ADDENDUM NO. 2
September 25, 2019

Walnut Plaza and the Ed Johnson Memorial
Chattanooga, Tennessee

DESIGNERS
WMWLA
TEAM JEROME MEADOWS
ROSS/FOWLER, P.C.,
MARCH ADAMS AND ASSOCIATES
CHAZEN ENGINEERING, INC.

The Bid Opening has been changed to Tuesday, October 15, 2019. The location and time are the same.

BIDDING DOCUMENTS STATUS:
Addendum No. 1 September 20, 2019

MAKE THE FOLLOWING CHANGES AND CORRECTIONS TO THE SPECIFICATIONS AND DRAWINGS:

Addenda form a part of the contract documents for the above referenced project and interpret/ and or modify and take precedence over the original drawings and specifications. These addenda shall become part of the contract documents when the construction contract is executed.

MAKE THE FOLLOWING CHANGES AND CORRECTIONS TO THE SPECIFICATIONS AND DRAWINGS:

A. SECTION II - TECHNICAL SPECIFICATIONS:

1. Add Ed Johnson Memorial Bidding scope narrative
2. Add Geotechnical Report, Ed Johnson Memorial Park, Chattanooga, Tennessee, S&ME project no. 1281-19-063, dated September 9, 2019.(32 pages)

B. DRAWINGS:

Civil Engineering:

1. On SHEETS C1.0, Add a note **related to a new soil nail wall to replace the existing demolished retaining wall and reference the Geotechnical report to be included in the project.**
2. ON SHEET C3.0 – Revised the site retaining wall schedule to increase the Memorial footing widths per the Geotechnical Report recommendations.
3. ON SHEET C3.0 – Added detail 4 regarding the new typical soil nail site retaining wall.

Landscape Architecture:

4. ON SHEET L0.1 – Add note to clarify the limits of the existing lower wall demolition.

5. Scope narrative:

Demolition Plan L0.1

1. The Memorial site shall be cleared of the existing shrub and ground cover vegetation and 6 existing trees within the work limits.
2. A portion of the Existing concrete paving shall be demolished and removed as shown on L0.1.
3. The existing concrete steps and associated metal handrails shall be removed.
4. The existing electrical box adjacent to the bridge shall be relocated eastward to the opposite side of the bridge in coordination with the electrical utility and the City.
5. The existing lower retaining wall and a portion of the existing concrete paving adjacent to that wall shall be demolished and removed as indicated on the drawing.
6. Existing irrigation components not to be re-used. Existing irrigation lines which are not required to be removed shall be capped.

Existing improvements to remain and be protected in place are indicated on the plans and shall include but not be limited to the existing condominium building wall, existing metal steps and handrails, the Walnut Street bridge, existing water valves, any adjacent condominium paving not impacted by construction and the existing retaining walls other than the lower retaining wall indicated to be removed.

<u>Site Drainage Plan C1.0, C3.0 and L3.1B</u>

1. Install (2) 12" DIA. Nyloplast catch basins and approximately 45 linear feet of new 6" dia. drain line and tie into the existing plaza storm structure as indicated on drawings C1.0 and C3.0.
2. Coordinate the final locations of the catch basins with the Memorial Artist and sheet L3.1B.

<u>Sediment and Erosion Control Plan C2.0</u>

1. Install all Memorial erosion control features as indicated on the drawings.

<u>Electrical Plan E1.0 and E1.1</u>

1. Install all electrical and lighting features and components complete to produce a fully operational lighting system as indicated on the drawings.
2. Coordinate all conduit runs and all final fixture locations and elevations with the Memorial Artist.
3. Install a power service location for the Memorial irrigation system.

END OF ADDENDUM NO. 2

ATTACHMENTS:

Geotechnical Report, Ed Johnson Memorial Park, Chattanooga, Tennessee

Drawings: L0.1, C1.0 and C3.0

PRIOR TO FINAL ACCEPTANCE BY THE CITY ENGINEER AND/OR ISSUANCE OF ANY **CERTIFICATE OF OCCUPANCY**, THE OWNER OR OWNER'S AGENT SHALL:

- SUBMIT AN INVENTORY OF THE CONSTRUCTED STORMWATER DRAINAGE SYSTEM, WHETHER PUBLIC OR PRIVATE, TO THE CITY OF CHATTANOOGA IN ELECTRONIC FORMAT. ELECTRONIC AS-BUILT DRAWINGS SHALL BE SUBMITTED IN AUTOCAD AND .PDF FORMAT AND SHALL SHOW PLAINLY THE APPROVED AND CONSTRUCTED LAYOUT OF THE STORMWATER SYSTEMS. THE AS-BUILT DRAWING SHALL INCLUDE ALL STORMWATER FEATURES, WHETHER NEW OR EXISTING, INCLUDING THE OUTFALL TO THE CITY DRAINAGE SYSTEM (EX: CATCH BASINS, CONDUITS, HYDROLOGIC FEATURES INCLUDING PONDS, STREAMS, CULVERT INLETS AND OUTFALLS, AND ALL PERVIOUS SURFACES, ETC.).
- COMPLY WITH ALL PERMANENT LANDSCAPING REQUIREMENTS AND SCHEDULE A LANDSCAPE INSPECTION WITH THE CITY OF CHATTANOOGA'S LANDSCAPE INSPECTOR. AN APPOINTMENT MAY BE SCHEDULED BY CALLING 423-643-5837 A MINIMUM OF TWO BUSINESS DAYS BEFORE THE DESIRED INSPECTION APPOINTMENT.
- ALL EROSION AND SEDIMENT CONTROL PRACTICES MUST COMPLY WITH THE CURRENT EDITION OF THE TN EROSION & SEDIMENT CONTROL MANUAL, THE CITY OF CHATTANOOGA BMP MANUAL, AND THE TDEC CONSTRUCTION GENERAL PERMIT (IF APPLICABLE).

NOTES

- ANY EXCAVATED SLOPE 3:1 OR STEEPER IS TO BE STABILIZED WITHIN 7 DAYS.
- **CONTRACTOR SHALL NOTIFY SURVEYOR AND CITY STORM WATER INSPECTOR AT LEAST 48 HOURS PRIOR TO ANY COVER PLACED ON UNDERGROUND SYSTEMS. FAILURE TO DO SO MAY RESULT IN RE-EXCAVATION.**
- **CONTRACTOR IS RESPONSIBLE FOR PROVIDING A STORM WATER AS-BUILT AT THE CLOSE OUT OF PROJECT. AS-BUILT DRAWINGS SHALL BE ACCOMPANIED BY AS-BUILT PHOTOGRAPHS MADE DURING THE SURVEY/INSPECTION. MARCH ADAMS & ASSOCIATES CAN HELP PROVIDE THESE PHOTOGRAPHS, PROVIDED THAT 72 HOUR NOTICE IS PROVIDED BY THE CONTRACTOR.**

GENERAL NOTES:

1 THESE DRAWINGS DO NOT PURPORT TO LOCATE ALL UTILITIES.

2 ALL UTILITY LOCATIONS TO BE FIELD VERIFIED BY PROPER AGENCIES BEFORE BEGINNING CONSTRUCTION. UNDERGROUND UTILITIES ARE NOT FIELD LOCATED NOR ARE ALL PURPORTED TO BE SHOWN. INFORMATION SHOWN SHOULD BE CONSIDERED APPROXIMATE. CONTRACTOR TO CONTACT ALL UTILITY COMPANIES TO HAVE UTILITIES FIELD LOCATED BEFORE EXCAVATION OR DEMOLITION WORK BEGINS.

3 THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES SHOWN HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES WITHIN THE WORKING AREA BEFORE COMMENCING WORK & AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE & PRESERVE ANY & ALL UNDERGROUND UTILITIES.

4 THE CONTRACTOR SHALL COORDINATE LOCATION & INSTALLATION OF ALL UNDERGROUND UTILITIES & APPURTENANCES TO MINIMIZE DISTURBING CURB & GUTTER, PAVING, EXISTING UTILITIES & COMPACTED SUBGRADE.

5 CONTRACTOR SHALL VERIFY EXISTING UTILITY LINE OR EXISTING INFRASTRUCTURE PRIOR TO BEGINNING WORK. CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES ON THE DRAWING OR IN THE FIELD BEFORE BEGINNING WORK OR DURING CONSTRUCTION.

6 CONTRACTOR TO COORDINATE ALL WORK WITH OTHER UTILITY INSTALLATIONS NOT COVERED IN THESE PLANS (ELECTRIC, TELEPHONE, GAS, CABLE, ETC.) & ALLOW FOR THEIR OPERATIONS & CONSTRUCTION TO BE PREPARED.

7 THE CONTRACTOR SHALL IMMEDIATELY INFORM THE OWNERS REPRESENTATIVE OR ENGINEER OF ANY DISCREPANCIES OR ERRORS HE DISCOVERS IN THE PLAN.

8 DEVIATION FROM THESE PLANS & NOTES WITHOUT THE PRIOR CONSENT OF THE OWNERS REPRESENTATIVE MAY BE CAUSE FOR THE WORK TO BE UNACCEPTABLE.

9 ALL WORK SHALL COMPLY WITH APPLICABLE STATE, FEDERAL, AND LOCAL CODES, & ALL NECESSARY LICENSES & PERMITS SHALL BE OBTAINED BY THE CONTRACTOR AT HIS EXPENSE UNLESS PREVIOUSLY OBTAINED BY THE OWNER/DEVELOPER.

10 FOR THE WORK ON THE STATE OR CITY RIGHT-OF-WAY, THE CONTRACTOR SHALL:
   A. NOT STORE MATERIAL, EXCESS DIRT OR EQUIPMENT ON THE SHOULDERS OF PAVEMENT IN CASE OF MULTI-LANE HIGHWAYS, IN THE MEDIAN STRIPS. THE PAVEMENT SHALL BE KEPT FREE FROM ANY MUD OR EXCAVATION WASTE FROM TRUCKS OR OTHER EQUIPMENT. ON COMPLETION OF THE WORK ALL EXCESS MATERIAL SHALL BE REMOVED FROM THE R/W.
   B. SHALL PROVIDE ALL NECESSARY & ADEQUATE SAFETY PRECAUTIONS SUCH AS SIGNS, FLAGS, LIGHTS, BARRICADES & FLAG MEN AS REQUIRED BY THE LOCAL AUTHORITIES & IN ACCORDANCE WITH THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR & HOLD HARMLESS THE STATE OF TENNESSEE DEPARTMENT OF TRANSPORTATION, THE CITY OF CHATTANOOGA & THE OWNER FROM ANY CLAIMS FOR DAMAGE DONE TO EXISTING PRIVATE PROPERTY, PUBLIC UTILITIES, OR TO THE TRAVELING PUBLIC.
   C. SHALL COMPLETE THE WORK TO THE SATISFACTION OF THE CITY OF CHATTANOOGA OR DOT AND OBTAIN A LETTER FROM THE DEPARTMENT STATING THAT THE WORK IS ACCEPTABLE.
   D. POST NECESSARY BONDS AS REQUIRED BY THE CITY AND/OR STATE.

11 ALL WORK & MATERIALS SHALL COMPLY WITH CITY OF CHATTANOOGA REGULATIONS & CODES OF O.S.H.A. STANDARDS.

12 NECESSARY & SUFFICIENT BARRICADES, LIGHTS, SIGNS & OTHER TRAFFIC CONTROL MEASURES AS MAY BE NECESSARY FOR THE PROTECTION AND SAFETY OF THE PUBLIC SHALL BE PROVIDED & MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.

13 EXISTING DRAINAGE STRUCTURES TO BE INSPECTED, REPAIRED AS NEEDED & CLEANED OUT TO REMOVE ALL SILT & DEBRIS.

14 THE CONTRACTOR SHALL REPAIR OR REPLACE IN-KIND ANY DAMAGE THAT OCCURS TO PROPERTY AS RESULT OF HIS WORK.

15 ALL AREAS NOT OTHERWISE SURFACED ARE TO BE SEEDED, LANDSCAPED, MULCHED, WATERED, & MAINTAINED UNTIL ADEQUATE STAND OF GRASS IS OBTAINED.

16 ALL PIPE LENGTHS & DISTANCES BETWEEN STRUCTURES ARE MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE ALONG A HORIZONTAL PLANE.

17 THE CONTRACTOR SHALL PROVIDE ALL THE MATERIALS & APPURTENANCES NECESSARY FOR THE COMPLETE INSTALLATION OF THE STORM DRAINAGE, SEWER, WATER & UTILITY SYSTEMS. ALL PIPE & FITTINGS SHALL BE INSPECTED BY THE UTILITY DEPARTMENT INSPECTOR PRIOR TO BEING COVERED. THE INSPECTOR MUST ALSO BE PRESENT DURING PRESSURE TESTING & DISINFECTION OF LATERALS & HIS SIGNATURE OF APPROVAL IS REQUIRED.

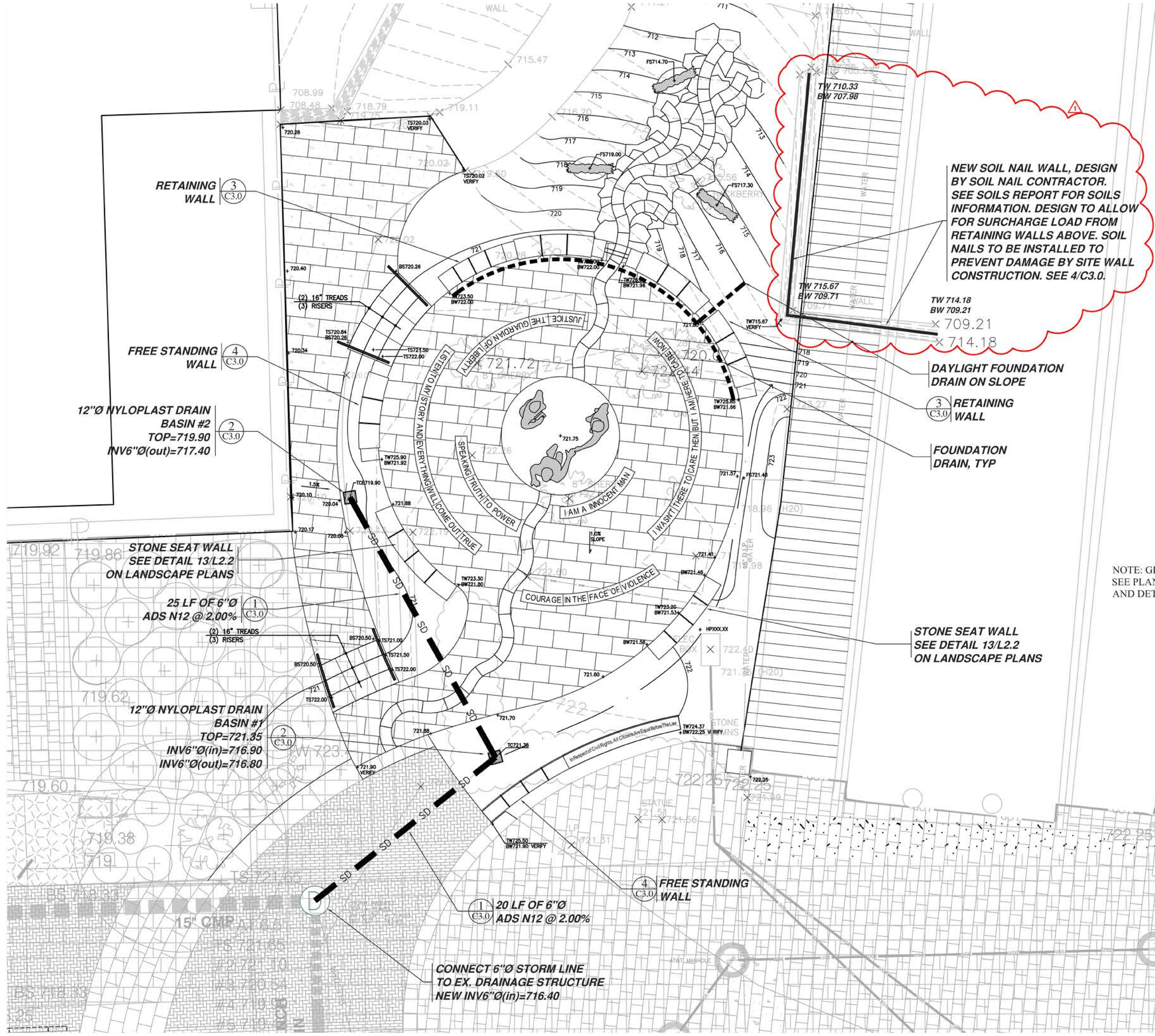
18 THE CONTRACTOR SHALL MAKE ARRANGEMENTS WITH THE LOCAL UTILITY AUTHORITIES FOR CONNECTION TO THE EXISTING MAINS & PAY ALL APPLICABLE FEES.

