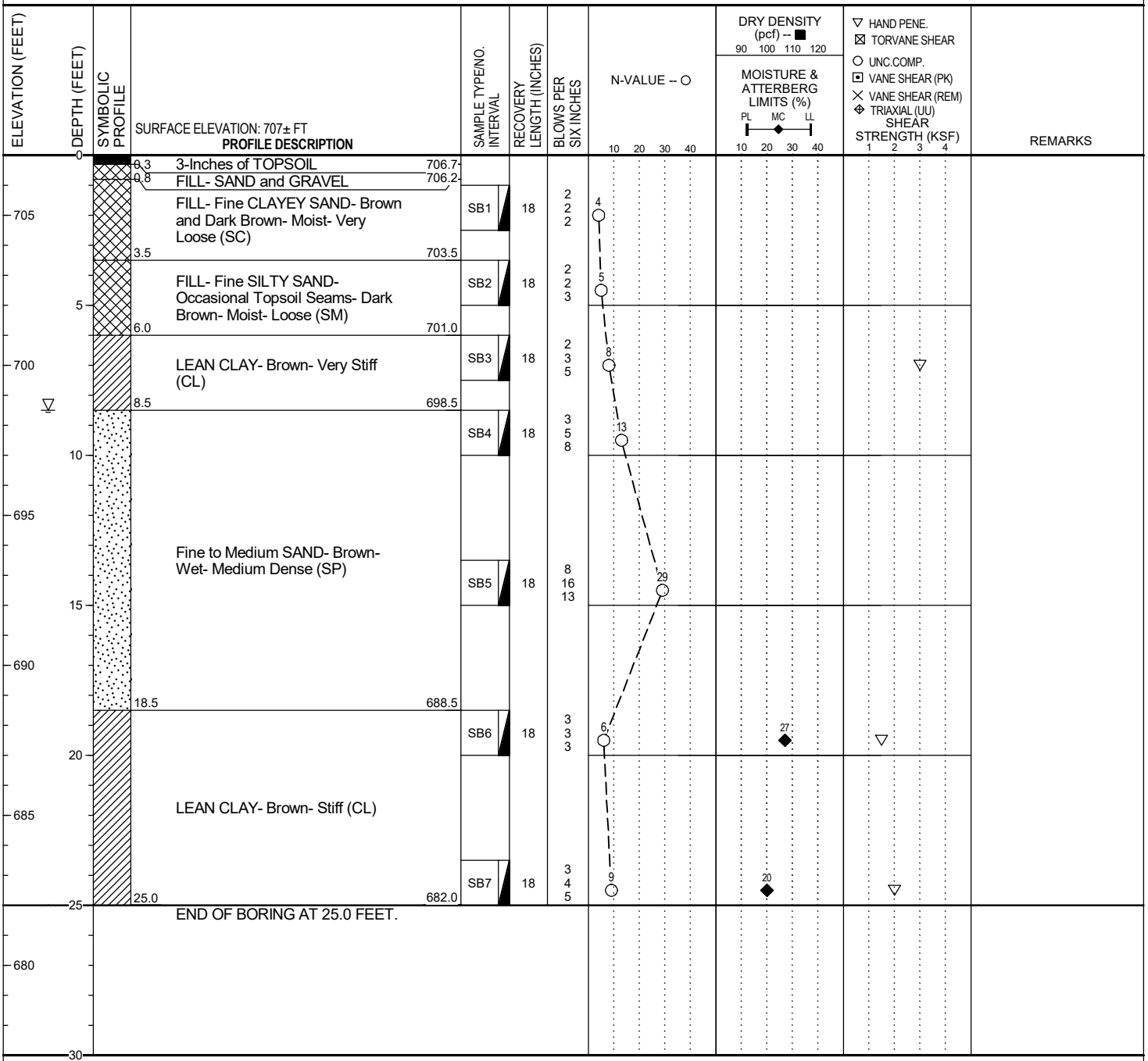
	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	8.5	698.5
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	6.0	701.0

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B22

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/27/20 **COMPLETED:** 4/27/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

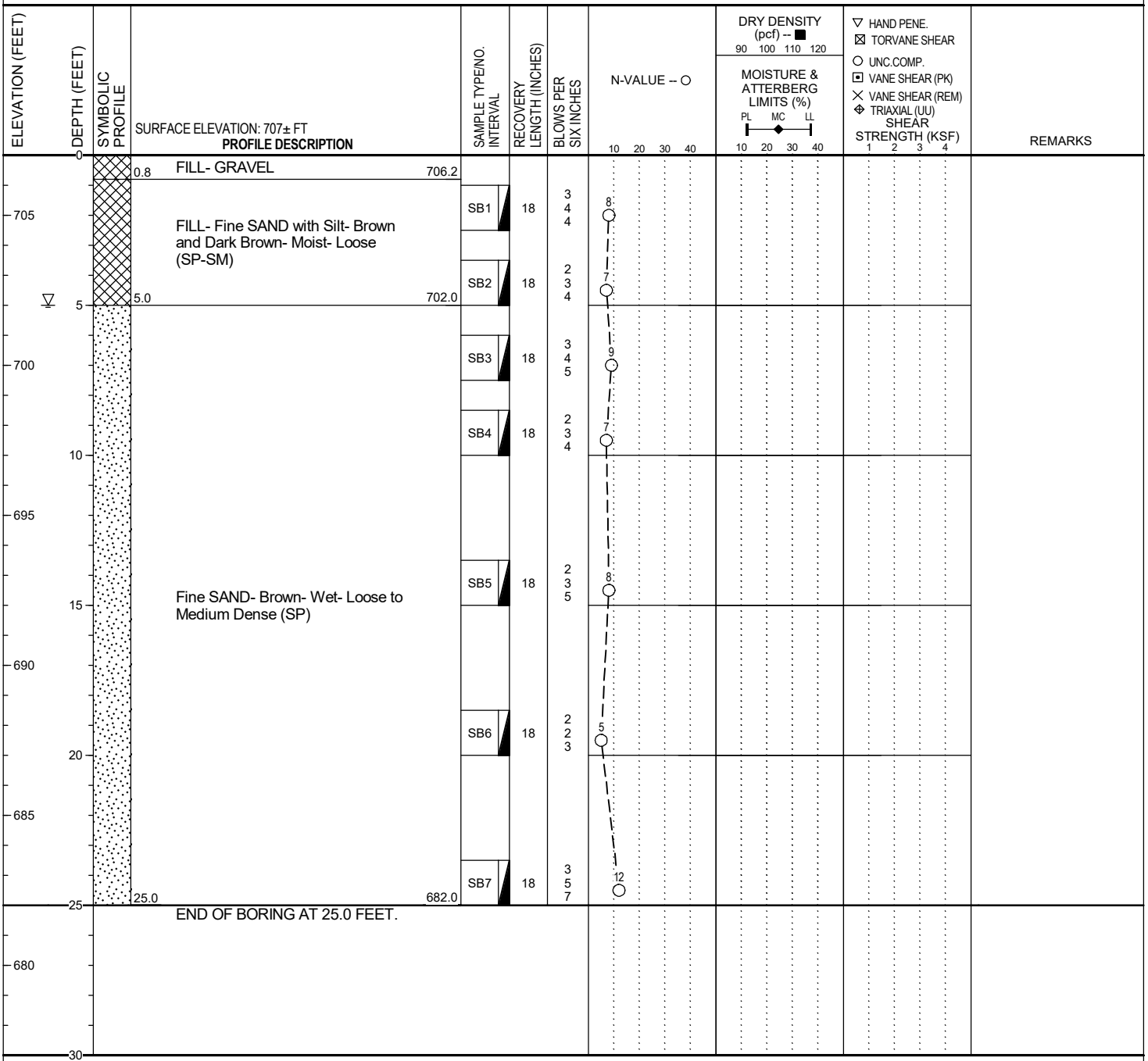
	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	8.5	698.5
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	6.0	701.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.

BORING B23

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/27/20 **COMPLETED:** 4/27/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

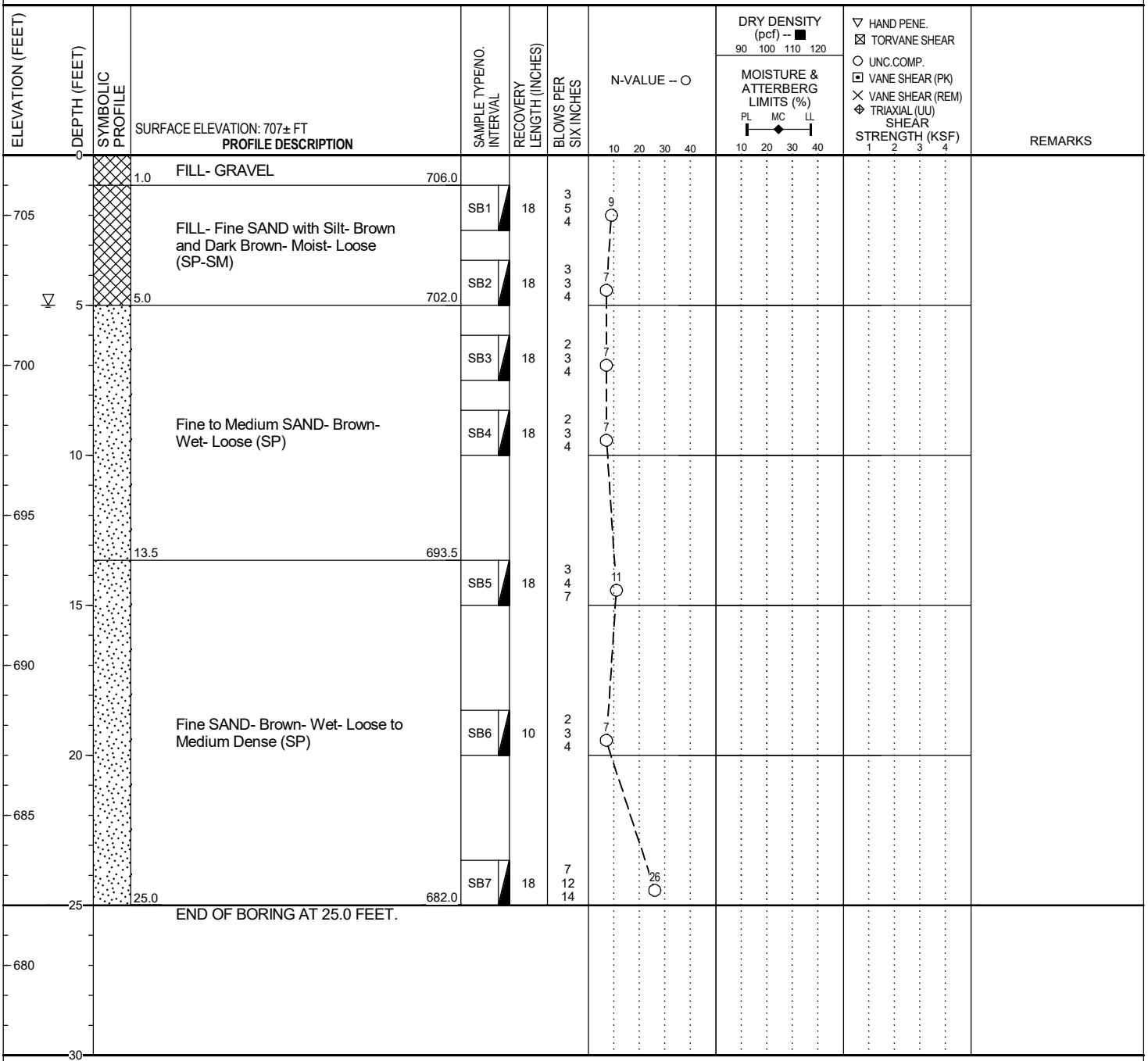
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	5.0	702.0
▼ AT END OF BORING:	Note 2	
CAVE-IN OF BOREHOLE AT:	5.0	702.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 6 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.

BORING B24

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/27/20 **COMPLETED:** 4/27/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

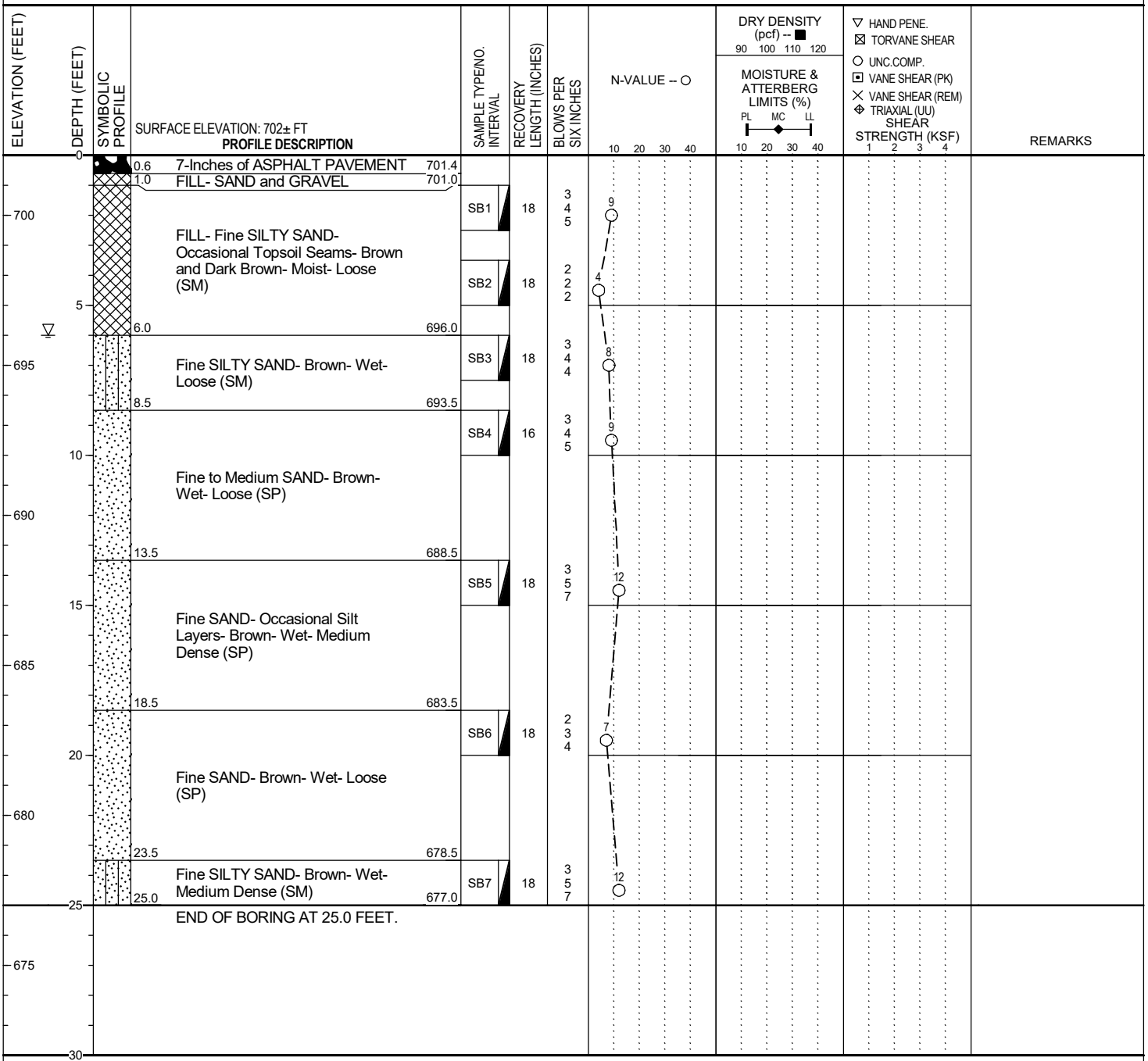
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	5.0	702.0
▼ AT END OF BORING:	Note 2	
CAVE-IN OF BOREHOLE AT:	5.0	702.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 6 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.

BORING B25

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/22/20 **COMPLETED:** 4/22/20 **BORING METHOD:** Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55 **LOGGED BY:** GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

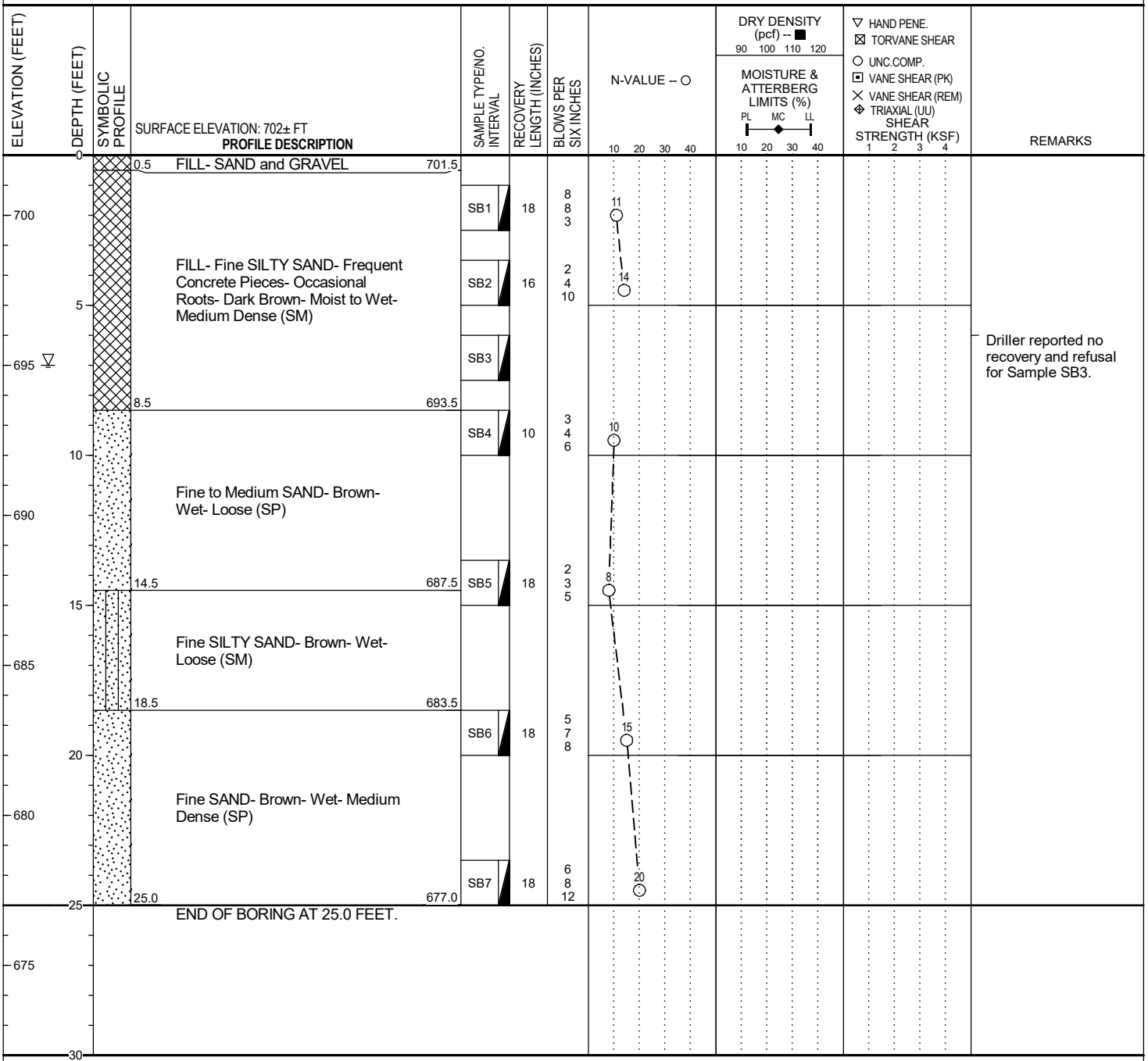
	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	6.0	696.0
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	8.0	694.0

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B26

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/22/20 **COMPLETED:** 4/22/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

