# PARADIGM OFFICE BUILDING

A TRACT OF LAND BEING PROPOSED LOT 3 OF SUNSET RIDGE AT MANCHESTER, PB 363 PG 393, BEING PART OF THE SOUTHEAST QUARTER OF SECTION 28, TOWNSHIP 45 NORTH, RANGE 5 EAST ST. LOUIS COUNTY, MISSOURI

# SITE IMPROVEMENT PLANS

### LEGEND

EXISTING CONTOURS	120
PROPOSED CONTOURS	120
EXISTING SANITARY SEWERS	=====
EXISTING STORM SEWERS	=====
PROPOSED SANITARY SEWERS	<u> </u>
PROPOSED STORM SEWERS	
EXISTING RIGHT-OF-WAY	
PROPOSED RIGHT-OF-WAY	
CENTERLINE	
EASEMENT	
NON-REINFORCED CONCRETE PAVEMENT	
REINFORCED CONCRETE PAVEMENT	
EXISTING SPOT ELEVATION	+ EX. 120.15
PROPOSED SPOT ELEVATION	± <u>120.10</u>
SWALE	<del></del>
TO BE REMOVED	T.B.R.
TO BE REMOVED & RELOCATED	T.B.R. & R.
TO BE USED IN PLACE	U.I.P.
BACK OF CURB	B.C.
FACE OF CURB	F.C.
TRASH ENCLOSURE	$\boxtimes$
EXISTING LIGHT STANDARD	<b>\$</b>
GAS MAIN	G
WATER MAIN	w
UNDERGROUND TELEPHONE	— т —
FIRE HYDRANT	***
POWER POLE	<b>₽</b>
HAY BALE	oxtimes
SILTATION CONTROL	_

### **ABBREVIATIONS**

C.O. – CLEANOUT	
DB. – DEED BOOK	
E – ELECTRIC	
FL - FLOWLINE	
FT - FEET	
FND. – FOUND	
G – GAS	
LOC LOCATOR NUMBER	
M.H. – MANHOLE	
N/F - NOW OR FORMERLY	
PB. – PLAT BOOK	
PG. – PAGE	
P.V.C POLYVINYL CHLORIDE PIPE	
R.O.W RIGHT-OF-WAY	
R.C.P REINFORCED CONCRETE PIPE	
SQ. — SQUARE	
T — TELEPHONE CABLE	
V.C.P VETRIFIED CLAY PIPE	
W – WATER	
(86'W) - RIGHT-OF-WAY WIDTH	
(R) — REMOVED	
(DND) - DO NOT DISTURB	
(TBR) — TO BE REMOVED	
(TBR&R)- TO BE REMOVED & REPLACED	

# M.S.D. BENCHMARK

BENCHMARKNAVD88 Elev = 586.07 NGVD29
Cut "U" on the top southeast edge of a round concrete base
for traffic signal mast situated on a traffic island at the
northwest corner of the intersection of Des Peres Road with
Corporate Hill Drive from the east side and the ramps to and
from Westbound Manchester Road on the west side; roughly 29
feet west of the centerline of Des Peres Road, 25 feet north
of the centerline of the combined Manchester ramps, and 330
feet more or less north of the northern edge of the bridge for
Westbound Manchester Road over Des Peres Road.

# LOCATION MAP

# PERTINENT DATA:

SITE ACREAGE	=	0.916 ACRES ±
OWNER	=	LOCKWOOD DPR, LLC
LOCATOR No.	=	220530325
ZONING	=	MXD (ORD. NO. 27040)
FIRE DISTRICT	=	WEST COUNTY EMS & FIRE
SCHOOL DISTRICT	=	PARKWAY SCHOOL DISTRICT
SEWER DISTRICT	=	METROPOLITAN ST. LOUIS SEWER DIST
WATER SERVICE	=	MISSOURI-AMERICAN WATER COMPAN
GAS SERVICE	=	SPIRE
ELECTRIC SERVICE	=	AMEREN UE ELECTRIC COMPANY
PHONE SERVICE	=	AT&T
STREET ADDRESS	=	12818 DAYLIGHT CIRCLE
ZIP CODE	=	63131
WUNNENBURG MAP	=	PG. 34 GRID W-24

### SPECIAL INSPECTOR FOR SWPPP INSPECTION

JOSEPH FISCHER: 314.581.0414

# **EMERGENCY CONTACT**

JIM REDING: 314.966.3400

CONTRACTOR NOTE: PRIOR TO OBTAINING A CONSTRUCTION PERMIT FROM THE METROPOLITAN ST. LOUIS SEWER DISTRICT, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE THE DISTRICT WITH A COPY OF AN EXECUTED CERTIFICATE OF INSURANCE INDICATING THAT THE PERMITTEE HAS OBTAINED AND WILL CONTINUE TO CARRY COMMERCIAL GENERAL LIABILITY AND COMPREHENSIVE AUTO LIABILITY INSURANCE. THE REQUIREMENTS AND LIMITS SHALL BE AS STATED IN THE "RULES AND REGULATIONS AND ENGINEERING DESIGN REQUIREMENTS FOR SANITARY AND STORMWATER DRAINAGE FACILITIES", SECTION 10.090 (ADDENDUM).

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C-2.1	DEMOLITION PLAN
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C-8.2	BMP DRAINAGE ARAE MAP
L1	LANDSCAPE PLAN
L2	BIO-RETENTION PLANTING PLAN

RATE TO BE AT LEAST EQUAL TO THE MISSOURI PREVAILING WAGE RATE AT THE TIME OF CONSTRUCTION START. AN AFFIDAVIT CERTIFYING THATTHE MISSOURI PREVAILING WAGE RATE ALTERATION, OR RECONSTRUCTION OF EXISTING MSD FACILITIES IS REQUIRED PRIOR TO MSD CONSTRUCTION APPROVAL OF THIS PROJECT.

### ATTENTION SEWER CONTRACTOR:

FOR SEWER PIPE (STORM, SANITARY AND COMBINED) WITH A DESIGN GRADE LESS THAN ONE PERCENT (1□), VERIFICATION OF THE PIPE GRADE WILL BE REQUIRED FOR EACH INSTALLED DOCUMENTATION VERIFYING THAT THE AS-BUILT PIPE GRADE MEETS THE DESIGN GRADE THROUGH THE SUBMITTAL OF SIGNED CUT SHEETS TO THE MSD INSPECTOR UPON REQUEST.

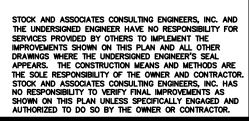
FIELD SURVEYED VERIFICATION MUST BE MADE UNDER THE DIRECTION OF A LICENSED LAND SURVEYOR OR REGISTERED ENGINEER. THE CONTRACTOR WILL BE REQUIRED TO REMOVE AND REPLACE ANY SEWER REACH HAVING AN AS-BUILT GRADE WHICH IS FLATTER THAN THE DESIGN GRADE BY MORE THAN 0.1□. SEWERS WITH GRADE GREATER THAN THE DESIGN SLOPE MAY BE LEFT IN PLACE, PROVIDED NO OTHER SEWER GRADE IS REDUCED BY THIS VARIANCE IN THE AS-BUILT GRADE.

MSD ALSO RESERVES THE RIGHT TO REQUIRE THE CONTRACTOR TO REMOVE AND REPLACE ANY SEWER (AT ANY TIME PRIOR TO CONSTRUCTION APPROVAL) FOR WHICH THE AS-BUILT GRADE DOES NOT COMPLY WITH THE GRADE TOLERANCE STATED IN THE ABOVE PARAGRAPH.

THE SEWER CONTRACTOR SHALL BE RESPONSIBLE FOR ANY COSTS ASSOCIATED WITH THE FIELD VERIFICATION OF THE SEWER GRADE, OR REMOVAL AND REPLACEMENT OF THE SEWER PIPE OR ASSOCIATED APPURTENANCES.

PROJECT DISTURBANCE = 0.916 ACRES PROJECT RUNOFF DIFFERENTIAL = □ 0.70 CFS

Any future land disturbance and/or increase in impervious area on this site requires additional stormwater management per MSD regulations in place at



SHEET TITLE:

PREPARED FOR: PARADIGM FINANCIAL ADVISORS, LLC 12231 MANCHESTER ROAD DES PERES, MO 63131 P: (314) 966-3400 CONTACT: JAMES T, REDING, J.D., CTFA

UTILITY NOTE: UNDERGROUND FACILITIES, STRUCTURES AND UTILITIES HAVE BEEN PLOTTED FROM AVAILABLE SURVEYS, RECORDS AND INFORMATION, AND , THEREFORE DO NOT NECESSARILY REFLECT THE ACTUAL EXISTENCE, NON—EXISTENCE, SIZE, TYPE, NUMBER, OR LOCATION OF THESE FACILITIES, STRUCTURES AND UTILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE ACTUAL LOCATION OF ALL UNDERGROUND FACILITIES, STRUCTURES, AND UTILITIES, EITHER SHOWN OR NOT SHOWN ON THESE PLANS. THE UNDERGROUND FACILITIES, STRUCTURES, AND UTILITIES SHALL BE LOCATED IN THE FIELD PRIOR TO ANY GRADING, EXCAVATION OR CONSTRUCTION OF IMPROVEMENTS. THESE PROVISIONS SHALL IN NO WAY ABSOLVE ANY PARTY FROM COMPLYING WITH THE UNDERGROUND FACILITY SAFETY AND DAMAGE PREVENTION ACT, CHAPTER 319 RSMo... **REVISIONS:** 

STOCK

FIRM PANEL: 29189C0302K . **"** MO-00

SHEET

### GENERAL NOTES:

- 1.) ALL UTILITIES SHOWN HAVE BEEN LOCATED BY THE ENGINEER FROM AVAILABLE RECORDS. THEIR LOCATION SHOULD BE CONSIDERED APPROXIMATE. THE CONTRACTOR HAS THE RESPONSIBILITY TO NOTIFY ALL UTILITY COMPANIES, PRIOR TO CONSTRUCTION, TO HAVE EXISTING UTILITIES FIELD LOCATED.
- 2.) GRADING CONTRACTOR SHALL INSTALL SILTATION CONTROL PRIOR TO STARTING THE GRADING. ADDITIONAL SILTATION CONTROL DEVICES SHALL
- BE INSTALLED AS DIRECTED BY ST. LOUIS COUNTY. 3.) ALL MATERIALS AND METHODS OF CONSTRUCTION TO MEET THE CURRENT STANDARDS AND SPECIFICATIONS OF ST. LOUIS COUNTY AND THE
- 4.) GRADING & STORM WATER PER 2009 M.S.D. STANDARD CONSTRUCTION SPECIFICATIONS AND DETAILS AND STANDARD SPECIFICATIONS.
- 5.) ALL GRADED AREAS SHALL BE PROTECTED FROM EROSION BY EROSION CONTROL DEVICES AND/OR SEEDING AND MULCHING.

METROPOLITAN ST. LOUIS SEWER DISTRICT (MSD).

- 6.) ALL FILLS AND BACKFILLS SHALL BE MADE OF SELECTED EARTH MATERIALS, FREE FROM BROKEN MASONRY, ROCK, FROZEN EARTH, RUBBISH, ORGANIC MATERIAL AND DEBRIS. SEE GEOTECHNICAL REPORT LOCATED IN THIS PLAN SET, SHEETS C2.1-C2.5.
- 7.) GRADING CONTRACTOR SHALL KEEP EXISTING OFFSITE ROADWAYS CLEAN OF MUD AND DEBRIS AT ALL TIMES.
- 8.) NO GRADE SHALL EXCEED 3:1 SLOPE, EXCEPT AS NOTED AND APPROVED PER PLAN.
- 9.) ALL LANDSCAPE/SOD AND/OR SEED AREAS TO BE FILLED WITH A

IMMEDIATELY SEEDED OR SODDED.

ROADWAY AND DRIVEWAY CONDITIONS

- 10.) ALL LANDSCAPED AREAS DISTURBED BY OFF-SITE WORK SHALL BE
- 11.) ADEQUATE TEMPORARY OFF-STREET PARKING FOR CONSTRUCTION EMPLOYEES SHALL BE PROVIDED. PARKING ON NON-SURFACED AREAS SHALL BE PROHIBITED IN ORDER TO ELIMINATE THE CONDITION WHEREBY MUD FROM CONSTRUCTION AND EMPLOYEES'
- 12.) ALL PUBLIC SEWER CONSTRUCTION MUST CONFORM TO 2009 M.S.D. "STANDARD CONSTRUCTION SPECIFICATIONS AND DETAILS"

VEHICLES IS TRACKED ONTO THE PAVEMENT CAUSING HAZARDOUS

- 13.) THE UNDERGROUND UTILITIES SHOWN HEREIN HAVE BEEN SHOWN FROM SURVEY AND RECORD INFORMATION AND DO NOT NECESSARILY REFLECT THE ACTUAL EXISTENCE, NONEXISTENCE, SIZE, TYPE, NUMBER OR LOCATION OF THESE OR OTHER UTILITIES. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THEACTUAL LOCATION OF ALL UTILITIES, SHOWN OR NOT SHOWN, AND SAID UTILITIES SHALL BE LOCATED IN THE FIELD PRIOR TO ANY GRADING, EXCAVATION OR CONSTRUCTION OF IMPROVEMENTS. THESE PROVISIONS SHALL IN NO WAY ABSOLVE ANY PARTY FROM COMPLYING WITH THE UNDERGROUND FACILITY SAFETY AND DAMAGE PREVENTION ACT, CHAPTER 319, RSMO.
- 14.) CLEARING TECHNIQUES THAT RETAIN EXISTING VEGETATION TO THE MAXIMUM EXTENT PRACTICABLE SHALL BE USED AND THE TIME PERIOD FOR DISTURBED AREAS TO BE WITHOUT VEGETATIVE COVER SHALL
- BE MINIMIZED TO THE EXTENT PRACTICAL. 15.) AREAS SHALL BE SEEDED AFTER CLEARING AND GRUBBING WHEN NO ACTIVITY WILL OCCUR WITHIN THIRTY DAYS.
- 16.) ALL OFFSITE PROPERTY OWNERS SHALL BE GIVEN 48 HOURS NOTICE IN ADVANCE
- 17.) ANY DISTURBED OFF SITE PROPERTY (i.e. BUSHES, FENCES, MAILBOXES, etc..) SHALL
- BE REPLACED IN KIND, AT THE DEVELOPER'S EXPENSE.
- 18.) ALL NEW UTILITY FEEDS TO THE BUILDING AND RELOCATED PUBLIC UTILITIES WILL BE LOCATED UNDERGROUND.
- 19.) ALL UTILITIES, OUTDOOR STORAGE, AND MECHANICAL EQUIPMENT SHALL BE SCREENED IN ACCORDANCE WITH ST. LOUIS COUNTY ZONING CODE.
- 20.) ALL SIDEWALKS TO BE CONSTRUCTED TO ST. LOUIS COUNTY ADA STANDARDS. 21.) DRIVEWAYS AND ENTRANCES PER ST. LOUIS COUNTY STANDARDS.

# M.A.W.C. WATER LINE NOTES

1. The service connection will require the plumber to purchase a tap at least two weeks prior to when he needs it. As a general rule Missouri American Water Co. makes the taps in the order in which they are received, and cannot guarantee two weeks during a busy time of the year. Once the tap is purchased the plumber has to schedule it with the District Supervisor. The plumber has to have all required information, plus Missouri American Water requires two sets of a site plans showing the proposed layout and valving. Along with this Missouri American Water Co. can insure that they are able to provide the required flow. The only fee is the actual cost of the tap itself. The tapping fee is different for every combination of pipe size and tap size and is based on previous year's actual

2. The footing of the building must be in before Missouri American Water Co. will make a tap. Missouri American Water does not make taps for vacant lots or previous to substantial building construction.

3. A minimum Class 52 ductile iron pipe, conforming to applicable AWWA standards, is required on any service line that is 4" or greater in size before a meter. Copper piping is required for smaller services from the main through the meter box. For services smaller than 4" in size, flexible Type "K" copper is required through the stop box. After the stop box, flexible or rigid Type "K" or "I" copper is required to four feet beyond the meter box. For larger services, ductile iron pipe should run from the main to a point at least six feet beyond the meter box. From the building foundation, copper or ductile iron pipe must extend a minimum of ten feet outside the building wall. Once a fire line is past a detector check meter it is considered to be metered and any materials can be used that comply with the local plumbing codes (C-900 PVC is the minimum). A "Master Service" would not metered.

4. The joints on copper service lines (excluding joints on pre-purchased "meter setters" shall be either flared, compression, or silver soldered 5. Existing services will have to be destroyed at the main unless they are being

reused. Permission to reuse a service (either permanently or temporarily) must come

6. Missouri American Water does not own, operate, or maintain service lines. As a general rule St. Louis Co. Water does not run a water main extension on a project which can be served by a service line.

from the District Supervisor.

7. Missouri American Water Co. requires a detector check valve on all fire protection lines for sprinkler systems. They also require a detector check valve on fire hydrants, with the possible exception of hydrants that are immediately adjacent to and visible from public streets. Missouri American Water also requires valves on both fire and domestic lines after they split from a combined service. Thus a typical split service would have valves on both fire and domestic lines after a tee. Of course this would also require a valve on a line going to a fire hydrant that came off of a "Master Water Service".

8. All means and methods of construction shall be in accordance with M.A.W.C. construction specifications, current addition.