19 UTILITY COORDINATION & COSTS SHALL BE INCLUDED IN THE PROJECT SCHEDULE & IT IS THE EXPLICIT RESPONSIBILITY OF THE CONTRACTOR TO ASSURE THAT THE PROJECT SCHEDULE INCLUDES THE NECESSARY RELOCATION. THE CONTRACTOR WILL NOT BE PAID ADDITIONALLY FOR THIS COORDINATION. THE CONTRACTOR SHOULD SEEK ASSISTANCE FROM ALL UTILITY COMPANIES TO LOCATE & PROTECT THEIR FACILITIES.

20 CONTRACTOR SHALL OBTAIN ALL PERMITS BEFORE CONSTRUCTION BEGINS.

21 CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO BEGINNING CONSTRUCTION.

22 THE CONTRACTOR SHALL PROVIDE FOR ANY NECESSARY BONDS AS REQUIRED BY GOVERNING AGENCIES.



LEGEND

- Ex. Curb
- Ex. Centerline
- X — Ex. Fence
- EX W — Ex. Water Line
- EX FL — Ex. Fire Line
- EX IRR — Ex. Irrigation Line
- EX SD — Ex. Storm Drainage Line
- EX SS — Ex. Sanitary Sewer Line
- EX FM — Ex. Sanitary Sewer Force Main
- S — Ex. Swale Centerline
- D — Ex. Ditch Centerline
- EX G — Ex. Gas Line
- EX OHE — Ex. Overhead Elect. or Utility Line
- EX UGE — Ex. Underground Electrical
- EX UGFO — Ex. Underground Fiber Optics
- EX UGT — Ex. Underground Telephone
- PROPERTY LINE
- BUILDING LINE
- EASEMENT LINE
- BUILDING SETBACK LINE
- LANDSCAPE BUFFER LINE
- LOT LINE
- ROW LINE
- CURB
- CENTERLINE
- PROP. FENCE LINE
- LOC — PROP. LIMITS OF CONSTRUCTION
- TF — PROPOSED TREE PROTECTION
- S — PROPOSED SWALE CENTERLINE
- D — PROPOSED DITCH CENTERLINE
- W — PROP. WATER LINE
- FL — PROP. FIRE LINE
- IRR — PROP. IRRIGATION LINE
- G — PROP. GAS LINE
- SD — PROP. STORM DRAINAGE LINE
- SS — PROP. SANITARY SEWER LINE
- FM — PROP. SANITARY SEWER FORCE MAIN
- OHE — PROP. OVERHEAD ELECT. OR UTILITY LINE
- UGE — PROP. UNDERGROUND ELECTRICAL
- UGFO — PROP. UNDERGROUND FIBER OPTICS
- UGT — PROP. UNDERGROUND TELEPHONE

ABBREVIATIONS:
SSE – NEW PUBLIC SANITARY SEWER EASEMENT (SEE PLAN FOR WIDTH).
DE – NEW DRAINAGE EASEMENT (SEE PLAN FOR WIDTH).
WE – NEW PUBLIC WATER EASEMENT (SEE PLAN FOR WIDTH).
L/A BUFFER – NEW LANDSCAPE BUFFER (SEE PLAN FOR WIDTH AND TYPE).
FYSB – FRONT YARD SETBACK
SYSB – SIDE YARD SETBACK
RYSB – REAR YARD SETBACK
FFE – FINISHED FLOOR ELEVATION
TW – FINISH GRADE AT TOP OF RETAINING WALL
BW – FINISHED GROUND GRADE AT BOTTOM OF RETAINING WALL (GRASS GRADE)
SDCO / SSCO – STORM DRAINAGE / SANITARY SEWER CLEAN-OUT
DS – ROOF DOWNSPOUT CONNECTION

NOTE: GRADE ELEVATIONS SHOWN ARE FOR REFERENCE ONLY. SEE PLANS BY ROSS/FOWLER FOR FINAL GRADE ELEVATIONS AND DETAILING OF PLAZA HARDSCAPES.

DRAINAGE & GRADING NOTES:

1 CONTRACTOR SHALL OBTAIN ALL PERMITS BEFORE CONSTRUCTION BEGINS.

2 CONTRACTOR SHALL NOTIFY & COOPERATE WITH ALL UTILITY COMPANIES OR FIRMS HAVING FACILITIES ON OR ADJACENT TO THE SITE BEFORE DISTURBING, ALTERING, REMOVING, RELOCATING, ADJUSTING OR CONNECTING TO SAID FACILITIES. CONTRACTOR SHALL PAY ALL COSTS IN CONNECTION WITH THE ALTERNATION OF OR RELOCATION OF THE FACILITIES. CONTRACTOR SHALL RAISE OR LOWER TOPS OF EXISTING MANHOLES AS REQUIRED TO MATCH FINISHED GRADES.

3 COMPACTION OF THE BACK FILL OF ALL TRENCHES SHALL BE COMPACTED TO THE DENSITY OF 95% OF THEORETICAL MAXIMUM DRY DENSITY (ASTM D698). BACK FILL MATERIAL SHALL BE FREE FROM ROOTS, STUMPS, OR OTHER FOREIGN DEBRIS & SHALL BE PLACED AT OR NEAR OPTIMUM MOISTURE. CORRECTION OF ANY TRENCH SETTLEMENT WITHIN A YEAR FROM THE DATE OF APPROVAL WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.

4 THE CONTRACTOR WILL INSURE THAT POSITIVE & ADEQUATE DRAINAGE IS MAINTAINED AT ALL TIMES WITHIN THE PROJECT LIMITS. THIS MAY INCLUDE, BUT NOT BE LIMITED TO, REPLACEMENT OR RECONSTRUCTION OF EXISTING DRAINAGE STRUCTURES THAT HAVE BEEN DAMAGED OR REMOVED OR RECONSTRUCTED AS REQUIRED BY THE ENGINEER, EXCEPT FOR THOSE DRAINAGE ITEMS SHOWN AT SPECIFIC LOCATIONS IN & HAVING SPECIFIC PAY ITEMS IN THE DETAILED ESTIMATE. NO SEPARATE PAYMENT WILL BE MADE AT ANY COSTS INCURRED TO COMPLY WITH THIS REQUIREMENT.

5 THE CONTRACTOR SHALL PROVIDE ANY EXCAVATION & MATERIAL SAMPLES NECESSARY TO CONDUCT REQUIRED SOIL TESTS. ALL ARRANGEMENTS & SCHEDULING FOR THE TESTING SHALL BE THE CONTRACTOR'S RESPONSIBILITY.

6 PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL VERIFY EXISTING GRADES ESPECIALLY WITHIN & ALONG DRAINAGE WAYS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.

7 IT IS THE INTENT OF THIS PROJECT FOR THE CONTRACTOR TO VERIFY & MATCH EXISTING CONDITIONS UNLESS OTHERWISE NOTED. THE CONTRACTOR SHALL NOTIFY THE ENGINEER/ARCHITECT OF ANY ITEMS THAT DO NOT EXIST AS SHOWN.

8 PRE CAST STRUCTURES MAY BE USED AT THE CONTRACTORS OPTION. ALL CONCRETE TO HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 P.S.I.

9 THE CONTRACTOR SHALL COORDINATE WITH THE PROJECT ENGINEER FOR ANY FIELD GRADE ADJUSTMENTS NEEDED DUE TO ACTUAL TOPOGRAPHY VARYING FROM THE TOPOGRAPHIC SURVEY.

CITY OF CHATTANOOGA STORM WATER NOTES & CLARIFICATIONS:

IN ADDITION TO ALL EXISTING REQUIREMENTS THE FOLLOWING ITEMS WILL BE ENFORCED EFFECTIVE IMMEDIATELY. THESE REQUIREMENTS ARE ALREADY AUTHORIZED BY CITY CODE SECTION 31. PLEASE BE AWARE THAT THESE REQUIREMENTS ARE CITY REQUIREMENTS. STATE OF TENNESSEE NPDES PERMIT REQUIREMENTS MAY BE DIFFERENT.

1. ALL PERMIT APPLICATIONS AND REPORTS MUST BE SIGNED AS FOLLOWS:
   A. CORPORATION: A PRESIDENT, SECRETARY, TREASURER, OR VICE PRESIDENT OF THE CORPORATION OR OTHER PERSON WHO PERFORMS SIMILAR POLICY- OR DECISION-MAKING FUNCTIONS FOR THE CORPORATION.
   B. PARTNERSHIP OR SOLE PROPRIETORSHIP: BY A GENERAL PARTNER OR THE PROPRIETOR.
   C. PUBLIC FACILITY: A PRINCIPAL EXECUTIVE OFFICER OR THE CHIEF EXECUTIVE OFFICER OF THE AGENCY OR A SENIOR EXECUTIVE OFFICER HAVING RESPONSIBILITY FOR THE OVERALL OPERATIONS OF A PRINCIPAL GEOGRAPHIC UNIT OF THE AGENCY.

   SIGNATURES WILL BE ACCEPTED ONLY FROM PROPERTY OWNERS AND/OR THE GENERAL CONTRACTORS. IN CASE OF A FILL PERMIT, WRITTEN AUTHORIZATION FROM THE PROPERTY OWNER MUST BE INCLUDED WITH THE APPLICATION. ALL ENFORCEMENT RESULTING FROM PERMIT OR POLLUTION VIOLATIONS WILL BE JOINTLY APPLIED TO BOTH THE PROPERTY OWNER AND GENERAL CONTRACTOR.
2. THE APPLICANT MUST SUBMIT THE NAME AND ADDRESS OF THE CONTRACTOR AND ANY SUBCONTRACTORS WHO SHALL PERFORM THE LAND DISTURBING ACTIVITY AND WHO SHALL IMPLEMENT THE EROSION CONTROL PLAN.
3. A LOCATION MUST BE NOTED ON THE PLANS FOR CONCRETE TRUCK WASH AREAS. THE DISCHARGE OF CONCRETE CHUTE WASH WATER AND ALL OTHER NON-STORM WATER DISCHARGES SUCH AS PAINT BRUSH WASH WATER ARE AN ILLEGAL DISCHARGE.
4. PERIMETER EROSION AND SEDIMENT CONTROL MEASURES MUST BE IN PLACE AND FUNCTIONAL BEFORE EARTH MOVING OPERATIONS BEGIN.
5. ANY DISTURBED AREAS THAT ARE TO REMAIN BARE FOR LONGER THAN 30-DAYS MUST BE TEMPORARILY STABILIZED.
6. A SPECIFIC INDIVIDUAL SHALL BE DESIGNATED TO BE RESPONSIBLE FOR EROSION AND SEDIMENT CONTROLS ON EACH SITE. THIS PERSON MUST BE IDENTIFIED, ALONG WITH A PHONE NUMBER, IN THE APPLICATION FOR LAND DISTURBANCE PERMIT.
7. AT A MINIMUM, ALL EROSION AND SEDIMENT CONTROL MEASURES MUST BE CHECKED AND, IF NECESSARY REPAIRED, WEEKLY AND WITHIN 24-HOURS AFTER A RAINFALL EVENT GREATER THAN 0.5-INCHES. THE PERMITTEE SHALL MAINTAIN RECORD OF SUCH CHECKS AND REPAIRS. THESE RECORDS MUST BE KEPT ON-SITE OR IN THE OFFICE OF THE RESPONSIBLE PERSON AND AVAILABLE FOR REVIEW AT ANY TIME BY STORM WATER PERSONNEL. THESE RECORDS MUST BE SUBMITTED TO THE STORM WATER OFFICE ON A YEARLY BASIS. PROJECTS PERMITTED UNDER THE STATE NPDES PERMIT PROGRAM MUST FOLLOW ITS REQUIREMENTS. USE OF THAT INSPECTION FORM IS PERMITTED INSTEAD OF CITY SELF-INSPECTION FORM.
8. UPON COMPLETION OF THE REQUIRED IMPROVEMENTS, AND PRIOR TO FINAL ACCEPTANCE BY THE CITY ENGINEER, THE DEVELOPER/CONTRACTOR WILL FURNISH "AS BUILT" DRAWINGS OF ALL SANITARY SEWER AND STORMWATER STRUCTURES. THE DEVELOPER/CONTRACTOR WILL HAVE A REGISTERED LAND SURVEYOR CERTIFY THAT THE INFORMATION FURNISHED IS A TRUE AND COMPLETE REPRESENTATION OF THE IMPROVEMENTS THAT WERE CONSTRUCTED. THE ENGINEER WILL REVIEW THE CERTIFIED "AS BUILT" DRAWINGS FOR COMPLIANCE WITH THE ORIGINAL CONSTRUCTION DOCUMENTS. THE "AS BUILT" DRAWINGS SHALL BE PROVIDED PER CITY OF CHATTANOOGA STANDARDS AND SPECIFICATIONS.