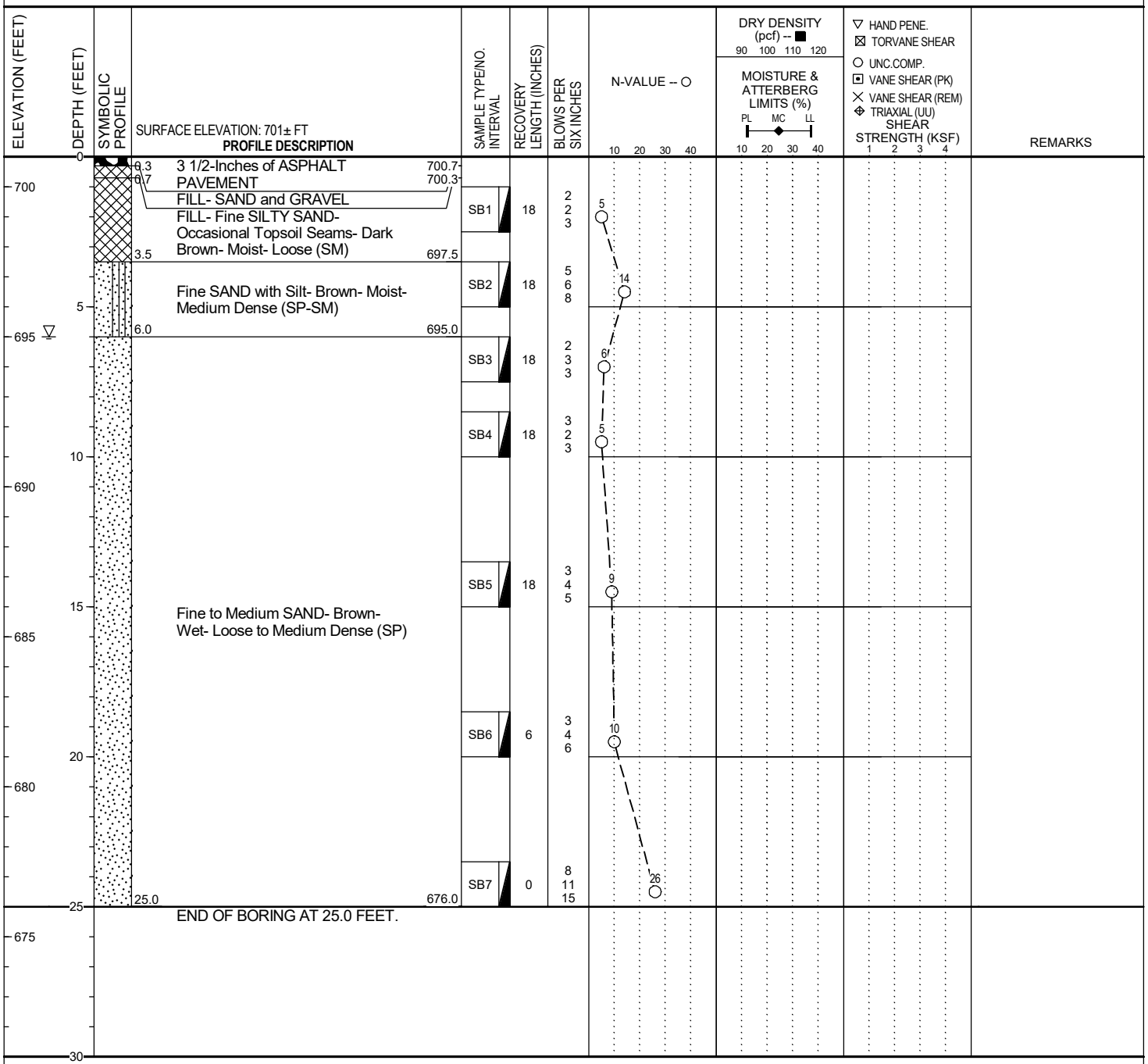
	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	7.0	695.0
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	8.0	694.0

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Driller reported encountering an obstruction about 6 feet below the ground surface. Boring was offset 3 feet west, blind drilled to 8.5 feet and drilled to the explored depth.

BORING B27

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/22/20 **COMPLETED:** 4/22/20 **BORING METHOD:** Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55 **LOGGED BY:** GBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	6.0	695.0
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	6.0	695.0

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.
3. Surface capped with cold patch after backfilling the borehole.

BORING B28

PROJECT NAME: MCDC Drain Culvert Replacements
PROJECT NUMBER: 084059.00
CLIENT: Land & Resource Engineering
PROJECT LOCATION: Muskegon County, Michigan
DATE STARTED: 4/22/20 **COMPLETED:** 4/22/20
BORING METHOD: Hollow-stem Augers
DRILLER: JN **RIG NO.:** Truck-CME 55
LOGGED BY: GBS **CHECKED BY:** ATB

SURFACE ELEVATION: 701± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	BLOWS PER SIX INCHES	N-VALUE -- ○ (10 20 30 40)	DRY DENSITY (pcf) -- ■ (90 100 110 120); MOISTURE & ATTERBERG LIMITS (%) PL MC LL (10 20 30 40)	SHEAR STRENGTH (KSF) ▽ HAND PENE. ⊠ TORVANE SHEAR ○ UNC.COMP. ⊡ VANE SHEAR (PK) × VANE SHEAR (REM) ◈ TRIAXIAL (UU) (1 2 3 4)	REMARKS
700	0	FILL- Fine SILTY SAND- Occasional Topsoil Seams- Dark Brown- Moist- Very Loose (SM)	SB1	18	2 2 2	4			
		3.5 / 697.5	SB2	18	4 4 5	9			
695	5 ▽		SB3	18	3 4 4	8			
			SB4	18	2 3 3	6			
690	10	Fine SAND- Brown- Moist to Wet- Loose to Medium Dense (SP)	SB5	18	3 5 6	11			
685	15								
			SB6	12	3 4 4	8			
680	20		SB7	18	10 13 15	28			
	25	25.0 / 676.0 END OF BORING AT 25.0 FEET.							
675									
	30								

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	5.5	695.5
▼ **AT END OF BORING:**	Note 2	
CAVE-IN OF BOREHOLE AT:	7.0	694.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. In situ, the transition between materials may be gradual.
2. Drilling mud was added to annulus of augers 10 feet below the ground surface. Therefore, obtaining an accurate water level after completion of drilling was not possible.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

GENERAL COMMENTS

BASIS OF GEOTECHNICAL REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practices to assist in the design and/or evaluation of this project. If the project plans, design criteria, and other project information referenced in this report and utilized by SME to prepare our recommendations are changed, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed, and the conclusions and recommendations of this report are modified or approved in writing by our office.

The discussions and recommendations submitted in this report are based on the available project information, described in this report, and the geotechnical data obtained from the field exploration at the locations indicated in the report. Variations in the soil and groundwater conditions commonly occur between or away from sampling locations. The nature and extent of the variations may not become evident until the time of construction. If significant variations are observed during construction, SME should be contacted to reevaluate the recommendations of this report. SME should be retained to continue our services through construction to observe and evaluate the actual subsurface conditions relative to the recommendations made in this report.

In the process of obtaining and testing samples and preparing this report, procedures are followed that represent reasonable and accepted practice in the field of soil and foundation engineering. Specifically, field logs are prepared during the field exploration that describe field occurrences, sampling locations, and other information. Samples obtained in the field are frequently subjected to additional testing and reclassification in the laboratory and differences may exist between the field logs and the report logs. The engineer preparing the report reviews the field logs, laboratory classifications, and test data and then prepares the report logs. Our recommendations are based on the contents of the report logs and the information contained therein.

REVIEW OF DESIGN DETAILS, PLANS, AND SPECIFICATIONS

SME should be retained to review the design details, project plans, and specifications to verify those documents are consistent with the recommendations contained in this report.

REVIEW OF REPORT INFORMATION WITH PROJECT TEAM

Implementation of our recommendations may affect the design, construction, and performance of the proposed improvements, along with the potential inherent risks involved with the proposed construction. The client and key members of the design team, including SME, should discuss the issues covered in this report so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk, and expectations for performance and maintenance.

FIELD VERIFICATION OF GEOTECHNICAL CONDITIONS

SME should be retained to verify the recommendations of this report are properly implemented during construction. This may avoid misinterpretation of our recommendations by other parties and will allow us to review and modify our recommendations if variations in the site subsurface conditions are encountered.

PROJECT INFORMATION FOR CONTRACTOR

This report and any future addenda or other reports regarding this site should be made available to prospective contractors prior to submitting their proposals for their information only and to supply them with facts relative to the subsurface evaluation and laboratory test results. If the selected contractor encounters subsurface conditions during construction, which differ from those presented in this report, the contractor should promptly describe the nature and extent of the differing conditions in writing and SME should be notified so that we can verify those conditions. The construction contract should include provisions for dealing with differing conditions and contingency funds should be reserved for potential problems during earthwork and foundation construction. We would be pleased to assist you in developing the contract provisions based on our experience.

The contractor should be prepared to handle environmental conditions encountered at this site, which may affect the excavation, removal, or disposal of soil; dewatering of excavations; and health and safety of workers. Any Environmental Assessment reports prepared for this site should be made available for review by bidders and the successful contractor.

THIRD PARTY RELIANCE/REUSE OF THIS REPORT

This report has been prepared solely for the use of our Client for the project specifically described in this report. This report cannot be relied upon by other parties not involved in the project, unless specifically allowed by SME in writing. SME also is not responsible for the interpretation by other parties of the geotechnical data and the recommendations provided herein.

LABORATORY TESTING PROCEDURES

VISUAL ENGINEERING CLASSIFICATION

Visual classification was performed on recovered samples. The appended General Notes and Unified Soil Classification System (USCS) sheets include a brief summary of the general method used visually classify the soil and assign an appropriate USCS group symbol. The estimated group symbol, according to the USCS, is shown in parentheses following the textural description of the various strata on the boring logs appended to this report. The soil descriptions developed from visual classifications are sometimes modified to reflect the results of laboratory testing.

MOISTURE CONTENT

Moisture content tests were performed by weighing samples from the field at their in-situ moisture condition. These samples were then dried at a constant temperature (approximately 110º C) overnight in an oven. After drying, the samples were weighed to determine the dry weight of the sample and the weight of the water that was expelled during drying. The moisture content of the specimen is expressed as a percent and is the weight of the water compared to the dry weight of the specimen.

HAND PENETROMETER TESTS

In the hand penetrometer test, the unconfined compressive strength of a cohesive soil sample is estimated by measuring the resistance of the sample to the penetration of a small calibrated, spring-loaded cylinder. The maximum capacity of the penetrometer is 4.5 tons per square-foot (tsf). Theoretically, the undrained shear strength of the cohesive sample is one-half the unconfined compressive strength. The undrained shear strength (based on the hand penetrometer test) presented on the boring logs is reported in units of kips per square-foot (ksf).

TORVANE SHEAR TESTS

In the Torvane test, the shear strength of a low strength, cohesive soil sample is estimated by measuring the resistance of the sample to a torque applied through vanes inserted into the sample. The undrained shear strength of the samples is measured from the maximum torque required to shear the sample and is reported in units of kips per square-foot (ksf).

LOSS-ON-IGNITION (ORGANIC CONTENT) TESTS

Loss-on-ignition (LOI) tests are conducted by first weighing the sample and then heating the sample to dry the moisture from the sample (in the same manner as determining the moisture content of the soil). The sample is then re-weighed to determine the dry weight and then heated for 4 hours in a muffle furnace at a high temperature (approximately 440º C). After cooling, the sample is re-weighed to calculate the amount of ash remaining, which in turn is used to determine the amount of organic matter burned from the original dry sample. The organic matter content of the specimen is expressed as a percent compared to the dry weight of the sample.

ATTERBERG LIMITS TESTS

Atterberg limits tests consist of two components. The plastic limit of a cohesive sample is determined by rolling the sample into a thread and the plastic limit is the moisture content where a 1/8-inch thread begins to crumble. The liquid limit is determined by placing a ½-inch thick soil pat into the liquid limits cup and using a grooving tool to divide the soil pat in half. The cup is then tapped on the base of the liquid limits device using a crank handle. The number of drops of the cup to close the gap formed by the grooving tool ½ inch is recorded along with the corresponding moisture content of the sample. This procedure is repeated several times at different moisture contents and a graph of moisture content and the corresponding number of blows is plotted. The liquid limit is defined as the moisture content at a nominal 25 drops of the cup. From this test, the plasticity index can be determined by subtracting the plastic limit from the liquid limit.

SECTION 00500 AGREEMENT

This Agreement is dated the _____ day of _____ 20___, by and between the Muskegon County Drain Commissioner, hereinafter called OWNER, and _____, hereinafter called CONTRACTOR.

OWNER and CONTRACTOR, in consideration of the mutual covenants set forth herein, agree as follows:

ARTICLE 1-WORK

CONTRACTOR shall complete the Work as specified or indicated in the Contract Documents, generally described as follows: Black Creek Consolidated Drain – Division IV.

ARTICLE 2-ENGINEER

The Work has been designed by the firm of Land & Resource Engineering, who will act as ENGINEER on the Work, unless Notice is otherwise given by the OWNER.

ARTICLE 3-CONTRACT TIME

3.1 The Work to be completed under this Contract shall be commenced immediately after receipt of a fully executed Contract and Notice to Proceed.

3.2 The Work under this Contract shall be substantially complete on or before Friday, October 1, 2021 and completed and set for final payment in accordance with the General Conditions on or before Friday, October 29, 2021 which shall be the Contract Time.

3.3 OWNER and CONTRACTOR recognize that time is of the essence of this Contract and that OWNER will suffer financial loss if the Work is not completed within the Contract Time(s) plus any extensions as provided for in the General Conditions. They recognize that the financial loss suffered by OWNER in the event that CONTRACTOR fails to complete the Work within the Contract Time(s) would be most difficult to determine accurately in any legal or arbitration proceedings. Instead of requiring such proof, OWNER and CONTRACTOR agree that as liquidated damages, but not as a penalty, CONTRACTOR shall pay OWNER Five Hundred & 00/100 Dollars ($500.00) for each day of delay in the completion of the Work beyond the Contract Time(s).

3.4 CONTRACTOR agrees to pay, in addition to liquidated damages, expenses arising from failure to complete the Work within the Contract Time including expenses for engineering services, attorney's fees, technical services and administration costs.

ARTICLE 4-CONTRACT PRICE

4.1 OWNER shall pay CONTRACTOR for performance of the Work in accordance with the Contract Documents in current funds as follows: _____ Dollars ($_____).

4.2 The amount paid shall be equitably adjusted to cover changes in the Work ordered by the ENGINEER but not required by the specifications. Such increases or decreases in the Contract Price shall be determined by agreement between the OWNER and CONTRACTOR.

ARTICLE 5-PAYMENTS

5.1 CONTRACTOR will prepare and submit monthly and final payment requests in accordance with the General Conditions.

5.2 OWNER will make monthly and final payments in accordance with the GENERAL CONDITIONS.

5.3 All monies not paid when due shall bear interest at the greater of the rate of 7% per annum, or the highest rate allowed by law.

ARTICLE 6-CONTRACT DOCUMENTS

6.1 The complete Contract between OWNER and CONTRACTOR consists of the following Contract Documents:

Bid Solicitation	General Conditions
Instruction to Bidders	Supplemental Conditions
Proposal	Specifications
Bid Form	Drawings
Bonds	Agreement
Modifications	Addenda (numbers ___ thru ___ inclusive)

6.2 In resolving conflicts, errors and discrepancies, the Contract Documents shall be given precedence in the following order: Modifications, Agreement, Addenda Supplemental Conditions, General Conditions, Specifications, Drawings, Advertisement, Instructions to Bidders, Proposal/Bid Form, and Bonds.

ARTICLE 7-CONTRACTOR'S REPRESENTATION

7.1 By executing the Agreement, CONTRACTOR represents that CONTRACTOR has visited the Site and assumes full responsibility for being familiar with the nature and extent of the Contract Documents, Work, locality, local conditions and availability of manpower, materials and machinery that may in any manner affect the Work to be done, the Contract Price or the Contract Time.

7.2 Contractor is familiar with all federal, state and local laws and regulations that pertain to completion of the Work as specified in the contract documents.

7.3 CONTRACTOR has carefully studied and compared the Contract Documents and checked and verified all figures shown thereon and all field measurements. CONTRACTOR has reported to ENGINEER any conflict, error or discrepancy which CONTRACTOR has discovered.

ARTICLE 8-MISCELLANEOUS

8.1 Terms used in this Agreement are defined in the General Conditions.

8.2 Neither party shall assign, in whole or in part, any of its rights or obligations, including any monies due, or to become due, under the terms of the Contract Documents without the written prior consent of the other party. This paragraph shall not be construed to limit the powers vested in the OWNER under the General Conditions.

8.3 The OWNER and CONTRACTOR each binds itself, successors and assigns to the other party hereto in respect to all covenants, agreements, and obligations contained in the Contract Documents.

8.4 The Contract Documents may only be altered, amended, or repealed by a Modification.

IN TESTIMONY WHEREOF, the parties hereto have executed this contract in at least three (3) counterparts, each of which shall be deemed an original, the day and year first above written.

WITNESS

CONTRACTOR

_____
(Contractor)

_____
(Name)

_____ By_____
(Signature)

Title_____

WITNESS

OWNER

Muskegon County Drain Commissioner

Brenda M. Moore

_____ By_____
(Signature)

Title Drain Commissioner

LEGAL STATUS OF CONTRACTOR: (Fill out appropriate form and cross out others.)

*A Corporation: The same officer shall not execute both the Agreement and this certificate, unless only one person occupies all corporation offices.

I, _____ certify that I am the _____ _____ of the corporation named as CONTRACTOR herein; that _____, who signed this Agreement on behalf of the corporation, was then _____ of the corporation, that the Agreement was duly signed for and in behalf of the corporation by authority of its board of directors, and is within the scope of its corporate powers. If a foreign corporation, this corporation is qualified to and will register in state in which project Work is located.

_____ _____ LS
(Date) (Signature)

*A Partnership: The same officer shall not execute both the Agreement and this certificate, unless only one person occupies all partnership offices.

I, _____, certify that I am the _____ _____ of the partnership named as CONTRACTOR herein; that _____, who signed this Agreement on behalf of the partnership, was then _____ of the partnership, that the Agreement was duly signed for and in behalf of the partnership by authority of its partners, and is within the scope of its partnership powers. If a foreign partnership, this partnership is qualified to and will register in state in which project Work is located.

_____ _____ L.S.
(Date) (Signature)

SECTION 00600 AFFIDAVIT OF COMPLETION

ARTICLE 1-AFFIDAVIT OF COMPLETION

STATE OF MICHIGAN _____)
) ss
COUNTY OF MUSKEGON _____)

The undersigned _____, as CONTRACTOR, being duly sworn, deposes and says that he entered into a contract with the Muskegon County Drain Commissioner, as OWNER, on the ____ day of _____, 20____ for the construction of Black Creek Consolidated Drain – Division IV. Deponent further says that the Work under the terms of the said Contract has been completed and all indebtedness incurred by him to subcontractors, material-men, and laborers in his employ has been paid in full or satisfactorily secured.

Deponent further says this affidavit is furnished before final payment or before the retainage, withheld in accordance with the provisions stated in said Contract, may be reduced.

Deponent further says he hereby waives and releases any and all claims or rights which he may have, in connection with said Contract, against OWNER or the premises upon which said Contract Work was performed, and agrees to indemnify OWNER against any and all such claims or rights which may be asserted by subcontractors, material-men, and laborers with whom CONTRACTOR has contracted for performance under said Contract.

Further, deponent saith not.

WITNESSES: SIGNED:

_____ _____

By:_____

Title:_____

Subscribed and sworn to before me this _____ day of _____, 20____.

_____

Notary Public, _____ County,_____

My commission expires: _____

We, _____, as Surety on the above described Contract, hereby give our consent to the payment to the CONTRACTOR as indicated above.

DATE: _____ SIGNED: _____
(Attorney-in-fact)

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that _____ _____, as Principal, and _____, a Corporation, organized and existing under the laws of the State of _____, and duly authorized to transact business in the State of Michigan, as Surety, are held and firmly bound unto the Black Creek Consolidated Drain Drainage District, c/o Brenda M. Moore, Muskegon County Drain Commissioner, as obligee, and hereinafter called OWNER, in the just and full sum of _____ Dollars ($_____) lawful money of the United States of America, for the payment whereof the Principal and Surety bind themselves, their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above Principal has entered into a written Contract with the OWNER, dated the _____ day of _____, 20____, for Black Creek Consolidated Drain – Division IV in accordance with plans and specifications prepared by Land & Resource Engineering, 2121 3 Mile Road NW, Walker, MI 49544 which Contract is hereby referred to and made a part hereof as fully and to the same extent as if the same were entirely written herein.