### SANITARY SEWER NOTES

- 1.) ALL MEANS AND METHODS OF CONSTRUCTION FOR SANITARY SEWERS SHALL BE IN ACCORDANCE WITH M.S.D. "STANDARD CONSTRUCTION SPECIFICATIONS FOR SEWERS AND DRAINAGE FACILITIES", 2009.
- 2.) 6" AND 8" LATERAL JOINTS TO CONFORM TO A.S.T.M. STANDARD S.D.R.-35 AND C-900 THICKWALL COMPRESSION JOINT FOR P.V.C.
- 3.) ALL LATERAL SEWER CONSTRUCTION METHODS TO CONFORM TO LATEST STANDARDS AND SPECIFICATIONS OF THE ST. LOUIS COUNTY PLUMBING CODE. ALL LATERALS SHALL HAVE A MINIMUM SLOPE OF 2%.
- 4.) ALL TRENCHES UNDER AREAS TO BE PAVED SHALL BE GRANULARLY FILLED WITH 3/4" CRUSHED LIMESTONE. BACKFILL SHALL BE PLACED IN ACCORDANCE WITH METROPOLITAN ST. LOUIS SEWER DISTRICT
- 5.) CONTRACTOR TO START LAYING PIPE AT DOWNSTREAM MANHOLE AND WORK UPSTREAM.
- 6.) TAILSTAKE ELEVATIONS ARE SHOWN ON SITE UTILITY PLAN.
- 7.) CLEANOUTS SHALL BE LOCATED AT ALL HORIZONTAL AND VERTICAL CHANGES IN DIRECTION OF FLOW OF HOUSE LATERALS AND ANY SANITARY LATERAL OF 100 FEET OR LONGER.
- 8.) TYPE "C" BEDDING PER M.S.D. STANDARDS REQUIRED FOR PIPES IN
- 9.) VERTICAL CLEARANCE BETWEEN SEWER AND WATER MAINS SHALL BE A MINIMUM OF 2' - 0".
- 10.) ALL TRENCH BACKFILLS UNDER PAVEMENT WITHIN THE PUBLIC RIGHT-OF-WAY SHALL BE GRANULAR BACKFILLED. TRENCH BACKFILLS UNDER PAVED AREAS, OUTSIDE OF PUBLIC RIGHT-OF-WAY SHALL BE GRANULAR BACKFILL IN LIEU OF THE EARTH BACKFILL COMPACTED TO 90 PERCENT OF THE MODIFIED AASHTO T-180 COMPACTION TEST A.S.T.M. D-1557.
- 11.) JETTING IS NOT AN ACCEPTABLE METHOD OF ACHIEVING BACKFILL COMPACTION. ALL BACKFILL MATERIAL SHALL BE MECHANICALLY COMPACTED TO AT LEAST 95 PERCENT OF THE MATERIAL'S STANDARD PROCTOR MAXIMUM DRY DENSITY.
- 12.) MAINTENANCE OF THE SEWERS DESIGNATED AS "PUBLIC" SHALL BE THE RESPONSIBILITY OF THE METROPOLITAN ST. LOUIS SEWER DISTRICT UPON DEDICATION OF THE SEWERS TO THE DISTRICT.
- 13.) SOILS ENGINEER WILL VERIFY THAT ALL COMPRESSIBLE MATERIAL HAS BEEN REMOVED PRIOR TO FILL PLACEMENT AND THAT FILLED AREAS INCLUDING TRENCH BACKFILLS, UNDER BUILDINGS, PROPOSED SANITARY AND STORM SEWER LINES, AND PAVED AREAS CONSTRUCTED ABOVE ORIGINAL GRADE, HAS BEEN COMPACTED TO 90% OF "MODIFIED PROCTOR." FILL IS TO BE PLACED IN A MAXIMUM OF 9" LIFTS. TESTS SHALL BE TAKEN AT A MAXIMUM OF 50 FOOT INTERVALS ALONG THE ROUTE OF THE PIPE, AT A MAXIMUM OF 2 FEET VERTICALLY, AND LATERALLY ON EACH SIDE OF THE PIPE AT A DISTANCE EQUAL TO THE DEPTH OF FILL OVER THE PIPE. A COPY OF THESE RESULTS WILL BE SUBMITTED TO MSD PRIOR TO CONSTRUCTION.
- 14.) SEPTIC TANKS SHALL BE ABANDONED IN ACCORDANCE WITH THE METROPOLITAN ST. LOUIS SEWER DISTRICT STANDARD CONSTRUCTION SPECIFICATIONS FOR SEWER AND DRAINAGE FACILITIES, 2009.
- 15.) WHEN AN EXTERNAL GREASE TRAP IS REQUIRED, GREASE TRAP TO BE LOCATED IN AN ACCESSIBLE LOCATION FOR MSD INSPECTION. GREASE TRAP TO PROVIDE MEANS FOR VISUAL INSPECTION FROM ABOVE FOR BOTH THE INFLUENT AND EFFLUENT SIDES. MSD SAMPLING MANHOLE TO BE LOCATED ON PRIVATE LATERAL IN AN ACCESSIBLE LOCATION FOR MSD SAMPLING. SAMPLING MANHOLE SHALL BE LOCATED DOWNSTREAM OF GREASE TRAP AND ALL OTHER COMMERCIAL SANITARY LATERALS TO FACILITATE MSD SAMPLING. GREASE TRAPS AND SAMPLING MANHOLES SHALL BE SHOWN ON THE PLANS AND SHALL NOT BE LOCATED IN DRIVE-THRU LANES OR WITHIN PARKING SPACES.
- 16.) STRUCTURES NOTED TO BE ADJUSTED TO FINISH GRADE SHALL BE ADJUSTED BY EITHER REMOVAL OR PLACEMENT OF GRADE RINGS, BRICK WORK, OR MORTAR BEDDING BY SUCH METHODS AS APPROVED BY M.S.D. "STANDARD CONSTRUCTION SPECIFICATIONS", 2009.
- 17.) ALL MANHOLE FRAMES AND COVERS SHALL BE M.S.D. STANDARD FRAME
- 18.) THE REMOVAL AND REPLACEMENT, OR REHABILITION OF THE EXISITNG STRUCTURES(s) WILL BE DETERMINED BY THE MSD FIELD INSPECTOR. IF THE STRUCTURE IS DETERMINED TO REMAIN IN PLACE, THEN THE TOP SHALL BE ADJUSTED TO GRADE, IF NEEDED.
- 19.) PARTIAL REMOVAL OR CONVERSION OF A STRUCTURE: THE PARTIAL REMOVAL, REPLACEMENT, AND CONVERSION OF THE EXISTING STRUCTURE(s) WILL BE DETERMINED BY THE MSD FIELD INSPECTOR. IF THE STRUCTURE IS DETERMINED TO REMAIN IN PLACE, AND THE TOP SECTION CAN BE CONVERTED AS PROPOSED AND STILL MEET MSD STANDARDS, THEN CONVERT AND ADJUST TO GRADE. OTHERWISE, THE ENTIRE STRUCTURE WILL BE REMOVED AND REPLACED WITH A NEW STRUCTURE.
- 20.) ANY ABANDONED SEWERS SHALL BE REMOVED OR COMPLETELY GROUT
- 21.) NOTE PIPE JOINTS WITH ADAPTERS AND COUPLINGS SHALL BE SUPPLIED AND INSTALLED WITH 311 STAINLESS STEEL NUT AND BOLT CLAMS (T-BOLT) CONFIGURATION; AND WITH STAINLESS STEEL SHEAR BANDS, BEING A MINIMUM TWELVE (12) MILS) (MSD STD. CONST SPECS, PT 2, SUBSECTION H11), WORM DRIVE HOSE CLAMPS AND CONCRETE BACKFILLING (CAUSTICITY) WILL NO LONGE R BE ALLOWED AT THESE JOINTS. GRANULAR BACKFILL SHOULD BE USED. IF FLOWABLE FILL IS REQUIRED, THE CONTRACTOR SHALL WRAP AND TAPE THE ADAPTERS AND COUPLINGS WITH A SIX (6) MIL POLYETHYLENE SHEET.
- 22.) TRENCH BACKFILL COMPACTION AND TESTING REQUIREMENTS: THE CONTRACTOR IS TO REFER TO PART 4, SECTION H OF THE METROPOLITAN ST. LOUIS SEWER DISTRICT. STANDARD CONSTRUCTION SPECIFICATIONS FOR SEWERS AND DRAINAGE FACILITIES, 2009 EDITION, TO ESTABLISH THE REQUIREMENTS FOR THE SPECIFIC TYPE OF
- BACKFILL BEING USED.
  23.) WHEN A STORM PIPE CROSSES OVER A NEW SANITARY SEWER AND THE VERTICAL CLEARANCE IS LESS THAN TWO (2) FEET, THE SANITARY SEWER MUST BE ENCASED IN CONCRÈTÉ THROUGH THE CROSSING AND FOR TEN LINEAL FEET EACH SIDE OF THE CROSSING.
- 24.) BACKFLOW PREVENTION WILL BE PROVIDED IN ACCORDANCE WITH COUNTY REQUIREMENTS. 25.) SWIMMING POOL BACKWASH FILTER MUST BE CONNECTED TO

PART 4 - PIPE SEWER CONSTRUCTION

AND THE FOLLOWING REPLACEMENT APPLIES:

SENTENCE AND THE FOLLOWING REPLACEMENT APPLIES:

DEPARTMENT OF NATURAL RESOURCES SPECIFICATIONS.

AFTER THE FIRST SENTENCE THE FOLLOWING ADDITION APPLIES:

THE SANITARY SEWER. DISCHARGE MUST NOT EXCEED FIFTY (50)

ADDITIONAL SEWER NOTES

ALL STORM AND SANITARY SEWER STRUCTURES AND APPURTENANCES TO BE DEDICATED TO MSD, OR TO BE PRIVATE UNDER MSD INSPECTION, SHALL CONFORM TO THE METROPOLITAN ST. LOUIS SEWER

SECTION B, PIPE FIELD TESTS, PARAGRAPH 2, REACH INTEGRITY TESTING - DELETE THE FIRST

DISTRICT, STANDARD CONSTRUCTION SPECIFICATIONS FOR SEWERS AND DRAINAGE FACILITIES, 2009.

THAT WILL INCLUDE STANDARD DETAILS SHOWN THEREIN, AND SHALL INCLUDE ALL SUBSEQUENT CHANGES

SOME RECENT CHANGES CONCERN PIPE FIELD TESTING AND PERFORMANCE, AND INCLUDE THE FOLLOWING:

ALL SANITARY AND COMBINED SEWERS SHALL SUSTAIN A MAXIMUM LEAKAGE LIMIT OF 100

THE MEASUREMENT OF LEAKAGE SHALL NOT EXCEED 100 GALLONS/INCH OF PIPE DIAMETER/MILE OF LINE/DAY, AS REQUIRED BY THE MISSOURI DEPARTMENT OF NATURAL RESOURCES SPECIFICATIONS.

: VACUUM TEST MUST BE PERFORMED PRIOR TO BACKFILLING AROUND THE MANHOLE UNLESS THE CONTRACTOR PROVIDES DOCUMENTATION FROM THE PRECAST MANHOLE MANUFACTURER STATING

SECTION B. PIPE FIELD TESTS, PARAGRAPH 4. MANHOLE TESTING, SUBPARAGRAPH a. VACUUM TESTING -

THAT THE MANHOLE MAY BE VACUUM TESTED AFTER BACKFILLING HAS TAKEN PLACE. TH CONTRACTOR MUST SUBMIT THIS DOCUMENTATION PRIOR TO BACKFILLING AROUND ANY MANHOLF

ECTION B, PIPE FIELD TESTS, PARAGRAPH 4, MANHOLE TESTING, SUBPARAGRAPH b, EXFILTRATION TESTING - DELETE THE SECOND SENTENCE, CONCERNING LEAKAGE LIMITS, AND THE FOLLOWING ADDITION

FOR EXFILTRATION TESTING, THE ALLOWABLE LEAKAGE LIMIT IS 100 GALLONS/INCH OF PIPE DIAMETER/MILE OF LINE/DAY WHEN THE AVERAGE HEAD ON THE TEST SECTION IS THREE FEET (3') OR

GALLONS/INCH OF PIPE DIAMETER/MILE OF LINE/DAY, AS REQUIRED BY THE MISSOURI

SECTION B, PIPE FIELD TESTS, PARAGRAPH 2, REACH INTEGRITY TESTING, SUBPARAGRAPH c, INFILTRATION/EXFILTRATION TESTING - DELETE THE SIXTH SENTENCE, CONCERNING LEAKAGE LIMITS,

### STORM SEWER NOTES

- 1.) ALL MEANS AND METHODS OF CONSTRUCTION FOR STORM SEWERS SHALL BE IN ACCORDANCE WITH M.S.D. "STANDARD CONSTRUCTION SPECIFICATIONS FOR SEWERS AND DRAINAGE FACILITIES", 2009.
- 2.) ALL CONCRETE SHALL BE REINFORCED, AND CONFORM TO A.S.T.M. DESIGNATION C76-80 CLASS III UNLESS NOTED.
- 3.) TYPE "C" BEDDING PER M.S.D. AND ST. LOUIS COUNTY STANDARDS IS
- REQUIRED FOR PIPES IN ROCK. 4.) ALL TRENCHES UNDER AREAS TO BE PAVED AND UNDER EXISTING PAVING
- ONLY. BACKFILL SHALL BE PLACED IN ACCORDANCE WITH M.S.D. AND ST. LOUIS COUNTY STANDARDS. 5.) ALL TRENCH BACKFILLS UNDER PAVEMENT WITHIN THE PUBLIC RIGHT-OF-WAY SHALL BE GRANULAR BACKFILLED. TRENCH BACKFILLS UNDER PAVED AREAS, OUTSIDE OF PUBLIC RIGHT-OF-WAY SHALL BE GRANULAR BACKFILL IN LIEU OF

THE EARTH BACKFILL COMPACTED TO 90 PERCENT OF THE MODIFIED AASHTO

95 PERCENT OF THE MATERIAL'S STANDARD PROCTOR MAXIMUM DRY DENSITY.

SHALL BE GRANULARLY FILLED WITH 3/4" MINUS CRUSHED LIMESTONE

- T-180 COMPACTION TEST A.S.T.M. D-1557. 6.) JETTING IS NOT AN ACCEPTABLE METHOD OF ACHIEVING BACKFILL COMPACTION. ALL BACKFILL MATERIAL SHALL BE MECHANICALLY COMPACTED TO AT LEAST
- 7.) FOR SEWER PIPE (STORM, SANITARY AND COMBINED) WITH A DESIGN GRADE LESS THAN ONE PERCENT (1%). VERIFICATION OF THE PIPE GRADE WILL BE REQUIRED FOR EACH INSTALLED REACH OF SEWER, PRIOR TO ANY SURFACE RESTORATION OR INSTALLATION OF ANY SURFACE IMPROVEMENTS. THE CONTRACTOR'S FIELD SUPERVISOR WILL BE REQUIRED TO PROVIDE DAILY DOCUMENTATION VERIFYING THAT THE AS-BUILT PIPE GRADE MEETS THE DESIGN GRADE THROUGH THE SUBMITTAL OF SIGNED CUT SHEETS TO THE MSD

INSPECTOR UPON REQUEST.

- FIELD SURVEYED VERIFICATION MUST BE MADE UNDER THE DIRECTION OF A LICENSED LAND SURVEYOR OR REGISTERED ENGINEER. THE CONTRACTOR WILL BE REQUIRED TO REMOVE AND REPLACE ANY SEWER REACH HAVING AN AS-BUILT GRADE WHICH IS FLATTER THAN THE DESIGN GRADE BY MORE THAN 0.1%. SEWERS WITH GRADE GREATER THAN THE DESIGN SLOPE MAY BE LEFT IN PLACE, PROVIDED NO OTHER SEWER GRADE IS REDUCED BY THIS VARIANCE
- IN THE AS-BUILT GRADE. MSD ALSO RESERVES THE RIGHT TO REQUIRE THE CONTRACTOR TO REMOVE AND REPLACE ANY SEWER (AT ANY TIME PRIOR TO CONSTRUCTION APPROVAL) FOR WHICH THE AS-BUILT GRADE DOES NOT COMPLY WITH THE GRADE TOLERANCE
- STATED IN THE ABOVE PARAGRAPH. THE SEWER CONTRACTOR SHALL BE RESPONSIBLE FOR ANY COSTS ASSOCIATED WITH THE FIELD VERIFICATION OF THE SEWER GRADE, OR REMOVAL AND REPLACEMENT OF THE SEWER PIPE OR ASSOCIATED APPURTENANCES.
- 8.) MAINTENANCE OF THE SEWERS DESIGNATED AS "PUBLIC" SHALL BE THE RESPONSIBILITY OF THE METROPOLITAN ST. LOUIS SEWER DISTRICT UPON DEDICATION OF THE SEWERS TO THE DISTRICT.
- 9.) STRUCTURES NOTED TO BE ADJUSTED TO FINISH GRADE SHALL BE ADJUSTED BY EITHER REMOVAL OR PLACEMENT OF GRADE RINGS, BRICK WORK, OR MORTAR BEDDING BY SUCH METHODS AS APPROVED BY M.S.D. "STANDARD CONSTRUCTION SPECIFICATIONS", 2009. AND ST. LOUIS

COUNTY SPECIFICATIONS FOR STORM SEWERS.

- IO.) SOILS ENGINEER WILL VERIFY THAT ALL COMPRESSIBLE MATERIAL HAS BEEN REMOVED PRIOR TO FILL PLACEMENT AND THAT FILLED AREAS INCLUDING TRENCH BACKFILLS, UNDER BUILDINGS, PROPOSED SANITARY AND STORM SEWER LINES, AND PAVED AREAS CONSTRUCTED ABOVE ORIGINAL GRADE, HAS BEEN COMPACTED TO 90% OF "MODIFIED PROCTOR." FILL IS TO BE PLACED IN A MAXIMUM OF 9" LIFTS. TESTS SHALL BE TAKEN AT A MAXIMUM OF 50 FOOT INTERVALS ALONG THE ROUTE OF THE PIPE, AT A MAXIMUM OF 2 FEET VERTICALLY, AND LATERALLY ON EACH SIDE OF THE PIPE AT A DISTANCE EQUAL TO THE DEPTH OF FILL OVER THE PIPE. A COPY OF THESE RESULTS WILL BE SUBMITTED TO MSD PRIOR TO CONSTRUCTION.
- 11.) THE REMOVAL AND REPLACEMENT, OR REHABILITION OF THE EXISITNG STRUCTURES(s) WILL BE DETERMINED BY THE MSD FIELD INSPECTOR. IF THE STRUCTURE IS DETERMINED TO REMAIN IN PLACE, THEN THE TOP SHALL BE ADJUSTED TO GRADE, IF NEEDED.
- 12.) PARTIAL REMOVAL OR CONVERSION OF A STRUCTURE: THE PARTIAL REMOVAL, REPLACEMENT, AND CONVERSION OF THE EXISTING STRUCTURE(s) WILL BE DETERMINED BY THE MSD FIELD INSPECTOR. IF THE STRUCTURE IS DETERMINED TO REMAIN IN PLACE. AND THE TOP SECTION CAN BE CONVERTED AS PROPOSED AND STILL MEET MSD STANDARDS, THEN CONVERT AND ADJUST TO GRADE. OTHERWISE, THE ENTIRE STRUCTURE WILL BE REMOVED AND REPLACED WITH A NEW STRUCTURE.
- 13.) ANY ABANDONED SEWERS SHALL BE REMOVED OR COMPLETELY GROUT
- 14.) NOTE PIPE JOINTS WITH ADAPTERS AND COUPLINGS SHALL BE SUPPLIED AND INSTALLED WITH 316 STAINLESS STEEL NUT AND BOLT CLAMPS (T-BOLT) CONFIGURATION: AND WITH STAINLESS STEEL SHEAR BANDS, BEING A MINIMUM TWELVE (12) MILS (MSD STD. CONST SPECS. PT 2, SUBSECTION H11). WORM DRIVE HOSE CLAMPS AND CONCRETE BACKFILLING (CAUSTICITY) WILL NO LONGER BE ALLOWED AT THESE JOINTS, GRANULAR BACKFILL SHOULD BE USED. IF FLOWABLE FILL IS REQUIRED, THE CONTRACTOR SHALL WRAP AND TAPE THE ADAPTERS AND COUPLINGS WITH A SIX (6) MIL POLYETHYLENE SHEET.
- 15.) TRENCH BACKFILL COMPACTION AND TESTING REQUIREMENTS: THE CONTRACTOR IS TO REFER TO PART 4. SECTION H OF THE METROPOLITAN ST. LOUIS SEWER DISTRICT, STANDARD CONSTRUCTION SPECIFICATIONS FOR SEWERS AND DRAINAGE FACILITIES, 2009 EDITION, TO ESTABLISH THE REQUIREMENTS FOR THE SPECIFIC TYPE OF BACKFILL BEING USED.
- 16.) WHEN A STORM PIPE CROSSES OVER A NEW SANITARY SEWER AND THE VERTICAL CLEARANCE IS LESS THAN TWO (2) FEET, THE SANITARY SEWER MUST BE ENCASED IN CONCRÈTÉ THROUGH THE CROSSING AND FOR TEN LINEAL FEET EACH SIDE OF THE CROSSING

### ST. LOUIS COUNTY NOTES

- 1.) ALL SIDEWALKS TO BE CONSTRUCTED TO SAINT LOUIS COUNTY ADA STANDARDS WITHIN ST. LOUIS COUNTY R/W.
- 2.) THE DEVELOPER IS REQUIRED TO PROVIDE ADEQUATE STORM WATER SYSTEMS IN ACCORDANCE WITH SAINT LOUIS COUNTY AND MSD STANDARDS.
- 3.) ALL GRADING AND DRAINAGE TO BE IN CONFORMANCE WITH SAINT LOUIS COUNTY AND MSD STANDARDS.
- 4.) NO SLOPES WITHIN ST. LOUIS COUNTY RIGHT-OF-WAY SHALL EXCEED 3 (HORIZONTAL) TO
- 5.) STORM WATER SHALL BE DISCHARGED AT AN ADEQUATE NATURAL DISCHARGE POINT.
- SINKHOLES ARE NOT ADEQUATE DISCHARGE POINTS.
- 6.) ALL WORK WITHIN ST. LOUIS COUNTY RIGHT-OF-WAY SHALL BE TO COUNTY STANDARDS. 7.) ALL DISTURBED EARTH AREAS WITHIN ST. LOUIS COUNTY RIGHT-OF-WAY SHALL BE SODDED.