SCALE: 3/16 = 1'

NORTH

MAA CIVIL CONTACT: MICHAEL HUTCHERSON, P.E.
DIRECT LINE: 423-664-1484

March Adams & Associates
Consulting Engineers
310 Dodds Ave.
P.O. Box 3689
Chattanooga, Tennessee 37404
PH: (423)698-6675
MAA #: 18371

ROSS/FOWLER
LANDSCAPE ARCHITECTURE
URBAN DESIGN & PLANNING
5103 Kingston Pike · Suite 105
Knoxville, Tennessee 37919
P. 865-637-1100 F. 865-637-1101

Jerome Meadows

MeadowLark Studio

Charlie Anderson

Full Circle Stone Wor

ED JOHNSON MEMORIAL

CHATTANOOGA, TENNESSEE

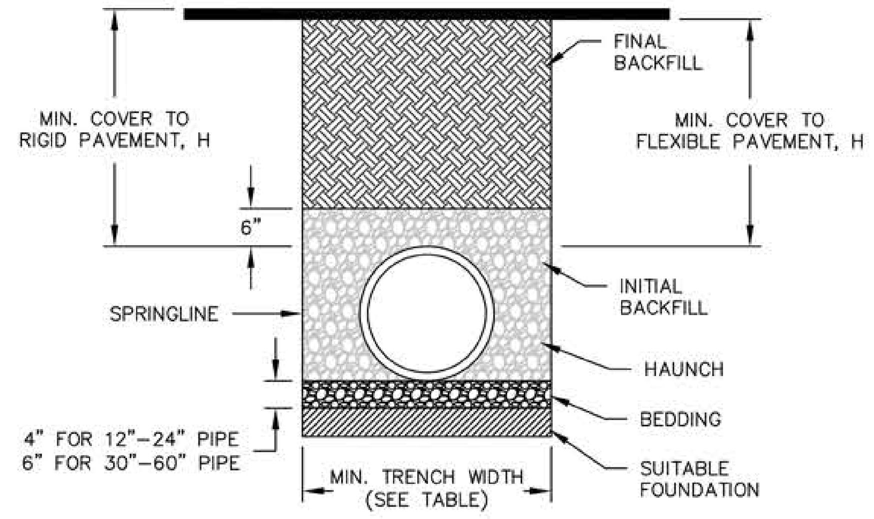
STATE OF TENNESSEE
AGRICULTURE
COMMERCE
NO. 13152

REVISIONS
1 ADDENDUM #1 09/23/19

PROJECT NUMBER.................. 17010
ISSUE DATE...................8 -14 -2019

SITE DRAINAGE

C1.0



RECOMMENDED MINIMUM TRENCH WIDTHS

PIPE DIAM.	MIN. TRENCH WIDTH
4"	21"
6"	23"
8"	26"
10"	28"
12"	30"
15"	34"
18"	39"
24"	48"
30"	56"
36"	64"
42"	72"
48"	80"
54"	88"
60"	96"

MINIMUM RECOMMENDED COVER BASED ON VECHICLE LOADING CONDITIONS

PIPE DIAM.	SURFACE LIVE LOADING CONDITION	
	H-25	HEAVY CONSTRUCTION (75T AXLE LOAD) *
12" - 48"	12"	48"
54" - 60"	24"	60"

* VEHICLES IN EXCESS OF 75T MAY REQUIRE ADDITIONAL COVER

MINIMUM RECOMMENDED COVER BASED ON RAILWAY LOADING CONDITIONS

PIPE DIAM.	COOPER E-80**
UP TO 24"	24"
30"-36"	36"
42"-60"	48"

** COVER IS MEASURED FROM TOP OF PIPE TO BOTTOM OF RAILWAY TIE.
*** E-80 COVER REQUIREMENTS, ARE ONLY APPLICABLE TO ASTM F 2306 PIPE.

NOTES:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, "STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS", LATEST ADDITION

2. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.

3. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.

4. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II OR III. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" (100mm) FOR 4"-24" (100mm-600mm); 6" (150mm) FOR 30"-60" (750mm-900mm).

5. INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II OR III IN THE PIPE ZONE EXTENDING NOT LESS THAN 6" ABOVE CROWN OF PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.

6. MINIMUM COVER: MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOATION. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS 12" UP TO 48" DIAMETER PIPE AND 24" OF COVER FOR 54"-60" DIAMETER PIPE, MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT.

REV.	DESCRIPTION	BY	MM/DD/YY	CHK'D
2	ADDED E-80 INFORMATION	TJR	08/20/07	

TYPICAL TRENCH DETAIL
DRAWING NUMBER: STD–101

ADS ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD HILLIARD, OHIO 43026

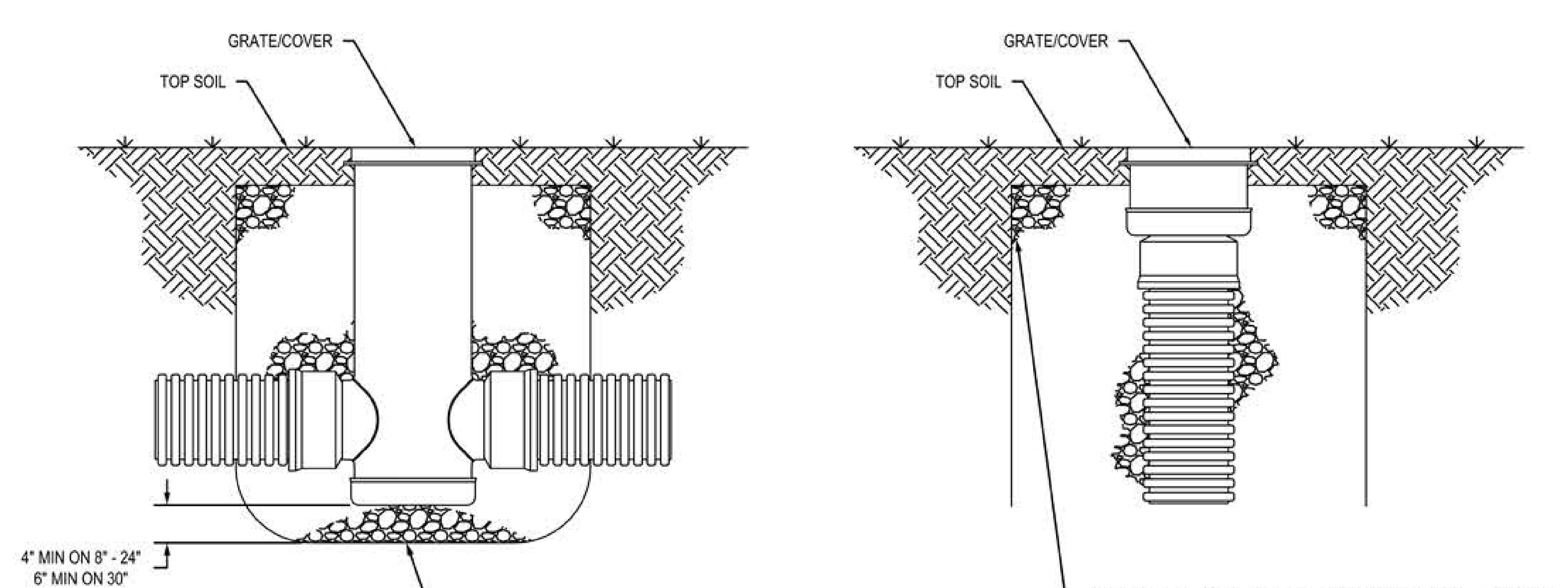
CKS 10/18/06 NTS 1 OF 1

1 / C3.0 DETAIL: HDPE PIPE INSTALLATION
(NTS)

NON TRAFFIC INSTALLATION

DRAIN BASIN

INLINE DRAIN



THE BACKFILL MATERIAL SHALL BE CRUSHED STONE OR OTHER GRANULAR MATERIAL MEETING THE REQUIREMENTS OF CLASS I, CLASS II, OR CLASS III MATERIAL AS DEFINED IN ASTM D2321. BEDDING & BACKFILL FOR SURFACE DRAINAGE INLETS SHALL BE PLACED & COMPACTED UNIFORMLY IN ACCORDANCE WITH ASTM D2321.

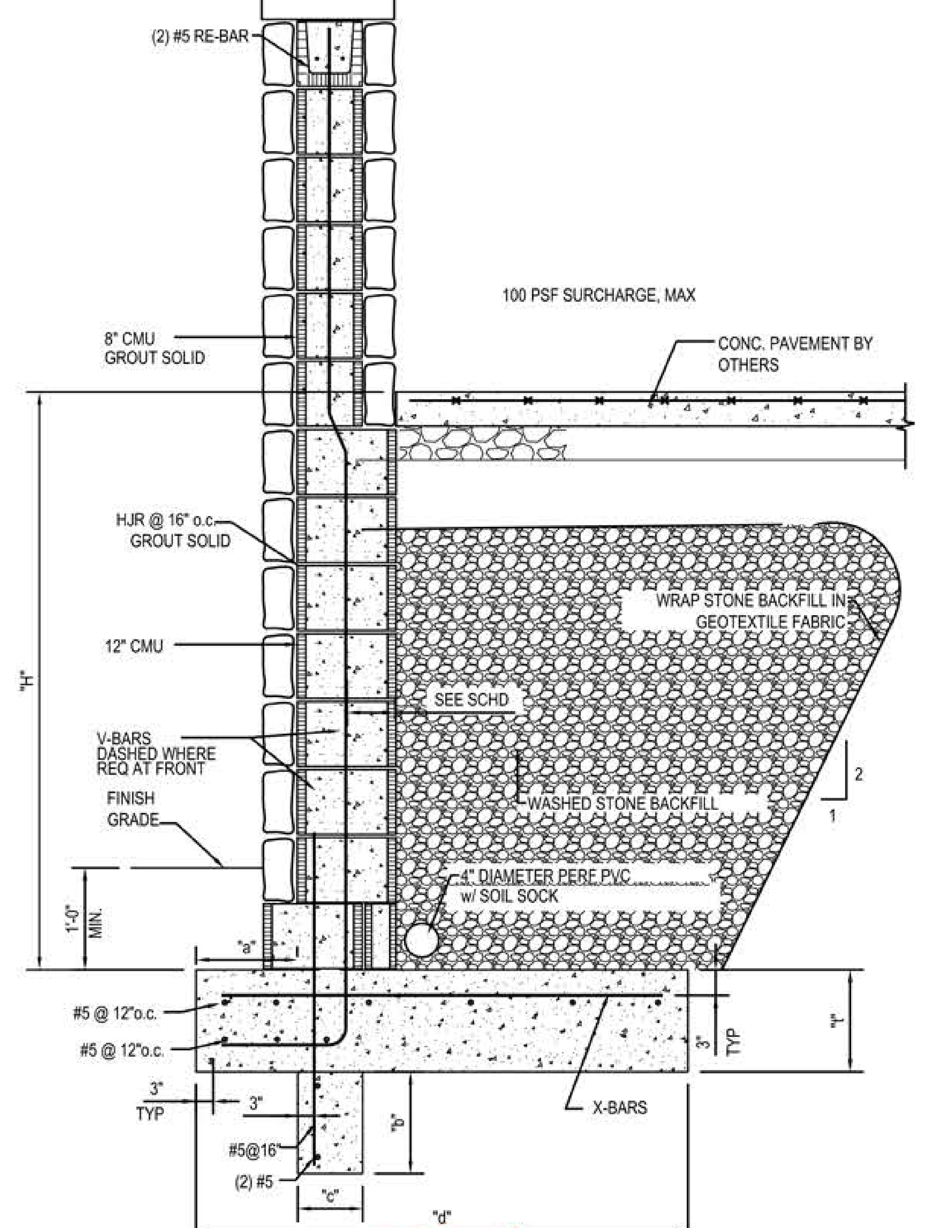
THE BACKFILL MATERIAL SHALL BE CRUSHED STONE OR OTHER GRANULAR MATERIAL MEETING THE REQUIREMENTS OF CLASS I, CLASS II, OR CLASS III MATERIAL AS DEFINED IN ASTM D2321. BEDDING & BACKFILL FOR SURFACE DRAINAGE INLETS SHALL BE PLACED & COMPACTED UNIFORMLY IN ACCORDANCE WITH ASTM D2321.

DRAWN BY CJA MATERIAL
DATE 9-30-99
REVISED BY NMH PROJECT NO./NAME
DATE 03-11-16
DWG SIZE A SCALE 1:25 SHEET 1 OF 1

Nyloplast
3130 VERONA AVE
BUFORD, GA 30518
PHN (770) 932-2443
FAX (770) 932-2490
www.nyloplast-us.com

TITLE DRAIN BASIN & INLINE DRAIN NON TRAFFIC INSTALLATION
DWG NO. 7001-110-111 REV E

2 / C3.0 DETAIL: NYLOPLAST DRAIN BASIN
(NTS)

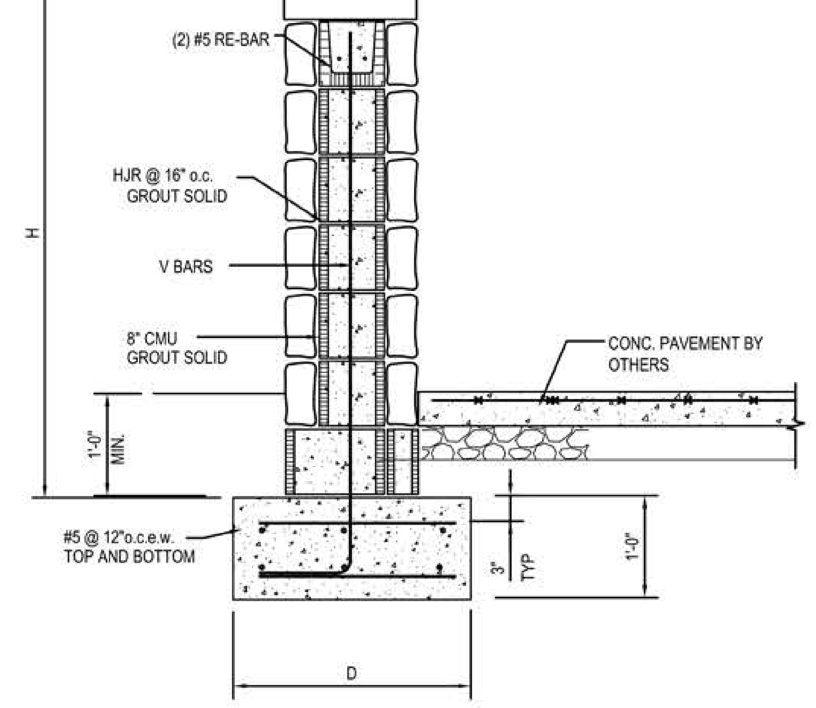


"H" ft.-in.	"w" in	"a" ft.-in.	"b" in	"c" in	"d" ft.-in.	"t" in	V-BARS	X-BARS
2'-8"	12"	0'-9"	--	--	3'-3"	12"	#5 @ 32"o.c. centered	#5 @ 12"o.c.
4'-8"	12"	1'-0"	--	--	5'-0"	12"	#5 @ 16"o.c. earth side	#5 @ 12"o.c.
6'-8"	12"	1'-6"	12"	12"	5'-6"	12"	#5 @ 8"o.c. earth side	#5 @ 12"o.c.