NOW, THEREFORE, the conditions of this obligation are such, that if the said Principal shall in all respects well and truly keep and perform the said Contract, and shall pay all sums of money due or to become due, for any labor, materials, apparatus, fixtures or equipment furnished for the purpose of constructing the work provided in said Contract, and shall defend, indemnify and save harmless the OWNER against any and all liens, encumbrances, damages, demands, expenses, costs and charges of every kind except as otherwise provided in said Contract Documents, arising out of or in relation to the performance of said Work and the provisions of said Contract, and shall remove and replace any defects in workmanship or materials which may be apparent or may develop within a period for one year from the date of final acceptance, then this obligation shall be null and void; otherwise it shall remain in full force and effect;

AND PROVIDED, that any alterations which may be made in the terms of said Contract, or in the Work to be done under it, or any extension of time for the performance of said Contract, or any forbearance on the part of either party to the other, or the placing of an inspector or resident engineer thereon by the OWNER, shall not in any way release the Principal and Surety or either of them, their heirs, executors, administrators, successors or assigns from any liability hereunder; notice to the surety of any such alteration, extension or forbearance being hereby waived.

Signed and sealed this _____ day of _____A.D., 20__.

WITNESS: PRINCIPAL:

_____

By_____(Seal)

_____ By _____

WITNESS: SURETY:

_____ By_____(Seal)

Title _____

LOCAL ADDRESS OF AGENT FOR SURETY:

_____

Street City State Zip Code

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that _____ _____, as Principal, and _____, a Corporation, organized and existing under the laws of the State of _____, and duly authorized to transact business in the State of Michigan, as Surety, are held and firmly bound unto the Black Creek Consolidated Drain Drainage District, c/o Brenda M. Moore, Muskegon County Drain Commissioner, as obligee, and hereinafter called OWNER, in the just and full sum of ($_____) lawful money of the United States of America, or the payment whereof the Principal and Surety bind themselves, their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above Principal has entered into a written Contract with the OWNER, dated the _____ day of _____, 20__ for the Black Creek Consolidated Drain – Division IV in accordance with plans and specifications prepared by Land & Resource Engineering, 2121 3 Mile Road NW, Walker, MI 49544 which Contract is hereby referred to and made a part hereof as fully and to the same extent as if the same were entirely written herein;

AND WHEREAS, this bond is given in compliance with subject to the provisions of Act. No. 213 of the Public Acts of Michigan, for the year 1963, as amended by subsequent acts to date.

NOW, THEREFORE, the condition of this obligation is that if the Principal and his Subcontractors shall make all payments as they become due and payable of all amounts owing to Subcontractors and to parties supplying labor or materials to the Principal or to his Subcontractors in the prosecution of the Work provided for in said Contract (intending to include herein all claimants as defined in Section 6 of Act 213 of 1963, as amended), then this obligation shall be void, otherwise the same shall be in full force and effect;

AND PROVIDED, that any alterations which may be made in the terms of said Contract, or in the Work to be done under it, or the giving by the party of the first part of said Contract, any extension of time for the performance of said Contract or any other forbearance on the part of either party to the other, shall not in any way release the Principal and the Surety or either of them, their heirs, executors, administrators, successors or assigns from any liability hereunder; notice to the Surety of any alterations, extensions of or of any forbearance being hereby waived.

Signed and sealed this _____ day of _____A.D., 20__.

WITNESS: PRINCIPAL:

_____

By_____(Seal)

_____ By _____

WITNESS: SURETY:

_____ By_____(Seal)

Title _____

LOCAL ADDRESS OF AGENT FOR SURETY:

_____

Street City State Zip Code

ARTICLE 1-DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents, the following terms shall have the meanings indicated which shall be applicable to both the singular and plural thereof:

Act of God	Unpredictable phenomenon of nature such as earthquake, flood or cyclone.
Addendum	A document issued by ENGINEER prior to the receipt of bids which sets forth additional provisions, changes or clarifications of the Contract Documents.
Advertisement	The notice published by OWNER to solicit Bids.
Affidavit of Completion	A document which includes the CONTRACTOR's sworn statement that the Work has been completed in accordance with the Contract Documents and that labor and material men have been paid and the Surety's consent to final payment.
Agreement	An instrument, signed by OWNER and CONTRACTOR covering the Work to be performed and setting forth the Contract Time, the Contract Price and other matters.
Allowance	A fixed sum stipulated in the Contract Documents, to be used in total or in part, as determined by the OWNER, for a specific service, product or group of products to be furnished by CONTRACTOR. All cash allowances shall be included in the Contract Price.
Bid	The offer of the BIDDER submitted on the prescribed forms setting forth the conditions under and prices for which the Work will be performed.
Bid Documents	The Bid and additional documents required to be submitted with the Bid as set forth in the Instructions to Bidders.
BIDDER	Any person, firm, joint venture or corporation submitting a Bid for the Work.
Bid Security	Bid Bond or other instrument of security furnished by BIDDER.
Bonds	Bid, Performance and Payment Bonds furnished by CONTRACTOR.
Bulletin	A document issued by ENGINEER which clarifies and interprets the Contract Documents or which directs minor changes or alterations in the Work not involving extra cost.
Certificate of Completion	Notice from ENGINEER to OWNER that the Work has been completed and establishing a one year bonded correction period.
Change Order	An order to CONTRACTOR signed by OWNER authorizing an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Time or both, issued after execution of the Agreement.
Construction Schedule	The timetable outline of CONTRACTOR's sequence of operations.
Contract	The agreement between OWNER and CONTRACTOR set forth in the Contract Documents.
Contract Documents	The Agreement and all related documents as identified in the Agreement.
Contract Price	The total moneys payable to CONTRACTOR for the Work.
Contract Time	The stated date or number of days for the completion of the Work.
CONTRACTOR	The person, firm, joint venture or corporation with whom OWNER has executed the Contract.
Day	Calendar day of 24 hours from midnight to the next midnight.
Defective Work	Work that does not conform to the requirements of the Contract Documents and damaged Work.

Drawings	The Drawings prepared or approved by ENGINEER and approved by OWNER, which show the character and scope of the Work to be performed.
Effective Date of Contract	The date shown in the Agreement.
ENGINEER	The designated representative of the OWNER.
General Requirements	The Sections of Division 1 of the Specifications.
Inspect, Inspection, Inspector	Observe the work of the CONTRACTOR as it relates to implementing CONSULTANT's plans, specifications, reports, and other instruments of professional service. An inspector has no authority or responsibility to direct any construction workers, and may not stop the work. An inspector is not responsible for the means, methods, sequences, or operations of construction, or safety procedures attendant thereto.
Insurance Certificate	The documents issued by CONTRACTOR's insurer listing policies and extent of coverage applicable to the Work.
Liens	Claims, security interests, and encumbrances.
Modification	(a) An amendment of the Contract Documents signed by both parties, (b) a Change Order, or (c) Bulletin. A Modification may only be issued after the Effective Date of the Contract.
Notice	A written communication between the parties specifically called for by the Contract Documents.
Notice of Award	The Notice by OWNER to BIDDER that BIDDER has been awarded the Contract.
Notice of Termination	Notice from OWNER to CONTRACTOR terminating services of the CONTRACTOR.
Notice to Proceed	A Notice by ENGINEER to CONTRACTOR fixing the date on which the Contract Time will commence and on which CONTRACTOR shall start the Work.
OWNER	The public body or authority, corporation, association, partnership, or individual with whom CONTRACTOR has entered into the Contract and for whom the Work is to be performed.
Partial Completion	For the Work that is being constructed in phases, Partial Completion is Substantial Completion of a defined portion of the Work. Partial Completion is reached whenever the defined portion of the Work is ready for use by OWNER. To be considered partially complete, use must not be prevented by other activities of CONTRACTOR. When use is delayed by factors that are beyond CONTRACTOR's control, the designated portion of the Work shall be considered partially complete.
Partial Utilization	Partial Utilization is placing a portion of the Work or facility in service for the purpose for which it was intended or for a related use before reaching Partial Completion or Substantial Completion.
Planholders of Record	Parties recorded by ENGINEER as having received a copy of Contract Documents and a separate set of Bid Documents and as making required deposit therefor, under their own name.
Product	Materials, systems, and equipment incorporated or to be incorporated in the Work.
Product Data	Catalog data, illustrations, standard schedules, performance charts, instructions, and other information prepared by manufacturer or supplier.
Project	Work and other related facilities of the OWNER.
Project Manual	The volume or volumes containing the bidding information, schedules, equipment uses, page-size details, and the Contract Documents for the Work except large drawings and modifications.

Proposal	The document which forms a portion of the Bid.
Provide	Furnish and install.
Resident Project Representative	The authorized representative of ENGINEER who is assigned to the Work site or any part thereof.
Schedule of Values	The breakdown of the Bid into component parts aggregating the total Bid.
Shop Drawings	All drawings, diagrams, illustrations, schedules and other data specifically prepared by CONTRACTOR, a Subcontractor, manufacturer, fabricator, supplier or distributor to illustrate the equipment, material or some portion of the Work.
Site	The location(s) where the Work is to performed.
Specifications	Those portions of the Contract Documents consisting of technical descriptions of materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative details applicable thereto, specifically Divisions 1 through 16.
Subcontractor	An individual, firm, joint venture or corporation having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the Site.
Substantial Completion	The stage in construction when the Work can be utilized for the purposes for which it was intended. This includes the completion of all contract items in accordance with the plans and specifications with the exception of restoration.
Supplier	Firm providing products to CONTRACTOR.
Surety	A company which provides a Bond.
Work	The entire completed construction and the various separately identified parts thereof required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor, and furnishing and incorporating Products into the construction as required by the Contract Documents.

ARTICLE 2-PRELIMINARY MATTERS

COPIES OF DOCUMENTS

2.1 OWNER will furnish CONTRACTOR up to 10 copies of the Contract Documents. Additional copies will be furnished, upon request, as ENGINEER determines are necessary for execution of the Work. Copies requested beyond these limits are available at the cost of reproduction.

CONTRACTOR'S REPRESENTATION:

2.2 By executing the Agreement, CONTRACTOR represents that CONTRACTOR has visited the Site and assumes full responsibility for being familiar with the nature and extent of the Contract Documents, Work, locality, local conditions and availability of manpower, materials and machinery that may in any manner affect the Work to be done, the Contract Price or the Contract Time.

CONTRACT TIME

2.3 The Contract Time will commence on the day indicated in the Notice to Proceed; but in no event shall the Contract Time commence later than the later of 30 days after the time stipulated for Bids to remain firm or 30 days after the Effective Date of Contract.

2.4 The date of beginning and the Contract Time for completion of the Work are essential conditions of the Contract Documents. Time requirements are for the benefit of OWNER, CONTRACTOR and other Project Contractors.

2.5 CONTRACTOR shall proceed with the Work at a rate of progress to ensure completion within the stipulated Contract Time. It is expressly agreed by CONTRACTOR that the Contract Time is reasonable, taking into consideration the average climatic and economic conditions and the availability of manpower, products, and construction machinery prevailing at the locality of the Work.

BEFORE STARTING THE WORK

2.6 CONTRACTOR shall carefully study and compare the Contract Documents and check and verify all figures shown thereon and all field measurements. CONTRACTOR shall, within 48 hours, report to ENGINEER any conflict, error or discrepancy which CONTRACTOR may discover before proceeding with the Work.

2.7 CONTRACTOR shall submit to the ENGINEER:
Construction Schedules;
Schedule of Values;
Schedule of Shop Drawings,
Product Data and samples.

2.8 A preconstruction meeting will be held to review the Construction Schedules, to establish procedures for handling Shop Drawings and other submissions and for processing payments, and to establish working relationships between the parties.

STARTING THE WORK

2.9 CONTRACTOR shall start to perform the Work on the date when the Contract Time commences.

2.10 CONTRACTOR shall attend a progress meeting a minimum of once each month at a time and place designated by the ENGINEER.

ARTICLE 3-CONTRACT DOCUMENTS INTENT

GENERAL:

3.1 It is the intent that the Contract Documents comprise the entire agreement between OWNER and CONTRACTOR and may be altered only by a Modification.

3.2 All communications between OWNER, CONTRACTOR, and ENGINEER intended to affect or modify any of the terms or obligations contained in the Contract Documents shall be in writing in order to be valid. Communications intended to affect or modify the Contract Documents include the following terms: claim, submission, notice, request, acceptance, report, objection, order, consent, advise, communicate, communications, certify, authorize, authorization, issue, or like terms.

3.3 No oral order, objection, claim or notice by OWNER, CONTRACTOR or ENGINEER shall affect or modify any of the terms or obligations contained in the Contract Documents.

3.4 The Contract Documents are complementary; what is called for by one is as binding as if called for by all. In resolving conflicts, errors and discrepancies, the documents shall be given precedence in the order stipulated in the Agreement. Detailed drawings shall govern over general drawings. Any Work that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials or equipment described in words which, so applied, have a well-known technical or trade meaning shall be deemed to refer to such recognized standards or meanings.

3.5 The Contract Documents shall be governed by the law of the place of the Work.

REUSE OF DOCUMENTS

3.6 Neither CONTRACTOR nor any Subcontractor, manufacturer, fabricator, supplier or distributor shall have or acquire any title to or ownership rights in any of the Drawings, Specifications or other documents or copies thereof prepared by or bearing the seal of ENGINEER; and they shall not reuse any of them on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaptation by ENGINEER.

ARTICLE 4-LANDS AND CONTROLS

GENERAL

4.1 OWNER will, upon request, furnish to CONTRACTOR copies of all available boundary surveys and subsurface tests.

AVAILABILITY OF LANDS

4.2 OWNER will furnish, not later than CONTRACTOR's Construction Schedule starting date, the lands or rights-of-way upon which or within which the Work is to be performed, rights-of-way for access thereto, and lands designated for the use of CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained by OWNER. CONTRACTOR shall obtain all additional lands and access required for temporary construction facilities and storage of materials and equipment.

UNFORESEEN SUBSURFACE CONDITIONS

4.3 The underground conditions indicated in the Contract Documents represent the information available at the time of preparation and are not guaranteed as to accuracy or completeness. CONTRACTOR shall within 48 hours after discovery notify OWNER and ENGINEER of any subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents. ENGINEER will investigate within 72 hours after Notice and, if warranted, advise OWNER to obtain additional investigations and tests. If said additional investigations and tests show subsurface or latent physical conditions to be materially different and which could not have reasonably been anticipated by CONTRACTOR, a Change Order will be issued incorporating the necessary revision.

REFERENCE POINTS

4.4 CONTRACTOR shall be responsible for the preservation of established property corners, monuments, bench marks and similar reference points outside of the normal working area. CONTRACTOR shall report to ENGINEER whenever any reference point is lost, destroyed or requires relocation.

4.5 Replacement of reference points within the normal working area are the responsibility of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point is in danger of being lost or destroyed or requires relocation.

4.6 Construction stakes will be provided by the OWNER to the extent as may be set forth in the Specifications.

ARTICLE 5 - BONDS AND INSURANCE

PERFORMANCE AND PAYMENT BONDs:

5.1 CONTRACTOR shall furnish separate Bonds as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. Each of these Bonds shall be in amounts at least equal to the Contract Price and in such form and with such Sureties as are acceptable to OWNER. Bond forms for the aforementioned securities are a part of the Contract Documents and CONTRACTOR shall ensure that each executed copy of the Bond form is complete and sealed.

A. Bonds shall be issued by a Surety named in U.S. Treasury Circular 570 licensed to conduct business in the state where the Work is located.

B. If the Surety on any Bond is declared bankrupt or becomes insolvent or its right to do business is terminated in the state where the Work is located, or it ceases to be listed as an acceptable Surety in U.S. Treasury Circular 570, CONTRACTOR shall, within 5 days thereafter, substitute another Bond from an acceptable Surety.

CONTRACTOR'S LIABILITY INSURANCE

5.2 CONTRACTOR shall purchase and maintain such comprehensive general liability and other insurance from an insurance company authorized to write casualty insurance in the state where the Work is located and shall provide protection from claims set forth below which may arise out of, or result from, CONTRACTOR's performance of the Work and CONTRACTOR's other obligations under the Contract Documents, whether such performance is by CONTRACTOR, by any Subcontractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

A. Claims under worker's compensation, disability benefits, and other similar employee benefits.

B. Claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees.

C. Claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees.

D. Claims for damages insured by personal injury liability coverage which are sustained by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR or by any other person for any other reason.

E. Claims for damages because of injury to, or destruction of, tangible property, including loss of use resulting therefrom.

F. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

ARTICLE 6-CONTRACTOR'S RESPONSIBILITIES

GENERAL

6.1 CONTRACTOR will issue communications relative to the Work, to OWNER through ENGINEER.

6.2 CONTRACTOR shall supervise and direct the Work competently, efficiently and with skill and attention required to complete the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. CONTRACTOR shall be responsible for accurate compliance of the finished Work with the Contract Documents.

6.3 CONTRACTOR shall keep on the Work, at all times the Work is in progress, a competent superintendent who shall be replaced only under extraordinary circumstances with Notice to OWNER and ENGINEER. The superintendent shall have authority to act on behalf of CONTRACTOR. All communications given to the superintendent shall be binding on CONTRACTOR.

6.4 CONTRACTOR shall provide notice to allow all utilities to locate their facilities prior to the performance of Work. The form and time of notice, the person(s) notified and all other issues related to notice to utilities which may be affected by the Work shall be in accordance with the laws and regulations of the state in which the Work is to be performed.

6.5 Unless otherwise specified, restricted work times shall be as follows, except in the event of an emergency as defined in this Article: Sunday or holiday work will not be permitted; and, work will not be permitted from 8:00 p.m. to 7:00 a.m.

LABOR, MATERIALS AND EQUIPMENT

6.6 CONTRACTOR shall provide competent, suitably qualified personnel to execute and complete the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site. ENGINEER may judge the competency and qualifications of personnel and, upon his written request to the CONTRACTOR, the CONTRACTOR shall cause the immediate dismissal from the Work of any personnel considered by ENGINEER to be incompetent and/or unqualified.

6.7 CONTRACTOR shall guarantee that he has available the quantities and quality of labor and supervision necessary to fulfill the CONTRACTOR'S obligations under the Contract Documents.

6.8 CONTRACTOR shall furnish all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, and all other facilities and incidentals necessary for the execution, testing, initial operation, and completion of the Work.

6.9 All Products shall be of good quality and new. When required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence as to the kind and quality of materials and installed equipment. CONTRACTOR shall submit to the ENGINEER Shop Drawings, Product Data and samples of Products to be incorporated in the Work.

SUBCONTRACTORS

6.10 CONTRACTOR shall be fully responsible for all acts and omissions of Subcontractors and of persons directly or indirectly employed by them and persons for whose acts any of them may be liable to the same extent that CONTRACTOR is responsible for the acts and omissions of persons directly employed by CONTRACTOR. Nothing in the Contract Documents shall create any contractual relationship between any Subcontractor and OWNER or ENGINEER or any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any Subcontractor, except as may otherwise be required by law. OWNER or ENGINEER may furnish to any Subcontractor, to the extent practicable, evidence of amounts paid to CONTRACTOR for specific work done.

6.11 The Divisions and Sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or delineating work to be performed by any specific trade.

6.12 All work performed for CONTRACTOR by a Subcontractor shall be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor, subject to the applicable terms and conditions of the Contract Documents.

SUBSTITUTE PRODUCTS

6.13 Whenever Products are specified or described in the Drawings or Specifications by using the name of a proprietary item or the name of a particular manufacturer, fabricator, supplier or distributor, it is intended to establish the type, function and quality required. Unless the substitution is specifically prohibited, substitute items may be accepted by ENGINEER. ENGINEER will be the sole judge of the acceptability of proposed substitutions. No substitution shall be ordered or installed without ENGINEER's prior acceptance. OWNER may require CONTRACTOR to furnish a special performance guarantee or other surety with respect to any substitute.

A. During the bidding period, requests for substitutions may be given consideration by the ENGINEER, and if approved, an Addendum will be issued to incorporate the approved Product into the Contract Documents. Such requests must be received by the ENGINEER in ample time, not later than 10 days before bid due date, so that any necessary Addendum can be issued to all prospective BIDDERS before submission of the Bids.

B. A request for substitution after award of the Contract shall be accepted from the CONTRACTOR only, shall be accompanied by manufacturer's data or other detailed description of the proposed Product and will be considered for one of the following reasons only:

1. Increased value to the OWNER.
2. Decreased cost to the OWNER.
3. Specified item not procurable.

C. A request for a substitution constitutes a representation that the CONTRACTOR has investigated and determined that the proposed Product is equal to or superior in all respects to that specified.

D. CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's consultants for evaluating accepted or rejected substitutes and for resulting changes in Drawings and Specifications.

OWNER FURNISHED PRODUCTS:

6.14 When the Contract Documents stipulate that the OWNER will furnish Products to be incorporated in the Work, the CONTRACTOR'S responsibilities will be:

A. Coordinate the delivery of each product with the OWNER. OWNER'S requirements for notification for each product will be determined at the pre-construction meeting but under no circumstance shall the notification period be less than 3 business days.

B. Review the Shop Drawings, Product Data and samples.

C. Submit to ENGINEER Notice of any discrepancies or problems anticipated in the use of the Product.

D. Receive and unload the Products at the Site.

E. Promptly inspect Products jointly with the OWNER, record shortages, and damaged or defective items.

F. Handle Products at the Site, including uncrating and storage.

G. Protect the Products from exposure to the elements and from damage.

H. Assemble, install, connect, and adjust the Products as stipulated in the Specifications.

I. Repair or replace items damaged by the CONTRACTOR.

PERMITS

6.15 CONTRACTOR shall obtain all temporary permits required to complete the Work. Application and inspection fees associated with temporary permits shall be paid by the CONTRACTOR.

USE OF PREMISES

6.16 CONTRACTOR shall confine Work operations to the Site and other designated areas. All disturbed areas shall be restored to equal to or better than original condition.

6.17 Material and equipment storage areas on Site shall be established and maintained in a manner that will not disrupt or impair the use of the Site.

PATENT FEES AND ROYALTIES

6.18 CONTRACTOR shall pay license fees, royalties and costs incident to the use of any invention, design, process or device which is the subject of patent rights or copyrights in connection with the Work. OWNER will pay for processes involved in the operation of the completed facilities.

SAFETY AND PROTECTION

6.19 CONTRACTOR shall be responsible for initiating, maintaining and supervising safety programs in connection with the Work. CONTRACTOR shall take precautions and provide protection to prevent damage, injury or loss to:

A. Employees on the Work and other persons who may be affected thereby;
B. The Work and Products to be incorporated therein, whether in storage on or off the site; and

C. Other property at the Site or adjacent thereto, both above and below ground, not designated for removal, relocation or replacement. CONTRACTOR shall erect and maintain necessary safeguards for safety and protection of property and shall notify owners of adjacent utilities when prosecution of the Work may affect them. CONTRACTOR shall be responsible for costs associated with all damage, injury or loss.

6.20 CONTRACTOR shall designate a superintendent at the site as safety officer, whose duty shall be the prevention of accidents.

6.21 Damage, injury or loss to property referred to in this Article caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor and anyone directly or indirectly employed by any of them and anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR at CONTRACTOR'S cost. CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until the Work is completed and ENGINEER has issued the Certificate of Completion.

LAWS AND REGULATIONS

6.22 CONTRACTOR shall comply with all laws, ordinances, rules, regulations and orders of public bodies applicable to the Work.

6.23 When the CONTRACTOR becomes aware that the Contract Documents, or any requirements thereof, are at variance to laws and regulations, CONTRACTOR shall promptly serve written Notice to the ENGINEER. Any alterations required to bring the Work in compliance will be made by Modification.

6.24 When the CONTRACTOR is aware that the Contract Documents, or any requirements thereof, are at variance to laws and regulations and performs any of the Work contrary to laws and regulations without Notice to the ENGINEER, all costs incurred in correcting the Work shall be borne by the CONTRACTOR.

HAZARDOUS MATERIALS

6.25 In the event CONTRACTOR discovers on the Site unexpected regulated hazardous materials, including without limitation, inorganics, organics and asbestos, CONTRACTOR shall immediately give Notice to ENGINEER and request a determination of how to proceed. In the event CONTRACTOR releases, under any circumstances, regulated hazardous materials on the Site, CONTRACTOR shall immediately give Notice to ENGINEER, take emergency action as appropriate and, following approval by ENGINEER of CONTRACTOR'S proposed plan of remediation, CONTRACTOR shall remediate said release at CONTRACTOR'S expense, all in compliance with all applicable laws and regulations.

EMERGENCIES

6.26 In emergencies affecting the safety of persons, the Work or adjacent property, CONTRACTOR, without authorization from ENGINEER or OWNER, is obligated to act, at CONTRACTOR's discretion, to prevent threatened damage, injury or loss. CONTRACTOR shall give ENGINEER prompt Notice of the emergency action taken, and any significant changes in the Work or deviations from the Contract Documents caused thereby.

INDEMNIFICATION

6.27 CONTRACTOR shall indemnify, defend and hold harmless OWNER and ENGINEER, their consultants, agents and employees, from and against claims, damages, losses, attorney's fees, and expenses arising out of, or resulting from, the performance of the Work, provided that any such claim, damage, loss or expense:

A. is attributable to bodily injury, sickness, disease or death, or to injury to, or destruction of, tangible property other than the Work itself, including the loss of use resulting therefrom; and

B. is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

6.28 In all claims against OWNER or ENGINEER or their agents or employees, by any employee of CONTRACTOR or Subcontractors or anyone for whose acts they may be liable, the indemnification obligation shall not be limited by the amount or type of damages, compensation or benefits under workmen's compensation acts, disability benefit acts, or other employee benefit acts.

6.29 The indemnification obligation of CONTRACTOR shall not extend to the liability of ENGINEER, agents or employees arising out of the preparation or approval of maps, Drawings, reports, surveys, Change Orders, designs or Specifications.

ARTICLE 7-WORK BY OTHERS

7.1 OWNER may perform or may contract with others to do additional work related to the Project. CONTRACTOR shall afford others a reasonable opportunity to perform work as well as to store materials and equipment on Site and shall properly integrate and coordinate CONTRACTOR's work with others. CONTRACTOR shall coordinate and cooperate with contractors working in the area for other owners or jurisdictions.

7.2 If any part of CONTRACTOR's work depends for proper execution or results upon the work of other contractors, other owners, or OWNER, CONTRACTOR shall inspect and promptly report to ENGINEER any defects or deficiencies in such work. CONTRACTOR's failure to so report shall constitute an acceptance of the other work as fit and proper for integration with CONTRACTOR's work.

7.3 Additional Work resulting from other contracts, or work by OWNER not noted in the Contract Documents will be added by Change Order.

ARTICLE 8-OWNER'S RESPONSIBILITIES

GENERAL

8.1 In case of termination of the employment of ENGINEER, OWNER will appoint an engineer against whom CONTRACTOR makes no substantial objections, whose status under the Contract Documents will be that of the former ENGINEER.

8.2 OWNER will furnish the data required under the Contract Documents promptly and will make payments to CONTRACTOR promptly.

OWNER FURNISHED PRODUCTS

8.3 When the Contract Documents stipulate that the OWNER will furnish Products to be incorporated in the Work, the OWNER'S responsibilities will be:

A. Arrange for and deliver the necessary Shop Drawings, Product Data, and samples to the CONTRACTOR.

B. Arrange and pay for delivery of the Products to the Site in accordance with the Construction Schedule.

C. Deliver supplier's bill of materials to the CONTRACTOR.

D. Inspect deliveries jointly with the CONTRACTOR.

E. Submit claims for transportation damage.

ARTICLE 9-ENGINEER'S STATUS

OWNER'S REPRESENTATIVE

9.1 ENGINEER will be OWNER'S representative during the bidding and construction period. Communications between the OWNER and the CONTRACTOR, or claimant, will be directed through the ENGINEER. The duties, responsibilities and limitations of authority of ENGINEER as OWNER's representative during the bidding and construction are set forth in these Contract Documents and shall be modified only with consent of OWNER and ENGINEER.

9.2 ENGINEER will not be responsible for the construction means, methods, techniques, sequences or procedures, or the safety precautions and programs incident thereto, and ENGINEER will not be responsible for the CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

9.3. ENGINEER will not be responsible for the acts or omissions of the CONTRACTOR, or any Subcontractors, or any of their agents or employees, or any other persons performing any of the Work.

VISITS TO SITE

9.4 ENGINEER will make visits to the site at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. ENGINEER'S efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform to the Contract Documents. On the basis of such visits and on-site observations as an experienced and qualified professional, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defects and deficiencies in the Work.

CLARIFICATIONS AND INTERPRETATIONS

9.5 ENGINEER may issue clarifications or interpretations consistent with, or inferable from, the intent of the Contract Documents.

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

9.6 ENGINEER shall review Shop Drawings, Product Data and samples of Products submitted by the CONTRACTOR.

REJECTING DEFECTIVE WORK

9.7 ENGINEER will have authority to disapprove of or reject Defective Work. ENGINEER will also have authority to require special inspection or testing of Work whether or not the Work is fabricated, installed or completed.

SITE REPRESENTATIVE

9.8 ENGINEER will furnish a Resident Project Representative, who may have one or more assistants, to aid OWNER and ENGINEER in carrying out their responsibilities at the Site. The duties, responsibilities and authority of the Resident Project Representative are set forth in Article 18 of these General Conditions.

DECISIONS ON DISAGREEMENT

9.9 ENGINEER will be initial interpreter of the requirements of Contract Documents and judge of acceptability of the Work. Claims, disputes, and other matters pertaining to bidding, execution and progress of the Work shall be referred initially to ENGINEER with a request for an informal meeting and a formal decision. Notice of each such claim, dispute and other matter shall be delivered by claimant to ENGINEER and other party within 15 days of occurrence of the event giving rise thereto. Additional supporting data shall be supplied within 30 days of occurrence. ENGINEER's written decision will be rendered within 40 days after the occurrence. In ENGINEER's capacity as interpreter and judge, ENGINEER will be impartial to OWNER, CONTRACTOR or claimant and will not be liable for any decision rendered in good faith.

9.10 The rendering of a decision by ENGINEER with respect to any such claim, dispute or other matter, will be a condition precedent to arbitration under these General Conditions. The ENGINEER's decision shall become final and binding on the parties 30 days after the decision is rendered unless deferred by an arbitration request, litigation or administrative appeal (if applicable) is filed by either party within the 30-day period. Lawsuits shall be brought in Kent County.

9.11 No decision made by ENGINEER in good faith, either to exercise or not to exercise authority under this Article shall give rise to any duty, liability or responsibility of ENGINEER to claimant, CONTRACTOR, any Subcontractor, any of their agents or employees, or any other person performing any of the Work.

ARTICLE 10-CHANGES IN THE WORK

10.1 Without invalidating the Contract, OWNER may, at any time, order additions, deletions or revisions in the Work by Change Orders. Upon receipt of an executed Change Order, CONTRACTOR shall proceed with the Work involved.

10.2 ENGINEER may authorize minor changes or alterations in the Work not involving extra cost and not inconsistent with the overall intent of the Contract Documents. These changes will be authorized by a Bulletin and will be binding upon OWNER and CONTRACTOR.

10.3 Additional work performed by CONTRACTOR without authorization of a Change Order will not entitle CONTRACTOR to an increase in the Contract Price or an extension of the Contract Time, except as set forth in these General Conditions.

10.4 OWNER shall execute appropriate Change Orders recommended by ENGINEER as set forth in these General Conditions.

10.5 It shall be CONTRACTOR's responsibility to notify Surety of any changes affecting the general scope of the Work or change in the Contract Price or Time. The amount of the applicable Bonds shall be adjusted accordingly.

ARTICLE 11-CHANGE OF CONTRACT PRICE

GENERAL

11.1 The Contract Price constitutes the total compensation payable for performing all duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR, and includes all taxes payable by CONTRACTOR as a result of the Work.

11.2 The Contract Price shall only be changed by a Change Order. Claims for a change in the Contract Price shall be submitted, with supporting data, to ENGINEER within 15 days of the occurrence of the event giving rise to the claim.

11.3 Claims for extra compensation shall not be made by CONTRACTOR for reasonable delays:

A. caused by the work of other Project contractors or subcontractors.

B. due to the failure of OWNER to perform any obligations required of OWNER under these Contract Documents.

11.4 Value of the Work covered by a Change Order shall be determined by one of the following methods:

A. where the Work is covered by Contract unit prices by application of unit prices to the items involved.

B. by mutual acceptance of a lump sum.

C. on the basis of the cost of the Work, plus overhead and profit, but only in the event OWNER and CONTRACTOR cannot agree on one of the above methods.

COST-PLUS WORK

11.5 Cost-plus work means cost of the Work plus a fee. Cost of the Work means the sum of all costs incurred and paid by CONTRACTOR in the performance of cost-plus work. Such costs shall be in amounts no higher than those prevailing in the locality of the Work. Cost of the Work shall only include:

A. payroll costs for employees including superintendents and foremen at the Site in the direct employ of CONTRACTOR under schedules of job classifications. Payroll costs shall include, but not be limited to, salaries and wages, social security contributions, unemployment, excise and payroll taxes, workers' or workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay.

B. cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation, storage and manufacturers' field services.

C. rentals of all construction equipment, machinery and accessories, and costs of transportation, loading, unloading, installation, dismantling and removal. Rental rates shall not exceed rates listed in the "Rental Rate Blue Book for Construction Equipment" published by Equipment Guide Book Company. Rates allowed will be based on the most economical time unit. The rental determined by multiplying the rate (e.g., hourly, daily, weekly, etc.) by the period of use shall not exceed the rental determined by applying the next highest rate (e.g., for this purpose the daily rate would be "higher" than the hourly rate, etc.) to the corresponding period of use.

D. fees of special consultants.

E. cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, hand tools, office and temporary facilities at the Site.

F. transportation, travel and subsistence expenses.

G. sales, use or similar taxes imposed by any governmental authority.

H. unavoidable deposit losses, royalty payments, and fees for permits and licenses, and losses and damages to the Work not compensated by insurance.

I. the cost of utilities, fuel, telegrams, long distance telephone calls, and expressage.

11.6 Cost of the Work shall not include:

A. compensation for CONTRACTOR's officers, executives, principals, managers, professionals, clerks and other personnel, whether at the Site or office.

B. any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

C. cost due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of Defective Work or damage to the property, disposal of materials or equipment wrongly supplied.

D. other overhead or general expense costs.

11.7 The fee allowed to the CONTRACTOR for overhead and profit shall be 10 percent of the cost of the Work; except for payments to Subcontractors in which case the fee shall be 5 percent.

11.8 Payments to Subcontractors will be determined in the same manner as CONTRACTOR's cost of the Work. The fee allowed to the Subcontractors for overhead and profit shall be 10 percent.

11.9 The amount of credit to OWNER for any change which results in a net decrease in cost will be the amount of the actual net decrease, exclusive of any fee for overhead and profit. When both additions and credits are involved in any one change, the overhead and profit shall be based on the net increase in the Work.

11.10 CONTRACTOR shall submit daily cost reports of cost-plus work to the ENGINEER.

ARTICLE 12-CHANGE OF THE CONTRACT TIME

12.1 The Contract Time may only be altered by a Change Order. Claim for a change of Contract Time shall be delivered to OWNER and ENGINEER within 15 days of the event giving rise to the claim. Adjustment in the Contract Time will be determined by ENGINEER.

12.2 The Contract Time will be extended in an amount equal to time lost due to unreasonable time delays beyond control of CONTRACTOR. Reasons for such delays shall be restricted to fires, labor disputes, epidemics, abnormal weather conditions, and Acts of God. In addition Contract Time may be extended for unreasonable time delays:

A. caused solely by work of other Project contractors or subcontractors directly contracted by the OWNER

B. due to failure of OWNER to perform any obligations required of OWNER under these Contract Documents.

ARTICLE 13-WARRANTY, TESTS AND DEFECTIVE WORK

WARRANTY AND GUARANTEE

13.1 CONTRACTOR warrants and guarantees to OWNER and ENGINEER that materials and equipment shall be new and that Work shall be of good quality and free from faults or defects and in accordance with requirements of the Contract Documents. Prompt Notice of any defects will be given to CONTRACTOR.

13.2 CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by monthly estimates, passes automatically to OWNER at the time of payment, free and clear of all liens.

TESTS AND INSPECTIONS

13.3 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested, or approved by someone other than CONTRACTOR, CONTRACTOR shall give ENGINEER timely notice of readiness therefore. Such tests shall be in accordance with the methods prescribed by the applicable organization or the Contract Documents. All certification fees, testing laboratory fees, and inspection fees of said public authorities will be paid by CONTRACTOR. Inspection coordination is the responsibility of the CONTRACTOR, unless otherwise indicated in the Contract Documents.

13.4 Neither observations by ENGINEER nor inspections, tests or approvals by persons other than CONTRACTOR shall relieve CONTRACTOR from obligations to perform the Work required by the Contract Documents, laws, ordinances, rules, regulations or orders of public authority having jurisdiction.

13.5 When inspection readiness is declared by the CONTRACTOR and the inspection proves unsuccessful, all costs for the inspection shall be borne by the CONTRACTOR.

ACCESS TO THE WORK

13.6 ENGINEER, his representatives, and representatives of OWNER shall at all times have access to the Work. CONTRACTOR shall provide proper facilities for access, observation of the Work, and for any inspection or testing by manufacturers, suppliers, material men, and other parties as authorized by OWNER.

UNCOVERING WORK

13.7 If Work requiring inspection, testing or approval is covered either without ENGINEER's written approval where required, or contrary to ENGINEER's specific request, the Work shall, if requested by ENGINEER, be uncovered for observation and replaced at CONTRACTOR's expense.

13.8 If ENGINEER considers it necessary or advisable that covered Work be inspected or tested, other than as outlined under the previous paragraph, CONTRACTOR, at ENGINEER's request, shall uncover and expose that portion of the Work. If the Work is defective, CONTRACTOR shall bear all the expenses of satisfactory repair and reconstruction, including compensation for additional engineering services resulting therefrom. If such Work is not found to be defective, CONTRACTOR shall be allowed an increase in Contract Price, an extension of Contract Time, or both, directly attributable to such uncovering and reconstruction.

CUTTING AND PATCHING

13.9 CONTRACTOR shall be responsible for all cutting, fitting and patching required to complete the Work, to make its several parts fit together properly, or to uncover portions of the Work to provide for installation of ill-timed Work. CONTRACTOR shall not cut or alter any part of the Work or the work of another Contractor or Subcontractor without written approval of the ENGINEER. In no case shall the CONTRACTOR endanger any portion of the Work by cutting or altering any part of it.

CORRECTION OR REMOVAL OF DEFECTIVE WORK

13.10 CONTRACTOR shall promptly, as specified by ENGINEER, either correct any Defective Work or remove it from the Site and replace it with acceptable Work. If CONTRACTOR does not correct or remove and replace such Defective Work within a reasonable time, OWNER may have the deficiency corrected or the Defective Work removed and replaced by others. All direct and indirect costs of such correction or removal, and replacement, including compensation for additional engineering services, shall be paid by CONTRACTOR in an amount as verified by ENGINEER. CONTRACTOR shall also repair all Work of others destroyed or damaged by replacement of CONTRACTOR's Defective Work.

ONE YEAR CORRECTION PERIOD

13.11 Prior to the expiration of one year after the date of Acceptance or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, CONTRACTOR shall promptly correct identified Defective Work or remove it from the Site and replace it with acceptable Work. If CONTRACTOR does not promptly comply, OWNER's rights to correction will be the same as for Defective Work in this Article. Repairs and replacements made under this paragraph shall bear an additional 12-month correction period dated from the acceptance of repair and replacement.

ACCEPTANCE OF DEFECTIVE WORK

13.12 If OWNER prefers to accept Defective Work, an appropriate reduction in the Contract Price will be made. If the acceptance occurs after final payment, an appropriate amount, as determined by ENGINEER, shall be paid by CONTRACTOR to OWNER.

OWNER'S RIGHT TO DO WORK:

13.13 If CONTRACTOR should neglect to prosecute the Work properly and diligently, or fail to perform any provision of this Contract, including requirements of the Construction Schedule, OWNER, after three (3) days Notice to CONTRACTOR and his Surety may, without prejudice to any other remedy that OWNER may have, correct and remedy any such deficiency. Direct and indirect costs of OWNER, including compensation for additional engineering services, shall be verified by ENGINEER and an appropriate

reduction in the Contract Price will be made. If the payments due CONTRACTOR are not sufficient to cover such amount, CONTRACTOR shall pay the difference to OWNER.