CONSIDERATIONS AND APPROVED PRIOR TO INSTALLATION OR CONSTRUCTION.

- 8.) INSTALLATION OF LANDSCAPING AND ORNAMENTAL ENTRANCE MONUMENT OR IDENTIFICATION SIGNAGE CONSTRUCTION, IF PROPOSED, SHALL BE REVIEWED BY THE DEPARTMENT OF HIGHWAYS AND TRAFFIC FOR SIGHT DISTANCE
- 9.) THE DEVELOPER IS ADVISED THAT UTILITY COMPANIES WILL REQUIRE COMPENSATION FOR RELOCATION OF THEIR FACILITIES WITHIN THE PUBLIC ROAD RIGHT-OF-WAY. ST. LOUIS COUNTY SHALL BEAR NO RESPONSIBILITY FOR UTILITY RELOCATION OR ADJUSTMENT COSTS OR ASSOCIATED DELAYS. UTILITY RELOCATION COST SHALL BE CONSIDERED THE DEVELOPER'S RESPONSIBILITY. THE DEVELOPER SHALL ALSO BE AWARE OF EXTENSIVE DELAYS IN UTILITY COMPANY RELOCATION AND ADJUSTMENTS. SUCH DELAYS WILL NOT CONSTITUTE A CAUSE TO ALLOW OCCUPANCY PRIOR TO COMPLETION OF ROAD IMPROVEMENTS.
- 10.) PROVIDE ADEQUATE OFF-STREET PARKING FOR CONSTRUCTION EMPLOYEES. PARKING ON NON-SURFACED AREAS SHALL BE PROHIBITED IN ORDER TO ELIMINATE THE CONDITION WHEREBY MUD FROM CONSTRUCTION AND EMPLOYEE VEHICLES IS TRACKED ONTO THE PAVEMENT CAUSING HAZARDOUS ROADWAY AND DRIVEWAY CONDITIONS.
- 11.) ADDITIONAL SILTATION CONTROL SHALL BE INSTALLED AS REQUIRED BY ST. LOUIS COUNTY DEPARTMENT OF HIGHWAYS
- 12.) PERMIT WILL BE REQUIRED BY ST. LOUIS COUNTY DEPARTMENT OF PUBLIC WORKS FOR CONSTRUCTION OF RETAINING
- 13.) PERMIT WILL BE REQUIRED BY ST. LOUIS COUNTY DEPARTMENT OF PUBLIC WORKS FOR ROOF DRAIN CONNECTIONS. 14.) ALL OFFSITE PROPERTY OWNERS SHALL BE GIVEN NOTICE 48 HOURS IN ADVANCE OF ANY WORK.
- 15.) ANY DISTURBED OFF SITE PROPERTY (I.E. BUSHES, FENCES, MAILBOXES, ETC.) SHALL BE REPLACED, IN KIND, AT THE
- 16.) INTERNAL (PRIVATE) STORM SEWERS WILL REQUIRE A SEPARATE DRAINLAYER PERMIT FROM ST. LOUIS COUNTY DEPARTMENT OF PUBLIC WORKS.
- 17.) TREES AND/OR SHRUBS SHALL NOT BE REMOVED OR DISTURBED WITHIN ST. LOUIS COUNTY RIGHT-OF-WAY WITHOUT PRIOR APPROVAL OF THE ST. LOUIS COUNTY DEPARTMENT OF HIGHWAYS AND TRAFFIC.
- 18.) TRUCKS SHALL NOT EXCEED POSTED WEIGHT LIMITS FOR ST. LOUIS COUNTY BRIDGES DURING HAUL OPERATIONS.
- 19.) SEDIMENT SHALL BE WASHED FROM ALL VEHICLES AT WASHDOWN STATION PRIOR TO LEAVING SITE. NO TRACKING OF
- MUD ONTO COUNTY ROADS SHALL BE ALLOWED.
- 20.) INTERIM STORM WATER DRAINAGE CONTROL IN THE FORM OF SILTATION CONTROL MEASURES ARE REQUIRED. 21.) ALL CONSTRUCTION SHALL BE PER MOST CURRENT DETAILS LOCATED IN THE ST. LOUIS COUNTY DESIGN CRITERIA
- MANUAL AND/OR THE SEDIMENT AND EROSION CONTROL MANUAL. 22.) ALL HYDRANTS, POWER POLES OR OTHER OBSTRUCTIONS WITHIN ST. LOUIS COUNTY ROAD RIGHT-OF-WAY SHALL
- HAVE A MINIMUM TWO FOOT SETBACK FROM FACE OF CURB OR EDGE OF SHOULDER OF THE ULTIMATE PAVEMENT SECTION AS DIRECTED BY ST. LOUIS COUNTY DEPARTMENT OF HIGHWAYS AND TRAFFIC. 23.) RIGHT-OF-WAY DEDICATION SHALL BE COMPLETED PRIOR TO THE ISSUANCE OF A SPECIAL USE PERMIT. ROAD
- IMPROVEMENTS SHALL BE COMPLETED PRIOR TO THE ISSUANCE OF AN OCCUPANCY PERMIT. IF DEVELOPMENT PHASING IS ANTICPATED, THE DEVELOPER SHALL COMPLETE ROAD IMPROVEMENTS, RIGHT-OF-WAY DEDICATION, AND ACCESS REQUIREMENTS OF EACH PHASE OF DEVELOPMENT AS DIRECTED BY THE DEPARTMENT OF HIGHWAYS AND TRAFFIC. THE DELAYS DUE TO UTILITY RELOCATION AND ADJUSTMENTS WILL NOT CONSTITUTE A CAUSE TO ALLOW OCCUPANCY PRIOR TO COMPLETION OF ROAD IMPROVEMENTS. 24.) APPLICANT SHALL USE EXTREME CAUTION IN AREAS WHERE TRAFFIC SIGNAL FACILITIES ARE EXISTING. IT IS THE
- RESPONSIBILITY OF THE CONTRACTOR/DEVELOPER TO CONTACT THE ST. LOUIS COUNTY DEPARTMENT OF HIGHWAYS AND TRAFFIC AT (314) 615-0215 A MINIMUM OF 48 HOURS IN ADVANCE OF CONSTRUCTION WORK FOR LOCATING and spotting existing traffic signal conduit. In the event the contractor damages any traffic signal FACILITIES, REPAIRS SHALL BE MADE AT THE CONTRACTOR'S EXPENSE BY AN ELECTRICAL CONTRACTOR AS DIRECTED
- 25.) THE CONTRACTOR SHALL NOTIFY THE ST. LOUIS COUNTY DIVISION OF OPERATIONS STRIPING PERSONNEL AT (314) 615-0233. 24 HOURS IN ADVANCE OF ANY STRIPING RELATED WORK, ALL GRINDING OF EXISTING STRIPING AND INSTALLATION OF TEMPORARY STRIPING AS REQUIRED BY ST. LOUIS COUNTY SHALL BE PERFORMED BY THE CONTRACTOR. ALL PERMANENT STRIPING WILL BE INSTALLED BY THE ST. LOUIS COUNTY DEPARTMENT OF HIGHWAYS
- 26.) ANY ENTITY THAT PERFORMS WORK ON ST. LOUIS COUNTY MAINTAINED PROPERTY SHALL PROVIDE THE COUNTY WITH A CERTIFICATE OF INSURANCE EVIDENCING GENERAL LIABILITY COVERAGE (BODILY INJURY AND PROPERTY DAMAGE) IN THE AMOUNTS SPECIFIED AS THE LIMITS OF LIABILITY SET BY THE STATE FOR PUBLIC ENTITIES. SUCH CERTIFICATE SHALL INCLUDE "ST. LOUIS COUNTY" AS AN ADDITIONAL INSURED AND SHALL BE PROVIDED PRIOR TO THE ISSUANCE OF ANY PERMIT. CERTIFICATE SHALL PROVIDE FOR A 30 DAY POLICY CANCELLATION NOTICE TO ST. LOUIS COUNTY. UPON REQUEST, THE COUNTY WILL PROVIDE THE SPECIFIC AMOUNTS FOR BOTH PER PERSON AND PER OCCURRENCE
- 27.) ALL SIDEWALKS, SIDEWALK TERMINATIONS, AND ASSOCIATED ACCESSIBILITY IMPROVEMENTS SHALL BE CONSTRUCTED TO ST. LOUIS COUNTY ADA STANDARDS, WITHIN ST. LOUIS COUNTY R/W.
- 28.) PRIOR TO IMPROVEMENTS/CONSTRUCTION PLAN APPROVAL, THE ENGINEERS SHALL PROVIDE A SIGNED AND SEALED NOTE ON THE PLANS FÓR BOTH RESIDENTIAL AND COMMERCIAL PROJECTS STATING THAT THE UNIMPROVED EXISTING SIDEWALK ALONG THE PROJECT FRONTAGE MEETS CURRENT ST. LOUIS COUNTY/ADA STANDARDS.

# BULK EARTHWORK NOTES

ON-SITE QUANTITIES:

<sub>Cut</sub>.....8,292 .....± CUBIC YARDS

Fill 19,957 ± CUBIC YARDS

NET. 11,666 (short) ± CUBIC YARDS

THE ENGINEER HAS CALCULATED THE ABOVE QUANTITIES OF EARTHWORK TO BE REGARDED AS AN ESTIMATE OF THE BULK MOVEMENT OR REDISTRIBUTION OF SOILS ON THIS PROJECT. AS AN ESTIMATE, THESE QUANTITIES ARE INTENDED FOR GENERAL USE, AND THE ENGINEER ASSUMES NO LIABILITY FOR COST OVERRUNS DUE TO EXCESS EXCAVATED MATERIALS OR SHORTAGES OF FILL.

THE ENGINEER'S EARTHWORK ESTIMATE DOES NOT INCLUDE ANY OF THE FOLLOWING ITEMS REQUIRING EARTHWORK THAT MAY BE NECESSARY FOR COMPLETION OF THE PROJECT: MISCELLANEOUS UNDERGROUND CONDUITS, INCLUDING SEWER LINES AND WATER MAINS LESS THAN TWENTY-FOUR INCHES IN DIAMETER, STANDARD MANHOLES; PROCESS OR TRANSFER PIPING; ELECTRICAL OR TELEPHONE CONDUITS OR DUCT BANKS; BASES FOR LIGHT STANDARDS; BUILDING FOOTINGS AND FOUNDATIONS, RETAINING WALL BACKFILL, ETC.

THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THE ACTUAL SIZE OF THE FIELD EXCAVATIONS MADE FOR THE INSTALLATION OF UNDERGROUND STRUCTURES, AND AS SUCH, THE ACTUAL QUANTITIES OF EARTHWORK FROM SUCH ITEMS MAY VARY FROM THE ESTIMATE SHOWN ABOVE.

THE ENGINEER ASSUMES NO RESPONSIBILITY FOR COSTS INCURRED DUE TO REMOVAL OF UNSUITABLE MATERIAL FROM THE SITE.

IT IS THE RESPONSIBILITY OF THE GRADING CONTRACTOR TO PERFORM AN INDEPENDENT EARTHWORK ANALYSIS PRIOR TO SUBMISSION OF BID. IN THE EVENT A DISCREPANCY EXISTS THE GRADING CONTRACTOR SHALL NOTIFY ENGINEER OF DISCREPANCY PRIOR TO

AFTER CONTRACTOR RECEIVES AWARD AND NOTICE TO PROCEED (NTP), CONTRACTOR SHALL FIELD VERIFY EXISTING TOPOGRAPHY AND PERFORM EARTHWORK ANALYSIS PRIOR TO COMMENCING GRADING TO RE-CONFIRM BID QUANTITIES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO APPLY THE RECOMMENDATIONS SUPPLIED IN THE MARCH 16, 2015 GEOTECHNICAL REPORT, TITLED "GEOTECHNICAL INVESTIGATION MT JOB NO. 13805, THE RESIDENCES AT THE QUARRY, ST. LOUIS COUNTY, MISSOURI"

PREPARED BY MIDWEST TESTING AND ANY ADDENDUM THERERTO. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN "ALL" GEOTECHNICAL INVESTIGATIONS FROM THE "OWNER". CONTRACTOR SHALL REVIEW AND

FAMILIARIZE THEMSELVES WITH RECOMMENDATIONS AS OUTLINED BY THE PROJECT GEOTECHNICAL ENGINEER AND INCORPORATE IT IN THEIR PROPOSED SCOPE OF WORK. RE-USE OF EXISTING STOCKPILE MATERIALS AND EXCAVATION SPOILS ON-SITE

SHALL BE VERIFIED AND COORDINATED WITH THE PROJECT GEOTECHNICAL ENGINEER. CONTRACTOR IS RESPONSIBLE FOR REMOVAL OF ANY ROCK ENCOUNTERED. CONTRACTOR SHOULD FAMILIARIZE THEMSELVES WITH ALL THE GEOTECHNICAL REPORTS

AVAILABLE AND REVIEW THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER. **EARTHWORK ASSUMPTIONS:** 12" PAVEMENT SUBGRADE

12" BUILDING SUBGRADE 13" POROUS PAVEMENT SUBGRADE BIO-RETENTION SUBGRADE

10% NO SHRINKAGE ON FILL MATERIAL 4.000 CY SHRINKAGE FOR BUILDING PAD REMEDIATION OF ON-SITE SOILS 3,500 CY SPOILS FROM WATER, SANITARY, FOUNDATIONS, WALLS, AND STORM SEWERS 11,500 CY EXCESS MATERIAL TO BE PROVIDED FROM MASS GRADING OPERATIONS BY COLE

11,666 CY (SHORT) + 3,500 CY SPOILS - 3,200 CY REMEDIATION + 11,500 CY FROM MASS GRADING = 132 CY LONG

NUMBERS DO NOT INCLUDE SITE ELECTRIC, OR UNDERSLAB UTILITY SPOILS.

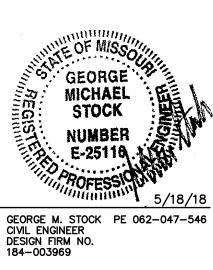
NO HAUL ON OR HAUL OFF EXPECTED

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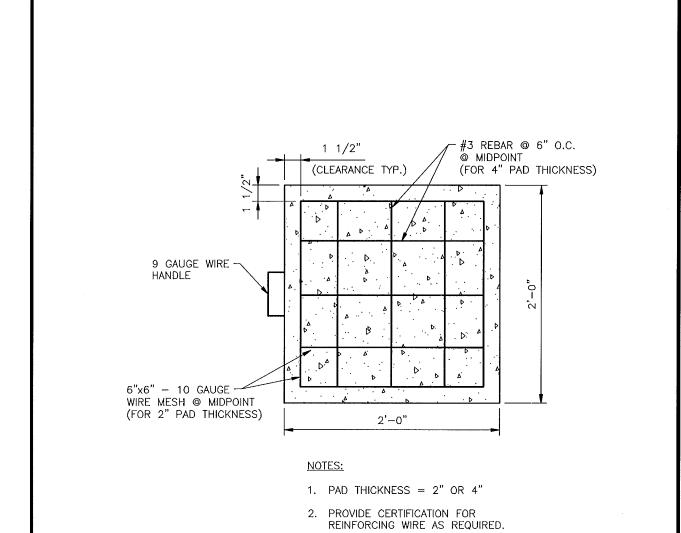
STOCK AND ASSOCIATES CONSULTING ENGINEERS, INC. AND THE UNDERSIGNED ENGINEER HAVE NO RESPONSIBILITY FOR SERVICES PROVIDED BY OTHERS TO IMPLEMENT THE IMPROVEMENTS SHOWN ON THIS PLAN AND ALL OTHER DRAWINGS WHERE THE UNDERSIGNED ENGINEER'S SEAL APPEARS. THE CONSTRUCTION MEANS AND METHODS ARE THE SOLE RESPONSIBILITY OF THE OWNER AND CONTRACTOR. STOCK AND ASSOCIATES CONSULTING ENGINEERS, INC. HAS NO RESPONSIBILITY TO VERIFY FINAL IMPROVEMENTS AS SHOWN ON THIS PLAN UNLESS SPECIFICALLY ENGAGED AND AUTHORIZED TO DO SO BY THE OWNER OR CONTRACTOR.

**REVISIONS:** MSD ISSUE

5/18/18

29189C0302 **SPECIFICATION** 

"MO-00



The FEBCO Series 800 is used in the protection of potable water supplies flow prevention assembly and should not be used as such.

Fire Sprinkler Systems

Size: 4" - 10" (100mm - 250mm)

SPECIFICATION SHEET

Detector Check for Automatic

Series 800

from unauthorized water usage. This requires installation of the proper valving to measure water loss. The Series 800 Detector check is not a back-UL listed and FM approved for horizontal or vertical installation.

 Spring-loaded swing check for reliability and minimum head loss. • 250psi (17.2 bar) working pressure for superior strength. DuraCast ductile iron body for superior strength and lighter weight. Fully rubber encapsulated ductile iron disc for strength. Fusion epoxy coated, inside and out, for corrosion protection. Simple service procedures.