SITE RETAINING WALL SCHEDULE

NOTE:
1) PROVIDE EXPANSION JOINTS IN WALL AT 24'-0" ON CENTER.
2) MINIMUM BAR LAP IS 40 DIAMETERS

3 / C3.0 DETAIL: RETAINING WALL SECTION
(NTS)

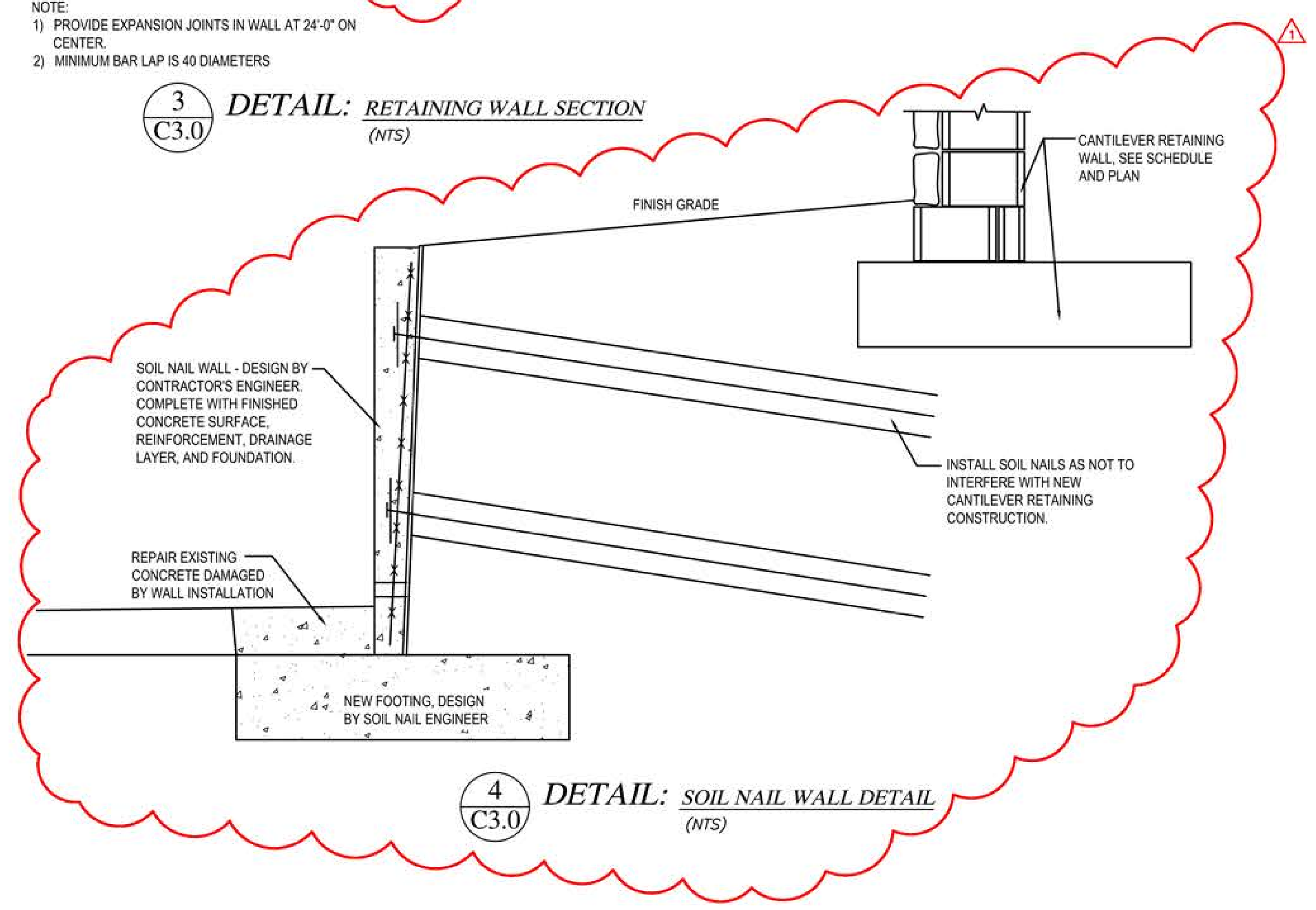


FREE STANDING WALL SCHEDULE

"H" ft.-in.	"w" in	"d" ft.-in.	"t" in	V-BARS
2'-8"	12"	2'-0"	8"	#5 @ 48"o.c. centered
4'-8"	12"	2'-0	8"	#5 @ 48"o.c. centered
6'-0"	12"	2'-4"	8"	#5 @ 48"o.c. centered

NOTE:
1) PROVIDE EXPANSION JOINTS IN WALL AT 24'-0" ON CENTER.
2) MINIMUM BAR LAP IS 40 DIAMETERS

4 / C3.0 DETAIL: FREE STANDING WALL SECTION
(NTS)



4 / C3.0 DETAIL: SOIL NAIL WALL DETAIL
(NTS)

NORTH

MAA CIVIL CONTACT: MICHAEL HUTCHERSON, P.E.
DIRECT LINE: 423-664-1484

March Adams & Associates Consulting Engineers
310 Dodds Ave.
P.O. Box 3689
Chattanooga, Tennessee 37404
PH: (423)698-6675
MAA #: 18371

ROSS/FOWLER
LANDSCAPE ARCHITECTURE URBAN DESIGN & PLANNING
5103 Kingston Pike · Suite 105
Knoxville, Tennessee 37919
P. 865-637-1100 F. 865-637-1101

Jerome Meadows
MeadowLark Studio

Charlie Anderson
Full Circle Stone Wor

ED JOHNSON MEMORIAL
CHATTANOOGA, TENNESSEE

REVISIONS
1 ADDENDUM #1 09/23/19

PROJECT NUMBER.................17010
ISSUE DATE.......................8 -14 -2019

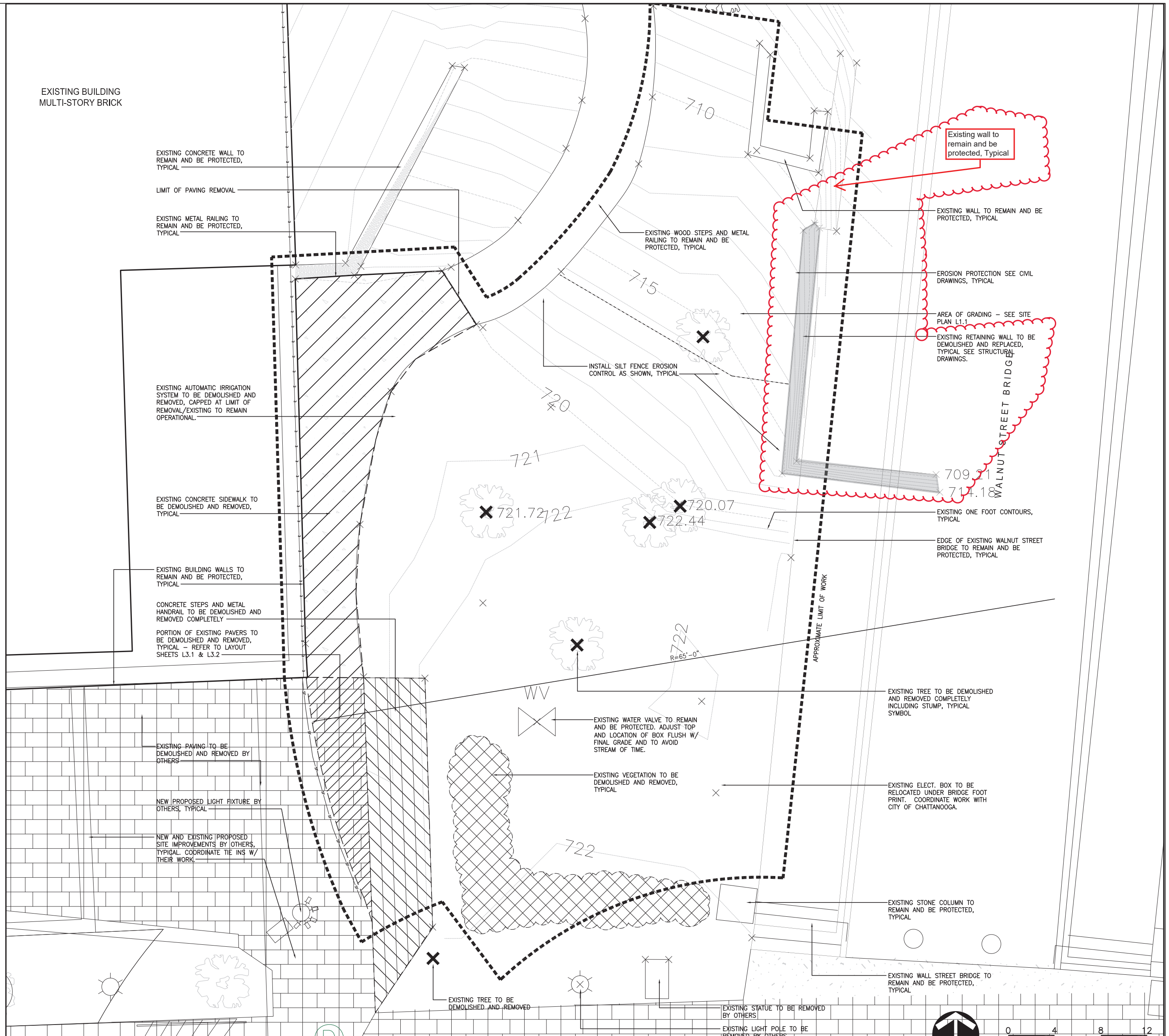
SITE DETAILS

C3.0

DEMOLITION NOTES:

1. THE LOCATION OF ALL SURFACE AND UNDERGROUND UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROTECT ALL UTILITIES FROM DAMAGE AS REQUIRED DURING CONSTRUCTION AND TO REPAIR ANY DAMAGE WHICH SHOULD OCCUR TO THE SATISFACTION OF THE LANDSCAPE ARCHITECT.
2. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROTECT ALL EXISTING BUILDINGS AND STRUCTURES TO REMAIN, BOTH ABOVE AND BELOW GRADE FROM DAMAGE WHICH OCCURS DIRECTLY OR INDIRECTLY AS A RESULT OF CONSTRUCTION OPERATIONS AND TO REPAIR ANY DAMAGE WHICH SHOULD OCCUR TO THE SATISFACTION OF THE OWNER OR INJURED PARTY.
3. ALL EXISTING TREES TO REMAIN ARE INDICATED ON THE DRAWINGS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF TOPS, TRUNKS, AND ROOTS OF EXISTING TREES ON THE PROJECT SITE THAT ARE TO REMAIN. EXISTING PLANTS SHALL BE FENCED OR OTHERWISE PROTECTED BEFORE ANY WORK IS STARTED. DO NOT PERMIT HEAVY EQUIPMENT OR STOCKPILES WITHIN BRANCH SPREAD. REMOVE INTERFERING BRANCHES ONLY UNDER THE DIRECTION OF THE LANDSCAPE ARCHITECT AND WITHOUT INJURY TO TREES. COVER SCARS WITH TREE PAINT.
4. THE LIMIT OF WORK LINE SHOWN ON THE DRAWINGS IS APPROXIMATE. THE LIMIT OF WORK SHALL BE AS DEFINED IN THE SPECIFICATIONS AND AS REQUIRED TO COMPLETE THE WORK SHOWN ON THE DRAWINGS.
5. THE LIMIT OF DEMOLITION WORK IN PAVEMENTS OR STRUCTURES SHALL ALWAYS BE A SAWED LINE AS SPECIFIED OR TO THE NEAREST EXISTING JOINT.
6. DEMOLISH ALL EXISTING IMPROVEMENTS IN THE LIMIT OF WORK, UNLESS NOTED TO REMAIN, AND AS REQUIRED TO COMPLETE THE WORK AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.
7. INSTALL EROSION CONTROL SEDIMENT BARRIERS, SILT FENCES, AND TREE PROTECTION DEVICES PRIOR TO STARTING CLEARING AND GRUBBING OPERATIONS. INSTALL STRAW BALES AROUND ALL STORM SEWER STRUCTURES AS SHOWN ON THE DRAWINGS AND AS DIRECTED. MAINTAIN EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION AS REQUIRED IN ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, ETC. OF AUTHORITIES HAVING JURISDICTION.
8. PROVIDE STRAW BALE CHECK DAMS IN ALL SWALES AT 100 FT. MAX. INTERVALS FOR ENTIRE LENGTH OF EACH SWALE.
9. REMOVE GRAVEL FROM ALL AREAS SHOWN TO BE GRASSED. GRAVEL SHALL BE REMOVED TO CLEAN EARTH SUBGRADE. BACKFILL SUCH AREAS WITH APPROVED SOIL MATERIALS.
10. ALL UNDAMAGED CAST IRON UTILITY FRAMES AND COVERS/GRATES MAY BE RE-USED OR SHALL BE RETURNED TO THE RESPECTIVE UTILITY. CONTRACTOR SHALL TRANSPORT ANY RETURNED ITEMS TO LOCATION AS DIRECTED BY EACH RESPECTIVE UTILITY.
11. REMOVE ALL PAVEMENTS AND CRUSHED STONE WITHIN DEMOLITION LIMITS TO CLEAN EARTH SUBGRADE UNLESS NOTED OTHERWISE.
12. CAREFULLY REMOVE EXISTING TRAFFIC SIGNS, ETC. WITHIN LIMIT OF WORK AND GIVE TO THEIR RESPECTIVE OWNERS IN GOOD CONDITION FOR POSSIBLE RE-USE.
13. REMOVE EXISTING LIGHT POLES AND STORE FOR RE-USE UNLESS NOTED TO REMAIN. LIGHT POLES SHALL BE RETURNED TO THE UTILITY FOR RE-USE.
14. MAINTAIN ELECTRICAL, SEWER, TELEPHONE, FIBER OPTICS, AND ALL OTHER EXISTING SERVICE WITHIN THE LIMITS OF WORK, IN GOOD WORKING CONDITION FOR THE LIFE OF THE PROJECT.
15. CONTRACTOR TO REFER TO CIVIL ENGINEERING PLANS FOR DEMOLITION AND PROTECTION OF STORM DRAINAGE SYSTEMS AS APPLICABLE.

✕ EXISTING TREE TO BE DEMOLISHED AND REMOVED



1 L0.1 DEMOLITION PLAN
SCALE: 1/4" =1'-0"

ROSS/FOWLER
LANDSCAPE ARCHITECTURE
URBAN DESIGN & PLANNING
5103 Kingston Pike · Suite 105
Knoxville, Tennessee 37919
P. 865-637-1100 F. 865-637-1101

Jerome Meadows
MeadowLark Studio

Charlie Anderson
Full Circle Stone Work

ED JOHNSON MEMORIAL
CHATTANOOGA, TENNESSEE

REVISIONS

PROJECT NUMBER.................17010
ISSUE DATE....................8-14-2019

DEMOLITION PLAN

L0.1

Report of Geotechnical Exploration
Ed Johnson Memorial Park
Chattanooga, Tennessee
S&ME Project No. 1281-19-063

PREPARED FOR:

Ross/Fowler
5103 Kingston Pike, Suite 105
Knoxville, TN 37919

PREPARED BY:

S&ME, Inc.
4291 Highway 58
Chattanooga, TN 37416

September 9, 2019

September 9, 2019

Ross/Fowler
5103 Kingston Pike
Knoxville, TN 37919

Attention: Mr. David Payne

Reference: **Report of Geotechnical Exploration**
Ed Johnson Memorial Park
Chattanooga, Tennessee
S&ME Project No. 1281-19-063

Dear Mr. Payne:

This report presents the results of the geotechnical exploration for the Ed Johnson Memorial Park site in Chattanooga, Tennessee. Our work was performed in general accordance with S&ME Proposal No. 121900375, dated August 25, 2019.

This report describes our understanding of the project, presents the results of the field exploration and laboratory testing, and discusses our conclusions and recommendations. S&ME appreciates this opportunity to be of service to you. Please call if you have questions concerning this report or any of our services.

Sincerely,

S&ME, Inc.

Drew Reed, PE
Project Engineer

JAMES ANDREW REED
REGISTERED ENGINEER
AGRICULTURE
DR 9/9/19
COMMERCE
No. 117056
STATE OF TENNESSEE

Jim McGirl, PE
Principal Engineer

Table of Contents

Appendices

Executive Summary

This summary is presented for the convenience of the reader. The full report text should be studied and understood before preparing an estimation of quantities or preparing designs based on this report, as it contains important information and recommendations that are not included in this brief summary.

1. The geotechnical exploration included drilling and sampling of one soil test boring and one offset boring drilled to collect undisturbed Shelby tube samples. The samples collected during our exploration were returned to our Chattanooga laboratory where they were further evaluated by a professional engineer.

2. Natural moisture content and Atterberg limits laboratory tests were performed on selected samples to aid our soil classification and to evaluate the on-site soil's volume change potential. We attempted to perform laboratory triaxial shear strength testing on representative Shelby tube samples. Due to the high percentage of chert gravel in the onsite residual soils, the samples collected were not suitable for triaxial testing. Therefore, we substituted additional Atterberg limits tests and laboratory grain size testing. The results of this additional testing was used in estimate appropriate shear strength and unit weight parameters for use in stability analyses.