ARTICLE 14-PAYMENTS AND COMPLETION

PROGRESS PAYMENTS AND RETAINAGES

14.1 As a condition precedent to the first progress payment, CONTRACTOR shall submit a Construction Schedule and Schedule of Values.

14.2 CONTRACTOR will prepare a monthly payment request, supported by such data as ENGINEER may reasonably request from CONTRACTOR.

14.3 The payment requests shall not include Products not incorporated in the Work unless specifically requested by CONTRACTOR and approved by OWNER subject to the following mandatory conditions:

A. the Products have been specifically manufactured for the Work;

B. the Products have been delivered and suitably stored at the Site or at another location agreed to; and

C. CONTRACTOR has furnished supporting data, satisfactory to OWNER that establishes OWNER's title to the Products, free of any Liens or other encumbrances, and protects OWNER's interest therein, including applicable insurance.

14.4 Progress payments and retainage shall conform to the following, provided CONTRACTOR'S progress is in accordance with the approved Construction Schedule and the conditions for payment as set forth in this Article.

A. Progress payments covering the first 50 percent of the Work shall be 90 percent of the progress period Work completed and 75 percent of the Products furnished and not incorporated in the Work, but specifically authorized by the OWNER.

B. Progress payments covering the final 50 percent of the Work, at the discretion of the OWNER, may be increased to 100 percent of the progress period Work completed and 75 percent of Products furnished and not incorporated in the Work, but specifically authorized by the OWNER.

C. All payments to the CONTRACTOR by the OWNER, including retainage, shall be in accordance with all laws and regulations applicable to these activities in the state in which the Work is performed.

APPROVAL OF PAYMENT

14.5 CONTRACTOR will prepare monthly payment requests and present them to ENGINEER for recommendation to the OWNER. ENGINEER shall complete review of such requests, make adjustments as deemed appropriate, and forward to the OWNER within ten (10) days of receipt from the CONTRACTOR.

14.6 ENGINEER'S submittal and recommendation of any payment request shall constitute a representation by ENGINEER to OWNER, based on ENGINEER's on-site observations of Work in progress as an experienced qualified professional, that the Work has progressed to the point indicated; that, to the best of ENGINEER's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents; and that CONTRACTOR is entitled to payment. However, by recommending payment, ENGINEER shall not thereby be deemed to have represented that ENGINEER made exhaustive or continuous on-site inspections to check the quality or the quantity of the Work, or that ENGINEER has reviewed the means, methods, techniques, sequences, and procedures of construction or that ENGINEER has made any examination to ascertain how or for what purpose CONTRACTOR has used the moneys paid or to be paid to CONTRACTOR or that title to any Work, materials, or equipment has passed to OWNER free and clear of any liens.

14.7 OWNER will make payment to CONTRACTOR on monthly requests within 30 days of ENGINEER'S presentation to OWNER.

PAYMENT WITHHELD

14.8 ENGINEER may not recommend any payment or may nullify any payment previously recommended, to such extent as may be necessary to protect OWNER from loss because:

A. Work is defective or completed Work has been damaged requiring correction or replacement.

B. Written claims have been made against OWNER or liens have been filed in connection with the Work.

C. Contract Price has been reduced by Modifications.

D. CONTRACTOR has failed to file receipts for payment of equipment and materials not incorporated in the Work.

E. OWNER has been required to correct Defective Work or complete neglected Work.

F. Unsatisfactory prosecution of the Work, including failure to clean-up or failure to perform testing as required by the Contract Documents.

PARTIAL UTILIZATION

14.9 OWNER shall have the right to take possession of, and use any completed or partially completed portions of the Work prior to completion. The OWNER's possession and use shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents. Unless otherwise called for in the Contract Documents, CONTRACTOR will be reimbursed for any extra costs or provide an extension of Contract Time for any delays or both which result from Partial Utilization of Work. Special insurance coverage, if required, shall be provided by the OWNER. Upon receipt of a request from OWNER to utilize a portion of the Work, ENGINEER shall:

A. make an inspection and shall prepare a list of items of incomplete and Defective Work remaining for the portion of the Work to be utilized.

B. determine if any extra compensation or time extension is due the CONTRACTOR due to the OWNER'S Partial Utilization of the Work.

SUBSTANTIAL COMPLETION

14.10 When ENGINEER considers that the Work has been substantially but not entirely completed and full completion thereof is materially delayed through no fault of CONTRACTOR, ENGINEER will issue a Certification of Substantial Completion. Liquidated damages for that portion of Work will not be assessed beyond the date of Substantial Completion.

PAYMENT FOR SUBSTANTIAL COMPLETION

14.11 OWNER will, upon Certificate of Substantial Completion by ENGINEER and without terminating the Contract, make payment of the balance due for Work fully completed and accepted. Consent of the Surety shall be submitted by CONTRACTOR to ENGINEER prior to certification of such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

NOTIFICATION OF COMPLETION

14.12 When CONTRACTOR considers the Work required in the performance of this Contract to be complete and ready for final inspection, CONTRACTOR shall provide Notice to the ENGINEER.

FINAL INSPECTION

14.13 CONTRACTOR shall serve Notice of completion on ENGINEER who will, within 7 days, schedule the final inspection with OWNER and CONTRACTOR, and will notify CONTRACTOR of incomplete and Defective Work. CONTRACTOR shall remedy such defects immediately and again submit a Notice of completion. Questions regarding quantities for payment will be measured jointly by the CONTRACTOR and ENGINEER.

FINAL PAYMENT

14.14 After CONTRACTOR has remedied all incomplete and Defective Work and delivered documents required by the Contract Documents, CONTRACTOR will prepare a request for final payment. CONTRACTOR shall furnish an executed Affidavit of Completion, in the form set forth in Article 19 of these General Conditions, including consent of the Surety to final payment. In lieu thereof, CONTRACTOR may furnish a Bond satisfactory to OWNER to indemnify OWNER against any lien.

APPROVAL OF FINAL PAYMENT

14.15 If ENGINEER is satisfied that the Work has been completed, and has received CONTRACTOR's Affidavit of Completion, ENGINEER will, within 10 days, issue the Certificate of Completion and present a recommendation for final payment to the OWNER for approval and payment. If said documentation is satisfactory in form and substance, OWNER shall pay CONTRACTOR within 30 days of receipt thereof.

CONTRACTOR'S CONTINUING OBLIGATION

14.16 The CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents shall be absolute. Recommendation of any progress or final payment by ENGINEER, issuance of a Certificate of Substantial Completion, any payment by OWNER to CONTRACTOR, any use or occupancy of the Work or any part thereof by OWNER, any act of acceptance by OWNER or any failure to do so, or any correction of Defective Work by OWNER shall not constitute an acceptance of Work contrary to the Contract Documents.

14.17 The duties and obligations imposed on CONTRACTOR by these General Conditions, and the rights and remedies available hereunder, and the rights and remedies available to OWNER and ENGINEER hereunder, shall be in addition to, and not a limitation of, any otherwise imposed or available by law, by special guarantee, or other provisions of the Contract Documents.

WAIVER OF CLAIMS

14.18 The making and acceptance of final payment shall constitute:

A. a waiver of all claims by OWNER against CONTRACTOR, except claims arising from unsettled Liens, from Defective Work appearing after final inspection pursuant to this Article or from failure to comply with the Contract Documents. However, it shall not constitute a waiver by OWNER of any rights with respect to CONTRACTOR's continuing obligations under the Contract Documents; and

B. A waiver of all claims by CONTRACTOR against OWNER, except those claims under negotiation, arbitration, or litigation.

14.19 CONTRACTOR'S refusal to accept the final payment as tendered by OWNER shall constitute a waiver of any right to interest thereon.

LIQUIDATED DAMAGES

14.20 OWNER will deduct the amount of any liquidated damages and expenses, calculated in accordance with the Agreement, from moneys due or to become due to CONTRACTOR. If such amount exceeds such unpaid balance, the CONTRACTOR shall pay the difference to the OWNER.

ARTICLE15-SUSPENSION AND TERMINATION

WORK SUSPENSION

15.1 OWNER may order CONTRACTOR to suspend the Work, or any portion thereof, until the reason for such suspension has been eliminated; however, this right shall not give rise to any duty by OWNER to exercise this right for the benefit of CONTRACTOR or any other party.

15.2 OWNER may suspend the Work for the following reasons:

A. Defective Work.

B. CONTRACTOR fails to supply sufficient skilled workmen or suitable Products.

C. CONTRACTOR fails to make prompt payments to Subcontractors or for labor or Products.

D. CONTRACTOR fails to maintain proper insurance, bonds, licenses, or federal, state, or local permits.

OWNER TERMINATION OF WORK

15.3 Upon the occurrence of any one or more of the following events OWNER may, after giving CONTRACTOR and Surety 10 days written Notice of Termination, terminate the services of the CONTRACTOR.

A. CONTRACTOR fails to initiate and diligently proceed with the Work.

B. CONTRACTOR is adjudged bankrupt or insolvent.

C. CONTRACTOR makes a general assignment for the benefit of creditors.

D. a trustee or receiver is appointed for CONTRACTOR or for any of CONTRACTOR's property.

E. CONTRACTOR files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or similar laws.

F. CONTRACTOR repeatedly fails to supply sufficient skilled workmen or suitable Products.

G. CONTRACTOR repeatedly fails to make prompt payments to Subcontractors or for labor or Products.

H. CONTRACTOR disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction.

I. CONTRACTOR disregards the authority of the ENGINEER.

J. CONTRACTOR otherwise violates any provisions of the Contract Documents.

OWNER COMPLETION OF WORK ON TERMINATION:

15.4 If the Surety does not resume performance of the Work within 10 days after Notice of Termination is received from OWNER, OWNER shall have the absolute right to complete the Work in the most expeditious manner and shall have the right to exclude CONTRACTOR from the Site and take possession of the Work and of all CONTRACTOR's tools, appliances, equipment and machinery at the Site and use the same without liability to CONTRACTOR for trespass or conversion. OWNER may incorporate in the Work all Products for which OWNER has paid CONTRACTOR but which are stored elsewhere. In such case CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the balance due to CONTRACTOR at the time of termination exceeds the direct and indirect costs of completing the Work, including compensation for additional engineering services, attorney's fees, technical services and administrative costs, such excess shall be paid to CONTRACTOR. If such costs exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such costs incurred by OWNER

shall be verified by ENGINEER and incorporated in a Change Order, but in finishing the Work OWNER shall not be required to obtain the lowest cost for the remaining portion of the Work performed.

OWNER'S ADDITIONAL TERMINATION RIGHTS

15.5 Where CONTRACTOR's services have been terminated by OWNER, said termination shall not affect any rights of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention due or payment of money by OWNER to CONTRACTOR shall not release CONTRACTOR from liability.

OWNER'S TERMINATION FOR CONVENIENCE

15.6 Upon 10 days' written Notice to CONTRACTOR, Surety and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy, elect to abandon the Work and terminate the Contract. In such case, CONTRACTOR will be paid for Work executed and expense sustained plus a reasonable profit.

CONTRACTOR'S CONTINUING WORK DURING DISPUTES

15.7 CONTRACTOR shall carry on the Work and maintain the Construction Schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as CONTRACTOR and OWNER may otherwise agree.

CONTRACTOR MAY STOP WORK OR TERMINATE

15.8 If, through no act or fault of CONTRACTOR, the Work is suspended for a period of more than 90 days by the OWNER or by an order of court or other public authority, or OWNER fails to pay CONTRACTOR any sum recommended by ENGINEER within 90 days of its presentation, then CONTRACTOR may, upon 10 days' written Notice to OWNER, terminate this Contract and recover from OWNER payment for all Work executed and any expense sustained plus a reasonable profit. In lieu of terminating the Contract, CONTRACTOR may, upon 10 days' notice to OWNER, stop the Work until CONTRACTOR has been paid amounts then due.

ARTICLE 16-ARBITRATION

16.1 In the event that a claim, dispute or other question arises relating to the Contract Documents, except claims which have been waived by the making or acceptance of final payment or claims not subject to arbitration under applicable law, OWNER and CONTRACTOR may, by mutual agreement, submit the claim, dispute or matter to arbitration. In the event the parties agree to arbitration, the right to proceed to arbitration shall be subject to the terms and conditions in this Article.

16.2 The parties must agree on the specific claims, disputes or matters to be arbitrated. The written arbitration submission shall state the nature and circumstances surrounding the claim or dispute, state the amount claimed or relief sought, and the specific supporting provisions relied upon in the Contract Documents. The scope of the arbitration shall be strictly limited to matters defined in the arbitration submission.

16.3 Once the arbitration submission has been signed by both parties, it shall be submitted to the American Arbitration Association which shall proceed to process the case in accordance with the Construction Industry Arbitration Rules, except to the extent that the same have been modified by this Article and the arbitration submission.

16.4 The arbitration panel shall consist of one Professional Engineer or Architect, one Contractor, and one Attorney selected in accordance with the applicable rules of the American Arbitration Association. In lieu of the appointment of an Arbitration Panel to settle an existing claim or dispute, OWNER and CONTRACTOR may agree upon a permanent arbitrator or Arbitration Panel to decide all claims, disputes, and other matters relating to the Contract Documents.

16.5 The arbitrator or Arbitration Panel shall apply the terms and conditions of the Contract Documents to the claim, dispute or matter submitted to it and shall base its decision on said Contract Documents.

16.6 The arbitrator's or Arbitration Panel's decision shall be set forth in writing, shall state the decision on each claim, dispute or matter submitted, and the reason for each decision.

16.7 Once a written arbitration submission has been executed, the agreement to arbitrate shall be specifically enforceable under the prevailing arbitration law. The arbitration award rendered by the arbitrator(s) shall be final and judgment may be entered upon it in any court having jurisdiction thereof.

16.8 During the pendency of the arbitration proceedings, CONTRACTOR covenants and agrees that CONTRACTOR shall continue to proceed with the Work required pursuant to the Contract Documents. In the event that CONTRACTOR is terminated by OWNER at any time prior to the issuance of the arbitrator's or Arbitration Panel's written decision, or if CONTRACTOR fails to proceed with the Work during the pendency of the arbitration proceedings, OWNER shall be entitled to obtain a court order enjoining the continuance of said arbitration proceedings by reason of such action.

ARTICLE 17-MISCELLANEOUS

17.1 Whenever any provision of the Contract Documents requires the giving of Notice, it shall be deemed to have been validly given, if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if sent by certified mail or commercial carrier, with provision for receipt acknowledgement, to the last business address known to party who gives the Notice. Notice may also be made by facsimile transmission. In such case, Notice will be deemed received when the transmission is made. The party making such facsimile transmissions shall also forward a copy of such Notice by regular mail.

17.2 If any section, paragraph, clause or provision of the Contract Documents shall be held invalid, the invalidity of such section, paragraph, clause or provision shall not affect any of the other provisions of the Contract Documents. The Article and paragraph headings in the Contract Documents are furnished for convenience of reference only and shall not be considered to be a part of the Contract Documents.

ARTICLE 18-RESIDENT PROJECT REPRESENTATIVE

GENERAL

18.1 Resident Project Representative is ENGINEER's Agent under the supervision of ENGINEER in matters pertaining to the on-site Work. Dealings with Subcontractors shall be through, or with knowledge of, CONTRACTOR.

DUTIES AND RESPONSIBILITIES

18.2 Resident Project Representative will:

A. Review the Construction Schedule, schedule of Shop Drawing submissions, and Schedule of Values prepared by CONTRACTOR, and consult with ENGINEER concerning their acceptability.

B. Attend preconstruction conferences, progress meetings, and other job conferences; chair meetings and maintain and circulate copies of minutes and notices thereof.

C. Serve as ENGINEER's liaison with CONTRACTOR, principally through with CONTRACTOR's Superintendent. Assist ENGINEER as OWNER's liaison when CONTRACTOR's operations affect OWNER's on-site operations.

D. Assist ENGINEER in obtaining from OWNER additional details or information when required for proper execution of the Work.

E. Receive Shop Drawings, Product Data and samples, submittals, and receive samples delivered at the site for ENGINEER's examination.

F. Advise ENGINEER and CONTRACTOR immediately of the commencement of any Work requiring a Shop Drawing of sample submission if the submission has not been approved by ENGINEER.

G. Conduct on-site observations of the Work to assist ENGINEER in determining compliance with the Contract Documents.

H. Report to ENGINEER whenever it appears that any portion of the Work does not conform to the Contract Documents or has been damaged prior to final payment; and advise ENGINEER when it appears any portion of the Work should be uncovered for observation or requires special testing, inspection or approval.

I. Verify that required tests, equipment and systems startups, and operating and maintenance instructions are conducted in the presence of required personnel, and that CONTRACTOR maintains adequate records thereof; observe, record and report to ENGINEER details of test procedures, startups, inspections, and operating and maintenance instructions.

J. Accompany inspectors representing public or other agencies having jurisdiction on the Project; record and report to ENGINEER on the outcome of these inspections.

K. Transmit to CONTRACTOR, ENGINEER's clarifications and interpretations of the Contract Documents.

L. Consider and evaluate CONTRACTOR's suggestions for modifications in Drawings or Specifications and report them with recommendations to ENGINEER.

M. Maintain at the Site orderly files for correspondence, reports of job conferences, Shop Drawings, Product Data and samples submissions, reproductions of original Contract Documents, including all Addenda, Change Orders, additional Drawings, ENGINEER's clarifications and interpretations of the Contract Documents, progress reports, and other Project related documents.

N. Maintain a log book, recording hours on the Site, weather conditions, data relative to extras or deductions, list of visiting officials and representatives of manufacturers, fabricators, suppliers and distributors, daily activities, decisions, and general and specific observations of test procedures.

O. Consult with ENGINEER relative to scheduled major tests, inspections or start of critical phases of the Work.

P. Report accidents immediately to ENGINEER.

Q. Review applications for payment with CONTRACTOR and forward them with recommendations to ENGINEER, noting relation to the Schedule of Values, Work completed, and payment for materials and equipment not incorporated in the Work.

R. During the course of the Work, verify that certificates, maintenance and operation manuals, and other data required to be assembled and furnished by CONTRACTOR are applicable to the items actually installed; and that this material is delivered to ENGINEER for review and forwarding to OWNER prior to final acceptance of the Work.

S. Prior to, and as a condition of, recommending to ENGINEER issuance of a Certificate of Substantial Completion, Resident Project Representative will:

1. Prepare a list of incomplete or Defective Work.

2. Verify that all items required for Substantial Completion have been corrected or completed.

3. Secure agreement between OWNER and CONTRACTOR relative to responsibilities for utilities, heat, janitorial services, insurance, Project security, access by the parties, safety and any other matters.

4. Secure CONTRACTOR's specific Construction Schedule to fully complete the Work.

T. Conduct final inspection with ENGINEER, OWNER and CONTRACTOR and prepare a final list of items to be completed or corrected.

U. Verify that all items on final list have been completed or corrected and make recommendations to ENGINEER concerning acceptance.

LIMITATIONS OF AUTHORITY

18.3 Resident Project Representative shall not guarantee or warrant CONTRACTOR's Work. Except upon written instructions of ENGINEER, Resident Project Representative shall not:

A. Authorize any deviation from the Contract Documents or approve any substitute Products.

B. Exceed limitations on ENGINEER's authority as set forth in the Contract Documents.

C. Undertake any of the responsibilities of CONTRACTOR, Subcontractors or CONTRACTOR's Superintendent, or expedite the Work.

D. Advise on, or issue directions relative to, any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents.

E. Advise on, or issue directions as to, safety precautions and programs in connection with the Work.

F. Authorize OWNER to occupy the Project in whole or in part.

G. Participate in specialized field or laboratory tests.

SECTION 01270 MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Measurement and payment criteria applicable to the Work.

1.02 AUTHORITY:

A. Measurement methods delineated in the individual specification sections are intended to complement the criteria of this section.

B. The ENGINEER will take all measurements and compute quantities accordingly.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

1.03 UNIT QUANTITIES SPECIFIED:

A. Quantities and measurements indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the ENGINEER shall determine payment.

B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit prices contracted.

1.04 MEASUREMENT OF QUANTITIES:

A. Measurement Devices:
1. Weigh Scales: Inspected, tested and certified.
2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
3. Metering Devices: Inspected, tested and certified.

B. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook weights.

C. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

D. Measurement by Area: Measured by square dimension using mean length and width or radius.

E. Linear Measurement: Measured by linear dimension, at the item centerline.

1.05 PAYMENT:

A. Payment Includes: Full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

B. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the ENGINEER multiplied by the unit price for Work which is incorporated in or made necessary by the Work.