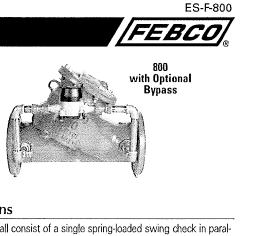
 Cast lifting ring for ease of installation. 4", 6", 8", and 10" Sizes • 3/4" standard bypass; optional sizes: 1", 11/2" and 2" End Connections – Flanged ANSI B16.42, Class 150

Operation In a non-flow condition, the mainline check and bypass check are closed and the meter is idle. All flows up to approximately 10 gpm will flow through the standard 3/4" (20mm) bypass. This operation at low flow rates is accomplished by designing the differential pressure drop across the bypass line to be slightly less than the mainline check valve. Therefore, the mainline check valve remains closed so that low flows through the fireline system are registered by the bypass meter. Flows in excess of approximately 10 gpm will open the mainline check valve causing flow to occur through the mainline assembly and the

4", 6", 8" and 10"

FEBCO product specifications in 4.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact FEBCO FEBCO reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on FEBCO products previously or subse-





Specifications Detector check shall consist of a single spring-loaded swing check in parallel with a bypass meter assembly. Seat rings shall be bronze, bolted to the valve bodies with an elastomer seal. The main check assembly shall be hinge guided . Head loss through the assembly shall not exceed 3psi (21 kPa) at velocities from zero up to and including 15fps (4.6mps). Mainline check body and cover shall be manufactured of Ductile Iron ASTM A536 Grade 6545-12. Ductile iron bodies shall be flanged ANSI B16.42, class 150 and fusion epoxy coated 8 mils minimum to meet A.W.W.A. C550-90. Detector check shall be rated at 250psi (17.2 bar) working pressure and be UL listed and FM approved for both horizontal and vertical installation. Disc shall be rubber encapsulated ductile iron. Detector check shall meet or exceed requirements of Underwriters

Laboratory and Factory Mutual Research Corporation. Detector check shall

32°F to 110°F (0°C to 60°C)

Ductile iron Grade 65-45-12

Totalizing type GPM/CFM

Fusion Epoxy coated

Internal and External

AWWA C550-90

Stainless Steel

Bronze

be FEBCO Series 800 or prior approved equal.

Maximum working pressure: 250psi (17.2 bar) Hydrostatic test pressure: 500psi (34.5 bar)

Pressure – Temperature

Temperature range:

Materials

Spring:

**ADJUSTABLE** 

**INDICATOR POST** FOR 4"-14" VALVES

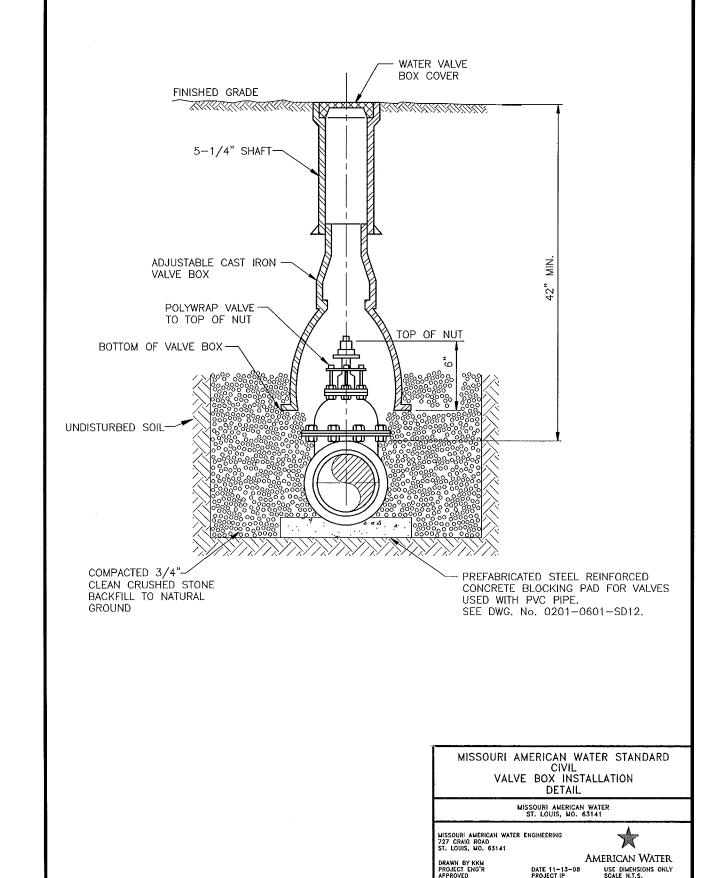
PARTS LIS	īT		
Catalog Part No.	Description	Material	Material Standar
P206	SHUT Target	Plastic	Nylon
P209	OPEN Target	Plastic	Nylon
P217	Cotter Pin (short)	Brass	ASTM B21
P218	Coupling	Steel	ASTM A500 GR.E
P219	Cotter Pin (long)	Brass	ASTM B21
P242	Retaining ring	Stainless Steel	AISI 302
P244	Hex Bolt	Steel/zinc plated	ASTM A307 GR.A
P248	Post Head	Cast Iron**	ASTM A126 CL.B
P273	Bell	Cast Iron	ASTM A126 CL.B
P303	Hex Nut	Steel/zinc plated	ASTM A563 GR.A
P304	Operating Nut	Ductile Iron	ASTM A536 ▼
P305	Сар	Plastic	Polypropylene
P307	Spring pin	Stainless Steel	AISI 420
P308	Threaded sleeve	Plastic	Nylon
P309	Upper stem	Steel	ASTM A513
P315	Pipe plug - hex socket	Steel	
P317	Window	Plexiglass	
P322	Hex head screw	Steel/zinc plated	ASTM A307 GR.A
P323	Lower Barrel	PVC	DR14 UL Listed
P324	Upper Barrel	Steel	ASTM A53 GR.B
P325	Wrench	Ductile Iron	ASTM A536 ▼
P326	Lower Stem	Steel	ASTM A500 GR.E
P329	Socket head set screw	Steel	ANSI B18,3
P350	Coupling Insert	Steel	ASTM A500 GR.E
P353	Washer*	Stainless Steel	AISI 304

FIRE PROTECTION PRODUCTS

Mueller Co.

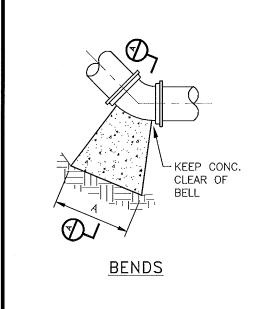
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Valve Size	LEN	DER GTH" A		DER 3TH" 3	"OR LENG	ЭТН"	LEN	DER GTH" O	LEN	DER GTH" E	LEN	DER GTH" F
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
4"	2' - 7"	4' - 5"	4' - 1"	6' - 2"	5' - 10"	7' - 11"	7' - 6"	9' - 8"	9' - 4"	11' - 5"	11' - 1"	13' - 2"
6"	3' - 0"	4' - 10"	4' - 6"	6' - 7"	6' - 3"	8' - 4"	8' - 0"	10' - 1"	9' - 9"	11' - 10"	11' - 6"	13' - 7"
8"	31 - 411	5' - 2"	4' - 11"	6' - 11"	6' - 8"	8' - 8"	8' - 5"	10' - 5"	10' - 2"	12' - 2"	11' - 11"	13' - 11"
10"	3' - 8"	5' - 6"	5' - 3"	7' - 3"	6¹ - 10"	9' - 0"	8' - 9"	10' - 9"	10' - 6"	12' - 6"	12' - 3"	14' - 3"
12"	4' - 0"	5' - 10"	5' - 7"	7' - 7"	7' - 4"	9' - 4"	9' - 1"	11' - 1"	10' - 10"	12' - 10"	12' - 7"	14' - 7"
14"	4' - 6"	6' - 4"	6' - 1"	8' - 1"	7' - 10"	9' - 10"	9' - 7"	11' - 7"	11' - 4"	13' - 4"	13' - 1"	15' - 1"
	4' - 6"		L			9' - 10"	9' - 7"	11' - 7"	11' - 4"	13' - 4"	13' - 1"	15' -
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i i												
Min.	17.	25"	36.0	00"	57.0	00"	78.	00"	99.	00"	120.	.00"

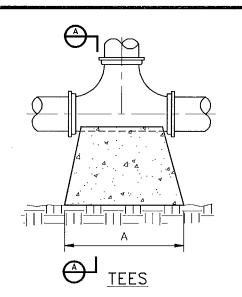
Page E-1-2 See page E-1-14 for ordering instructions

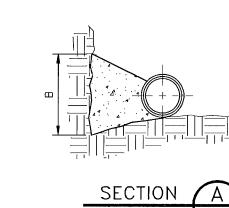


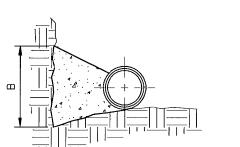
# MISSOURI AMERICAN WATER LINE NOTES

- THE SERVICE CONNECTION WILL REQUIRE THE PLUMBER TO PURCHASE A TAP AT LEAST TWO WEEKS PRIOR TO WHEN HE NEEDS IT. AS A GENERAL RULE, MISSOURI AMERICAN WATER CO. MAKES THE TAPS IN THE ORDER IN WHICH THEY ARE RECEIVED. AND CANNOT GUARANTEE TWO WEEKS DURING A BUSY TIME OF THE YEAR. ONCE THE TAP IS PURCHASED THE PLUMBER HAS TO SCHEDULE IT WITH THE DISTRICT SUPERVISOR. THE PLUMBER HAS TO HAVE ALL REQUIRED INFORMATION, PLUS MISSOURI AMERICAN WATER REQUIRES TWO SETS OF A SITE PLANS SHOWING THE PROPOSED LAYOUT AND VALVING. ALONG WITH THIS MISSOURI AMERICAN WATER CO. CAN INSURE THAT THEY ARE ABLE TO PROVIDE THE REQUIRED FLOW. THE ONLY FEE IS THE ACTUAL COST OF THE TAP ITSELF. THE TAPPING FEE IS DIFFERENT FOR EVERY COMBINATION OF PIPE SIZE AND TAP SIZE AND IS BASED ON PREVIOUS YEAR'S ACTUAL COSTS.
- 2. THE FOOTING OF THE BUILDING MUST BE IN BEFORE MISSOURI AMERICAN WATER CO. WILL MAKE A TAP. MISSOURI AMERICAN WATER DOES NOT MAKE TAPS FOR VACANT LOTS OR PREVIOUS TO SUBSTANTIAL BUILDING CONSTRUCTION.
- 3. A MINIMUM CLASS 52 DUCTILE IRON PIPE, CONFORMING TO APPLICABLE AWWA STANDARDS, IS REQUIRED ON ANY SERVICE LINE THAT IS 4" OR GREATER IN SIZE BEFORE A METER. COPPER PIPING IS REQUIRED FOR SMALLER SERVICES FROM THE MAIN THROUGH THE METER BOX. FOR SERVICES SMALLER THAN 4" IN SIZE, FLEXIBLE TYPE "K" COPPER IS REQUIRED THROUGH THE STOP BOX. AFTER THE STOP BOX, FLEXIBLE OR RIGID TYPE "K" OR "L" COPPER IS REQUIRED TO FOUR FEET BEYOND THE METER BOX. FOR LARGER SERVICES. DUCTILE IRON PIPE SHOULD RUN FROM THE MAIN TO A POINT AT LEAST SIX FEET BEYOND THE METER BOX. FROM THE BUILDING FOUNDATION, COPPER OR DUCTILE IRON PIPE MUST EXTEND A MINIMUM OF TEN FEET OUTSIDE THE BUILDING WALL. ONCE A FIRE LINE IS PAST A DETECTOR CHECK METER IT IS CONSIDERED TO BE METERED AND ANY MATERIALS CAN BE USED THAT COMPLY WITH THE LOCAL PLUMBING CODES (C-900 PVC IS THE MINIMUM). A "MASTER SERVICE" WOULD NOT
- 4. THE JOINTS ON COPPER SERVICE LINES (EXCLUDING JOINTS ON PRE-PURCHASED "METER SETTERS" SHALL BE EITHER FLARED, COMPRESSION, OR SILVER SOLDERED.
- 5. EXISTING SERVICES WILL HAVE TO BE DESTROYED AT THE MAIN UNLESS THEY ARE BEING REUSED. PERMISSION TO REUSE A SERVICE (EITHER PERMANENTLY OR TEMPORARILY) MUST COME FROM THE DISTRICT SUPERVISOR. EXCAVATIONS IN THE PUBLIC RIGHT-OF-WAY WILL REQUIRE AN EXCAVATION PERMIT.
- 6. MISSOURI AMERICAN WATER DOES NOT OWN, OPERATE, OR MAINTAIN SERVICE LINES. AS A GENERAL RULE, MISSOURI AMERICAN WATER DOES NOT RUN A WATER MAIN EXTENSION ON A PROJECT WHICH CAN BE SERVED BY A SERVICE LINE.
- 7. MISSOURI AMERICAN WATER CO. REQUIRES A DETECTOR CHECK VALVE ON ALL FIRE PROTECTION LINES FOR SPRINKLER SYSTEMS. THEY ALSO REQUIRE A DETECTOR CHECK VALVE ON FIRE HYDRANTS, WITH THE POSSIBLE EXCEPTION OF HYDRANTS THAT ARE IMMEDIATELY ADJACENT TO AND VISIBLE FROM PUBLIC STREETS. MISSOURI AMERICAN WATER ALSO REQUIRES VALVES ON BOTH FIRE AND DOMESTIC LINES AFTER THEY SPLIT FROM A COMBINED SERVICE. THUS A TYPICAL SPLIT SERVICE WOULD HAVE VALVES ON BOTH FIRE AND DOMESTIC LINES AFTER A TEE. OF COURSE THIS WOULD ALSO REQUIRE A VALVE ON A LINE GOING TO A FIRE HYDRANT THAT CAME OFF OF A "MASTER WATER SERVICE".
- 8. COVER OVER TOP OF PIPE SHALL BE A MINIMUM OF 42".
- 9. IT IS THE CONTRACTORS RESPONSIBILTY TO CONTACT MISSOURI AMERICAN WATER CO. & OBTAIN ALL THE NECESSARY PERMITS & CONSTRUCT IN ACCORDANCE WITH THEIR SPECIFICATIONS.









# REQUIRED MINIMUM BEARING AREA ON UNDISTURBED SOIL

MISSOURI AMERICAN WATER STANDARD

PRE-FABRICATED STEEL REINFORCED

CONCRETE BLOCKING PAD DETAIL

MISSOURI AMERICAN WATER ST. LOUIS, MO. 63141

USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES 0201-0601-SD12

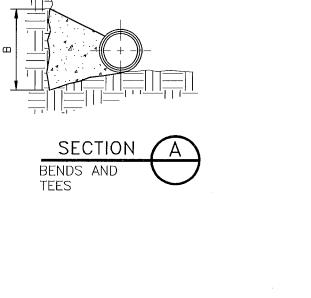
AMERICAN WATER

DATE 11-13-08 USE DIMENSIONS ONLY PROJECT IP SCALE N.T.S.

MISSOURI AMERICAN WATER ENGINEERING 727 CRAIG ROAD ST. LOUIS, MO. 63141

	90 DEGREE BENDS	45 DEGREE BENDS	22.5 DEGREE BENDS	11.25 DEGREE BENDS	TEES/PLUGS			
PIPE SIZE	AREA (SQ. FT.)	AREA (SQ. FT.)	AREA (SQ. FT.)	AREA (SQ. FT.)	AREA (SQ. FT.)			
6	8.0	4.5	2.0	1.0	6.0			
8	14.0	7.5	4.0	2.0	10.0			
10	20.5	11.0	6.0	3.0	14.5			
12	29.0	16.0	8.0	4.0	20.5			

- 1. BEARING TABLE AREA IS BASED ON 200 PSI MAXIMUM WITH SOIL BEARING CAPACITY OF 2000 LBS/SQUARE FOOT WITH A 1.5 SAFETY FACTOR.
- 2. FOR HIGHER WATER PRESSURES OR LOWER SOIL PRESSURES, CONSULT ENGINEER FOR ADJUSTMENTS.
- 3. A SAFETY FACTOR AND ADDITIONAL BEARING AREA MAY BE REQUIRED AS DIRECTED BY THE ENGINEER. 4. FOR DEVELOPER LAY PROJECTS, THE DEVELOPER SHALL VERIFY SOIL BEARING CAPACITIES.
- 5. SEE DWG. NO. 0201-0601-SD19 AND DWG. NO. 0201-0601-SD20 FOR ADDITIONAL BLOCKING INFORMATION.



1. COVER OVER TOP OF PIPE SHALL BE 42". IF GRADING PLANS RECEIVED BY THE ENGINEER/OWNER WITH THE REQUEST FOR WATER MAIN LAYOUT, INDICATE ADJUSTMENTS TO EXISTING GRADE, THEN PIPE SHALL BE INSTALLED TO MEET MINIMUM AND MAXIMUM COVER FROM PROPOSED GRADES SHOWN ON SAID PLANS, TOP OF FINISH CONCRETE TO BE A MINIMUM OF 26" FROM FINISH GRADE.

- THRUST BLOCKS SHALL BE BUILT AGAINST UNDISTURBED SOIL TO PREVEN 3. NO THRUST BLOCKS TO BE PLACED IN SEWER LATERAL DITCHES,. 4. THRUST BLOCKING MUST FIT IN EASEMENT, IN SOME CASES ADDITIONAL
- 5. POLYETHYLENE ENCASEMENT ON ALL D.I. PIPE AND FITTINGS.

RESTRAINT MAY BE REQUIRED.

- 6. PIPE JOINTS AND BOLTS MUST BE ACCESSIBLE.
- 7. ALLOW SUFFICIENT CLEARANCE BETWEEN CONCRETE AND BOLTS FOR FUTURE MAINTENANCE.
- 8. ALL BOLTS SHALL BE COR-BLUE, MINIMUM 1/2" DIAMETER. COAT EXPOSED ROD WITH APPROVED COATING AFTER CONCRETE HAS SET.
- 9. THRUST BLOCKING DETAILS ARE SHOWN HERE FOR TYPICAL INSTALLATIONS. IN SOME CASES, ADDITIONAL RESTRAINT MAY BE REQUIRED. 10. PORTLAND CEMENT CONCRETE USED FOR THRUST BLOCKS SHALL BE MIN
- 11. FOR UNSTABLE SOIL CONDITIONS, CHECK WITH ENGINEER FOR THRUST
- 12. FOR MAIN SIZES GREATER THAN 12", SEE ENGINEER FOR THRUST BLOCK DIMENSIONS.