3. Subsurface conditions consisted of about three feet of fill underlain by residual soils to the predetermined boring termination depth of about 40 feet. The fill was composed of stiff, red-brown silty clay with chert fragments. The residual soils were composed of stiff to very stiff, red-brown silty clay or sandy clay with chert fragments.

4. Groundwater was not observed in the test boring at the time of drilling. We installed a piezometer in the borehole to a depth of 40 feet. Delayed readings indicated groundwater at depths between about 36 and 38 feet (approx. elev. 684 to 686 ft.).

5. Global stability, settlement, sliding and bearing capacity analyses were performed for the planned construction. Minimum base widths for the concrete cantilever wall and soil nail lengths based on the results of our sliding stability analyses are provided in this report.

6. The site is adaptable for the proposed construction provided that necessary steps are taken during construction. This includes proper site preparation and construction testing as outlined in this report.

7. Based on our analysis, the slopes below the construction site have marginal stability. However, we did not observe signs of historical slope movement during our site reconnaissance. Based on our analyses, the construction of the planned park will not significantly increase the risk of failure of these slopes. However, it should be understood that there is always some risk when constructing on or near steep terrain.

1.0 Introduction

S&ME, Inc. has completed the geotechnical exploration at the Ed Johnson Memorial Park site in Chattanooga, Tennessee. Our work was performed in general accordance with S&ME Proposal Number 121900375 dated August 5, 2019. Our services were authorized by Ross/Fowler, P.C. on August 27, 2019.

The purpose of our work was to explore the subsurface soil conditions and groundwater level, provide feasible shallow foundation recommendations and provide applicable earthwork recommendations. This report describes our understanding of the project, presents the results of the field exploration and laboratory testing, and discusses our conclusions and recommendations relative to the above considerations. The scope of our geotechnical services did not include an environmental assessment for evaluating the presence or absence of wetlands, or hazardous or toxic materials.

A Site Location Plan and a Boring Location Plan are included in Appendix I. A discussion of the field investigative procedures, a legend of soil classification and symbols, and the Test Boring Records are included in Appendix II. Appendix III contains a discussion of the laboratory test procedures and the laboratory test results. The results of our stability analyses are contained in Appendix IV. Appendix V contains a document titled "Important Information about Your Geotechnical Engineering Report."

2.0 Site and Project Description

Our understanding of the project is based on email and phone correspondence with Mr. Brian Horne, PE, of March Adams and Associates. Mr. Horne also provided us with electronic copies of drawings C1.0 – Site Drainage, C2.0 – Erosion Control, and C3.0 – Site Details.

2.1 Site Description

The site is located at the south end of the walnut Street Bridge on the west side of the bridge abutment. The site is currently a landscaped area with several large trees and hardscape located between the bridge and Museum Bluff Condominiums. The site slopes down from 1st Street to the south with about 3 feet of relief across the upper portion of the project site. However, the area just north of the park slopes steeply to Riverside Drive and the River Walk below. A Site Location Plan showing the general project site location is provided in Appendix I.

2.2 Project Description

The project will consist of the construction of a partially walled in circular veranda constructed adjacent to the bridge. As part of the project, an existing soil nail reinforced, modular block wall located downhill from the planned veranda area will be demolished and replaced with a new soil nail wall. We understand that the footings from the existing wall will be repurposed as a foundation for the new wall. Based on the provided topographic plan and planned grades, we estimate this wall will be up to about 8 feet in height.

In addition to the lower soil nail wall, there will be a concrete cantilever retaining wall with a block facing around the circular veranda constructed uphill from the soil nail wall. This retaining wall will support the downhill side of the veranda where it is built partially out onto the existing slope. Based on provided topography and planned grading, we estimate this retaining wall will be up to about 6 feet in height.

3.0 Regional Geology

Chattanooga, Tennessee is located in the Valley and Ridge Physiographic Province. Elongated ridges that trend in a northeast-southwest direction characterize this province. The ridges are typically formed on highly resistant sandstones and shales, while the valleys and rolling hills are formed on less resistant limestone, dolomite, and shales.

Based on our review of the Geologic Map of Tennessee, East-Central Sheet, dated 1966, the project site is underlain by the Cambrian-age Copper Ridge Dolomite formation. At about 1000 feet thick, the Copper Ridge is a relatively thick formation of medium- to dark-gray, fine- to coarsely-crystalline dolomite. It is relatively well-bedded with medium to thick beds. The formation typically contains dark masses of chert in layers or thin nodules. During weathering, the Copper Ridge produces large quantities of tough, irregularly shaped, dark chert fragments and nodules and layers. The chert masses may form hills or ridges and are frequently layered. The strata of the Knox formations weather to form a thick cherty overburden typically in excess of 40 feet thick.

Carbonate rock, such as the strata underlying this site, is of great geologic age and has been subject to solution weathering over geologic time. Rainwater falling onto the surface and percolating downward through the soil and into cracks and fissures gradually dissolves the rock, producing insoluble impurities such as chert and clay. Since carbonate rock varies greatly in its resistance to weathering, the soil/bedrock contact may be extremely irregular. More soluble bedrock develops a thicker soil cover and a more irregular bedrock surface with pinnacles and slots, and less soluble bedrock usually develops a thinner soil cover and a less irregular soil-bedrock surface.

These large variations in bedrock depth are greatly enhanced by the presence of fractures, bedding planes, and faults, which provide an increased opportunity for a greater influx of percolating water. The weaknesses may form clay-filled cavities or enlarge into caves and may be connected by a network of passageways. If a cave forms close to the bedrock surface, its roof may collapse and the overlying soils may erode into the cave. Once the weight of the overlying soil exceeds the soil's arching strength, the soil collapses and an open hole or depression may appear at the ground surface. Such a feature is termed a sinkhole.

There is always some risk associated with developing any site underlain by carbonate bedrock. However, the test boring drilled at this site did not encounter open voids or other signs of incipient sinkhole conditions. We have reviewed the USGS quadrangle map for this area. The map does not show a pattern of closed depressions that would indicate past sinkhole activity in near proximity to the site. We also observed successful development in the surrounding area. Therefore, it is our opinion the proposed construction will not increase the risk of sinkhole development.

4.0 Subsurface Conditions

4.1 Field Exploration Procedures

The procedures used by S&ME, Inc. for field sampling and testing are in general accordance with ASTM procedures and established engineering practice in the State of Tennessee. Appendix II contains brief descriptions of the procedures used in this exploration.

S&ME, Inc. drilled one soil test boring to obtain subsurface information at the project site. One additional offset boring was drilled to collect undisturbed Shelby tube samples. Members of our engineering staff established the boring location in the field by measuring distances and estimating right angles relative to on-site landmarks and existing utilities. The boring elevation was obtained by superimposing the boring location onto the provided topographic site plan and interpolating between contours. Therefore, both boring location shown on Figure 2 – Boring Location Plan in Appendix I, and the elevations shown on the Test Boring Records in Appendix II, should be considered approximate. After the boring was completed, we installed a piezometer in order to collect delayed groundwater measurements.

Our field representative packaged the soil samples in sealed containers, labeled them for identification, and returned them to the Chattanooga office where a geotechnical engineer further examined them. We visually classified the soils according to the Unified Soil Classification System (ASTM D 2488). The resulting soil descriptions are shown on the Test Boring and Test Pit Records in Appendix II. Samples were then selected for laboratory testing.

4.2 Soil Stratification

The results of our field testing program are summarized in the following paragraphs and are shown on the Test Boring Record in Appendix II. This record presents our interpretation of the subsurface conditions at the specific boring location at the time of our exploration. The stratification lines represent the approximate boundary between soil types. The actual transitions may be more gradual than implied.

SURFACE MATERIALS

Surface material consisting of about 3 inches of mulch and topsoil was encountered at the ground surface.

FILL

Below the mulch and topsoil, fill was encountered to a depth of about 3 feet. Fill is material that has been transported to its present location by man. The fill was composed of red-brown silty clay with chert fragments. The Standard Penetration Test (SPT) N value in the fill was 14 blows per foot, indicating a stiff soil consistency.

RESIDUUM

Residual soils were encountered below the fill to the predetermined boring termination depth of about 40 feet. Residual soil forms from the in-place weathering of the underlying bedrock. The residual soils encountered at the site were typically composed of red-brown silty clay with an abundance of chert fragments. Standard Penetration Test (SPT) N values in the residuum ranged from 9 to 24 blows per foot, indicating a stiff to very stiff soil consistency.

4.3 Water Levels

The borehole was observed for the presence of groundwater at the termination of boring. Groundwater was not observed in the boring at the time of drilling. Delayed groundwater measurements taken from the piezometer are presented in Table 4-1.

Table 4-1 - Groundwater Measurements

Date of Measurement	Depth (feet)	Approximate Elevation (feet)
8/29/2019	36.5	685
9/3/2019	37.4	684

It should be noted that groundwater levels can fluctuate with seasonal, climatic, and environmental changes. We expect groundwater levels at this site may be higher during periods of heavy rainfall.

5.0 Laboratory Testing

Laboratory tests were performed on representative split-spoon samples obtained during the field exploration phase of this project. We conducted moisture content and Atterberg limits tests on selected samples to aid our soil classification and to evaluate the relative volume change potential of on-site soils.

In addition to laboratory testing performed on split-spoon samples, we also attempted to perform triaxial shear strength testing on undisturbed samples collected using thin-walled Shelby tubes from an offset boring. Due to the high percentage of chert fragments in the residual soils, the undisturbed samples were either damaged during sampling or too rocky to test. Therefore, we performed additional index property testing on the Shelby tube samples collected. This testing included Atterberg limits testing, unit weight testing and grain size testing. The results of the additional testing were used to estimate soil shear strength parameters for the onsite residual soils. The resulting soil descriptions are shown on the Test Boring Record in Appendix II and laboratory testing results are presented in Appendix III.

6.0 Engineering Analyses and Design Recommendations

Global stability, settlement, sliding and bearing capacity analyses of the proposed retaining walls was performed. The results of the global stability analyses are included in Appendix IV. A discussion of the analysis methods and results is presented in the following paragraphs. In addition to global and external stability analyses, this section also includes seismic parameters for use in the retaining wall design.

6.1 Global Stability

6.1.1 Methodology

We analyzed two cross-sections for the planned construction. The cross-sections were selected based on the planned wall configuration and the geometry of the existing ground surface. The cross-section locations are identified on the Boring Location Plan in Appendix I. Stability of a selected cross-sections was assessed using a two-dimensional limit equilibrium modeling technique which simplifies the failure or "slip" surfaces by dividing the slope into vertical "slices" and fitting line segments or arcs of various radii and centers, or plane slip surfaces, to the slope. Various surfaces are then checked to determine the slip surface with the smallest ratio of resisting forces (soil strength and soil nail resistance) to driving forces (mass of the soil and water and surcharge loading). The ratio of the resisting forces divided by the summation of the driving forces acting on the slices is the factor of safety for the slope section analyzed. The finite difference computer program SLIDE 2018 was used to perform the analyses. We used the GLE/Morganstern-Price and Spencer methods to evaluate the stability of each cross-section analyzed.

6.1.2 *Material Strength Parameters, Loading and Supports*

The test boring data and the available laboratory test data from the area were reviewed and the subsurface boundary conditions developed for the selected cross-sections. In addition to published correlations between soil index properties and strength parameters in the absence of triaxial shear strength testing, we also performed a back analysis of the existing slope near Riverside Drive. This existing slope has an inclination of about 1Horizontal:1Vertical. The purpose of the back analysis is to check the estimated soil strength parameters with the assumption that, since the slope shows no indication of failure, it is characterized by a factor of safety of at least 1.0 for slope stability. With this lower bound on a factor of safety, we are able to also place a lower bound on the soil strength parameters used in our analyses. Table 6-1 presents the estimated material properties used in our global stability analyses.

Table 6-1 - Material Strength Parameters

Soil Type	Unit Weight γ (pcf)	Effective Cohesion C′ (psf)	Effective Friction Angle Φ′ (degrees)
Washed Stone	100	0	40
Existing Soil Fill	120	0	30
New Soil Fill	125	50	30
Residuum	120	80	31

The soil test boring did not encounter bedrock above the planned termination depth. Therefore, bedrock was not included in the stability model. Groundwater has been modeled at an elevation 10 feet higher than encountered during the monitoring period to account for elevated groundwater levels that may occur during the wet winter and spring months. A surcharge of 100 pounds per square foot (psf) was applied to represent live loading. The support properties used for the soil nails are provided in Table 6-2.

Table 6-2 – Soil Nail Parameters

Support Type	Out of Plane Spacing (feet)	Bond Strength (kips/foot)	Soil Nail Length (feet)
Soil Nail	5	1.0	8

6.1.3 Global Stability Results and Discussion

Table 6-3 contains the resulting factors of safety for the global stability analyses. The full results of our global stability analyses are included in Appendix IV.

Table 6-3 - Slope Stability Analyses Results

Cross-Section	Estimated Factor of Safety*
**A-A'	1.74/1.77
**B-B'	1.36/1.35

*GLE/Morganstern-Price / Spencer factors of safety

**See Figure 2 in Appendix I for location of cross-sections

Also included in Appendix IV is the stability model used in the back analysis of the slope near Riverside Drive. Based on our analysis, the conservative soil parameters used suggest marginal stability of the steep slopes below the construction site. However, we did not observe indications of slope movement during our site reconnaissance. Based on our analyses, construction of the planned park will not significantly increase the risk of failure of these slopes. However, it should be understood that there is always some risk when constructing on or near steep terrain.

6.2 Settlement

We estimate that additional loads of up to about 1,000 psf will result from the new construction of the upper concrete cantilever wall, veranda and associated fill. Based on our settlement analysis, we estimate that about ½ inch of settlement will result in the areas where the deepest fills are planned. This settlement should occur relatively rapidly and will likely go unnoticed during construction.

For the lower soil nail wall, we estimate that the planned construction will closely resemble the existing construction in terms of plan layout, overall height and structural loading. We estimate that settlement for this construction will be less than about ½ inch and will go unnoticed.

6.3 Sliding

6.3.1 Concrete Cantilever Wall Sliding Analysis

Based on the results of our analysis, the factor of safety for the concrete cantilever wall system using the wall dimensions specified in the Site Retaining Wall Schedule on the provided sheet C3.0, Site Details, resulted in inadequate sliding resistance for the concrete cantilever wall. We recommend that the overall base width for the specified sections be increased by 1 foot to satisfy sliding stability requirements. Table 6-4 contains the recommended based widths.

Table 6-4 - Recommended Concrete Cantilever Base Widths

Height, "H" (ft.-in.)*	Minimum Base Width, "d" (ft.-in.)
2′-8″	3′-3″
4′-8″	5′-0″
6′-8″ **	5′-0″

* Parameters "H" and "d" are defined on Sheet C3.0, Site Details, in the provided project plans.

** The Site Retaining Wall Schedule and Cross-Section Detail indicates that the 6′-8″ wall section will have a 12 inch key.

6.3.2 Soil Nail Wall Sliding Analysis

We performed sliding stability analyses of the proposed soil nail wall for various heights. Based on our experience with past projects, we have estimated a soil nail inclination of 15 degrees below horizontal. For the purpose of our sliding models, we included a 2Horizontal:1Vertical backslope behind the soil nail wall. For sliding stability of a soil nail wall, the reinforced mass of the soil behind the wall is considered in the summation of the resisting forces. Table 6-5 contains the minimum soil nail lengths required to reach a factor of safety of 1.5 for sliding stability. Note that soil nail lengths may need to be increased based on other wall design requirements.