1.06 MEASUREMENT AND PAYMENT SCHEDULE:

A. The following schedule outlines the method of measurement and basis of payment to be used on this project. Requirements for materials and methods described under each unit price are included in the specification sections.

1. Mobilization (10% Max.):
   a. Includes, but not limited to the following in accordance with these Documents:
      i. Preparatory work and expenses incurred prior to beginning work onsite.
      ii. Transporting materials, personnel and equipment to the jobsite.
      iii. Establishing temporary on site construction facilities.
      iv. Insurances, bonding and other costs associated with the project in general and not included in other pay items.
      v. Furnishing, installing and maintaining all SESC measures not otherwise specified on the Drawings.
      vi. Furnishing all labor, materials, and equipment necessary to excavate in the vicinity of proposed drain location ahead of the progress of Work to locate existing underground utilities.
      vii. Coordinating the removal, replacement or relocation of utilities with the service provider or property owner as required to complete the Work. the ENGINEER, OWNER or Muskegon County Road Commission.
      ix. Coordinating with Contractor working on Division II.
   b. Unit of Measure: Lump Sum limited to 10% of each bid sub total.

2. Traffic Control:
   a. Includes the following as indicated on the Drawings and in accordance with the specifications:
      i. Furnishing all labor, materials, and equipment as necessary to complete te Work.
      ii. Traffic control devices including barricades, barrels and signage as directed by the ENGINEER, OWNER or Muskegon County Road Commission.
      iii. Maintaining access to residential driveways.
      iv. Maintaining one access lane at all times for emergency vehicles.
   b. Unit of Measure:
      i. Lump Sum.
      ii. 50% payment shall be made for installation of traffic control devices.
      iii. 50% payment shall be made after removal of traffic control devices.

3. Sediment Sump:
   a. Includes the following as indicated on the Drawings and in accordance with the specifications:
      i. Furnishing all labor, materials, and equipment to complete the Work, including but not limited to coir log and wood stakes.
      ii. Selective clearing, grubbing and snagging as necessary to access and complete the Work.
      iii. Excavating open channel to the lines and grades indicated on the Drawings or as directed by the ENGINEER.
      iv. Placing, levelling, spreading and shaping of soil.
      v. Placing coir log and securing with wood stakes.
      vi. Cleanup and maintenance of the Work in the finished condition until final acceptance.
   b. Unit of Measure: Each.

4. Open Channel Excavation (8’ Bottom Width):
5. Open Channel Excavation (4’ Bottom Width):
6. Open Channel Excavation (2’ Bottom Width):
    a. Includes the following as indicated on the Drawings and in accordance with the specifications:
        i. Furnishing all labor, materials, and equipment necessary to complete the Work.
        ii. Selective clearing, grubbing and snagging as necessary to access and complete the Work.
        iii. Removal and disposal of debris from within the channel limits.
        iv. Excavating open channel to the lines and grades indicated on the Drawings.
        v. Removal of sediment and debris from existing culverts.
        vi. Protecting existing structures, landscaping, fencing, and appurtenances and removing and replacing such items as necessary to complete the Work.
        vii. Cleanup and maintenance of the Work in the finished condition until final acceptance.
    b. Unit of Measure: Linear Foot of open channel as measured along the centerline of the survey stationing indicated on the Drawings.

7. 142”x91” CMP Arch Culvert:
8. 72” CMP Culvert:
9. 60” CMP Culvert:
10. 48” CMP Culvert:
    a. Includes the following as indicated on the Drawings and in accordance with the specifications:
        i. Furnishing all labor, materials and equipment as necessary to complete the Work.
        ii. Excavating and dewatering.
        iii. Removal and disposal or salvaging (as indicated on plans) of existing storm sewers, culverts or bridges and appurtenance items.
        iv. Placing and compacting bedding and backfill.
        v. Installing pipe and appurtenant items.
        vi. Removal and disposal of all vegetation and debris including inorganic material, trees, brush, stumps and roots as required for construction of surface.
        vii. Cleanup and maintenance of the Work in the finished condition until final acceptance.
    b. Unit of Measure: Linear Foot as measured along the pipe centerline from end of pipe to end of pipe.

11. Remove Culvert:
    a. Includes the following as indicated on the Drawings and in accordance with the specifications:
        i. Removal and disposal of existing structures and appurtenance items where indicated on the plans.
        ii. Clean up and maintenance of the Work in the finished condition until final acceptance.
    b. Unit of Measure: Each

12. Goebel Road Restoration:
    a. Includes the following as indicated on the Drawings and in accordance with the specifications:
        i. Furnishing all labor, materials and equipment as necessary to complete the Work.
        ii. Sawcutting, removing, and disposing of existing bituminous pavement as necessary to complete the Work.
        iii. Cutting, filling, shaping, grading, compacting, or otherwise preparing a finished subgrade, sand subbase, and aggregate base.
        iv. Furnishing, placing, and compacting bituminous base and top course mixtures.
        v. Spreading topsoil stripped during grading adjacent to roadway.
        vi. Restoration of all other disturbed areas with seed and straw mulch.
        vii. Cleanup and maintenance of the Work in the finished condition until final acceptance.
    b. Unit of Measure: Lump Sum.

13. Private Crossing Restoration:
    a. Includes the following as indicated on the Drawings and in accordance with the specifications:
        i. Furnishing and/or installing all labor, materials and equipment as necessary to complete the Work.
        ii. Cutting, filling, shaping, grading, compacting, or otherwise preparing a finished subgrade.
        iii. Furnishing, placing and compacting sand subbase and aggregate base.
        iv. Fine grading aggregate surface course.
        v. Spreading topsoil stripped during grading adjacent to roadway.
        vi. Restoration of all other disturbed areas with seed and mulch blanket.
        vii. Cleanup and maintenance of the Work in the finished condition until final acceptance.
    b. Unit of Measure: Each.

14. Bioengineering Stabilization:
    a. Includes the following as indicated on the Drawings and in accordance with the specifications:
        i. Furnishing all labor, materials and equipment as necessary to complete the Work including but not limited to riprap, geotextile fabric, brush bundles, live stakes, and coir logs.
        ii. Clearing, excavating and grading necessary to complete the Work.
        iii. Placing rock riprap, geotextile fabric, brush bundles, live stakes, and coir log as indicated on the Drawings or as directed by the ENGINEER.
        iv. Adjustments as directed by the ENGINEER in order to ensure proper function.
        v. Cleanup and maintenance of the Work in the finished condition until final acceptance.
    b. Unit of Measure: Square Yards.

15. Riprap
    a. Includes the following as indicated on the Drawings and in accordance with the specifications:
        i. Furnishing all labor, materials and equipment as necessary to complete the Work including but not limited to riprap and geotextile fabric.
        ii. Clearing, excavating and grading necessary to complete the Work.
        iii. Placing rock riprap and geotextile fabric as indicated on the Drawings or as directed by the ENGINEER.
        iv. Adjustments as directed by the ENGINEER in order to ensure proper function.
        v. Cleanup and maintenance of the Work in the finished condition until final acceptance.
    b. Unit of Measure: Square Yards.

16. Mulch Blanket:
    a. Includes the following as indicated on the Drawings and in accordance with the specifications:
        i. Furnishing all labor, materials and equipment as necessary to complete the Work.
        ii. Placing and anchoring mulch blanket as indicated on the Drawings or as directed by the ENGINEER.
        iii. Cleanup and maintenance of the Work in the finished condition until final acceptance.
    b. Unit of Measure: Square Yard.

17. Open Channel Seeding:
    a. Includes the following as indicated on the Drawings and in accordance with the specifications:
        i. Furnishing all labor, materials and equipment as required to complete the Work, including but not limited to topsoil, seed and fertilizer.
        ii. Salvaging, stockpiling, replacing and grading existing topsoil.
        iii. Placing seed along channel banks and other disturbed areas.
        iv. Cleanup and maintenance of the Work in the final condition until finalc acceptance.
    b. Unit of Measure: Linear Foot of open channel as measured along the centerline of the survey stationing indicated on the Drawings.

SECTION 01330 SUBMITTAL PROCEDURES

PART 1-GENERAL

1.01 CONSTRUCTION SCHEDULES:

A. General:
1. Coordinate with work by others as explained in the General Conditions
2. CONTRACTOR shall notify the ENGINEER 72 hours prior to start of work or a major increase in the work force if these vary from schedule as submitted.

B. Form of Schedules:
1. CONTRACTOR shall prepare and submit a construction schedule in an acceptable format to the OWNER and ENGINEER.

C. Content of Schedules:
1. The construction project schedule shall include as a minimum:
a. Project start date.
b. Start dates and durations for each major trade group, work tasks or other subdivisions of the work.
c. Shop drawings, product data, and sample submittal dates and dates when reviewed copies will be required.
d. Equipment and/or material delivery dates if approved.
e. Total project duration and end date.

D. Updating:
1. Show all occurring changes of previous submission.
2. Show progress completion dates of each activity.
3. Submit a narrative report, if required by ENGINEER defining:
a. Problem areas: Impact of current and anticipated delay factors.
b. Schedule changes: Effect on other contractors.
c. Revision description: Effect of change of scope and duration of activities.

E. Submittal of Schedules:
1. The CONTRACTOR shall submit the initial detailed construction schedule within seven (7) days after the notice of award. ENGINEER will return copy within ten (10) days of receipt. The resubmittal, if required, shall be within (10) days.
2. An updated schedule shall be submitted on the first work day of each month.

F. Distribution:
1. The reviewed schedule shall be distributed by ENGINEER to:
a. The job site file.
b. OWNER.

1.02 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES:

A. General:
1. Where required by the specifications, the CONTRACTOR shall submit descriptive information which will enable the ENGINEER to advise the OWNER whether the CONTRACTOR's proposed materials, equipment, or methods of work are in general conformance to the design concept and in compliance with the drawings and specifications. The information to be submitted shall consist of drawings, specifications, descriptive data, certificates, samples, test results and such other information, all as specifically required in the specifications.

B. CONTRACTOR Responsibility:
1. CONTRACTOR shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment or method of work shall be as described in the submittal. The CONTRACTOR shall verify that the material and equipment described in each submittal conform to the requirements of the specifications and drawings. If the information shows deviations from the specifications or drawings, the CONTRACTOR shall insure that there is no conflict with other submittals and notify the ENGINEER in each case where his submittal may affect

the work of another CONTRACTOR or the OWNER. The CONTRACTOR shall insure coordination of submittals among the related crafts and subcontractors.

2. The CONTRACTOR shall be responsible to check and verify all field measurements, all dimensions on shop and setting drawings and all schedules required for the work of all the various trades.
3. The CONTRACTOR may authorize in writing a material or equipment supplier to deal directly with the ENGINEER or with the OWNER with regard to a submittal. These dealings shall be limited to contract interpretations.
4. The CONTRACTOR shall stamp each submittal with stamp, initialed and signed, certifying to review of the submittal by the CONTRACTOR, verification of field measurements and compliance with Contract Documents.

C. Transmittal Procedure:

1. General:
   a. Submittals shall be submitted promptly in accordance with dates in proposals, approved schedules and in such sequence that there is no delay in the Work or the work of any other CONTRACTOR.
   b. Submittals regarding material and equipment shall be accompanied by the attached Transmittal Form identifying the equipment and any variations from these specifications. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete sections, for which the submittal is required. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole
   c. A unique number, sequentially arranged, shall be noted on the transmittal form accompanying each item's submittal. Original submittal numbers shall have the following format "XXX-Y:; where "XXX is the originally assigned submittal number, and "Y" is a sequential letter assigned for resubmittals, i.e., A, B, or C being the 1st, 2nd and 3rd resubmittals, respectively. Submittal 25-B, for example, is the second resubmittal of submittal 25.
2. Deviation From Contract:
   a. If the CONTRACTOR proposed to provide material or equipment which does not conform to the specifications and drawings, he shall indicate so under "deviations" on the transmittal form accompanying the submittal copies. He shall prepare his reason for a change, including cost differential, and request a change order to cover the deviations.
3. Submittal Completeness:
   b. Submittals which do not have all the information required to be submitted, including deviations, are not acceptable and will be returned without review.

D. Review Procedure:

1. When the contract documents require a submittal, the CONTRACTOR shall submit five (5), and no more than eight (8), copies of all submittal data of which two (2) copies will be retained by the ENGINEER. For samples this number may vary. For samples, submit the number stated in each specifications section.
2. Unless otherwise specified, within 14 calendar days after receipt of the submittal, the ENGINEER shall review the submittal and return a minimum of three (3) copies which carry the ENGINEER's stamp of approval. The returned submittal shall indicated one of the following actions:
   a. If the review indicates that the material, equipment or work method is in general conformance with the design concept and complies with the drawings and specifications, submittal copies will be marked "FURNISH AS SUBMITTED". In this event the CONTRACTOR may begin to implement the work method or incorporate the material or equipment covered by the submittal.
   b. If the review indicates limited corrections are required, submitted copies will be marked "FURNISH AS CORRECTED". The CONTRACTOR may begin implementing the work method by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in O&M data, a corrected copy shall be provided.

c. If the review reveals that the submittal is insufficient or contains incorrect data, submitted copies will be marked "REVISE AND RESUBMIT". Except at his own risk, the CONTRACTOR shall not undertake work covered by this submittal until it has been revised, resubmitted and returned marked either "FURNISH AS SUBMITTED" or "FURNISH AS CORRECTED".

d. If the review indicates that the material, equipment or work method is not in general conformance with the drawings and specifications, copies of the submittal will be marked "REJECTED". Submittals with deviations which have not been identified clearly may be rejected. Except at his own risk the CONTRACTOR shall not undertake the work covered by such submittals until it has been revised, resubmitted and returned marked either "FURNISH AS SUBMITTED" or "FURNISH AS CORRECTED".

e. If the review indicates that the material or equipment is not from an acceptable manufacturer, as indicated in the specifications, copies of the submittal will be marked "SUBMIT SPECIFIED ITEM". Except as his own risk, the CONTRACTOR shall not undertake the work covered by such submittals until it has been revised, resubmitted and returned marked either "FURNISH AS SUBMITTED" or "FURNISH AS CORRECTED".

E. Effect of Review of CONTRACTOR's Submittal:

1. Review of drawings, methods of work, or information regarding materials or equipment the CONTRACTOR proposes to provide, shall not relieve the CONTRACTOR of his responsibility for errors therein and shall not be regarded as an assumption of risks or liabilities by the ENGINEER or the OWNER, or by an officer or employee thereof, and the CONTRACTOR shall have no claim under the contract on account of the failure, or partial failure, of the method of work, material, or equipment so reviewed. A mark of "FURNISH AS SUBMITTED" or "FURNISH AS CORRECTED" shall mean that the OWNER has no objection to the CONTRACTOR, upon his own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

1.03 RECORD DOCUMENTS:

A. Requirements:

1. The CONTRACTOR shall maintain on the construction site a minimum of one (1) complete set of contract documents amended by "RED LINE" or highlight inclusion to reflect the most immediate status methods, materials, and locations and routings of construction. Supplementary sketches shall be included, if necessary, to clearly indicate all work as constructed.
2. At conclusion of work, the CONTRACTOR shall submit to the ENGINEER one (1) complete amended record set of these site documents.
3. Submittal shall be thirty (30) days prior to final payment.
4. Failure of the CONTRACTOR to maintain an up-to-date set of modified drawings on the project site shall be reason to withhold payments.

SECTION 01410 REGULATORY REQUIREMENTS

PART 1-GENERAL

1.01 SUMMARY:

A. This Section includes provisions for requirements and fees of regulatory agencies.

B. The General Conditions requires that Contractor obtain and pay for all construction permits. This Section includes provisions for specific permits but does not include all permits.

1.02 PERMITS:

A. Highway, Road or Street:
1. Work performed and operations of Contractor within the limits of rights-of-way shall fulfill the requirements of the authority having jurisdiction over and control of the rights-of-way.
2. Owner will obtain permits to occupy and maintain the utility in the rights-of-way, but contractor shall obtain permits to perform construction and shall furnish necessary insurance and bonds required by the authority.
3. Contractor shall obtain a written release from the authority having jurisdiction stating that all repairs within said rights-of-way have been completed to their satisfaction prior to final acceptance to Owner.

B. Soil Erosion and Sedimentation Control (Part 91, Act 451, PA 1994)
1. The Muskegon County Drain Commissioner is an Authorized Public Agency (APA) and a separate SESC permit is not required.
2. CONTRACTOR shall comply with the requirements and conditions of the APA.

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included:
1. Provide permanent and/or temporary erosion and sedimentation control as called for on the plans.

B. Intent and Purpose of Control:
1. Keep disturbed areas small.
2. Stabilize and protect disturbed areas as soon as possible.
3. Keep storm water runoff velocities low.
4. Protect disturbed areas from runoff.
5. Retain sediment within the corridor or site area.

C. Method of Measurement and Basis of Payment:
1. Temporary Measures - Incidental to construction.
2. Permanent Measures - See Proposal for pay item.

1.02 PERMIT:

A. Soil Erosion and Sedimentation Control (Part 91, Act 451, PA 1994)
1. The Muskegon County Drain Commissioner is an Authorized Public Agency (APA) and a separate SESC permit is not required.
2. CONTRACTOR shall comply with the requirements and conditions of the APA.

1.03 JOB CONDITIONS:

A. Scheduling:
1. Control measures shall be constructed prior to the time construction starts uphill or upstream from the control measure location.
2. Removal and cleanup of temporary control structures: Within one week after control measure is no longer needed.

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Seeding:
1. MDOT, Sec. 816.02, 917.12
2. Temporary Measures:
a. MDOT Table 816-2, 917-1.
b. CR (Cereal Rye, less than 6 mos.) at a rate of 70lb/acre.
3. Permanent Measures:
a. MDOT Table 816-1 and 917-1.
b. TDS Mix at a rate of 220lb/acre.
c. Incorporate Temporary Measures as necessary.

B. Topsoil:
1. Temporary Measures: Not required unless readily available.
2. Permanent Measures: MDOT 816.02.

C. Mulching:
1. Temporary and Permanent Measures: MDOT 816 shall apply. Required as specified on plans and/or in Project Specifications.
2. Mulch Blanket: NA Green SC-150BN or equal.

D. Riprap:
1. Crushed Cobblestone: Sound, non-stratified, durable rock free from structural defects. Material shall be range in dimension as indicated on the Drawings. MDOT 916.01 shall apply.
2. Limestone: Sound, non-stratified, durable rock free from structural defects. Material shall range in dimension as indicated on the Drawings. MDOT 916.01 shall apply.
3. Broken Concrete: Not permitted.

E. Geotextile Fabric:
1. Mirafi 140N or approved equal.

PART 3 - EXECUTION

3.01 PERFORMANCE:

A. General:
1. Abide with all applicable rules and regulations as established by the State of Michigan and the local governmental unit pursuant to Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act, Act 451, PA 1994.
2. Achieve Effective Erosion Control:
a. Provide all materials.
b. Promptly take actions necessary to prevent off Site sedimentation.
3. Maintain erosion controls.
4. Remove temporary soil erosion and sedimentation control measures once permanent measures are established and accepted by the ENGINEER.
5. Even though a specific erosion control measure is not called out on the plans, this does not relieve the CONTRACTOR from his obligation under the above Act to properly control and/or prevent all erosion caused by the CONTRACTOR's construction operation.

B. Sediment Removal:
1. Take such steps as are necessary to assure the retention and removal of any sediment which enters an existing storm sewer or open ditch along the construction route before said sewer or ditch discharges into a stream or pond.
2. If eroded material is allowed to enter a storm sewer system it shall be the CONTRACTOR's responsibility to see that all catch basins and manholes are cleaned following construction prior to receipt of final payment. Unless the CONTRACTOR can document positively to what extent an existing storm sewer system along the construction area is silted in prior to construction, no credit will be allowed for cleaning the system stem.
3. The CONTRACTOR shall be responsible for maintaining the roadways in a passable condition until the paving is completed. This includes any maintenance necessary for dust control.

3.02 SEEDING:

A. Scheduling:
1. Within 7 days from the time the area was first disturbed.
2 Channel Banks: Within 24 hours from the time the area was first disturbed.
3. Seasonal Limitations:
a April 20 through November 1.
a. Dormant seeding after November 1 to freeze up.