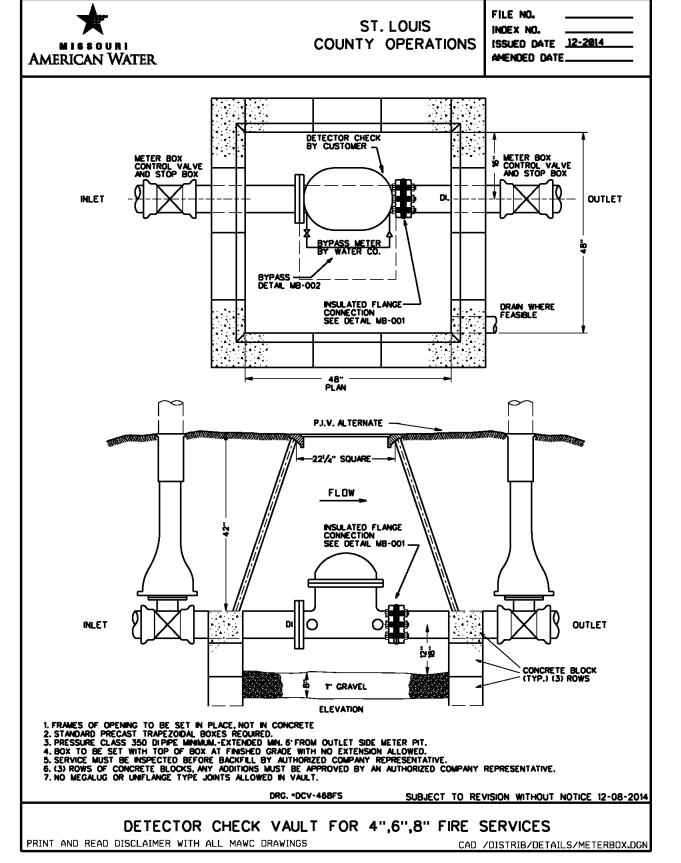
MISSOURI AMERICAN WATER STANDARD

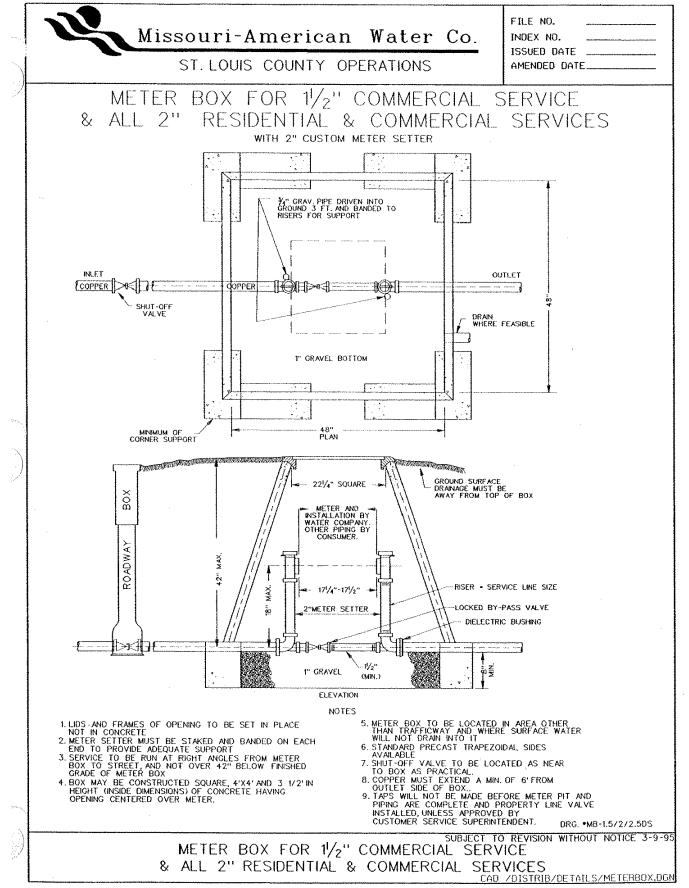
MISSOURI AMERICAN WATER ST. LOUIS, MO. 63141

USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES 0201-0601-SD6

AMERICAN&WAT USE DIMENSIONS ONL' SCALE N.T.S.

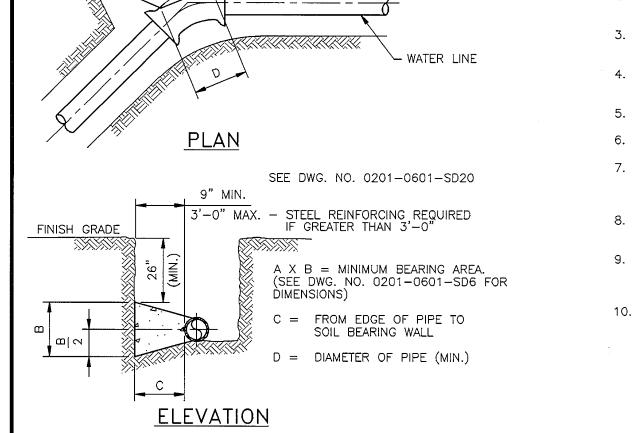
MISSOURI AMERICAN WATER ENGINEERING 727 CRAIG ROAD ST. LOUIS, MO. 83141





USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES 0201-0601-SD5

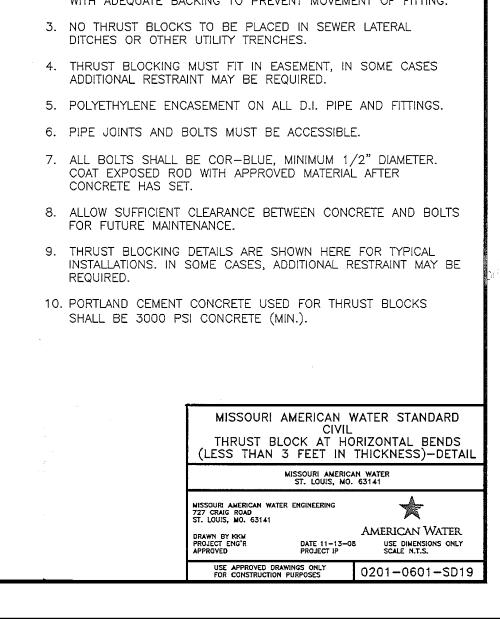
### **GENERAL NOTES:** 1. COVER OVER TOP OF PIPE SHALL BE A MINIMUM OF 42". IF -3,000 PSI (MIN.) OR ACCORDING GRADING PLANS RECEIVED BY THE ENGINEER/OWNER WITH THE O REGULATORY REQUIREMENTS REQUEST FOR WATER MAIN LAYOUT, INDICATE ADJUSTMENTS TO EXISTING GRADE, THEN PIPE SHALL BE INSTALLED TO MEET MINIMUM AND MAXIMUM COVER FROM PROPOSED GRADES SHOWN ON SAID PLANS. 2. THRUST BLOCKS SHALL BE BUILT AGAINST UNDISTURBED SOIL WITH ADEQUATE BACKING TO PREVENT MOVEMENT OF FITTING. DITCHES OR OTHER UTILITY TRENCHES. ADDITIONAL RESTRAINT MAY BE REQUIRED.

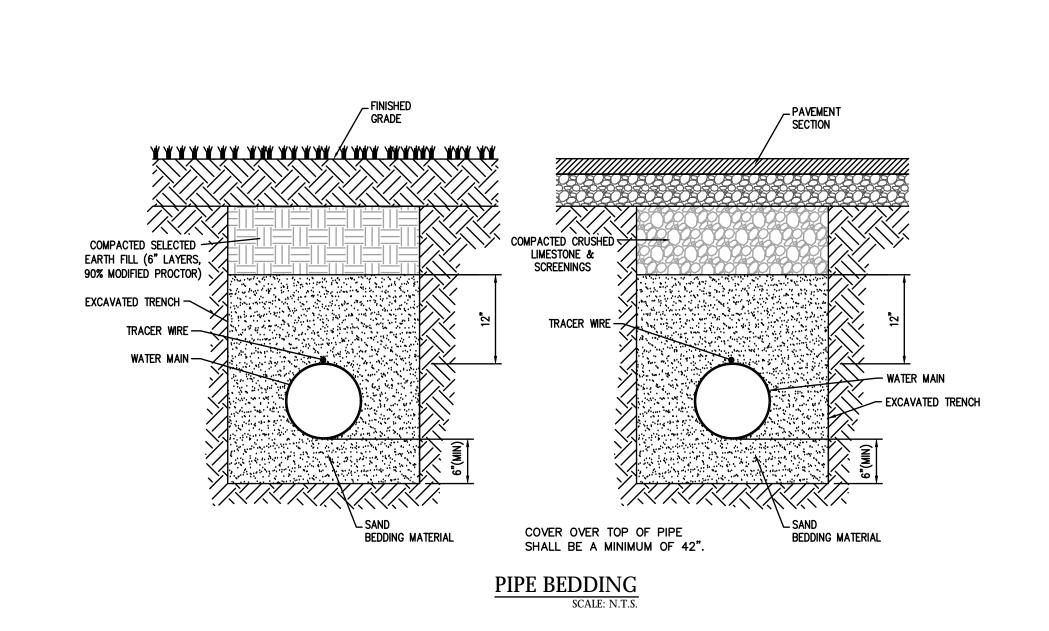


\* BEARING AREAS ARE BASED ON SOIL HAVING AN ALLOWABLE SAFE LATERAL BEARING OF 2000 POUNDS PER SQUARE FOOT AND 200 PSI TEST PRESSURE AND A 1.5 FACTOR OF SAFET

AREA MUST BE REVISED FOR SOILS WITH A LOWER BEARING

CAPACITY OR HIGHER TEST PRESSURE.





MICHAEL STOCK E-25116 GEORGE M. STOCK PE 062-047-546 CIVIL ENGINEER DESIGN FIRM NO. 184-003969 **REVISIONS:** MSD ISSUE

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SHEET TITLE: SPECIFICATION

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April 4, 2018

8606 Page Avenue St. Louis, Missouri 63114

Attn: Mr. Frank Haase

Gentlemen:

Submitted herein is the report of our geotechnical recommendations for the referenced project, as verbally authorized by Mr. Haase. <u>INTRODUCTION</u>

Geotechnical recommendations have been developed for a proposed office building on Lot 3 of Sunset Ridge, in St. Louis County, Missouri. The study consisted of engineering analyses of prior borings, a previous test pit, and associated laboratory testing.

<u>Purpose and Scope</u>. The purpose of the study was to explore the subsurface conditions at the site, and develop recommendations for the earth-related aspects of the design and construction of the proposed project. The scope of the study included:

- reviewing prior field explorations and laboratory testing for the Sunset Ridge development, performing engineering analyses to develop recommendations for feasible foundation types and related design parameters, lowest level floor slab support, seismic design considerations, pavement section design, general site drainage, suitability of on-site soils for use in engineered fills, and earth-related
- construction procedures, and preparing this summary report.

which we are aware of the following:

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Site History. The subject property was originally a portion of the former Des Peres Quarry, northwest of the intersection of Interstate 270 and Manchester Road. The former quarry site has been filled over the past 25 years or so. Several geotechnical explorations have been performed for this development, of

- Geotechnical Report—Sheraton Hotel—Bluffs at Manchester—Des Peres, Missouri, Brucker Engineering Limited [Brucker], April 15, 2002
- Geotechnical Report—Quarry at Manchester and I-270—St. Louis County, Missouri, SCI Engineering [SCI], June 9, 2004
- Geotechnical Report—Bluffs at Manchester—Des Peres, Missouri, Brucker, July 26, 2006
- Geotechnical Report—Quarry at Manchester and I-270—St. Louis County, Missouri, SCI, March 26, 2007
- Geotechnical Exploration—MT Job No. 12621—Des Peres Corners— Des Peres, Missouri, Midwest Testing, August 10, 2011
- Geotechnical Considerations—MT Job No. 13712—The Quarry—Des Peres, Missouri, Midwest Testing, September 18, 2014
- Geotechnical Exploration—MT Job No. 13796—Provisional Living—St. Louis County, Missouri, Midwest Testing, February 26, 2015
- Geotechnical Exploration—MT Iob No. 13805—The Residences at the Quarry—St. Louis County, Missouri, Midwest Testing, March 16, 2015
- Geotechnical Exploration—MT Job No. 13965–4–Story Hotel at the Quarry—St. Louis County, Missouri, Midwest Testing, November 24,

Based on the information included in these reports, we know the following regarding the placement and testing of backfill materials:

A hotel project was previously considered (circa 2000) in the southwestern quadrant of the property, estimated to be roughly coinciding with the northern portion of proposed Lot 1 (Provisional Living) and southern portion of proposed Lot 2 (The Residences at the Quarry/The Alinea-Town & Country). The previously considered hotel location could not be determined with certainty, as a plan of this formerly proposed development was not available to us at the time of this

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former quarry floor, and the placement of compacted fill within the proposed (at that time) building pad plus a distance of about 40 feet outside the pad. The top of fill, or ground surface, was about El. 558 at the time. The circa 2000 conditions appear to consist of a prepared, compacted building

report. The formerly proposed project included the removal of fill to expose the

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pad for the hotel proposed at the time, and undocumented fill to depths of 60 to 80 feet outside this prepared pad. As will be discussed later in this report, a portion of Lots 5 and 6 remained unfilled until the early 2000's. Over the next several years, from about 2002 to 2006, cursory observation of the filling operations was described in periodic letters by Brucker, but no testing was performed

The 2007 SCI report indicates the ground surface was near El. 590, suggesting that 72 feet or so of fill had been placed since 2000. An additional 7 feet of fill was placed at this location from 2007 to 2008. Based on available current site topography information from KPFF and Cole & Associates, up to 15 additional feet of fill was placed in this area since 2008, but documentation regarding its placement and compaction is not available.

Isolated improved fill zones were constructed for adjacent projects on Lots 1 and 2. These projects include removal, sorting, moisture-adjusting, and replacing the existing fill materials atop a geogrid-stabilized base layer. From our field observations, the quantity of oversize boulders can be fairly significant, but the pres-

ence of high plastic clay and deleterious materials (e.g., wood, trees, trash, etc.)

<u>Project Description</u>. The proposed project is a two- or three-story office building with a 70- by 100-foot footprint. Surface parking will be provided on the east and west sides of the building.

The building is expected to be constructed of steel framing with a masonry veneer. Current plans indicate that the ground floor will be of slab-on-grade construction, with a planned finished floor assumed near El. 596. The following

maximum column loads for the building options are as follows:

	Maximum Column Load, kips					
No. of Stories	Option 1	Option 2				
2	145	217				
3	260	390				

Option 1 has four interior columns with a bay spacing of 22'-4" by 32'-4". Option 2 has two interior columns with a bay spacing of 33'-6" by 32'-4". Columns will also be located along the building perimeter for both options. Maximum wall loads for all of the above configurations will be 2 kips per linear foot or less.

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The proposed project layout is depicted in Figure 1 in the appendix.

SUBSURFACE INFORMATION

The subsurface conditions were defined by previously drilled borings and a prior test pit on this lot and nearby areas. These locations are shown in Figures 1 and 2. The logs of these borings and the test pit are presented in the appendix, and include the results of the laboratory testing conducted at that time. **SUBSURFACE CONDITIONS** 

The subsurface conditions disclosed by the borings and prior explorations elsewhere in the former quarry consist of fill atop limestone bedrock at the base of the quarry termination, which is on the order of 105 to 110 feet at this site.

Estimated Historical Fill Depths. In order to determine the extents of the total fill mass thickness below the proposed building, the original quarry topography prior to filling was overlaid on the proposed site plan for the development, which is presented in Figure 1.

The historical topographic information indicates that the quarry floor was between Els. 473.5 and 481 beneath the proposed building footprint. The quarry walls were steep along the southeastern boundary of the site, just south of the south line of the proposed building and along the proposed parking spaces which parallel the existing stormwater drainage ditch to the southeast. The data suggest that the fill is on the order of 105 to 110 feet deep beneath Lot 3.

Existing Fill. The fill generally consists of silty clay with 'trace' to 'and' relative proportions (see Field Classification System in the appendix) of inclusions, consisting of crushed rock, concrete rubble, and limestone boulders. Minor inclusions of clay, asphalt, brick, mortar, sheet metal, and wood were encountered in isolated zones in the fill.

As can be seen in by the standard penetration test data shown on the boring logs, the N-values obtained in the fill ranged between the mid-teens and over 50 bpf (blows per foot). These data suggest that the fill received some compactive effort.

Moisture Contents. Long-term equilibrium moisture contents in a controlled fill are usually near the upper end to slightly above the compactible moisture range. The moisture contents of the fill materials range between about 10 and 30 percent, with an average in the upper teens. The estimated upper limit conducive to achieving the recommended level of compaction is on the order of 18 percent.

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It should be noted that typically over time fill moistures will increase to equilibrium above the as-placed moisture content, typically in the low- to mid-20s for low plastic silty clay and into the mid- to upper-20s for high plastic clay.

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Deeper Fills. The deeper fills have been in place for a longer period of time and, in our opinion, are nearing the end of the consolidation curve. This curve represents the pattern of settlement versus time, whereby the rate and magnitude of settlement decrease with the passage of time. This opinion is supported by longterm settlement monitoring we have done with similar fills that suggest 90 percent of internal settlement due to the weight of the fill itself occurs within 8 to

Conclusion. Based on the limited field and laboratory data, and the composition of the fill materials encountered, it appears that the fill received compactive effort to varying densities. It is our further opinion that the fills below the zone explored have been in place

for a sufficient length of time that internal consolidation due to the fill weight is nearing or may have reached essential completion. Auger Refusal. Refusal of the drilling auger was encountered in Borings 3 and 4

time of drilling. The borings encountered auger refusal on limestone, based on cuttings from the auger teeth, and represent the floor of the former quarry. Ground Water. Ground water was encountered in Borings 3 and 4 at depths of 50 and 16½ feet, respectively, below the existing ground surface at the time of

drilling. The water was observed to quickly seep into these test holes at

at a depth of 105½ and 110 feet, respectively, below the ground surface at the

completion. The water encountered is judged to be perched within the fill. The ground water level at this site may fluctuate due to variations in precipitation, site grading, and drainage.

**DESIGN RECOMMENDATIONS** 

April 4, 2018

Our findings indicate that the proposed building can be supported on shallow foundations bearing on compacted fill with a conventional slab-on-grade ground floor construction. Partial remediation of the existing fill will be required. These and other design-related considerations are discussed in the following

<u>Design Concept</u>. It is understood that building on undocumented fill poses risks. The fill placed in the former quarry is largely undocumented, in that full-time observation and testing of the fill were not conducted. No practical level of exploration can fully assess the quality and composition of an undocumented fill.

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However, there is information available which helps to define the constituents and condition of the fill. These include a system of assuring acceptance of only permissible materials to be placed, spreading and compactive effort applied to the fill, some documentation describing the fill materials and placement, and prior geotechnical exploration work.

Information obtained during our exploration in 2011, including correspondence and reports, indicates that only certain materials were acceptable for placement as fill. These included soil, concrete, asphalt, crushed stone, cobbles, boulders, masonry elements, and other non-degradable materials. Degradable materials such as wood, stumps, trees, brush, building debris, etc. were not permitted. We understand that these restrictions on materials accepted at the site were enforced by an employee of the property owner, who observed the arriving materials for conformance with the acceptance rules.