Table 6-5 - Minimum Soil Nail Lengths

Wall Height Range (ft.-in.)	Recommended Minimum Soil Nail Length (feet)
2′-0″ – 7′-0″	8′
7′-0″ – 9′-0″	10′
9′-0″ – 12′-0″	14′

6.4 Bearing Capacity

Based on our analyses, we recommend an allowable bearing capacity of 1,500 psf be used for the concrete cantilever wall and the soil nail wall, both bearing on shallow spread foundations. While computed capacities may be greater, we recommend this reduced capacity based on global stability requirements for the combination of the two walls. We also expect that this allowable bearing capacity will satisfy the project requirements.

6.5 Foundations Preparation Recommendations

The results of our analyses indicate that existing soils at the probable bearing depths for concrete cantilever retaining walls will be adequate to support the estimated wall loads. Standard penetration testing in the area of the proposed walls indicates bearing soils in the stiff to very stiff range. If soft soils are uncovered at the time of foundation excavation, these soils should be undercut and replaced with compacted soil fill. A geotechnical engineer should evaluate the condition of the foundation excavations at the time of construction and determine the need for additional undercutting.

It is our understanding that the planned soil nail wall will bear on the existing footing that was constructed for the modular block soil nail wall that is to be demolished and replaced. We have not been provided with documentation on how or when the existing footing was constructed. We recommend that a thorough evaluation of the existing footing be conducted once it is exposed. The footing should be evaluated for continuity along its length and for any deterioration or damage that may have occurred since the time of its construction. Additionally, it is our opinion that the new wall may need to extend beyond the limits of the existing footing. Areas where new footing construction will abut the existing footing should be adequately tied together with epoxied reinforcing steel dowels. Failure to adequately connect the new construction to that of the old construction could result in differential movement of wall sections.

Consideration should be given for removing and reconstructing the footing if its condition is marginal or was constructed without reinforcement. Removing and reconstructing the footing will alleviate the need for drilling and epoxying of reinforcing steel dowels for both the vertical elements of the new retaining wall and for any new footing elements that are needed adjacent to the existing footing.

6.6 Other Design Recommendations

We expect that the soil nail wall will be fully constructed prior to the construction of the concrete cantilever wall. Based on the estimated bearing elevations for the walls, the planned site grading and the expected inclination of the soil nails, it does not appear that the soils nails will impact the construction of the concrete cantilever wall. However, if the need to undercut the upper wall foundations arises, or if final designs indicate there will be some conflict between the two walls, we should be given the opportunity to reassess the final design. The soil nail wall design should consider the additional load imposed by the cantilever wall.

6.7 Seismic Considerations

Based on the drilling data, we recommend Seismic Site Class D for the proposed construction (reference Table 3.10.3.1-1 – Site Class Definitions, AASHTO 2017). From AASHTO 2017 Article 3.10 and the seismic maps from the USGS resources, we obtained the following peak ground acceleration (PGA), short- and long-period spectral accelerations (S_S and S_1, respectively) and five-percent-damped-design response spectrum accelerations (A_S, S_{DS}, and S_{D1}, respectively) for the site.

- PGA = 0.134 g
- S_s = 0.250 g
- S_1 = 0.069 g
- A_S = 0.205 g
- S_{DS} = 0.400 g
- S_{D1} = 0.166 g

With an S_{D1} value of 0.166, the site is assigned to Seismic Zone 2 (AASHTO 2017, Article 3.10.6).

7.0 Construction Considerations

7.1 Site Preparation

7.1.1 Demolition

We expect a number of existing structures will be demolished prior to construction. This work should include the removal of all existing grade slabs and shallow foundations. Abandoned utilities should be removed and replaced with compacted fill. Active utilities should be relocated outside of the construction area. If pipes are not removed from beneath the proposed construction, they may serve as conduits for subsurface erosion that could result in the formation of voids or depressions, with adverse effects on the construction.

7.1.2 Stripping

After completion of demolition, the topsoil and mulch should be stripped from the construction area and disposed of off-site. We encountered about 3 inches of mulch and topsoil in our boring. However, we expect this interval may be greater in unexplored areas.

7.1.3 General

Due to the confined nature of the construction area, proofrolling of the site will not be feasible. Therefore, after completion of stripping in areas to receive fill, and once grade is achieved in cut areas, we recommend the exposed surface of the subgrade soils be evaluated by a geotechnical engineer. The geotechnical engineer or his representative should evaluate the area with a steel probe rod and may elect to perform hand auger boring and dynamic cone penetrometer (DCP) testing. In general, unstable materials encountered in the construction area should be undercut until stable materials are exposed. Prior to placing fill on the site, the upper surface soils should be scarified and properly compacted.

Subgrade repair can be expected to be more extensive if grading operations are performed during wet periods of the year. The onsite soils are moisture sensitive and will be softened by construction traffic when wet. Once areas that need remediation have been repaired, the site may be brought to grade with structural fill.

7.2 Fill Placement

7.2.1 Materials

Fill soils should consist of low to moderately plastic clay or silt with a plasticity index of less than thirty (PI<30) and a standard Proctor maximum dry density greater than 95 pounds per cubic foot. The fill should contain no rock fragments larger than 4 inches in any dimension, and no organic matter.

Soil fill operations should not begin until representative samples of proposed fill soils are collected and tested. The test results will be used to assess whether the proposed fill material meets the previously discussed plasticity and density criteria, and for quality control during grading. Please allow at least 3 to 5 days for testing before the fill operations begin.

7.2.2 *Compaction*

We expect much of the fill placement for the project will take place in areas not accessible to full size compaction machinery. In confined areas such as utility trenches or areas inaccessible to full size compaction machinery, portable compaction equipment and thin lifts of 3 to 4 inches may be required to achieve specified degrees of compaction. In areas where full size compaction equipment can reach, fill may be placed with a maximum loose thickness of 8 inches.

Fill should be compacted to 95 percent of the standard Proctor maximum dry density, with a moisture content within 3 percent of the optimum moisture content, depending on the shape of the Proctor curve. Wetting or drying of soils may be required, depending on the time of year site grading is performed. We recommend the top one foot below grade supported slabs or stone pavers, and the top 2 feet beneath pavements be compacted to 100 percent standard Proctor compaction. A representative of S&ME should test the density and moisture content of each lift before placing additional lifts.

We recommend that fill placements be observed by one of S&ME's qualified soils technicians on a full time basis. Frequent fill density and moisture tests should be performed to evaluate that the specified degree of compaction is being achieved. However, the actual testing frequency should be determined by the geotechnical engineer based on the type of soil being placed, the equipment being used, and the time of year the fill is being placed. More frequent testing should be performed in confined areas. Any areas that do not meet the compaction specification should be re-compacted to achieve compliance.

7.3 Drainage and Runoff Concerns

In the Tennessee Valley Region, frequent and sometimes substantial rainfalls occur from November through May. These rainy months can greatly influence the cost and schedule of construction projects, particularly earthwork and work in confined excavations. The high plasticity clay soils present at the site will be difficult to work in periods of wet weather. Therefore, maintenance of the exposed subgrade surface will be important to achieve moisture control and to prevent softening of the surface soils due to rainwater infiltration. We recommend subgrades be sufficiently sloped to provide rapid drainage. We also recommend keeping the ground surface free from depressions or ruts that would hold water, and sealing the surface using rubber-tired equipment to reduce water infiltration.

8.0 Follow-Up Services

Our services should not end with the submission of this geotechnical report. S&ME should be kept involved throughout the design and construction process to maintain continuity and to determine if our recommendations are properly interpreted and implemented. To achieve this, we should review project plans and specifications with the designers to see that our recommendations are fully incorporated and have not been misinterpreted. We also should be retained by the owner to monitor and test the site preparation and foundation construction.

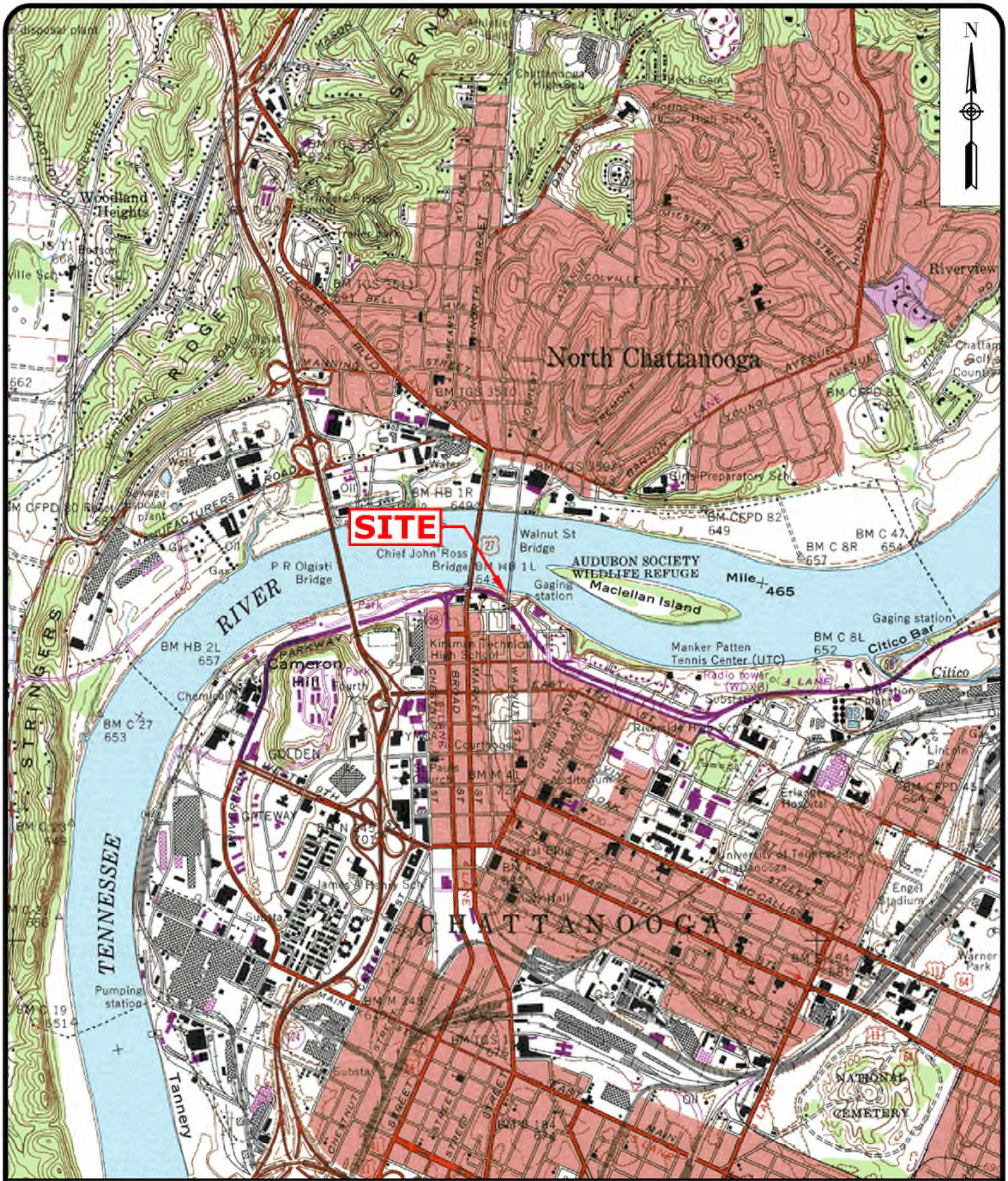
S&ME's familiarity with the site and foundation recommendations makes us a valuable part of your construction quality assurance team. S&ME recommends that we be retained by the owner on a full time basis to observe earthwork and foundation construction. Our personnel are uniquely qualified to recognize unanticipated ground conditions and can offer responsive remedial recommendations should these unanticipated conditions occur.

Appendices

Appendix I

Figure 1 - Site Location Plan

Figure 2 - Boring Location Plan



SOURCE: USGS 7.5 Minute Topographic Map -- CHATTANOOGA, TENNESSEE (1976)
DRAWING FOR ILLUSTRATION PURPOSES ONLY

SITE LOCATION PLAN	SCALE:	1"=2,000'	FIGURE NO.
ED JOHNSON MEMORIAL PARK CHATTANOOGA, TENNESSEE	DATE:	9/04/2019	1
	PROJECT NUMBER	1281-19-063	

NOTES:

- DRAWING FOR ILLUSTRATIVE PURPOSES ONLY
- BASE DRAWING PROVIDED BY MARCH ADAMS & ASSOCIATES

LEGEND:

- APPROXIMATE BORING LOCATION
- GLOBAL STABILITY CROSS-SECTION LOCATION

BORING LOCATION PLAN

ED JOHNSON MEMORIAL PARK
CHATTANOOGA, TENNESSEE

SCALE:	FIGURE NO.
1"=20'	2
DATE:	
9/04/2019	
PROJECT NUMBER	
1281-19-063	

Appendix II

Field Exploration Procedures

Test Boring Record Legend

Test Boring Records

HOLLOW STEM AUGERING PROCEDURES
WITH STANDARD PENETRATION RESISTANCE TESTING
ASTM D 1586

The borings were advanced using auger drilling techniques. At regular intervals, soil samples were obtained with a standard 1.4-inch I.D., 2.0-inch O.D., split-tube sampler. The sampler was initially seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is the standard penetration resistance. Standard penetration resistance, when properly evaluated, is an index to the soil's strength and density. The criteria used during this exploration are presented on the Test Boring Record Legend.

Representative portions of the soil samples, thus obtained, were placed in sealed containers and transported to the laboratory. The engineer selected samples for laboratory testing. The Test Boring Records in this Appendix provide the soil descriptions and penetration resistances.

Soil drilling and sampling equipment may not be capable of penetrating hard cemented soils, thin rock seams, large boulders, waste materials, weathered rock, or sound continuous rock. Refusal is the term applied to materials that cannot be penetrated with soil drilling equipment or where the standard penetration resistance exceeds 100 blows per foot. Core drilling is needed to determine the character and continuity of the refusal materials.

UNDISTURBED SAMPLING PROCEDURES
ASTM D 1587

Relatively undisturbed samples were obtained for laboratory testing. A 3-inch O.D., 16-gauge, steel tube was slowly and uniformly pushed into the soil at the desired sampling level. The tube was then removed from the ground and the encased soil was sealed at the ends to prevent loss of moisture. The depth at which undisturbed samples were taken is indicated on the Test Boring Records.

TEST BORING/PIT RECORD LEGEND

FINE AND COARSE GRAINED SOIL INFORMATION

COARSE GRAINED SOILS (SANDS & GRAVELS)

N	Relative Density
0-4	Very Loose
5-10	Loose
11-20	Firm
21-30	Very Firm
31-50	Dense
Over 50	Very Dense

FINE GRAINED SOILS (SILTS & CLAYS)

N	Consistency	Qu, KSF Estimated
0-1	Very Soft	0-0.5
2-4	Soft	0.5-1
5-8	Firm	1-2
9-15	Stiff	2-4
16-30	Very Stiff	4-8
Over 31	Hard	8+

PARTICLE SIZE

Boulders	Greater than 300 mm (12 in)
Cobbles	75 mm to 300 mm (3 to 12 in)
Gravel	4.74 mm to 75 mm (3/16 to 3 in)
Coarse Sand	2 mm to 4.75 mm
Medium Sand	0.425 mm to 2 mm
Fine Sand	0.075 mm to 0.425 mm
Silts & Clays	Less than 0.075 mm

The **STANDARD PENETRATION TEST** as defined by ASTM D 1586 is a method to obtain a disturbed soil sample for examination and testing and to obtain relative density and consistency information. A standard 1.4-inch I.D./2-inch O.D. split-barrel sampler is driven three 6-inch increments with a 140 lb. hammer falling 30 inches. The hammer can either be of a trip, free-fall design, or actuated by a rope and cathead. The blow counts required to drive the sampler the final two increments are added together and designate the N-value defined in the above tables.