B. Sowing:
1. Sow the seed following or in conjunction with the fertilizer and while the seed bed is in a friable condition.
2. Do not sow seed through mulch.

C. Method:
1. Broadcast: Do not seed when wind velocity exceeds 5 miles per hour.
2. Mechanical drills.
3. Hydroseeder:
a. Use only equipment specifically designed for hydraulic seeding application.
b. Mix seed, fertilizer and pulverized mulch in water until uniformly blended into homogeneous slurry.
c. Continue mixing during application.

D. Inspection:
1. Visually inspect for uniform distribution.
2. Reseed areas as required to establish a uniform and stable stand of grass.

E. Finishing: Incorporate seed into the upper 1/2-inch of soil.

3.03 TEMPORARY VEGETATIVE COVER:

A. General:
1. Provide temporary seed if permanent measures will not be placed within 15 days of initial disturbance and area will not undergo further earth change within 15 days of initial disturbance:
2. Within 15 days from the time final grade has been established, provide permanent soil erosion and sedimentation control measures.

B. Seed: Apply uniformly at a minimum rate of 70 pounds per acre.

C. Mulch: As needed to effectively control soil erosion.

3.04 MULCH BLANKET:

A. General: Directions of installation, staple patterns and other requirements in accordance with Manufacturer's directions.

B. Location: Where indicated on the Drawings or as directed by the ENGINEER.

3.05 RIPRAP:

A. General:
1. Includes riprap bank stabilization and riprap end treatment.
2. Conform to slopes and dimensions indicated on the Drawings.

B. Grading:
1. Excavate to finished grade of required section and slope.
2. Excavate header and footer trench at upstream and downstream toe.

C. Geotextile Fabric:
1. Place geotextile fabric beneath all riprap areas.
2. Extend geotextile fabric into trenches for anchorage at upstream and downstream.

D. Placing Riprap: As indicated on the Drawings or as directed by ENGINEER.

E. Maintenance: Regrade, relay riprap and geotextile fabric as necessary.

3.06 RIPRAP SPILLWAY (SIDE INLET):

A. General:
1. Conform to slopes and dimensions indicated on the Drawings.

B. Grading:
1. Excavate to finished grade of required section and slope.
2. Excavate header and footer trench at upstream and downstream toe.

C. Geotextile Fabric:
1. Place geotextile fabric beneath all rock areas.
2. Extend geotextile fabric into trenches for anchorage at upstream and downstream.

D. Placing Rock: As indicated on the Drawings or as directed by ENGINEER.

E. Engineers Approval: Obtain approval from ENGINEER that riprap spillway is functioning properly.

F. Maintenance: Regrade, relay and adjust rock as necessary in order to ensure that riprap spillway is functioning properly.

3.07 TILE OUTLET PROTECTION:

A. General:
1. Backfill with suitable material.
2. Minimum pipe slope: 0.10%.
3. Extend or trim drain tile to prevent erosion of the channel bank.
4. Joints:
   a. Like Materials: Manufactured connector.
   b. Unlike materials: Wrap with geotextile fabric and pour concrete collar to form a soil tight joint.
5. Outlet Protection: Riprap splash pad in accordance with the Drawings or as directed by the ENGINEER.

B. Maintenance: Regrade, replace pipe, relay riprap and geotextile fabric as necessary.

3.08 OPEN CHANNEL EXCAVATION

A. Power equipment such as bulldozers shall not enter the water unless approved by ENGINEER.

B. Complete excavation, clearing, grubbing, snagging, tree cutting, pulling, raking, and related work in such a way as to minimize erosion of soil in the areas in which work is completed.

C. Channel banks and other disturbed areas.
1. Stabilize within 24 hours after a disturbance unless otherwise approved by ENGINEER.
2. In no case shall banks be left un-stabilized for more than 7 days.

D. Construct sediment basins or traps prior to excavation.

E. Comply with measures for soil erosion and sediment control as indicated on the Drawings.

3.10 AIRBORNE SEDIMENT

A. Dust Control:
1. Use legal means necessary to control dust on and near the Work and on and near off Site borrow areas if such dust is caused by CONTRACTOR's operations during performance of the Work or if resulting from the condition of the Site when earthwork operations are suspended.
2. Treat haul roads, delivery roads, temporary Site access roads and other surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the Site, and as directed by ENGINEER.
3. Periodically scrape and broom adjacent streets and paved areas to remove tracked dirt.

B. Wind Erosion:
1. Erect and maintain barriers to prevent migration of windblown sediment off Site.
2. Conduct operations in such a manner as to minimize the amount of Site area exposed to wind erosion.
3. Be responsible for removal of windblown sediments deposited off Site, including costs for repairs required due to sediment deposition and removal.

PART 1 - GENERAL

1.01 STAKING:

A. Construction staking will be furnished by the OWNER through the ENGINEER as needed on the following basis:

1. Open Channel Excavation or Realignment – One staking: Line and Grade points at 100-foot station intervals and at bends in the drain alignment.

2. Culverts – One staking: Line and Grade points at culvert ends.

3. In-Stream Structures – One staking: Line and Grade points at critical dimensions/locations.

B. CONTRACTOR shall order the staking Three (3) working days in advance of the need for said staking.

1.02 RESTAKING:

A. If restaking or additional staking is required, it shall be performed by the ENGINEER at the CONTRACTOR'S expense.

PART 1 - GENERAL

1.01 DESCRIPTION

A. Cleaning:
1. General:
a. Manufactured products: Manufacturer's instructions.
b. Clean-up during construction: Maintain premises and public properties free from accumulations of waste, debris and rubbish caused by operations.
c. Final clean-up: Remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all surfaces; leave the work clean and ready for occupancy.
2. Delinquency:
a. Remedies: Failure to clean-up promptly is considered to be defective Work:
(1) Payment: Per ARTICLE 14 of SECTION 00700, GENERAL CONDITIONS.
(2) OWNER may correct per ARTICLE 13 of SECTION 00700, GENERAL CONDITIONS.

B. Work Record Documents:
1. Maintenance of Documents:
a. Maintain 1 copy at jobsite in good order of:
(1) Contract Drawings.
(2) Specifications.
(3) Addenda.
(4) Reviewed shop drawings.
(5) Change Orders.
(6) Other contract Modifications.
b. Filing: Work specification format.
c. Accessibility: To OWNER and ENGINEER.

2. Recording:
a. Keep record documents current.
b. Contract Drawings: Legibly mark to record actual construction:
(1) Field changes of dimension and detail.
(2) Changes made by Change Orders and Bulletins.
(3) Details not on original contract Drawings.
c. Specifications and Addenda: Legibly mark up each SECTION to record:
(1) Manufacturer, trade name, catalog number and supplier of products actually installed.
(2) Changes made by Change Orders and Bulletins.
(3) Other matters not originally specified.

3. Submittal:
a. Transmittal letter: Contain:
(1) Date.
(2) Project title and number.
(3) CONTRACTOR'S name and address.
(4) Title and number of each record documents.
(5) Certification that each document as submitted is complete and accurate.

SECTION 02220 SITE DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Demolition, removal of existing structures, equipment, and related work necessary to complete the project as shown or specified is a part of the Contract unless otherwise noted.

1.02 PERMITS:

A. Permit for transport and disposal of debris by CONTRACTOR.

B. Submit demolition procedures and operational sequence for review and approval by ENGINEER.

1.03 PROTECTION:

A. Provide and place bracing or shoring as required for safety and/or support of structures.

B. Protect and maintain utility services.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. CONTRACTOR maintains possession of all materials being demolished.

B. Carefully remove, store and protect for reinstallation all equipment so designated.

C. Carefully remove, clean and deliver salvaged materials to the OWNER's storage area.

PART 3 - EXECUTION

3.01 DEMOLITION:

A. Completely demolish above grade structures and appurtenances to extent indicated on drawings and in specifications. Remove all scrap materials from site. Demolish in an orderly and careful manner. Install plugs or blind flanges on pipes as indicated or implied.

B. Do not remove underground piping which is to be abandoned, except where it interferes with new construction or is specifically noted for removal. Plug cut ends of abandoned underground piping with non-shrink grout.

C. The major structures and equipment to be demolished include:
1. Footbridge

3.02 REPAIR:

A. Repair damage to adjacent structures, piping, and conduits.

SECTION 02230 SITE CLEARING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This work consists of clearing, selective thinning and application of any growth preventive material where required. CLEARING: Shall consist of cutting, removing from the ground, and disposing of trees, stumps, brush, shrubs, and other vegetation occurring within the project site which interfere with excavation, embankment, channel flow or clear vision, or are otherwise noted on the construction drawings to be removed and includes the preservation from injury or defacement of all vegetation and objects designated to remain. Where removal of a stump may result in damage to existing utilities, the stump shall be removed by chipping to a depth of at least one foot below the finished ground surface. Other stumps may be removed by chipping when approved by the ENGINEER. Any trees or shrubs that are designated to be saved but are damaged by the CONTRACTOR's operations shall be repaired or replaced by the CONTRACTOR, as directed by the ENGINEER, at no additional cost to the Owner.

1.02 PERMITS:

A. Permit for transport and disposal of debris by CONTRACTOR.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Except as noted the CONTRACTOR maintains possession of all materials being demolished.

PART 3 - EXECUTION

3.01 GENERAL:

A. Limits of Work:
1. Selectively clear within drain right-of-way for access lane on one side.
2. Clear both sides of channel to 5-feet beyond (landward) of the top of bank and remove log jams and debris from the channel. Trees are to remain if they do not interfere with the flow or the construction process and are not in danger of falling into the drain.
3. Grubbing is not required except where tree roots interfere with construction.

B. Precautions: Avoid damage to stable, vegetated channel banks, or to trees and shrubs that are not designated for excavation or removal during completion of the clearing operations.

C. Ownership:
1. The property owner shall have the option of retaining ownership of trees that are removed on his property.
2. CONTRACTOR shall notify the property owner of CONTRACTOR's schedule for clearing in order to allow a reasonable amount of time for removal of material by the property owner.
3. If the owner of the property to be cleared requests to maintain possession of the material to be cleared the CONTRACTOR shall have the property owner complete the Land Owner Agreement Form found in the Supplemental Conditions. Cleared material claimed by the property owner shall be placed outside of the drain easement
4. Trees, stumps, etc., that are not removed by the property owner after a reasonable amount of time shall become the property of CONTRACTOR and shall be removed or disposed of in accordance with the Specifications.

3.02 CLEARING:

A. Cutting:
1. Cut trees and brush a maximum of 4 inches above the ground.
2. Remove tree tops and limbs prior to cutting the entire tree if necessary to avoid damage to adjacent structures or trees that are not designated for removal.
3. The final cut shall be an even cut, parallel with the ground.

B. Log Jams, Deadfall and Debris:
1. Trees, log jams, deadfall and debris specified for pulling will be marked by ENGINEER.
2. Only marked items shall be pulled.

C. Access:
1. Restrict equipment access for Clearing operations to areas indicated on the Drawings or as designated by ENGINEER.
2. Equipment shall remain outside of the channel limits unless authorized by ENGINEER.

D. Fruit Trees: Clear only when authorized by ENGINEER.

3.03 GRUBBING:

A. Stump Removal: Unless stumps are specifically designated for chipping, pull the entire stump and roots out from below ground.

B. Stump Treatment: Not in this Contract

C. Utilities:
1. Notify ENGINEER of instances in which stump removal may result in damage to existing utilities or culverts.
2. Be responsible for damage to utilities that may result from stump removal.

3.04 DISPOSAL:

A. Trash, debris and other nonwoody material: Sort out and dispose of in a licensed landfill.

B. Burial:
1. Trees, brush, stumps and other woody material may be disposed of by burial where authorized by ENGINEER and in areas that do not conflict with present land use.
2. Bury material in compacted trenches with a minimum of 2 feet of compacted earth cover.
3. Locate buried trenches a minimum of 10 feet (horizontal) beyond the top edge of the proposed channel bank.

C. Burning:
1. Woody material may be disposed of by burning where authorized by ENGINEER and in accordance with all local, State and Federal regulations.
2. Maintain a minimum 200 feet horizontal isolation distance between overhead public utilities or wooded areas and burning piles.
3. Bury material that remains following burning or remove from the Site.
4. Burning will not be permitted in areas with combustible organic soils.

D. Debris Piles:
1. Woody material may be placed in debris piles as authorized by ENGINEER and in locations that do not conflict with present land use.
2. Neatly windrow debris piles beyond the spoil piles or place in debris piles at intervals of not less than 100 feet.
3. Maintain a minimum clearance of 200 feet (horizontal) between debris piles and overhead public utilities.

4. Floodplains: Secure debris piles to prevent movement of debris during flooding events.

E. Chipping:
1. Woody material may be chipped and spread within the drain tight-of-way where authorized by ENGINEER and in areas that do not conflict with present land use.
2. Wood chip piles shall not exceed 6-inches in height (thickness).

F. Removal: Material that is required to be removed from the Site shall become the property of CONTRACTOR.

3.05 MAINTENANCE:

A. Clear and snag trees that become unstable (lean) or fall into drain between completion of the work and final completion.

SECTION 02300 EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The work includes excavation of open channel drains.

1.02 DEFINITIONS:

A. Earth: Materials which can be excavated with equal facility by equipment used for normal earth excavation. Examples include, but are not limited to:
   1. Common materials such as sand, clay, loam, gravel, silt, and stones less than 1/2 cubic yard in volume.
   2. Organic materials such as muck, peat, and marl.
   3. Rock-like material that is fragile, friable, or fragmented.

B. Rock: Igneous, metamorphic and sedimentary rock and hardpan requiring continuous drilling, blasting or use of ripper:
   1. Solid ledge rock.
   2. Solid boulders more than 1/2 cubic yard in volume.
   3. Hardpan consists of cemented soil layers but does not include uncemented clay layers.

C. Other:
   1. Natural items, such as trees, stumps, logs, brush, shrubs, and other vegetation.
   2. Man-made items, including but not limited to:
      a. Surface items, such as bituminous and concrete paving, curb, headwalls, and the like.
      b. Underground items, such as pipes, culverts, manholes, catch basins, foundations, walls, chambers, refuse, and the like.

PART 2 - PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 OPEN CHANNEL EXCAVATION:

A. Location: Excavate existing channels from one side only with the intent to incur minimal disturbance to the opposite bank.

B. Tolerance:
   1. Excavation of the open channel drain shall conform to the cross-sections and horizontal and vertical alignment indicated on the Drawings.
   2. The completed cross-section shall not be more than 0.2-foot above or 0.5-foot below the plan elevation without the prior approval of ENGINEER.
   3. The finished bottom grade shall not be greater than 0.5 foot below the plan elevation within 300 feet upstream or downstream of structures or enclosures.

C. Rock Excavation:
   1. CONTRACTOR shall notify ENGINEER immediately when rock is encountered during excavation.
   2. Rock excavation and removal methods shall be approved by ENGINEER prior to initiating the work.
   3. Rock excavation shall be paid under separate change order unless a specific item appears in the Bid Form.

D. Other Excavation:
   1. Natural Items: In accordance with Division 2 Section “SITE CLEARING.”
   2. Manmade Items:
      a. CONTRACTOR shall notify ENGINEER immediately when manmade items are encountered during excavation.
      b. Excavation and removal methods of manmade items shall be approved by ENGINEER prior to initiating the Work.
      c. Excavation, removal and disposal of manmade items greater than 1/2-cubic yard in volume shall be paid under separate change order unless a specific item appears in the Bid Form.

E. Unstable Soils:
   1. CONTRACTOR shall notify ENGINEER immediately when a significant amount of unstable soils are encountered during excavation.
   2. Additional excavation that is deemed necessary by ENGINEER to compensate for unstable soil conditions shall be paid under a separate change order, unless a specific item appears in the Bid Form.

F. Spoil Banks:
   1. Spoil material shall be placed and graded in the location and to the slopes indicated on the Drawings.
   2. Location:
      a. On one side of channel only unless indicated otherwise on the Drawings.
      b. Away from existing tributary water courses or drains.
      c. Away from landscaped areas.
      d. Away from the trunks of trees.
      e. Initial placement: Minimum 8 feet between the top of channel bank and the edge of the spoil pile.
   3. Grading:
      a. Grade spoil banks to no steeper than 4 on 1 side slopes away from the drain in open areas and a minimum 2 on 1 side slopes in wooded areas unless indicated otherwise on the Drawings.
      b. Level spoil to allow broad, flat drainage ways to enter the drain without the ponding of surface water behind the spoil banks.
      c. Maintain a minimum 4-foot buffer strip between the leveled spoil and the top of the channel bank.
   4. Organic Soils: Maintain a minimum 15-foot buffer strip between the leveled spoil and the top of the channel bank.
   5. Sticks and Stones: Sticks 1-inch diameter or larger and 18 inches in length or longer, and rocks or boulders 8 inches in diameter or larger shall be removed or buried within the drain right-of-way in accordance with Division 2 Section “SITE CLEARING”.

G. Spoil Ownership: If the owner of the property requests or is willing to accept excavated material, the CONTRACTOR shall have the property owner complete the Land Owner Agreement Form found in the Supplemental Conditions. Excavated material claimed by the property owner shall be spread in accordance with the agreed upon instructions in the Land Owner Agreement. Otherwise spoil material becomes property of the CONTRACTOR and shall be disposed of in accordance with all local, state and federal regulations.

H. Tributaries:
   1. Grade tributaries at a constant slope away from the drain excavation throughout the limit of the available right-of-way or 75 feet, whichever is less.
   2. Begin tributary grading at the proposed drain elevation and meet the existing grade at the limit of the regrading.
   3. Regrade the tributary to a bottom width equal to the existing bottom width. Regraded channel side slopes shall be a minimum of 2 on 1.

I. Channels Parallel to Roads:
   1. Excavate from field side of drain.

2. Comply with requests of highway authority having jurisdiction within road right-of-way.
3. Preserve and maintain existing driveways.

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section includes the work required for trenching, excavating and backfilling, clearing, special pipe foundations, and special work below grade.

1.02 DEFINITIONS:

A. Maximum density: Maximum dry weight in pounds per cubic foot of a specific material.

B. Optimum moisture: Percentage of water at maximum density.

C. Rock excavation: Includes all boulders or rock weighing 400 pounds (approx. one cubic yard) or more and all solid or ledge rock, slate, shale, sandstone, and other hard materials that require continuous use of pneumatic tools, heavy rippers, or continuous drilling and blasting for removal. Pavements are not included.

D. Suitable Excavated Material: Mineral (inorganic) soil free of cinders, refuse, sod, boulders, rocks, pavement, soft or plastic clays, vegetable or other organic material and capable of being compacted as specified. Moisture content has no bearing on the suitability of materials to be used.

E. Granular Material: Coarse grained material having no cohesion, which derives its resistance to displacement from internal stability.

F. Cohesive Material: Fine grained material which derives its resistance to displacement by mutual attraction between particles of the mass, involving forces of molecular origin (i.e. Clays are considered cohesive).

1.03 REFERENCES:

A. MDOT - Michigan Department of Transportation, "Standard Specifications for Construction," 2012

B. MDOT – Density Control Handbook, latest edition.

C. American Society of Testing Materials, latest edition.

1.04 SUBMITTALS:

A. Quality Assurance/Control Submittals: For imported materials:
1. Source.
2. MDOT classification.
3. Gradation.

B. Testing and Inspection Reports: Written reports shall be submitted to ENGINEER, with copy to the CONTRACTOR, documenting testing and/or inspection results. Tests shall include:
1. Test results on borrow material.
2. Gradation analysis for granular backfill and sub-base materials.
3. Field reports for in-place soil density tests.

1.05 JOB CONDITIONS:

A. Obtain and comply with construction permits from agencies having jurisdiction over the work.

B. Scheduling: Clean up promptly following utility installation backfilling.

C. Dust Control: Broom or apply dust palliatives as needed.

D. Existing Structures, Utility Structures, and Utilities:
1. Call MISS DIG to locate existing underground utilities prior to starting excavation.
2. Where utilities, utility structures or structures are encountered which are in active use:
a. Provide adequate protection for them.
b. Be responsible for damage to them.
3. Provide stand-by utility service if temporary removal is necessary for a period exceeding 2 hours.
4. Where utility service connections to occupied buildings must be temporarily disconnected, give 48 hours notice to the affected occupants of the time and duration of the anticipated shutoff.
5. Notify Fire Department 48 hours in advance if water main or fire supply line shutoff is required.
6. Raise, lower, or move underground utilities, utility structures or structures which interfere with the utility or utility structure being constructed as part of this Work.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General:
1. Approval Required: Material shall be subject to the approval of ENGINEER.
2. Notification: For approval of imported material, notify ENGINEER at least 1 week in advance of intention to import material, designate the proposed borrow area, and permit ENGINEER to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

B. Material Sources and Uses:
1. Imported Material:
a. Stone stabilization course.
b. Bedding.
c. Trench backfill.
2. Native material unless quantity is not sufficient; then shall be imported material: Suitable material.