Confirmation of enforcement is present in the form of multiple borings and test pits, by both Midwest Testing and SCI, which revealed the fill materials to consist of soil, concrete, crushed stone, asphalt, and brick. Only very trace amounts, relative to the fill volume, of small roots, wood, small pipe, and other non-compactible materials were found.

Information indicates that the material, once dumped, was spread and tracked with a dozer. We understand that the same operator was employed over most of the time the fill was placed at the site, suggesting continuity of the spreading and tracking methods over the majority of the fill placement.

Prior geotechnical exploration and periodic fill placement documentation by Brucker and SCI suggest that the fill material acceptance and placement methods were followed over the years of filling at this site. Our current study suggests similar conditions as described by the prior Brucker, SCI, and Midwest Testing documentation. Our past and present N-value data and previous test pit observations support the reports of compactive effort, even though not being verified by testing, being applied.

Fills which are insufficiently compacted for their depth of placement (i.e., the deeper the fill, the greater degree of compaction is needed) will settle. It is our opinion that the length of time that the majority of the fill at this site has been in place, along with permeabilities which facilitate consolidation, has allowed most of the settlement to near or reach essential completion.

We base the above opinion on a project for which we have been providing longterm monitoring services of an insufficiently compacted fill with a maximum depth of 113 feet. The data for this project show that essential completion of internal consolidation of the fill was reached in about 13 years. Thus, the fill at this site, which is similar in constituents, N-values, and moisture contents to the Mr. Frank Haase MT Job No. 14548 April 4, 2018

monitored site, probably experienced the bulk of the internal consolidation by the late 2000s. The impact of the fill on the proposed structures is threefold: 1) The total settlements of the fill are fairly uniform due to the consistent

depth of fill across the building area. Thus, any additional settlements

2) The uniformity of total settlement suggests that differential settlements, which are often the most detrimental to a structure, will be lim-

should be fairly uniform across the footprint of the building.

3) The variability of the fill quality in the upper portion of the fill, where foundation stresses will be concentrated, is the most significant factor in building performance. Improvement of this zone will create an earthen "mat" which will provide foundation support. In order to minimize differential settlements, the bearing pressures design concept is to maximize the foundation bearing pressure to allow stress dissipation quickly through the improved fill zone.

ited to values tolerable by the structure.

It is our opinion that the remaining consolidation is limited. We believe that the relatively modest loads of a two- to three-story office building can be supported on shallow foundations provided ground improvement is accomplished via partial removal and recompaction with geogrid reinforcement. It is our further opinion that any remaining consolidation is tolerable by pavement and other site

Existing Fill. The existing fill will require partial removal and replacement in the building area. Based on the existing fill information from this exploration, the depth of removal and recompaction will extend 8 to 11 feet below proposed subgrade, depending on the building height and interior column configuration:

The undercut excavation must extend 10 feet beyond the proposed building footprint on all sides. Since the site is relatively level across the proposed building pad, for design purposes the base of the excavation for removal and recompaction can be considered to be measured from a design building pad subgrade at El. 595 (assuming a 1-foot allowance for subgrade from the assumed finished ground floor at El. 596). The existing material can be reused in the backfill provided the non-compactible materials (e.g., large rubble, pipe, wire, rebar, etc.), if any, are removed

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Two layers of Miragrid 8XT geogrid will be required to be placed in the backfill—one layer over the base of the undercut excavation, followed by a second layer at 8 inches (i.e., one backfill lift) above the base of the undercut. The two geogrid layers are unidirectional and, therefore, must be placed perpendicular to one another since their machine and cross-machine strengths differ.

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The grids need not overlap parallel to the strength direction, but shall not be placed with gaps between the grids. Where "splicing" to full-length roll pieces is required in strength direction, the grids must overlap a minimum of 2 feet and be separated by 4 inches of soil between the overlap. Splices shall be laid out such that they do not align with the splice in a previous run. Splicing will not be allowed in the east-west direction, as the excavation width plus 10 feet outside the building lines on both sides, which equals 90 feet, is just under half of the roll length of 200 feet. One splice may be installed in the north-south direction, so long as the minimum size piece is not less than 60 feet.

The existing fill can be left in place for construction of the parking areas; however, a heavy proofroll will be required to identify any soft or yielding near–surface areas. Such areas will require removal and replacement with compacted fill to establish a firm subgrade for construction. The removed material must be moisture-adjusted as needed to facilitate compaction and be compacted prior to pavement construction.

The proofrolling can be accomplished with a heavily loaded tandem-axle dump truck, loaded scraper, or similar equipment approved by the Geotechnical Engi neer. Unsuitable areas disclosed by the proofrolling operation must be remedied by removal and replacement, scarifying and recompaction, or other methods acceptable to the Geotechnical Engineer.

High Plastic Clay. Isolated zones of high plastic clay are present in the existing fill, beneath the low plastic silty clay cap. It was not found in sufficient concentrations to warrant, in our opinion, volume change (i.e., shrink-swell) concerns. Should high plastic clay be excavated and placed as fill during earthwork, it is recommended that this material not be present in the 2-foot zone beneath the foundations and the lowest floor level subgrade.

Shallow Foundations. Following subsurface improvement, the proposed graderaise fill can be placed per the recommendations included herein, and the building can be supported on shallow foundations. Column and wall foundations bearing on compacted fill can be designed using an allowable net bearing pressure not to exceed 3,500 pounds per square foot (psf). Column and wall footings must have minimum dimensions of 2.0 and 1.5 feet, respectively, for bearing capacity considerations.

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Total settlements are difficult to predict but the long-term monitoring data for the 113-foot-deep fill project previously cited suggests 1 to 2 additional inches may occur. However, these settlements are expected to be relatively uniform over the site. Differential settlements are estimated to not exceed ¾ inch in 40 feet for the structure.

Exterior footings and foundations in unheated areas should be located at least 2.5 feet below final exterior grade for frost protection. Interior footings in heated areas can be located at a nominal depth below the finished floor.

The recommendations, including the design bearing pressure and settlement projections for the building, and the proposed new fill thicknesses, apply only to the proposed structure, including the type of construction (e.g., steel framing, and a two- or three-story structure, with loading as reported herein), as depicted in Figure 1. Should the building location be moved, or the type of construction or loads change, our recommendations will require review and, possibly, revisions.

Lowest Level Slab. The lowest level floor slab will be supported on new compacted fill atop the removed and recompacted existing fill. A subgrade modulus not to exceed 150 pounds per cubic inch (pci) can be used for the design of the

It is recommended that the floor slab be "floating" that is, not structurally connected to columns and foundations walls. This will permit modest horizontal and vertical movements to occur while minimizing cracking in these elements. The floor should be supported on a minimum 4-inch-thick layer of compacted

granular material such as sand and gravel, or crushed stone. This will help to distribute concentrated loads and equalize moisture conditions beneath the slab. If the floor slab must be connected to the exterior foundation walls for structural considerations (e.g., lateral load resistance), the backfill used in the foundation overdig (i.e., behind the foundation walls and beneath the floor slab) should consist of 1-inch minus crushed stone or low plastic (liquid limit less than 45 and plasticity index less than 20) cohesive soil. The backfill should be compacted to at

(ASTM D 698) maximum dry density. Field density testing is required to verify these requirements are being met in the field. If compaction is not obtained, the fill could settle, voids could occur beneath the floor slab, and the floor slab could crack. Also, if compaction is in excess of the maximum of 98 percent, it is possible that the additional pressure created by the compactive effort will exert excessive force, crack the walls, and/or push them away from the building.

least 95 percent, but not more than 98 percent, of the material's standard Proctor

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Construction sequence is also important for a tied slab. It is recommended that the foundation wall, roof, and any significant dead loads that will be applied to the footings be in place prior to tying the slab. If not, the addition of load following the connection of the slab to the foundation walls may crack the slab even though the foundation settlements are within the predicted limits.

Seismic Design Considerations. The International Building Code (IBC) requires the structural design of the building to be in accordance with the requirements of Section 1613.5.2 of the code. A site classification is required for seismic design. The classification is a function of the soil profile representing the average properties comprising the top 100 feet of the site. From the results of deep borings from previous studies conducted at the former quarry, it is our opinion that the soil profile is classified as IBC Site Class D.

Retaining Wall Systems. If retaining walls are required, it is our opinion that a mechanically stabilized earth (MSE) wall systems are best suited for this project due to their inherent flexibility

Backfill Materials. Cohesive soils are unsuitable for use as retaining wall backfill because of their tendency to creep over time. Additionally, rock backfill is unsuitable where retaining wall heights exceed 6 feet as it will produce unwanted differential settlements of the underlying fill beneath wall due to the increased stress imposed on the fill.

design of the retaining wall. The calculations should be performed at several cross-sections along the length of the wall. We recommend the design provide a minimum factor of safety of 1.5 under long-term static conditions, and 1.125 under seismic loading.

Global Stability. Global stability calculations must be performed as part of the

The retaining wall blocks which will form the face of the wall should be conser-

vatively ignored in the global stability analysis. Facing stability and connection analyses should instead be part of the retaining wall design calculations. We strongly suggest that we be retained to design any proposed retaining walls,

as the wall and fill loads are interdependent. If these walls are designed by

others, they must take into account the considerations for settlement, bearing,

<u>Pavement Design Considerations</u>. The fill at this site, once properly prepared, is suitable for the support of conventional pavement sections. Fills and the final subgrade in paved areas should be placed and compacted to a minimum dry density of 95 percent of the material's standard Proctor (ASTM D 698) maximum dry density at a moisture content of  $W_{opt} \pm 2$  percent.

and slope stability.

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As the site will require fills to achieve the proposed grades, we estimate that at least the upper 3 feet of subgrade will consist of new compacted fill. This will create a defined subgrade and help to control differential settlements beneath pavements. Existing fills should be proofrolled prior to placement of additional fill, as described herein.

The pavement sections indicated below are preliminary and are based on estimated traffic loadings, as actual traffic design data are not known for the project at this time. We recommend a heavy-duty asphalt pavement section consisting of 4½ inches of hot-mix asphalt (2 inches of surface course over 2½ inches of binder course) on top of 10 inches of crushed stone base cours Standard–duty asphalt pavement can consist of 3 inches of asphalt on top of 8 inches of crushed stone base course. Should traffic loading information become available, these pavement sections should be reviewed and revised as needed.

The base course for the above sections can be reduced 2 inches by the placement of one layer of woven ground stabilization fabric such as Mirafi 600X or equivalent between the base course and soil subgrade.

The base course should consist of MoDOT Type 5 Aggregate crushed stone. The surface and binder course asphalt mixes should conform to the requirements of St. Louis County Department of Highways and Traffic. We recommend Type C or Type D mixes for surface course asphalt, and Type X for binder asphalt.

Asphalt sections thicker than 3 inches will require placement in two lifts. The lower portion can consist of binder course asphalt and the upper portion can be comprised of surface or wearing course asphalt. Neither lift should be less than 1½ inches in thickness. The minimum asphalt compaction criterion at any tested location is to be not less than 92 percent of the material's maximum theoretical

It is recommended that the base course moisture content be within ±2 percent of the material's optimum moisture content prior to delivery to the site to facilitate compaction. The base course should be compacted to at least 95 percent of standard Proctor. The base course should have provisions for drainage at storm water inlet structures as shown in Figure 3.

As stated previously, the above sections were developed for estimated pavement loadings using the specified design life. At the time of this report, information regarding the actual traffic volumes and loading was unavailable. Therefore, we suggest that the pavement design be re-evaluated once accurate traffic loading and frequency information becomes available.

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It is recommended that a 7-inch-thick, unreinforced concrete slab-on-grade be constructed in front of the trash-loading areas. This will minimize the damage that would otherwise occur to asphalt pavement due to high wheel loads imposed by front-loading trash trucks. The slab should be adequately sized to ensure that it will sustain the load from the truck emptying the dumpster.

It may also be prudent to consider the use of concrete-paved entrances aprons, where vehicular traffic can induce short duration, high intensity stresses (turning, acceleration, and deceleration), that will generate deformations in asphalt over time. All concrete pavement areas should have a minimum compressive strength of 4,000 psi, and should have 4 to 7 percent entrained air to provide sufficient resistance to freeze/thaw.

Drainage and Grading. Positive drainage must be provided to minimize infiltration of surface water around the perimeter of the building and beneath the ground floor slab. Grades must be sloped away from the structure, and roof and surface drainage collected and discharged in such a manner that it is not permitted to infiltrate the near-surface soils.

Of particular concern are construction joints between pavements and slabs, and the abutting building. These joints must be sealed with a high quality flexible caulk, and stormwater drains (e.g., trench drains, grates, individual drains, etc.) must be kept clean to prevent ponding and the subsequent infiltration of surface water into the ground adjacent to foundations. Infiltration of surface water adjacent to foundations can cause settlement, as the water can soften cohesive soils and densify granular materials through flooding.

Slopes. It is recommended that all soil cut and fill slopes be made not steeper than 3H:1V. The recommended 3H:1V slopes are based on experience with slopes in the St. Louis area consisting of cohesive soils, such as those at this site. While not an absolute guarantee of long-term stability, 3H:1V slopes are widely used by state and local government agencies. Steeper slopes must certainly be evaluated for slope stability. It is recommended that all exposed earth slopes be seeded to provide protection against erosion. Seeded slopes should be protected with erosion mat until the vegetation is established.

Existing slopes steeper than 5H:1V must be benched prior to the placement of new fill in an attempt to prevent the formation of a weak plane which could lead to a slide between the new fill mass and the existing slope. The benches should be cut flat in the existing slope, and be approximately one machine width by a maximum vertical height of 5 feet.

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GENERAL CONSTRUCTION PROCEDURES/RECOMMENDATIONS

A geotechnical engineer must be retained during the earth-related portions of construction to verify compliance with the project documents and the recommendations presented herein.

Site Preparation. The existing fill will require partial removal and replacement in the building area to a depth of 8 to 11 feet below proposed subgrade, depending on the number of stories and the column configuration:

MT Job No. 14548

Undercut Depth below Design Subgrade, ft.

The undercut excavation must extend 10 feet beyond the proposed building footprint on all sides. The existing material can be reused in the backfill provided non-compactible materials (e.g., large rubble, pipe, wire, rebar, etc.), if any, are

Two layers of Miragrid 8XT geogrid will be required to be placed in the backfill—one layer over the bases of the undercut excavations, followed by a second layer at 8 inches (i.e., one backfill lift) above the base of the undercut. The two geogrid layers are unidirectional and, therefore, must be placed perpendicular to one another since their machine and cross–machine strengths differ.

The grids need not overlap parallel to the strength direction, but shall not be placed with gaps between the grids. Where "splicing" to full-length roll pieces is required in strength direction, the grids must overlap a minimum of 2 feet and be separated by 4 inches of soil between the overlap. Splices shall be laid out such that they do not align with the splice in a previous run. Splicing will not be allowed in the east-west direction, as the excavation width plus 10 feet outside the building lines on both sides, which equals 90 feet, is just under half of the roll length of 200 feet. One splice may be installed in the north-south direction, so long as the minimum size piece is not less than 60 feet.

The existing fill can be left in place for construction of the parking areas; however, a heavy proofroll will be required to identify any soft or yielding near-surface areas. Such areas will require removal and replacement with compacted fill to establish a firm subgrade for construction. The removed material must be moisture-adjusted as needed to facilitate compaction and be compacted to at least 95 percent of standard Proctor, prior to pavement construction.

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The proofrolling can be accomplished with a heavily loaded tandem-axle dump truck, loaded scraper, or similar equipment approved by the Geotechnical Engineer. Unsuitable areas disclosed by the proofrolling operation must be remedied by removal and replacement, scarifying and recompaction, or other methods acceptable to the Geotechnical Engineer.

Subgrade Considerations. The near-surface soils at this site are susceptible to disturbance in the presence of moisture and the traffic of construction. Care should be exercised to maintain the integrity of the subgrade when preparing the site for the placement of fill. If pumping and/or rutting occur, activity should be

plasticity index [PI] greater than 12), or a working mat of clean coarse crushed stone. The need for these measures will depend on soil, moisture, and weather conditions at the time of earthwork and can best be evaluated at that time. Siltation Control. Appropriate erosion control measures must be used during

construction. These siltation control devices will likely require periodic mainte-

nance during construction in the form of removing accumulated sediments and

Stabilization can normally be accomplished with aeration and recompaction,

incorporation of admixtures (e.g., hydrated lime for cohesive soils with a

re-establishing siltation devices as needed. Fill Materials. The soils at this site are suitable for reuse in an engineered fill, with the exception of high plastic clay in the 2-foot zone beneath the foundations and the lowest level floor slab subgrade. Imported borrow material should be free of organics and deleterious matter. The plasticity index of imported material should not to exceed 20 for the top 2 feet beneath foundations and the floor slab; higher PIs can be considered below. Cohesive fill material should be used where

Utility trenches must be backfilled with on-site material, less any rubble and non-compactible materials, or minus-fraction (at least 15 percent by weight passing the No. 200 sieve) crushed stone, compacted as recommended elsewhere in this report. Clean crushed stone is not acceptable for trench backfill, as it could

collect and feed water to the existing fill, causing localized settlements. Depending on moisture conditions at the time of construction, it may be necessary to add water or aerate the fill material to achieve the required compaction. At the time of drilling, the soils were below or within the range conducive for successful compaction. Therefore, the need for moisture adjustment (currently, the addition of water and possibly drying in wet weather periods) should be anticipated. Obviously, an increase in site precipitation will

likely increase soil moistures, increase the potential for subgrade instability, and,

it is desired to earth-form foundations.

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possibly, dictate the need for undercutting and recompaction to stabilize the In cold or wet weather conditions, it is often necessary to increase expenditures

to facilitate the construction schedule. The use of aeration, admixtures, and granular fill may be required to perform earthwork under adverse conditions. Compaction. On-site and imported fill and backfill must be placed in loose lifts and mechanically compacted. Field density tests must be performed as needed by a qualified soils technician to verify compliance with the density requirement. We recommend the following compaction criteria:

	Percent of Standard
Area	Proctor (ASTM D 698)
General site fill	95
Building pad fill	100
Utility trench backfill	
Beneath pavements and structures	95
Beneath landscaped areas	90
Landscape area fills	90
Slopes≥ 5 feet in height	95

The maximum loose lift thickness conducive to achieving the required compaction is a function of the material type and the compactor, among other factors.

Material	Compactor	Area	Loose Lift Thickness, in
Cohesive	Sheepsfoot	Open	6–8
	Jumping jack	Confined	5–6
	Vibratory plate (backhoe)	Confined	8
	Tracking	Open	4
Granular	Vibratory roller (large)	Open	8-10
	Vibratory roller (small)	Confined	6
	Vibratory plate/sled	Confined	4–5
	Vibratory plate (backhoe)	Confined	12-18

The moisture content of the upper 3 feet of floor slab and pavement area fills should be in the range of optimum plus or minus 2 points to minimize pumping and establish a firm subgrade.