ROCK PROPERTIES

ROCK QUALITY DESIGNATION (RQD)

Percent RQD	Quality
0-25	Very Poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

ROCK HARDNESS

Very Hard:	Rock can be broken by heavy hammer blows
Hard:	Rock cannot be broken by thumb pressure, but can be broken by moderate hammer blows.
Moderately Hard:	Small pieces can be broken off along sharp edges by considerable hard thumb pressure; can be broken with light hammer blows.
Soft:	Rock is coherent but breaks very easily with thumb pressure at sharp edges and crumbles with firm hand pressure.
Very Soft:	Rock disintegrates or easily compresses when touched; can be hard to very hard soil.

$$\text{RQD} = \frac{\text{Sum of 4 in. and longer Rock Pieces Recovered}}{\text{Length of Core Run}} \times 100$$

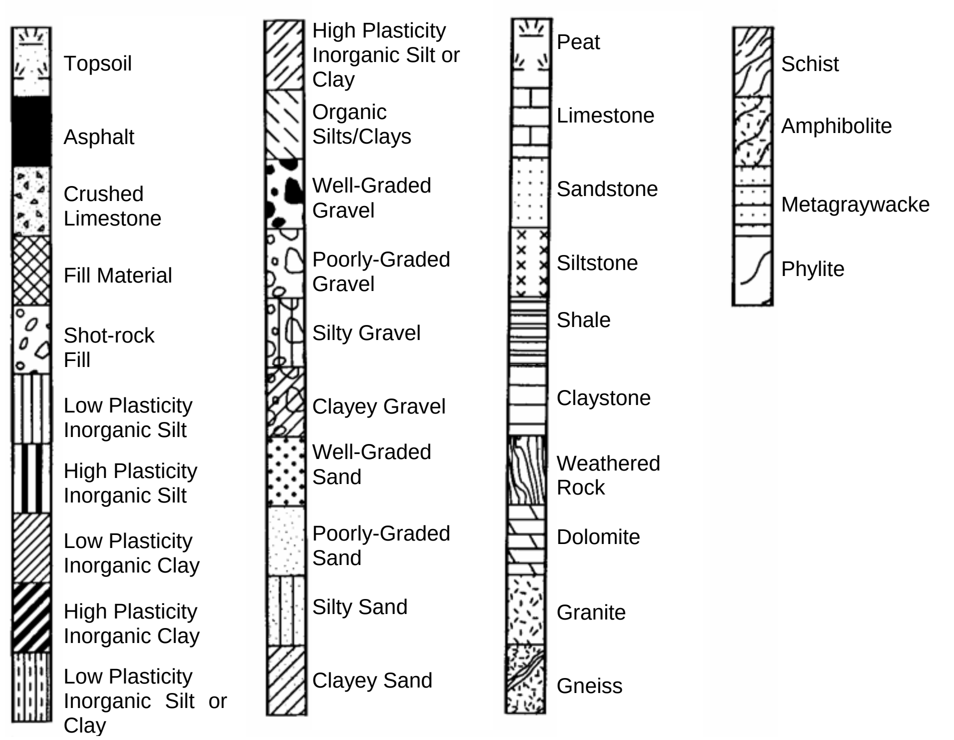
$$\text{Recovery} = \frac{\text{Length of Rock Core Recovered}}{\text{Length of Core Run}} \times 100$$

43 RQD
NQ
63 REC

Core Diameter	Inches
BQ	1-7/16
NQ	1-7/8
HQ	2-1/2

SYMBOLS

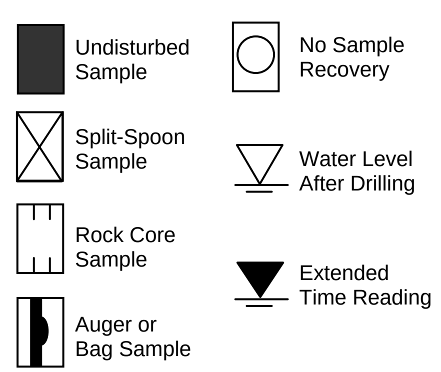
KEY TO MATERIAL TYPES



SOIL PROPERTY SYMBOLS

N:	Standard Penetration, BPF
M:	Moisture Content, %
LL:	Liquid Limit, %
PI:	Plasticity Index, %
Qp:	Pocket Penetrometer Value, TSF
Qu:	Unconfined Compressive Strength Estimated Qu, TSF
γ_D:	Dry Unit Weight, PCF
F:	Fines Content

SAMPLING SYMBOLS



TEST BORING RECORD

BORING NO.: B-1

PROJECT: Ed Johnson Park	JOB NO: 1281-19-063	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee		

ELEVATION: 721.3 feet ±	BORING STARTED: 8/20/2019	RIG TYPE: Geo-Probe	BORING DIA. (IN): 2¼
DRILLING METHOD: HSA	BORING COMPLETED: 8/20/2019	HAMMER: Automatic	

GROUNDWATER:
Dry ATD
36.5 feet on 8/29/19
37.4 feet on 9/3/19

Remarks:
Offset boring drilled to collect Shelby tube samples:
Pushed 4' to 6', Recovered 1.0'
Pushed 10' to 12', Recovered 1.2'
Pushed 20' to 22', Recovered 1.5'
Pushed 22' to 24', Recovered 1.0'

ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	
721.3	0		
721.0	0.3'	MULCH and TOPSOIL	
		SILTY CLAY (CL) with rock fragments, red-brown, stiff	FILL
718.3	3'	SANDY CLAY (CH) with chert fragments, red-brown, stiff	RESIDUUM
715.3	6'	SILTY CLAY (CH) with chert fragments, red-brown, very stiff and stiff	RESIDUUM
689.3	32'	SILTY CLAY (CH), some chert fragments, orange-brown, very stiff to stiff	RESIDUUM
681.3	40	*Boring terminated at 40 feet*	

R	M	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	23.2		14	5 - 7 - 7 **(14)**
50%	19.2	39	15	5 - 8 - 7 **(15)**
	16.0		24	13 - 13 - 11 **(24)**
	21.4		24	10 - 8 - 16 **(24)**
60%	19.8		16	6 - 7 - 9 **(16)**
	21.0		9	4 - 4 - 5 **(9)**
75% / 50%	29.9		16	6 - 8 - 8 **(16)**
	28.5	44	13	3 - 5 - 8 **(13)**
	30.2		18	5 - 9 - 9 **(18)**
	38.3		13	7 - 6 - 7 **(13)**

BORING RECORD S&ME 1281-19-063.GPJ 2016.GDT 9/9/19

Borehole ID: 1

Project Manager: D. Reed

Appendix III

Laboratory Test Procedures

Laboratory Test Results

NATURAL MOISTURE
ASTM D 2216, EM 1110-2-1906

The moisture content of soils is an indicator of various physical properties, including strength and compressibility. Selected samples obtained during exploratory drilling were taken from their sealed containers. Each sample was weighed and then placed in an oven heated to 110ºC ± 5ºC. The sample remained in the oven until the free moisture had evaporated. The dried sample was removed from the oven, allowed to cool, and re-weighed. The moisture content was computed by dividing the weight of evaporated water by the weight of the dry sample. The results, expressed as a percent, are shown on the attached Laboratory Test Results Summary.

ATTERBERG LIMITS DETERMINATION
ASTM D 4318/AASHTO T89/T90

Representative samples were subjected to Atterberg limits testing to determine the soil's plasticity characteristics. The plasticity index (PI) is the range of moisture content over which the soil deforms as a plastic material. The liquid limit (LL) marks the transition from the plastic state to the liquid state. The plastic limit (PL) marks the transition from the plastic state to the solid state.

To determine the liquid limit, a soil specimen is wetted until it is in a viscous fluid state. A portion of this soil is then placed in a brass cup of standardized dimensions, and a groove made through the middle of the soil specimen with a grooving tool of standardized dimensions. The cup is attached to a cam that lifts the cup 10 mm, and then allows the cup to fall and strike a rubber base of standardized hardness. The cam is rotated at about 2 drops per second until the two halves of the soil specimen come in contact at the bottom of the groove along a distance of 13 mm. The number of blows required to make this degree of contact is recorded, and a portion of the specimen is subjected to a moisture content determination. Additional water is added to the remainder of the specimen, and the grooving process and cam action process repeated. This testing sequence is repeated until the soil flows as a heavy viscous fluid. The number of blows vs. moisture content is then plotted on semi-logarithmic graph paper, and the moisture content corresponding to 25 blows is designated the liquid limit.

The plastic limit is the lowest moisture content at which the soil is sufficiently plastic to be manually rolled into threads 3 mm in diameter. It is determined by taking a pat of soil remaining from the liquid limit test, and repeatedly rolling, kneading, and air drying the specimen until the soil breaks into threads about 3 mm in diameter and 3 to 10 mm long. The moisture content of these soil threads is then determined and is designated the plastic limit. The results of these tests are presented on the Laboratory Test Results Summary.

GRAIN SIZE TEST PROCEDURES
ASTM D 1140

The clay and silt content of granular soils affects their physical properties such as strength, compressibility, and permeability. Selected granular soil (sand and gravel) samples were tested to determine the percent, by weight, of soil particles finer than the No. 200 sieve (silt and clay sized particles). Soil particles finer than 75 microns were flushed through a No. 200 sieve using water. The coarse materials retained on the No. 200 sieve were dried to obtain their dry weight. The dry weight of materials retained on the No. 200 sieve was compared to the dry weight of the total test specimen. The difference in weight, expressed as a percentage of the pre-wash weight, is designate as the percentage of "fines" (silt and clay particles). The results are plotted on the Grain Size Distribution Test Reports.

Ed Johnson Memorial Park
Chattanooga, Tennessee
S&ME Project No. 1281-19-063

Laboratory Test Results Summary

Boring No.	Sample Type	Sample Depth (ft)	Natural Moisture Content (%)	Atterberg Limits			Percent Finer than No. 200 Sieve	Wet Unit Weight (pcf)	Wet Unit Weight (pcf)
				LL	PL	PI			
B-1	SPT	1 – 2½	23.2%						
		3½ - 5	19.2%	60	21	39			
		6 – 7½	16.0%						
		8½ - 10	21.4%						
		13½ - 15	19.8%						
		18½ - 20	21.0%						
		23½ - 25	29.9%						
		28½ - 30	28.5%	68	24	44			
		33½ - 35	30.2%						
		38½ - 40	38.3%						
B-1A	UD	20 - 22 22 - 24	30.2%	72	24	48	58%	122.8	94.3

SPT – Standard Penetration Test Sample

UD – Undisturbed Shelby Tube Sample

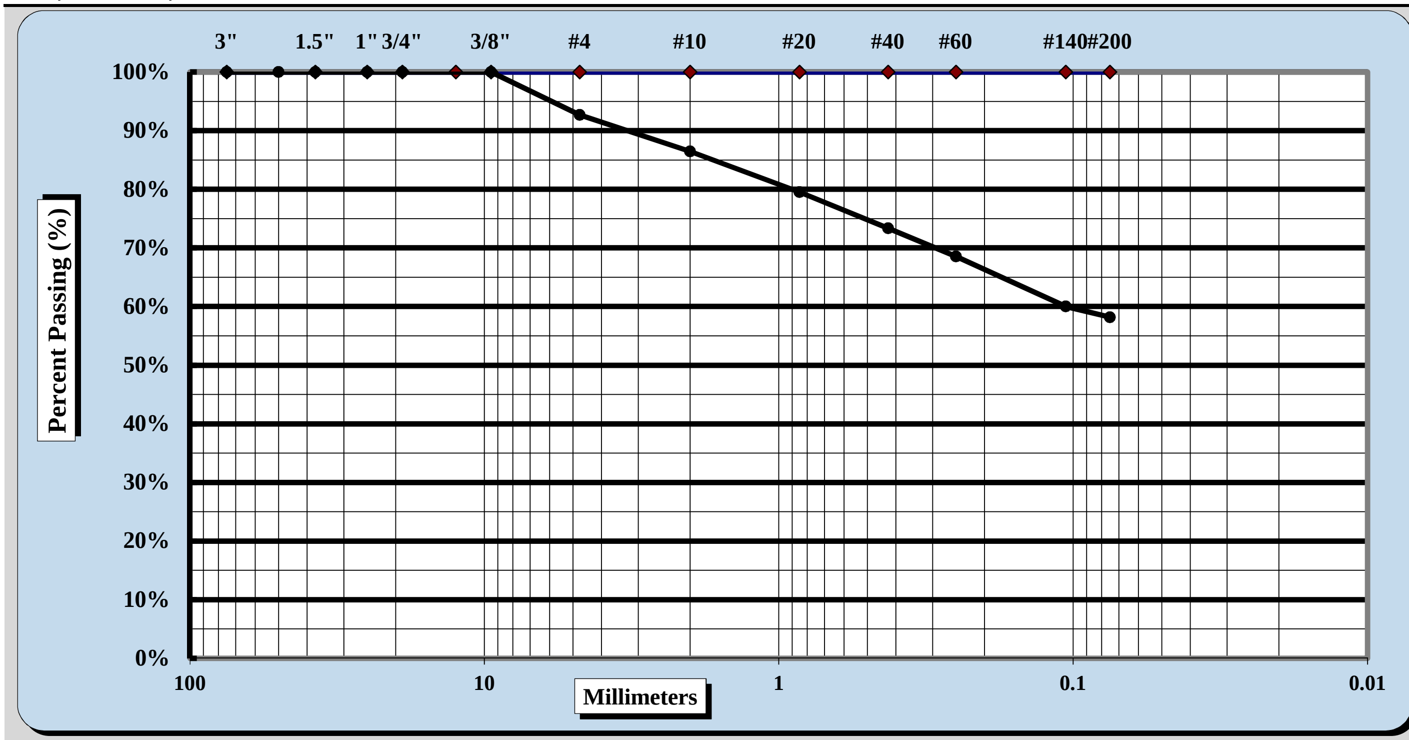
SIEVE ANALYSIS OF SOILS

ASTM D 422

S&ME, Inc. - Lexington: 2020 Liberty Road, Suite 105, Lexington, KY 40505

Project #:	1281-19-063	Report Date:	08/30/19
Project Name:	Ed Johnson Memorial Park	Test Date(s):	08/27/19 - 08/29/19
Client Name:	Ross/Fowler Landscape Architecture		
Client Address:	5103 Kingston Pike, Knoxville, Tennessee 37919		
Location: B-1	Type: UD	Sample Date:	08/20/19
		Depth (ft.):	20.0 - 24.0

Sample Description: Yellowish red Clayey gravel with sand with chert **GC**



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Nom. Maximum Particle Size	3/8"	Coarse Sand	6.2%	Fine Sand	15.2%
Gravel	7.3%	Medium Sand	13.1%	Silt & Clay	58.2%
Liquid Limit	72	Plastic Limit	24	Plastic Index	48
				Moisture Content	30.2%
Coarse Sand	6.2%	Medium Sand	13.1%	Fine Sand	15.2%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☒
Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