C. Stone Stabilization Course:
1. Crushed Stone: MDOT 6A or crushed concrete ranging from 1 to 3 inches in nominal diameter and containing less than 7 percent passing the No. 200 sieve.
2. Filter Fabric:
a. By Mirafi; Amoco; Exxon; Nicolon; or equal.
b. Monofilament polypropylene heavy, woven fabric.
c. Equivalent opening size of 70.

D. Bedding: See Drawings and MDOT Section 902.

E. Trench Backfill: See Drawings and MDOT Section 902.

F. Suitable Material:
1. Native Material Which is Used as Backfill:
a. Exclusive of gray or blue clay, peat, organic matter, or frozen lumps.
b. Containing no rocks or lumps over 3 inches in greatest dimension.
c. Having a moisture content such that material is capable of being compacted to 90% maximum density.
2. MDOT 902 Granular Material Class II if native material is not adequate in opinion of ENGINEER.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Conflicting Utilities:
1. Before starting excavation, establish location and extent of existing utilities in work area.
2. Establish potential conflict areas prior to construction.
3. Excavate and expose existing utilities presenting potential conflict to determine their exact location and elevation.
4. Provide adequate means of support and protection during operations.
5. Advise ENGINEER of conflicts and obtain instructions on how to proceed.
6. Make adjustments in proposed utility location at no additional cost to OWNER.
7. Make arrangements with owner of existing utility for relocation, if necessary.
8. Schedule work accordingly.

B. Signs, mailboxes, fences and other movable surface features:
1. Witness location prior to removal. Relocate to accessible location and maintain during construction.
2. Upon completion of construction, replace to original position and condition.
3. Replace regulatory traffic control signs immediately after utilities are placed and backfilled.

C Property Irons
1. Protect existing property irons at edge of right-of-way. If property iron must be removed for construction, the CONTRACTOR shall have a registered professional surveyor witness the property iron(s) prior to disturbance and replace the existing property iron(s) at the CONTRACTOR'S expense.

D. Clearing and Grubbing:
1. Remove trees and shrubs not indicated to be preserved, as required.
2. Grub out all roots.
a. To a minimum depth of 4 feet below finished grade within roadways.
b. To a minimum depth 2.0 feet below finished grade other location.
3. Remove all debris from site resulting from clearing and grubbing.

E. Topsoil: Remove from all areas of new construction and stockpile on site in designated areas.

F. Protect Plantings and other features to remain as part of final landscaping.

3.02 EXCAVATION:

A. General:
1. Dispose of surplus and unsuitable excavated material.
2. Remove, salvage and stockpile topsoil on-site in area designated by ENGINEER.
3. Unsuitable material encountered in subgrade or below payment line: Notify ENGINEER and obtain instruction on how to proceed.

B. Trenches:
1. Depth: Provide a uniform and continuous bearing and support for proposed utility on solid and undisturbed or compact granular material.
2. Minimum Width: Allow space for jointing and bedding.
3. Maximum Width: Limitations apply at utility crown.
a. 6 inch through 10 inch diameter: 30 inches.
b. 12 inch to 30 inch diameter: Outside diameter plus 24 inches.
c. 30 inch and over diameter: Outside diameter plus 36 inches.
d. Elliptical: Outside pipe width plus 36 inches.
4. Maximum Width of Trench at Ground Surface:

a. Not outside of the property line or easement.
b. As required for protection of the Work and safety of workers.
c. Use sheeting, bracing and shoring if required.

C. Length of Open Trench: Maximum 200 feet.
D. Damage to Existing Underground Utilities:
1. Report all damage to ENGINEER and Utility Owner.
2. Repair to utility owner's standard at CONTRACTOR's expense.

3.03 BACKFILLING:

A. Pipe bedding area: Compact granular material to 95% of maximum density.

B. Compaction:
1. Determine density by the modified Proctor method, ASTM D1557.
2. Compact trench backfill and bedding to at least 95% maximum density.
3. Compact suitable material to at least 90% maximum density.
4. The first 12 inches of native material at the bottom of utility trenches:
a. Test for density.
b. Compact to at least 95% maximum density if the existing density is below 95%.

C. Structures:
1. Density requirements: Same as Trenches.
2. Concrete structure: Place backfill only after 75 percent of concrete design strength has been reached.

3.04 TESTING AND INSPECTION:

A. Performance and test equipment: Paid for by the CONTRACTOR, performed by ENGINEER or OWNER approved independent laboratory.

B. Moisture - Density relationships:
1. AASHTO T99 Method C

C. Field Density: Either of following:
1. ASTM D-2167 (Rubber Balloon)
2. ASTM D-2922 (Nuclear)
3. AASHTO T191
4. One Point Michigan Cone

D. Furnish equipment and personnel to provide access to test location and depth. Density tests will be performed at various levels, as determined by ENGINEER, during or after backfilling operation.

E. Correct any deficiencies resulting from insufficient or improper compaction. Retest if required.

3.05 SOIL EROSION AND SEDIMENTATION CONTROL:

A. In accordance with Section 01570 "EROSION AND SEDIMENTATION CONTROL"

3.06 SURPLUS MATERIALS:

A. Surplus excavated and unsuitable excavated material becomes the property of the CONTRACTOR.

B. Dispose of surplus excavated or unsuitable excavated materials off-site or on-site in areas designated by ENGINEER in accordance with all Local, State and Federal regulations.

3.07 EXCESS WATER CONTROL

A. Regulations and Permits: Comply with soil erosion control permit in accordance with Mich. P.A. 451, Part 91 of 1994, the Natural Resource and Environmental Protection Act, and all pertinent rules, laws, and regulations.

B. Unfavorable Weather:
1. Do not place, spread or roll fill material during unfavorable weather conditions.
2. Do not resume operations until moisture content and fill density are satisfactory to ENGINEER.

C. Pumping and Drainage:
1. Provide, maintain and use at all times during construction adequate means and devices to promptly remove and dispose of water from every source entering the excavations or other parts of the Work.
2. Dewater by means which will ensure dry excavations, preserve final lines and grades, and do not disturb or displace adjacent soil. Use wells, portable pumps, temporary underdrains, or other methods as necessary.
3. Perform Pumping and Drainage:
   a. In such a manner to cause no damage to property or structures and without interference to the rights of the public, owners of private property, pedestrians, vehicular traffic, or the work of other CONTRACTORs.
   b. In accordance with pertinent laws, rules, ordinances, and regulations.
4. Do not overload or obstruct existing drainage facilities.

D. General:
1. Keep excavations dry during construction.
2. Remove water by use of wells, well points, portable pumps, bailing, drains, underdrains or other acceptable methods.
3. Provide crushed stone or gravel as required to aid dewatering operations.
4. Divert or temporarily reroute existing sewers and drainage of discharge lines to adequate and acceptable outlets during construction. CONTRACTOR responsible to ascertain availability of outlets.
5. Divert surface water from entering excavations by construction and maintenance of channels or berms.
6. Sediment traps and other soil erosion control measures shall prevent soil particles from entering any sewer, watercourse or similar conveyance.
7. Protect utilities, utility structures, and structures, existing and new, from hydrostatic uplift.

3.5 SHEETING, SHORING AND BRACING EXCAVATIONS

A. General:
1. Furnish, put in place and maintain sheeting, bracing and shoring as may be required to properly support the sides of excavations and to prevent movement of earth which could in any way injure the Work or adjacent property.
2. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the Work and adjacent property.
3. A pipe-laying box may be used in lieu of sheeting.

B. Sheeting:
1. Do not install by jetting.
2. Remove as backfilling proceeds, unless ordered left in place by ENGINEER. Use care to fill and compact voids created by removal, especially below mid-height of utility.
3. Sheeting Left in Place:
   a. Requires written approval of ENGINEER.
   b. Cut off minimum of 2 feet below finished grade.

3.6 CLEANUP

A. Upon completion of the work of this Section, remove all excess excavated material, trash, and debris resulting from construction operations. Remove equipment and tools. Leave the Site in a neat and orderly condition acceptable to ENGINEER.

PART 1 - GENERAL

1.01 DESCRIPTION:
A. This section includes work required for storm sewer pipe, structures and related work.

1.02 DEFINITIONS:
A. Line and grade control terminology: SEE PLAN DETAILS

1.03 SUBMITTALS:
A. Submit the following in accordance with SECTION 01330 – SUBMITTAL PROCEDURES.
1. Product Data for all pipe.
2. Shop Drawings on radius pipe.
3. Shop Drawings for all structures.

B. Notify ENGINEER on presence of wastewater:

C. Line and grade control method other than Laser Beam shall be approved by ENGINEER.

1.04 JOB CONDITIONS:
A. Maintain operation of existing storm sewer.

B. Clean-up promptly following pipe installation and within maximum of 400 feet behind pipe laying operation.

PART 2 – PRODUCTS

2.01 PIPE:
A. Corrugated Metal:
1. Metallic coated (Galvanized): AASHTO M 36, MDOT 402.
2. Wall thickness: Gauge as indicated on the Drawings.
i. For pipes less than 60-inch in diameter use 12 gauge (0.109-inch thick) 3x1 Corrugated Metal Pipe.
ii. For pipes 60-inch in diameter or larger use 10 gauge (0.138-inch thick) 3x1 Corrugated Metal Pipe.

2.02 PREMIUM JOINTS:
A. Corrugated Metal: NOT PERMITTED.

PART 3 - EXECUTION

3.01 PREPARATION:
A. Alignment and Grade:
1. Deviations: Notify ENGINEER and obtain instructions to proceed where there is a grade discrepancy or an obstruction not shown on the plans.

2. Expose existing utilities at crossings of proposed storm sewer in advance of laying pipe to verify existing depth. Advise ENGINEER of conflicts in grade and provide adjustments in grade of storm sewer at no additional cost to OWNER.

B. Laser Beam Control:
1. Check grade at set-up point, 25 feet, 50 feet, 100 feet and 200 foot points thereafter to the next set-up point.
2. Laser advancement: Reset at each manhole.

C. Bedding:
1. Method: As indicated on the Drawings.

2. Provide bedding area backfill in accordance with SECTION 02315 EXCAVATION AND FILL.
3. Provide continuous bearing by supporting entire length of pipe barrel evenly.

3.02 INSTALLATION:

A. Laying Pipe:
1. Install in accordance with manufacturers recommendations.
2. Provide continuous bearing by supporting entire length of pipe barrel evenly.
3. Direction shall be upstream with spigot or tongue end downstream and bell end upstream.
4. Joints shall be smooth and clean.
5. Wrap joint surfaces with geotextile fabric.
6. Place pipe length and bedding as a unit in a frost free, dry trench.
7. Special supports and saddles: As indicated on the Drawings.

3.03 GENERAL CONSTRUCTION and TOLERANCES:

A. General:
1. Coordination: By ENGINEER.
2. Completion: Before connecting to active system.
3. Notification: Arrange with ENGINEER for inspection.
4. Keep pipe and structures clean as work progresses.

B. Line and Grade Tolerances: Allowable drift between structures from proposed alignment will be as follows:
1. Line:
a. Thru 36 inch: 0.40 foot.
b. Over 36 inch: 0.80 foot.
2. Grade:
a. Thru 36 inch: 0.05 foot.
a. Over 36 inch: 0.10 foot.

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work includes construction of new HMA pavements including associated earthwork, paving and surfacing for all roads.

B. Definitions:
1. Pavement structure: Any combination of subbase, base course, and surface course, including shoulders, placed on a subgrade.
2. Permanent pavement: All improved pavement surfaces above the quality of treated or untreated gravel.
3. Subgrade: That portion of the earth grade upon which the pavement structure is to be placed.
4. Subbase: The layer of specified material of designed thickness placed on the subgrade as a part of the pavement structure.
5. Base course: The layer or layers of specified or selected material of designed thickness placed on a subbase or a subgrade to support leveling and surface courses.
6. Leveling course: Layer of specified material placed on the base course in preparation for the surface course.
7. Surface course: The top layer of a pavement structure.
8. Maximum density (soils): Maximum unit weight of soil material according to Modified Proctor Method ASTM D1557.
9. Maximum density (HMA): Maximum unit weight of a representative sample of the hot mix asphalt according to the Marshall Method ASTM D2726.

1.02 REFERENCES:

A. Michigan Department of Transportation (MDOT), "Standard Specifications for Construction," 2012 ed.

B. American Society of Testing Materials (ASTM), latest edition.

1.03 SUBMITTALS:

A. Asphalt Mix Design: Provide job-mix formula prepared by independent lab or approved by MDOT for HMA leveling and surface courses to ENGINEER two weeks prior to paving.

B. Certification of quality by producer for the following:
1. Cement
2. Aggregates
3. Asphalt cement
4. Pavement marking material
5. Prime coat
6. Bond coat

C. Concrete Test Specimens: Provide sample.

1.04 JOB CONDITIONS:

A. Seasonal Limitations:
1. Removal of permanent pavement: Unless otherwise specified, execute during the period from March 15 to October 15.
2. Restoration of permanent pavement: Unless otherwise specified, execute during the period from May 5 to November 15 (Region South of M-46).

B. Clean up promptly following pavement installation.

C. Maintenance of Temporary Surfaces: Maintain temporary surfaces until permanent pavement installation is completed.

D. Driveway Closing: 48 hour maximum

E. Allow access to the HMA plant for verification of mix proportions, aggregate gradations, and temperatures.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Subbase: Granular material MDOT Class II or IIA, MDOT 902.08.

B. Aggregate Base Course: For bases to be surfaced with concrete or HMA, use Aggregate 22A unless otherwise specified. MDOT 302 and 902.06.

C. Aggregate Surface Course:
1. Use Aggregate 22A when the Aggregate surface course is to receive a HMA surface at a later date. MDOT 302 and 902.06.
2. Use Aggregate 23A when the Aggregate Surface Course is to be constructed without a HMA surface. MDOT 302 and 902.06.

D. Aggregate Shoulders and Approaches:
1. Use Aggregate 22A for construction of Class AA shoulders and approaches. MDOT 302 and 902.06.
2. Use Aggregate 23A for construction of Class A shoulders and approaches. MDOT 302 and 902.06.
3. Use roadway excavation or borrow material for construction of Class B shoulders and approaches. MDOT 302 and 902.06.

E. HMA Base Course: Shall be an MDOT mixture as indicated on Plans.

F. HMA Leveling and Surface Courses: Shall be an MDOT mixture as indicated on Plans.

G. HMA Bond Coat: HMA material. MDOT 904-5. (SS 1h Asphalt emulsion)

I. Pavement Marking: Conform to MDOT 920.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Removal: Remove all existing pavement structure required, as shown on the plans or in the proposal.
1. Pavement remnant limit: Remove pavement to edge or joint, where dimension is less than 3 feet. All removals shall be to a saw cut edge if a joint is more than three feet away.
2. Butt joint: Provide where new pavement meets existing pavement.

B. Dispose of all material removed during the construction.

C. Subgrade:
1. Obtain approval prior to placing the subbase or base course.
2. Construct to the required line, grade and cross section. MDOT 205.03.N.
   a. Tolerance if subbase is required: Trim within $\pm$ 1inch of design grade.
   b. Tolerance if subbase is not required: Trim within $\pm$ 3/4 inch of design grade.
3. Compaction:
   a. Compact to not less than 95 percent of the maximum density using Modified Proctor.

D. Excavation: Conform to MDOT 205.03.G.

E. Embankment: Conform to MDOT 205.03.H.

3.02 PERFORMANCE:

A. Subbase:
1. Thickness: Conform to design cross section.
2. Construction method:
a. Place in layers not exceeding 12 inches loose measure.
b. Spread evenly and compact to not less than 95 percent maximum density according to Modified Proctor.
c. Conform construction to MDOT 301.01 thru 301.03.

B. Aggregate Base Course:
1. Thickness: Compacted depth of any layer of aggregate placed, maximum 6 inches, minimum 3 inches.
2. Construction Method: Conform the placing of aggregate base course with MDOT 302.01 thru 302.03.
3. Tolerances:
a. Curbed streets: Shape the aggregate base course to the established grade and cross section, within a tolerance of 1/4 inch.
b. Other: Unless otherwise specified, shape within 1/2 inch of the established grade and cross section.
c. Check and correct grades prior to pavement placement.

C. Aggregate Surface Course:
1. Thickness: Maximum 6 inches thickness of any one layer when compacted, unless otherwise specified.
2. Construction Method: Conform construction of an aggregate surface course to MDOT 306.01 thru 306.03.

D. Shoulder Area (aggregate): Provide 4 inches thickness of compacted aggregate shoulder on an aggregate base, unless otherwise specified.

E. Shoulder Area (other than aggregate): Stabilize shoulder to a 4 inch depth with compacted soil or topsoil.

F. HMA Base Course:
1. Thickness: Maximum lift thickness - 2 inches compacted, unless otherwise approved. MDOT 502.03.F.
2. Construction Methods: Conform placement of the HMA base course mixture in accordance with MDOT 502.03.F.
3. Tolerances:
a. Curbed streets: Shape the HMA base course to the established grade and cross section, within a tolerance of 1/4 inch. Windrowing (placing a lift of varying thickness to create a crown) HMA shall not be allowed to correct grading deficiencies.
b. Other: Unless otherwise specified, shape within 1/2 inch of the established grade and cross section.

G. HMA Bond Coat:
1. Construction method: Apply between successive paving courses where any soils are tracked onto the finished mat between successive lifts.
2. Application rate: Provide 0.10 gallon per square yard.
3. Not required when permitted by ENGINEER.

H. HMA Leveling and Surface Courses:
1. Cutting: Saw vertically and in straight lines at any angle with pavement centerline.
2. Thickness: Do not place HMA top course mixture in lifts exceeding 2 inches unless otherwise approved.
3. Construction Methods:

a. Paving: Conform method of paving to MDOT 502.03.F.
b. Prior to placement of HMA surface, crowns and grades of roadway will be verified by CONTRACTOR for positive drainage. Any deficiencies in grade or crown shall be corrected prior to placement of surface course.

4. Tolerances: HMA surface on streets with new curbs shall have a finish elevation of 1/4 inch above curb. Windrowing (placing a lift of varying thickness to create a crown) HMA shall not be allowed to correct grading deficiencies.
5. Pavement density: Minimum density of in-place course material when the course thickness is greater than 3 times the maximum aggregate size of the mix shall be 97 percent of the recorded laboratory specimen density and 95 percent when the course thickness is less.

3.03 STRUCTURE ADJUSTMENT:

A. Street Castings.
1. Adjust castings to finish grade or to a maximum of 1/4" below finish grade of all manholes, catch basins, and valve boxes.
a. Set grades of castings and valve boxes from street grades with a tilt of castings where necessary to meet proposed street grades and crown.
b. All castings, when adjusted to finish grade, shall be placed in a bed of hot HMA mix placed in entire area disturbed for casting adjustment. Alternately, as approved by the ENGINEER, a concrete mix may be used in the void created to raise the casting.
2. Castings shall be adjusted to finish grade after the leveling course is complete.
a. Castings shall be kept below grade or flush with the proposed sand subgrade so as not to conflict with grading operations or conflict with placement of leveling course.
3. Adjustment of new structures will not be paid for separately.

3.04 TESTING AND INSPECTION:

A. Inspection: By the ENGINEER or his designated authorized representative.

B. Acceptance Testing:
1. By the CONTRACTOR in accordance with plans and specifications and performed by OWNER and ENGINEER approved third party.
2. If initial testing indicates failed or nonconformance to specifications, perform additional tests. If further testing verifies nonconformance, additional testing shall be paid by CONTRACTOR. Replace nonconforming material at no additional cost to OWNER.

C. Aggregates:
1. Sampling and analysis: Michigan Testing Methods, Series 100.
2. Exception: Provide certification of approved stockpiled material.

D. HMA Mix Composition:
1. Sampling: ASTM D979, one sample per mix or one per two thousand tons.
2. Extraction: ASTM D2172.
3. Sieve analysis: ASTM C117 and ASTM C136.