Compaction of any fill or backfill by jetting (sometimes referred to as flooding) is not considered acceptable. The success of this method requires a free-draining fill material and the drainage of the water through and away from a fill area. Jetting in cohesive soils or confined areas will result in the entrapment of water by the fill boundaries (e.g., backfill in a trench) or by cohesive fill materials. This

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technique will generally not achieve the desired compaction because of nonuniformity, submergence, and the weakening of the resultant fill.

Foundation Excavations. All building footings must bear on low-plastic compacted fill. Each foundation excavation should be observed and densitytested to verify that the desired bearing stratum is exposed. The base of the excavation must be clean, dry, and free of soft soil, debris, and uncompacted fill.

Satisfactory foundation excavations should be protected against detrimental changes in condition such as from freezing, disturbance, etc. If possible, the concrete for foundations should be placed the same day their excavation is made. If this is not practical, the foundation excavations must be protected.

Construction Dewatering. Construction dewatering is not anticipated; however, if ground water seepage is experienced in shallow excavations, it is expected that it can be handled by pumping from sumps, or using perimeter trenches to collect and discharge the water away from the work area.

**LIMITATIONS OF REPORT** 

The analyses, conclusions, and recommendations contained in this report are based on the site conditions described herein and further assume that the exploratory borings are representative of the subsurface conditions throughout the site (i.e., the subsurface conditions everywhere are not significantly different from those disclosed by the borings). If, during construction, subsurface conditions different from those encountered in the exploratory borings are observed or appear to be present beneath excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary.

If there is a substantial lapse of time from the submittal of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, we recommend that this report be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

The scope of the exploration reported herein did not include any environmental assessment or exploration for the presence or absence of hazardous or toxic materials in the soil, ground water, or air on, around, or beneath this site. Any notations or statements in this report, including notes on the boring logs, regarding odors or unusual conditions observed are strictly presented for informational purposes only and are not intended as a definitive assessment of

Mr. Frank Haase April 4, 2018

potential contaminants present.

We recommend that we be retained to review those portions of the plans and specifications that pertain to foundations and earthwork to determine if they are consistent with our recommendations. In addition, we are available to observe construction, particularly construction of foundations, site grading, and earthwork. We would also be available to make such other field observations as may be necessary.

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This report was prepared for the exclusive use of the owner, architect, and engineer for evaluating the design of the structure as it relates to the geotechnical aspects discussed herein. It should be made available to prospective contractors for information on factual data only and not as a warranty of subsurfac conditions included in this report. Unanticipated soil conditions are commonly encountered and cannot be fully determined by taking soil samples from the borings. Such unexpected conditions require that additional expense should be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such costs.

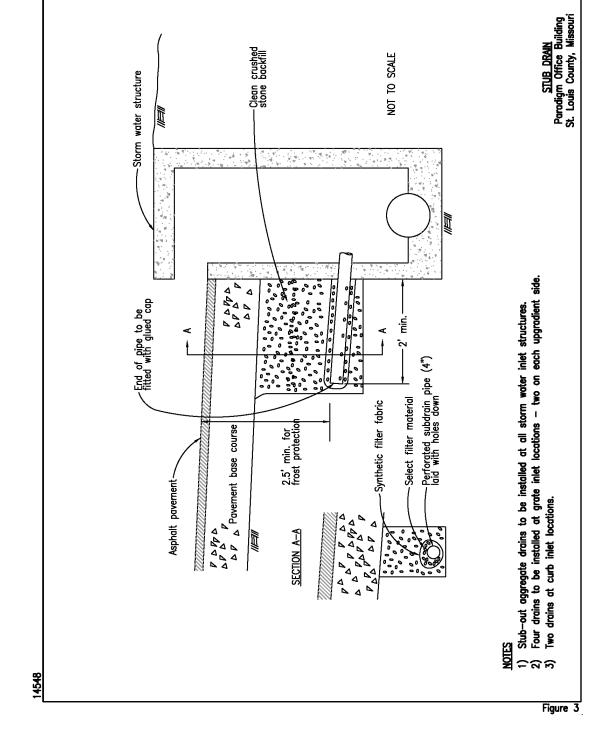
\* \* \* \* \* The following are made part of and complete this report:

> Figure 1: Site Plan Figure 2: Exploded Plan Figure 3: Stub Drain Field Classification System Logs of MT Borings B–3 & –4, and I–2 & –3 Log of Test Pit TP-1 Test Pit TP-1 Photographs

We appreciate the opportunity to be of service to you on this project. If we may be of further assistance, such as providing our quality control testing and



E-copy: BC Construction/Frank Haase



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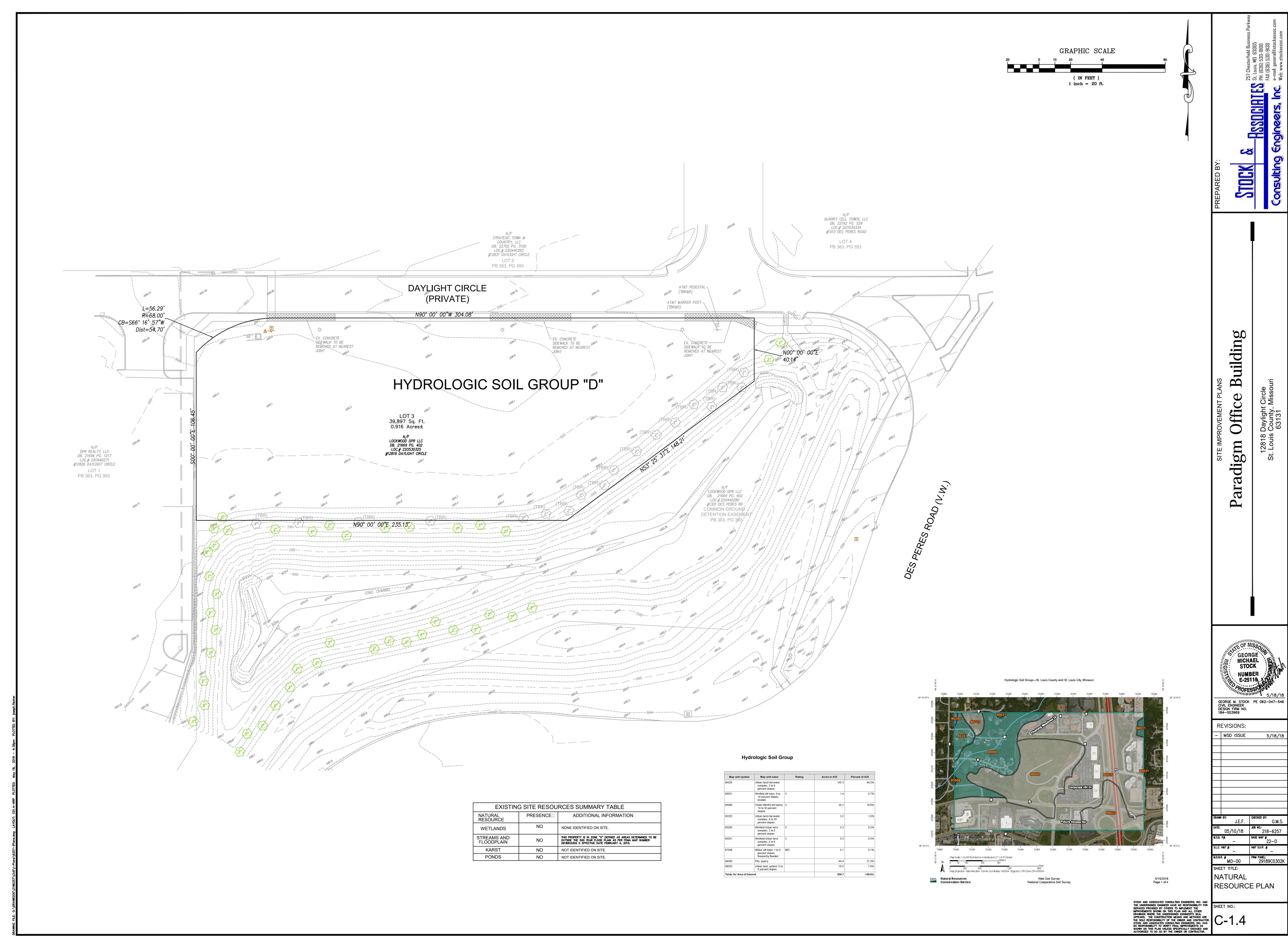
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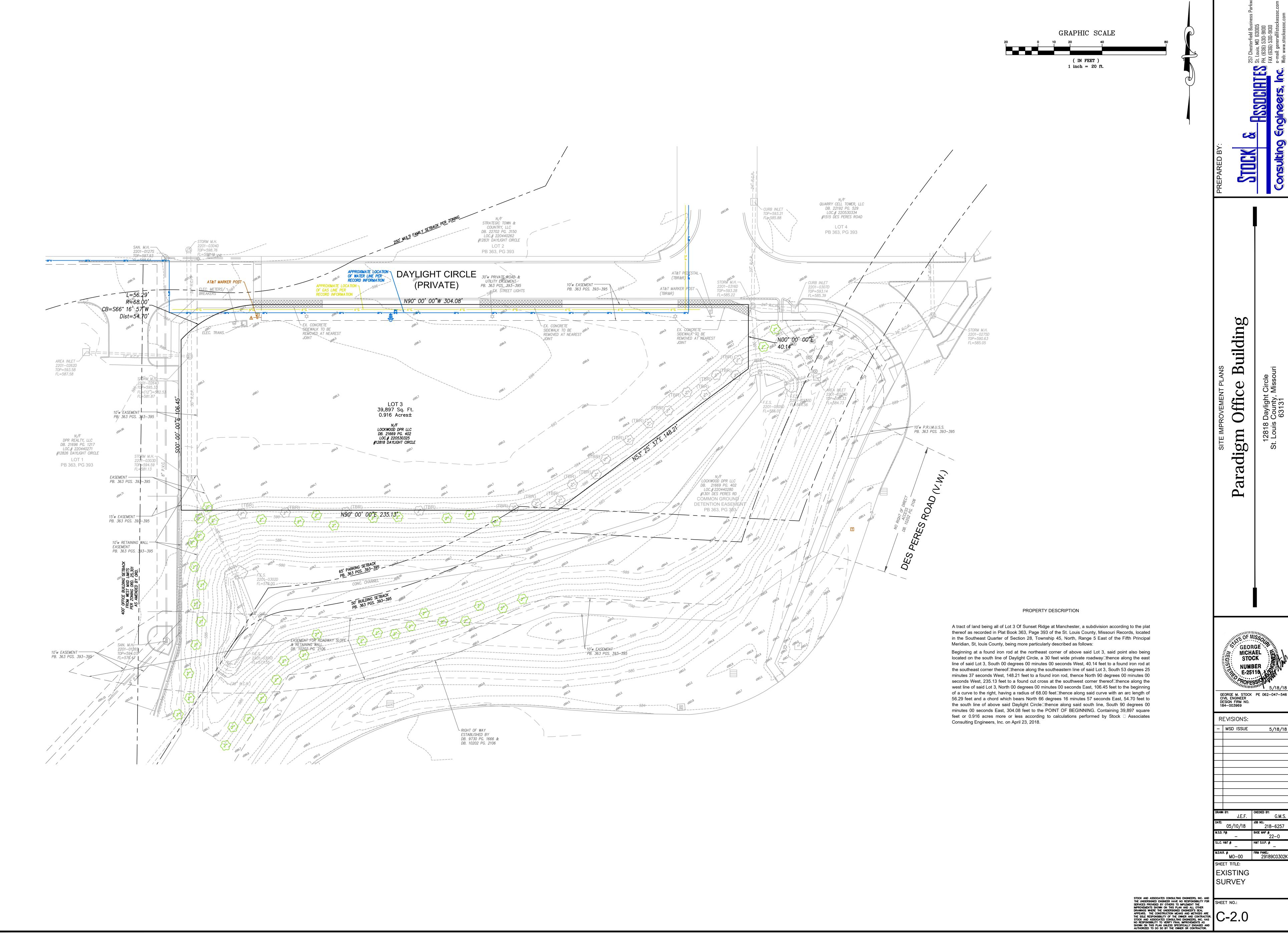
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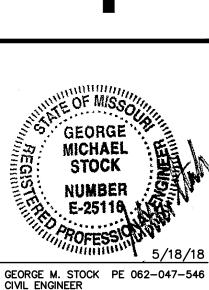
MICHAEL STOCK E-25116 GEORGE M. STOCK PE 062-047-546

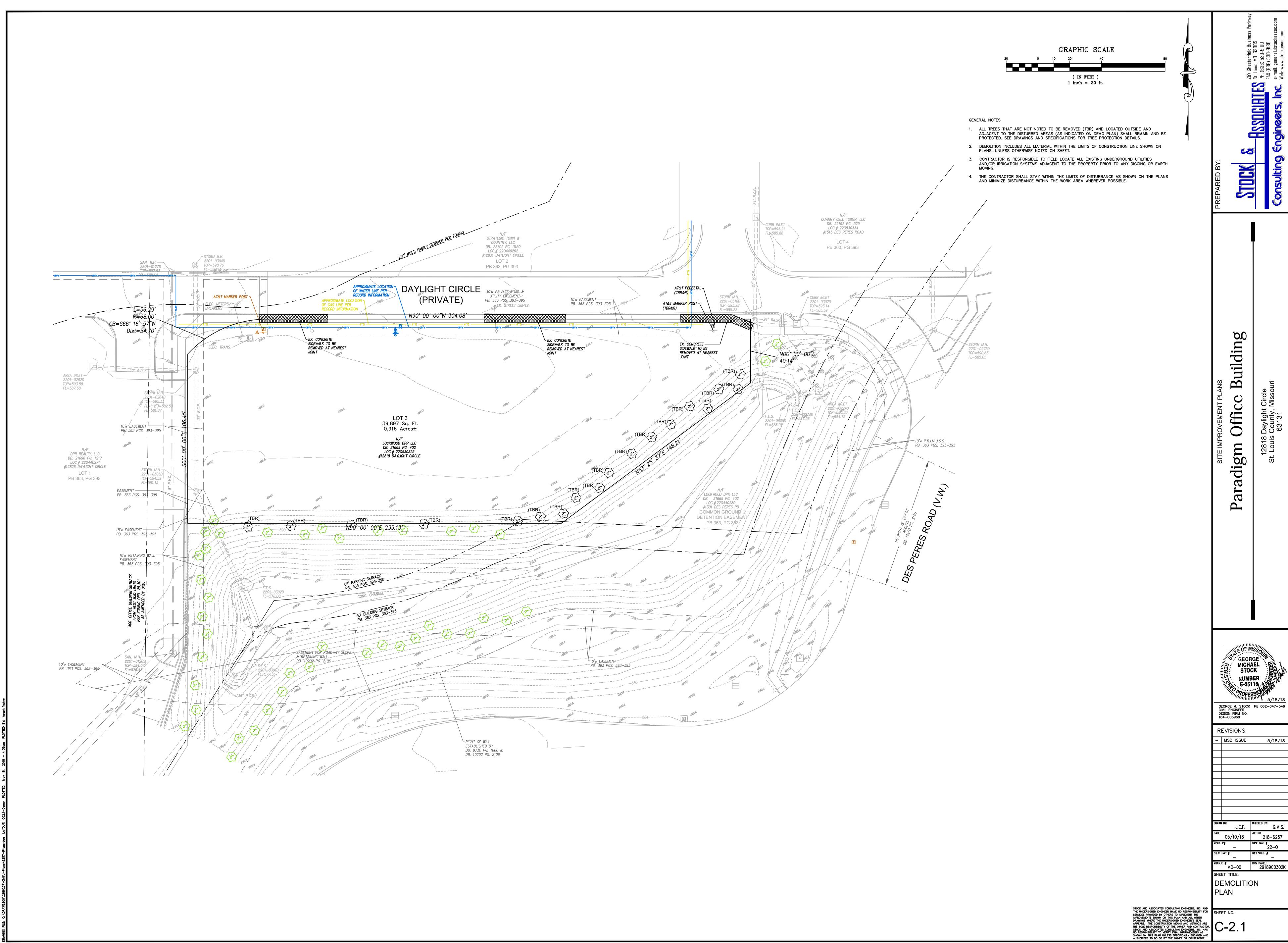
**REVISIONS:** MSD ISSUE

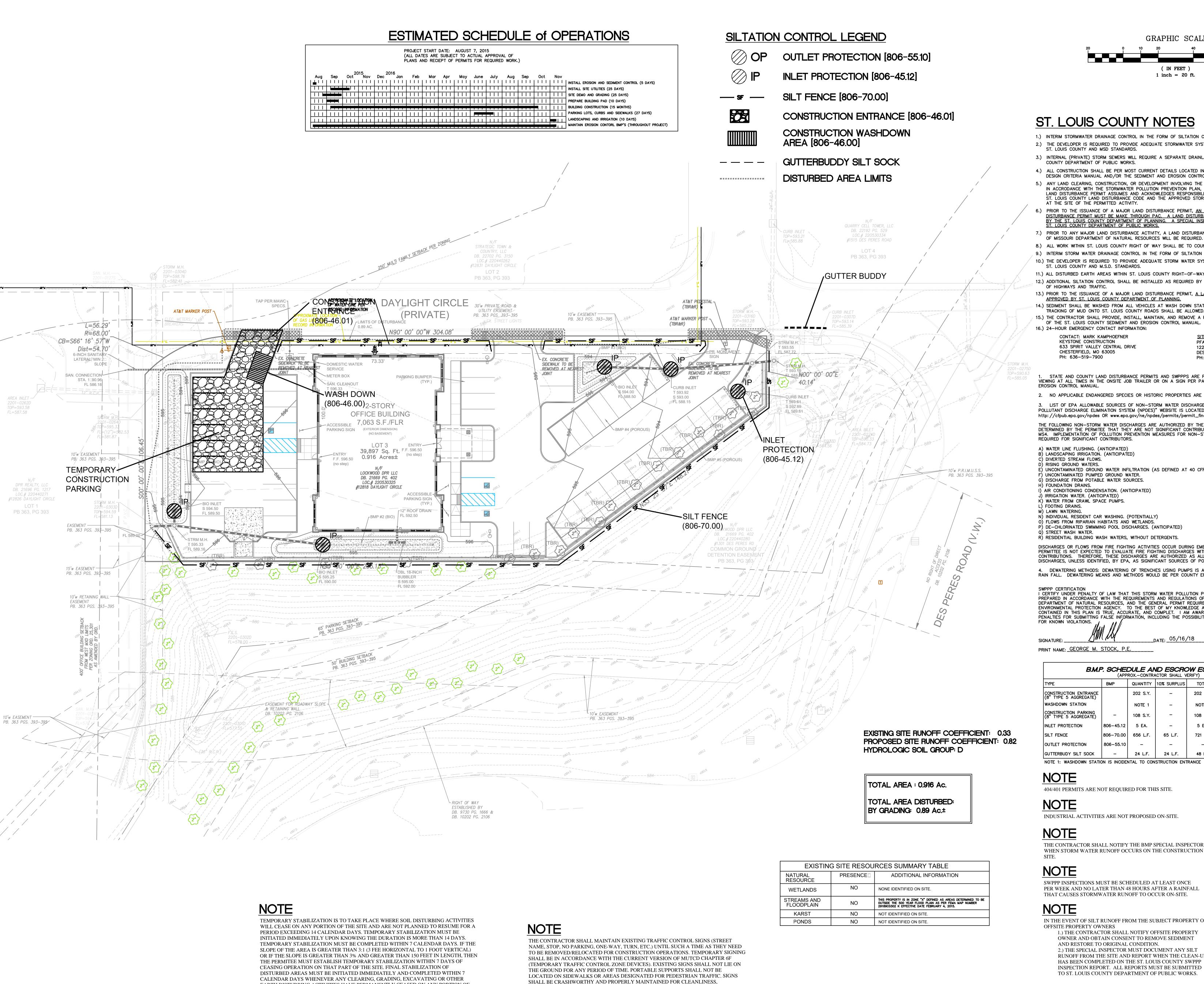
**GEOTECHNICAL** DATA











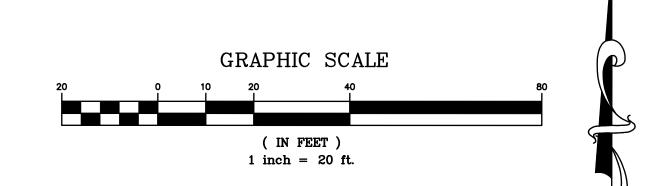
VISIBILITY, AND PROPER POSITIONING, AND SHALL BE COORDINATED WITH ST. LOUIS

COUNTY SIGN SHOP AT (314) 615-0242.