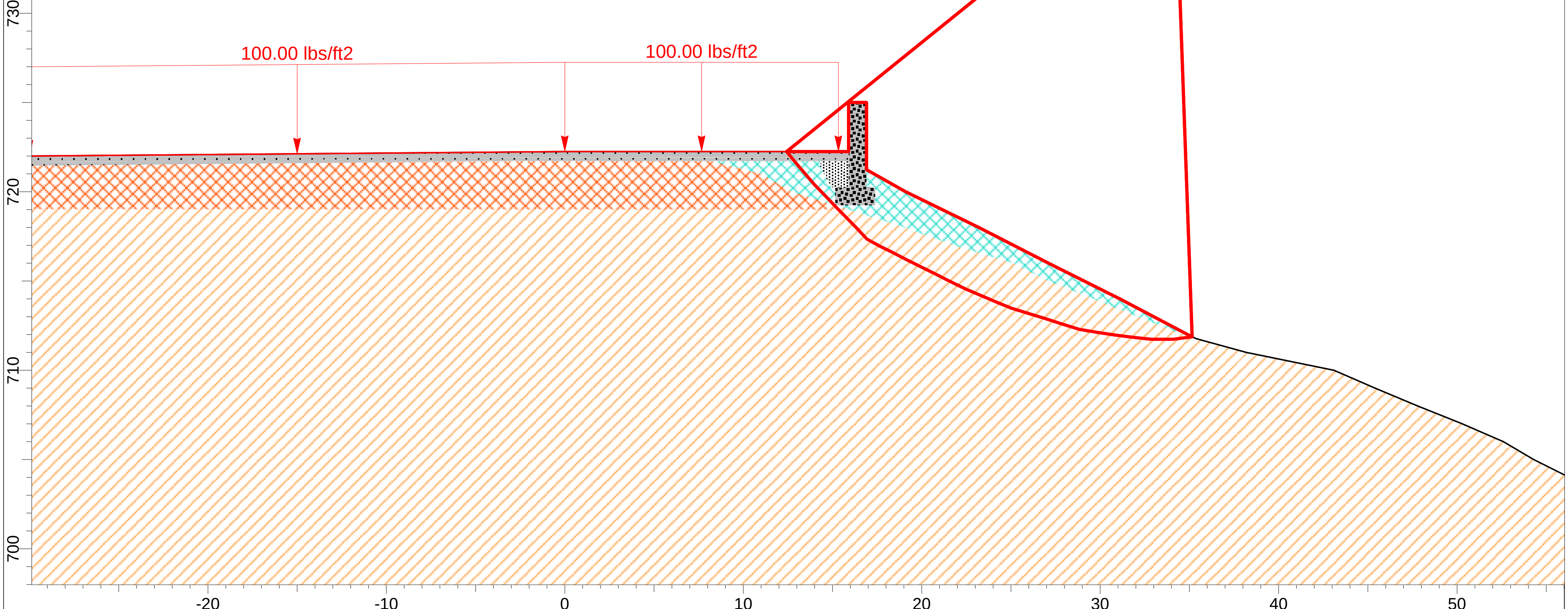
Notes / Deviations / References: * Sieve analysis was performed on the portion passing the 3/8 in. sieve.
Approximately 28% was retained on the 3/8 in. sieve.

Jacob Folsom	*Jacob Folsom*	Associate Project Manager	9/3/2019
Technical Responsibility	*Signature*	*Position*	*Date*

Appendix IV

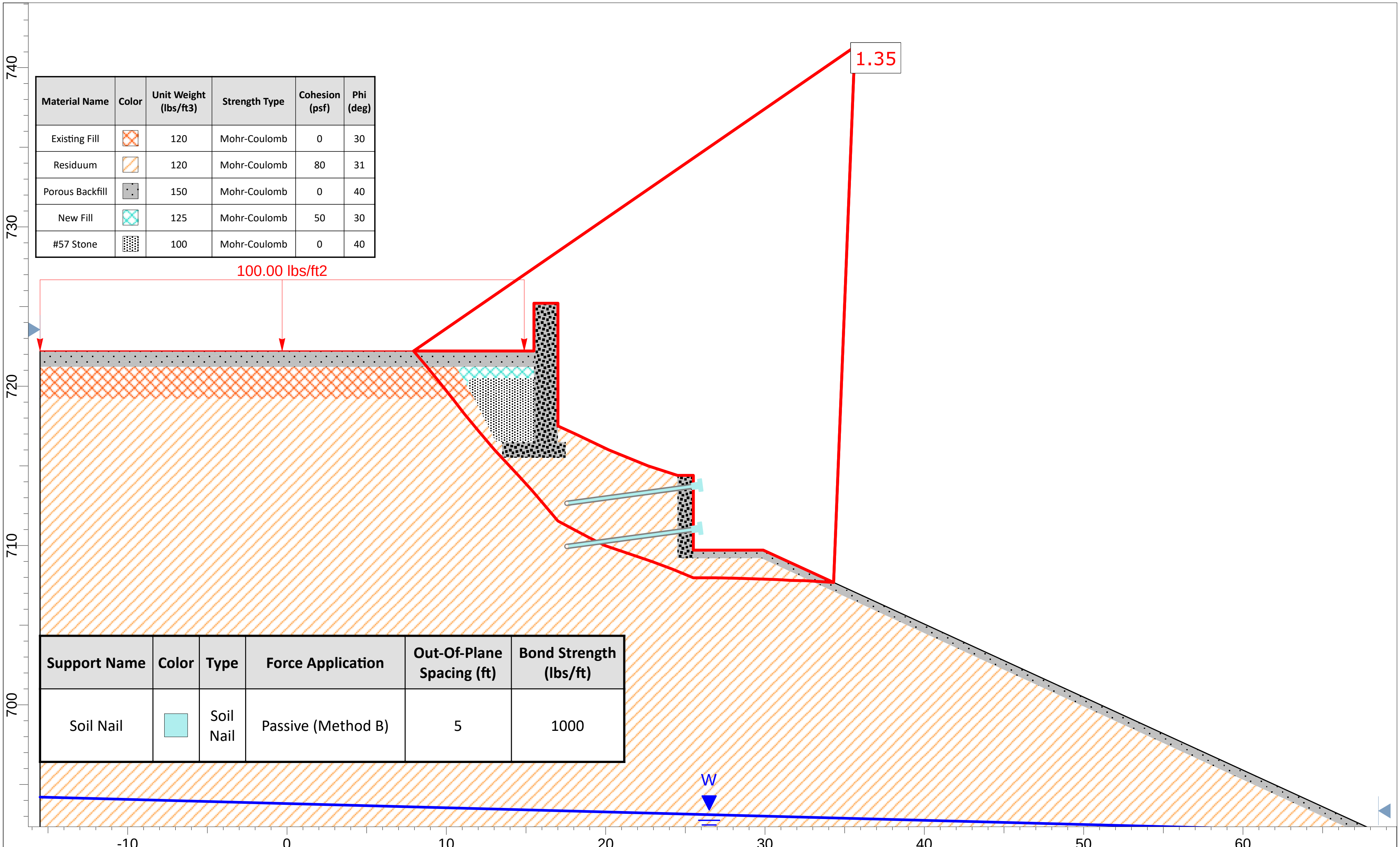
Global Stability Analysis Results

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Existing Fill		120	Mohr-Coulomb	0	30
Residuum		120	Mohr-Coulomb	80	31
Porous Backfill		150	Mohr-Coulomb	0	40
New Fill		125	Mohr-Coulomb	50	30
#57 Stone		100	Mohr-Coulomb	0	40



Project	Ed Johnson Memorial Park		
Analysis	Effective Stress Analysis	Description	Cross-Section A-A'
Drawn By	D. Reed	Project Number	1281-19-063
Company	S&ME	Figure	3
Location	Chattanooga, Tennessee	File Name	Ed Johnson Park.slmd
Date	9/9/2019		

SLIDEINTERPRET 8.02

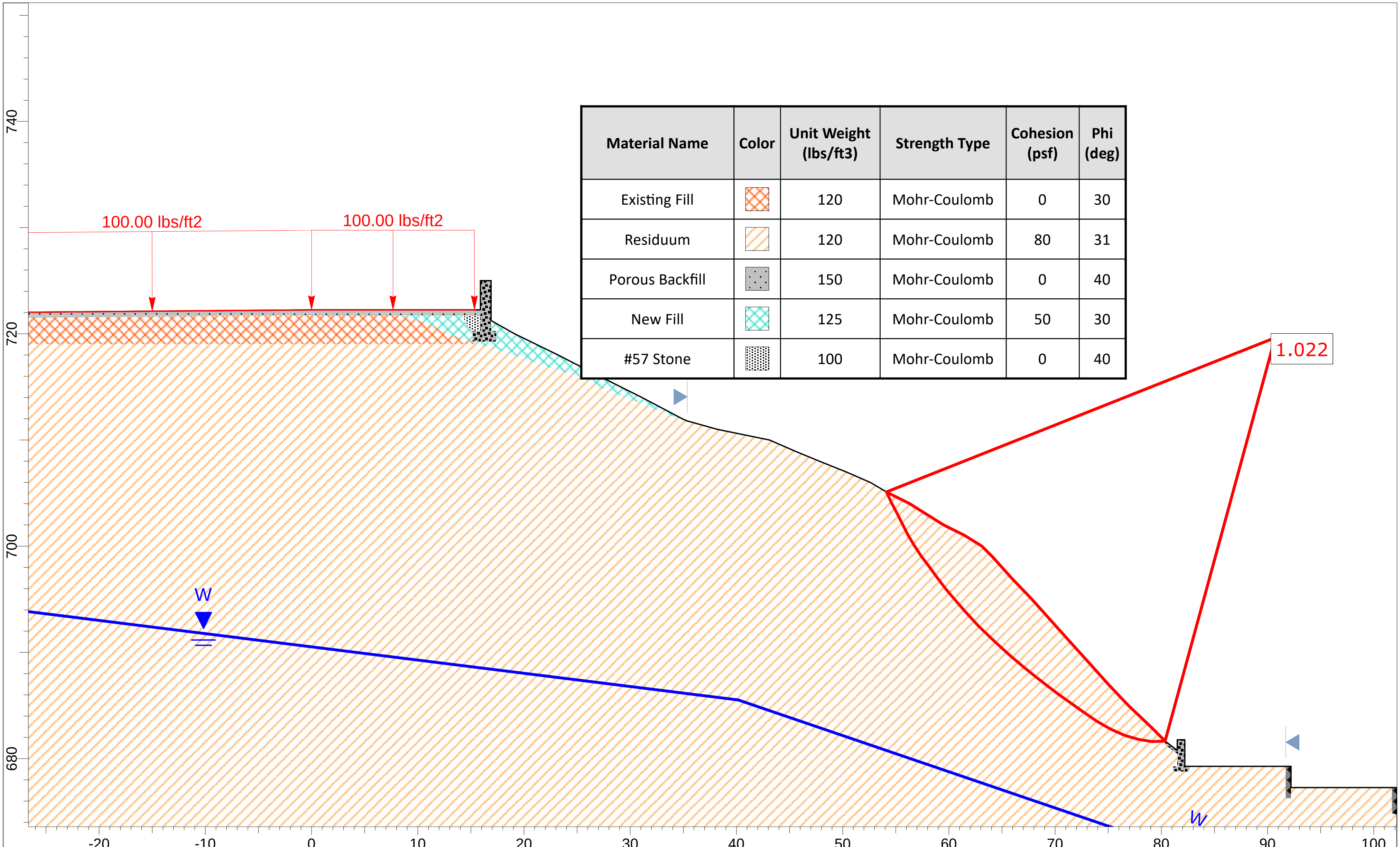


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Existing Fill		120	Mohr-Coulomb	0	30
Residuum		120	Mohr-Coulomb	80	31
Porous Backfill		150	Mohr-Coulomb	0	40
New Fill		125	Mohr-Coulomb	50	30
#57 Stone		100	Mohr-Coulomb	0	40

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (ft)	Bond Strength (lbs/ft)
Soil Nail		Soil Nail	Passive (Method B)	5	1000

Project	Ed Johnson Memorial Park		
Analysis	Effective Stress Analysis	*Description*	Cross-Section B-B'
Drawn By	D. Reed	*Project Number*	1281-19-063
Company	S&ME	*Figure*	4
Location	Chattanooga, Tennessee	*File Name*	Ed Johnson Park.slmd
Date	9/9/2019		

SLIDEINTERPRET 8.02



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Existing Fill		120	Mohr-Coulomb	0	30
Residuum		120	Mohr-Coulomb	80	31
Porous Backfill		150	Mohr-Coulomb	0	40
New Fill		125	Mohr-Coulomb	50	30
#57 Stone		100	Mohr-Coulomb	0	40

Project	Ed Johnson Memorial Park		
Analysis	Effective Stress Analysis	*Description*	Bottom Slope at Riverside Drive
Drawn By	D. Reed	*Project Number*	1281-19-063
Company	S&ME	*Figure*	5
Location	Chattanooga, Tennessee	*File Name*	Ed Johnson Park.slmd
Date	9/9/2019		

SLIDEINTERPRET 8.02

Appendix V

Important Information about Your Geotechnical Engineering Report

Important Information About Your
Geotechnical Engineering Report

Variations in subsurface conditions can be a principal cause of construction delays, cost overruns and claims. The following information is provided to assist you in understanding and managing the risk of these variations.

Geotechnical Findings Are Professional Opinions

Geotechnical engineers cannot specify material properties as other design engineers do. Geotechnical material properties have a far broader range on a given site than any manufactured construction material, and some geotechnical material properties may change over time because of exposure to air and water, or human activity.

Site exploration identifies subsurface conditions at the time of exploration and only at the points where subsurface tests are performed or samples obtained. Geotechnical engineers review field and laboratory data and then apply their judgment to render professional opinions about site subsurface conditions. Their recommendations rely upon these professional opinions. Variations in the vertical and lateral extent of subsurface materials may be encountered during construction that significantly impact construction schedules, methods and material volumes. While higher levels of subsurface exploration can mitigate the risk of encountering unanticipated subsurface conditions, no level of subsurface exploration can eliminate this risk.

Scope of Geotechnical Services

Professional geotechnical engineering judgment is required to develop a geotechnical exploration scope to obtain information necessary to support design and construction. A number of unique project factors are considered in developing the scope of geotechnical services, such as the exploration objective; the location, type, size and weight of the proposed structure; proposed site grades and improvements; the construction schedule and sequence; and the site geology.

Geotechnical engineers apply their experience with construction methods, subsurface conditions and exploration methods to develop the exploration scope. The scope of each exploration is unique based on available project and site information. Incomplete project information or constraints on the scope of exploration increases the risk of variations in subsurface conditions not being identified and addressed in the geotechnical report.

Services Are Performed for Specific Projects

Because the scope of each geotechnical exploration is unique, each geotechnical report is unique. Subsurface conditions are explored and recommendations are made for a specific project. Subsurface information and recommendations may not be adequate for other uses. Changes in a proposed structure location, foundation loads, grades, schedule, etc. may require additional geotechnical exploration, analyses, and consultation. The geotechnical engineer should be consulted to determine if additional services are required in response to changes in proposed construction, location, loads, grades, schedule, etc.

Geo-Environmental Issues

The equipment, techniques, and personnel used to perform a geo-environmental study differ significantly from those used for a geotechnical exploration. Indications of environmental contamination may be encountered incidental to performance of a geotechnical exploration but go unrecognized. Determination of the presence, type or extent of environmental contamination is beyond the scope of a geotechnical exploration.

Geotechnical Recommendations Are Not Final

Recommendations are developed based on the geotechnical engineer's understanding of the proposed construction and professional opinion of site subsurface conditions. Observations and tests must be performed during construction to confirm subsurface conditions exposed by construction excavations are consistent with those assumed in development of recommendations. It is advisable to retain the geotechnical engineer that performed the exploration and developed the geotechnical recommendations to conduct tests and observations during construction. This may reduce the risk that variations in subsurface conditions will not be addressed as recommended in the geotechnical report.