EARTH DISTURBING ACTIVITIES HAVE PERMANENTLY CEASED ON ANY PORTION OF

THE SITE. ALLOWANCES TO THE 7 DAY COMPLETION PERIOD FOR TEMPORARY AND

FINAL STABILIZATION MAY BE MADE DUE TO WEATHER OR EQUIPMENT MALFUNCTIONS. THE USE OF ALLOWANCES SHALL BE DOCUMENTED.



# ST. LOUIS COUNTY NOTES

- 1.) INTERIM STORMWATER DRAINAGE CONTROL IN THE FORM OF SILTATION CONTROL MEASURES ARE REQUIRED. 2.) THE DEVELOPER IS REQUIRED TO PROVIDE ADEQUATE STORMWATER SYSTEMS IN ACCORDANCE WITH
- 3.) INTERNAL (PRIVATE) STORM SEWERS WILL REQUIRE A SEPARATE DRAINLAYER PERMIT FROM ST. LOUIS COUNTY DEPARTMENT OF PUBLIC WORKS.
- 4.) ALL CONSTRUCTION SHALL BE PER MOST CURRENT DETAILS LOCATED IN THE ST. LOUIS COUNTY DESIGN CRITERIA MANUAL AND/OR THE SEDIMENT AND EROSION CONTROL MANUAL.
- 5.) ANY LAND CLEARING, CONSTRUCTION, OR DEVELOPMENT INVOLVING THE MOVEMENT OF EARTH SHALL BE IN ACCRODANCE WITH THE STORMWATER POLLUTION PREVENTION PLAN, AND THE PERSON ISSUED A
- LAND DISTURBANCE PERMIT ASSUMES AND ACKNOWLEDGES RESPONSIBILITY FOR COMPLIANCE WITH THE ST. LOUIS COUNTY LAND DISTURBANCE CODE AND THE APPROVED STORMWATER POLLUTION PREVENTION PLAN AT THE SITE OF THE PERMITTED ACTIVITY. .) PRIOR TO THE ISSUANCE OF A MAJOR LAND DISTURBANCE PERMIT, AN APPLICATION FOR A MAJOR LAND DISTURBANCE PERMIT MUST BE MAKE THROUGH PAC. A LAND DISTURBANCE ESCROW MUST BE APPROVED
- BY THE ST. LOUIS COUNTY DEPARTMENT OF PLANNING. A SPECIAL INSPECTOR MUST BE APPROVED BY THE ST. LOUIS COUNTY DEPARTMENT OF PUBLIC WORKS.
- 7.) PRIOR TO ANY MAJOR LAND DISTURBANCE ACTIVITY, A LAND DISTURBANCE PERMIT FROM THE STATE OF MISSOURI DEPARTMENT OF NATURAL RESOURCES WILL BE REQUIRED.
- 8.) ALL WORK WITHIN ST. LOUIS COUNTY RIGHT OF WAY SHALL BE TO COUNTY STANDARDS. 9.) INTERIM STORM WATER DRAINAGE CONTROL IN THE FORM OF SILTATION CONTROL MEASURES ARE REQUIRED. 10.) THE DEVELOPER IS REQUIRED TO PROVIDE ADEQUATE STORM WATER SYSTEMS IN ACCORDANCE WITH
- ST. LOUIS COUNTY AND M.S.D. STANDARDS. 11.) ALL DISTURBED EARTH AREAS WITHIN ST. LOUIS COUNTY RIGHT-OF-WAY SHALL BE SODDED.
- 12.) ADDITIONAL SILTATION CONTROL SHALL BE INSTALLED AS REQUIRED BY THE ST. LOUIS COUNTY DEPARTMENT OF HIGHWAYS AND TRAFFIC.
- 13.) PRIOR TO THE ISSUANCE OF A MAJOR LAND DISTURBANCE PERMIT, A LAND DISTURBANCE ESCROW SHALL BE
- 14.) SEDIMENT SHALL BE WASHED FROM ALL VEHICLES AT WASH DOWN STATION PRIOR TO LEAVING THE SITE. NO TRACKING OF MUD ONTO ST. LOUIS COUNTY ROADS SHALL BE ALLOWED.
- 15.) THE CONTRACTOR SHALL PROVIDE, INSTALL, MAINTAIN, AND REMOVE A PUBLIC NOTIFICATION SIGN, PER PAGES 41-42 OF THE ST. LOUIS COUNTY SEDIMENT AND EROSION CONTROL MANUAL. 16.) 24-HOUR EMERGENCY CONTACT INFORMATION:

CONTACT: MARK KAMPHOEFNER KEYSTONE CONSTRUCTION 633 SPIRIT VALLEY CENTRAL DRIVE CHESTERFIELD, MO 63005

PH: 636-519-7900

SITE OWNER:
PFA REAL ESTATE INVESTMENTS c/o JIM REDING 12231 MANCHESTER ROAD DES PERES, MO 63131 PH: 314-966-3400

1. STATE AND COUNTY LAND DISTURBANCE PERMITS AND SWPPPS ARE PROPOSED TO BE AVAILABLE FOR VIEWING AT ALL TIMES IN THE ONSITE JOB TRAILER OR ON A SIGN PER PAGES 41-42 OF THE COUNTY EROSION CONTROL MANUAL.

NO APPLICABLE ENDANGERED SPECIES OR HISTORIC PROPERTIES ARE KNOWN TO EXIST.

3. LIST OF EPA ALLOWABLE SOURCES OF NON-STORM WATER DISCHARGES. THE U.S. EPA "NATURAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)" WEBSITE IS LOCATED AT: http://cfpub.epa.gov/npdes OR www.epa.gov/ne/npdes/permits/permit\_final\_ms4.pdf

THE FOLLOWING NON-STORM WATER DISCHARGES ARE AUTHORIZED BY THE EPA PROVIDED IT HAS BEEN DETERMINED BY THE PERMITEE THAT THEY ARE NOT SIGNIFICANT CONTRIBUTORS OF POLLUTANTS TO THE MS4. IMPLEMENTATION OF POLLUTION PREVENTION MEASURES FOR NON-STORM WATER DISCHARGES IS REQUIRED FOR SIGNIFICANT CONTRIBUTORS.

A) WATER LINE FLUSHING. (ANTICIPATED) B) LANDSCAPING IRRIGATION. (ANTICIPATED)

C) DIVERTED STREAM FLOWS. D) RISING GROUND WATERS. E) UNCONTAMINATED GROUND WATER INFILTRATION (AS DEFINED AT 40 CFR 35.2005(20)).

F) UNCONTAMINATED PUMPED GROUND WATER. G) DISCHARGE FROM POTABLE WATER SOURCES. H) FOUNDATION DRAINS.

I) AIR CONDITIONING CONDENSATION. (ANTICIPATED) J) IRRIGATION WATER. (ANTICIPATED)

K) WATER FROM CRAWL SPACE PUMPS M) LAWN WATERING.

N) INDIVIDUAL RESIDENT CAR WASHING. (POTENTIALLY) O) FLOWS FROM RIPARIAN HABITATS AND WETLANDS.

P) DE-CHLORINATED SWIMMING POOL DISCHARGES. (ANTICIPATED) Q) STREET WASH WATER. R) RESIDENTIAL BUILDING WASH WATERS, WITHOUT DETERGENTS.

DISCHARGES OR FLOWS FROM FIRE FIGHTING ACTIVITIES OCCUR DURING EMERGENCY SITUATIONS. THE PERMITTEE IS NOT EXPECTED TO EVALUATE FIRE FIGHTING DISCHARGES WITH REGARD TO POLLUTANT CONTRIBUTIONS. THEREFORE, THESE DISCHARGES ARE AUTHORIZED AS ALLOWABLE NON-STORM WATER DISCHARGES, UNLESS IDENTIFIED, BY EPA, AS SIGNIFICANT SOURCES OF POLLUTANTS TO WATERS OF THE U.S.

4. DEWATERING METHODS: DEWATERING OF TRENCHES USING PUMPS IS ANTICIPATED UPON SUBSTANTIAL RAIN FALL. DEWATERING MEANS AND METHODS WOULD BE PER COUNTY EROSION CONTROL MANUAL.

SWPPP CERTIFICATION DEPARTMENT OF NATURAL RESOURCES, AND THE GENERAL PERMIT REQUIREMENTS OF THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY. TO THE BEST OF MY KNOWLEDGE AND BELIEF, THE INFORMATION CONTAINED IN THIS PLAN IS TRUE, ACCURATE, AND COMPLET. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT

PRINT NAME: GEORGE M. STOCK, P.E.

B.M.P. SCHEDULE AND ESCROW ESTIMATE  (APPROXCONTRACTOR SHALL VERIFY)									
TYPE	ВМР	QUANTITY	10% SURPLUS	TOTAL	UNIT COST	COST (\$)			
CONSTRUCTION ENTRANCE (8" TYPE 5 AGGREGATE)		202 S.Y.	-	202 S.Y.	7.50/S.Y.	1,515			
WASHDOWN STATION		NOTE 1	_	NOTE 1	NOTE 1	NOTE 1			
CONSTRUCTION PARKING (8" TYPE 5 AGGREGATE)	-	108 S.Y.	_	108 S.Y.	7.50/S.Y.	810			
INLET PROTECTION	806-45.12	5 EA.	_	5 EA.	100/EA.	500			
SILT FENCE	806-70.00	656 L.F.	65 L.F.	721 L.F.	2.25/L.F.	1,622			
OUTLET PROTECTION	806-55.10	-	_	-	1.75/S.Y.	_			
GUTTERBUDY SILT SOCK	-	24 L.F.	24 L.F.	48 L.F.	2.25/L.F.	108			
NOTE 1: WASHDOWN STATIO	ON IS INCIDE	NTAL TO CON	STRUCTION ENT	RANCE		TOTAL= <b>\$</b> 4,555			

404/401 PERMITS ARE NOT REQUIRED FOR THIS SITE.

### WHEN STORM WATER RUNOFF OCCURS ON THE CONSTRUCTION

SWPPP INSPECTIONS MUST BE SCHEDULED AT LEAST ONCE

PER WEEK AND NO LATER THAN 48 HOURS AFTER A RAINFALL THAT CAUSES STORMWATER RUNOFF TO OCCUR ON-SITE.

1.) THE CONTRACTOR SHALL NOTIFY OFFSITE PROPERTY OWNER AND OBTAIN CONSENT TO REMOVE SEDIMENT AND RESTORE TO ORIGINAL CONDITION. 2.) THE SPECIAL INSPECTOR MUST DOCUMENT ANY SILT RUNOFF FROM THE SITE AND REPORT WHEN THE CLEAN-UP HAS BEEN COMPLETED ON THE ST. LOUIS COUNTY SWPPP INSPECTION REPORT. ALL REPORTS MUST BE SUBMITTED TO ST. LOUIS COUNTY DEPARTMENT OF PUBLIC WORKS.

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OFF FROM THE SUBJECT PROPERTY ONTO OFFSITE PROPERTY OWNERS

STOCK AND ASSOCIATES CONSULTING ENGINEERS, INC. AND THE UNDERSIGNED ENGINEER HAVE NO RESPONSIBILITY FOR SERVICES PROVIDED BY OTHERS TO IMPLEMENT THE IMPROVEMENTS SHOWN ON THIS PLAN AND ALL OTHER DRAWINGS WHERE THE UNDERSIGNED ENGINEER'S SEAL APPEARS. THE CONSTRUCTION MEANS AND METHODS ARE THE SOLE RESPONSIBILITY OF THE OWNER AND CONTRACTOR. STOCK AND ASSOCIATES CONSULTING ENGINEERS, INC. HAS NO RESPONSIBILITY TO VERIFY FINAL IMPROVEMENTS AS SHOWN ON THIS PLAN UNLESS SPECIFICALLY ENGAGED AND AUTHORIZED TO DO SO BY THE OWNER OR CONTRACTOR.

MICHAEL STOCK NUMBER E-25116

STOCK

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**REVISIONS:** 

MO-00 SHEET TITLE:

TORMWATER PREVENTION PLAN

TYPICAL DETAIL - 803-10.00

Sediment and Erosion Control Manual

<u>Detergents</u> - Phosphorous and nitrogen containing detergents are used in wash water for cleaning vehicles. Excesses of these nutrients can be a major source of water pollution. Use detergents only as recommended, and limit their use on the site. Do not dump wash water containing detergents into the storm drain system; direct it to a sanitary sewer or contain it so that it can be treated at a wastewater

Sediment and Erosion Control Manual

### 1) HANDLING AND DISPOSAL OF HAZARDOUS MATERIALS

- Prevent spills
- Use products up Follow label directions for disposal Remove lids from empty bottles and cans when disposing in trash

Don't mix chemicals together

shall be disposed of at facilities approved for that material.

- Recycle wastes whenever possible
- Don't pour waste into sewers or waterways or on the ground Don't pour waste down the sink, floor drain or septic tanks Don't bury chemicals or containers, or dispose of them with construction debris
- Don't burn chemicals or containers
- Don't remove the original product label from the container 2) Containers shall be provided for collection of all waste material including construction debris, trash, petroleum products and any hazardous materials to be used onsite. All waste material
- 3) No waste materials shall be buried on-site.
- 4) Mixing, pumping, transferring or otherwise handling construction chemicals such as fertilizer, lime, asphalt, concrete drying compounds, and all other potentially hazardous materials shall be performed in an area away from any water course, ditch or storm drain.
- 5) Equipment fueling and maintenance, oil changing, etc., shall be performed only in an area designated for that purpose. The designated area is equipped for recycling oil and catching
- 6) Concrete wash water shall not be allowed to flow directly to storm sewers, streams, ditches, lakes etc without being treated. A sump or pit shall be constructed to contain concrete wash water. See additional requirements in the "Concrete Waste Management" section of this

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7) If substances such as oil, diesel fuel, hydraulic fluid, antifreeze, etc. are spilled, leaked, or

Sediment and Erosion Control Manual

TYPICAL DETAILS - Minimum seeding rates and acceptable dates for work attached.

removed from the site and recycled or disposed of in accordance with MoDNR requirements.

### report the spill to Missouri Department of Natural Resources (MoDNR) at (537) 634-2436, as soon as practical after discovery. Federal law requires the responsible party to report any release of oil if it reaches or threatens a sewer, lake, creek, stream, river, groundwater, wetland,

# released onto soil, the soil shall immediately be dug up and disposed of at a licensed sanitary

# landfill (not a construction / demolition debris landfill). Spills on pavement shall be immediately absorbed with sawdust, kitty litter or product designed for that purpose and disposed of at a

### or area, like a road ditch, that drains into one of the above O&M PROCEDURES - The only way to be sure that waste management practices are being followed is to be aware of worker habits and to inspect storage areas regularly. Extra management time may be

required to ensure that all workers are following the proper procedures. Inspect storage and use areas and identify containers or equipment that could malfunction and cause leaks or spills. Check equipment and containers for leaks, corrosion, support or foundation failure, or other signs of

deterioration, and test them for soundness. Immediately repair or replace any that are found to be

TYPICAL DETAILS - Not applicable.

# licensed sanitary landfill. Hazardous or industrial wastes such as most solvents, gasoline, oilbased paints, and cement curing compounds require special handling. These materials will be

# 8) State law requires the party responsible for a petroleum product spill in excess of 50 gallons to

10/10/2011

ENM = Effective neutralizing material per State evaluation of quarried rock.

Sediment and Erosion Control Manual

### ROCK OUTLET / EMBANKMENT PROTECTION / PAVED DITCH PHYSICAL DESCRIPTION - A rock apron installed over a geotextile fabric at a point of concentrated

charge, designed to slow the velocity of flow and protect the receiving area from erosion. Follow guidelines shown in the St. Louis County Standard Specifications for Highway Construction

- Light Stone Revetment-611-50.10
- Heavy Stone Revetment-611-50.30
- Concrete Slope Protection-611-60.10
- Gabions-611-70.00
- Reno Mattresses-611-70.11
- Type 2 Rock Blanket-611-30.20

### WHERE BMP IS TO BE INSTALLED - Installed at BMP outlets, for example, at the end of pipe slope drains, the emergency overflow or outlet pipe of a sediment basin.

CONDITIONS FOR EFFECTIVE USE OF BMP

Flow at Outlet: Maximum velocity of 10 fps

# WHEN BMP IS TO BE INSTALLED - With the construction of the upstream BMP that creates the

- ✓ Grade subgrade of rock blanket to required section. ✓ Place filter fabric, providing enough slack to assure that rock will not tear the fabric when it is
- ✓ Install rock with uniform profile and cross section.
- ✓ Inspect every week and after every storm during construction. ✓ Remove sediment and trash accumulation.

✓ Replace displaced rock - larger rock may be required. ✓ Stabilize eroded areas - extend if necessary.

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### POLLUTION PREVENTION PROCEDURES

**DESCRIPTION** - Building materials and other construction site wastes must be properly managed and disposed of to reduce the risk of pollution from materials such as surplus or refuse building materials or hazardous wastes. Practices such as trash disposal, recycling, proper material handling, and sp prevention and cleanup measures can reduce the potential for storm water runoff to mobilize construction site wastes and contaminate surface or ground water.

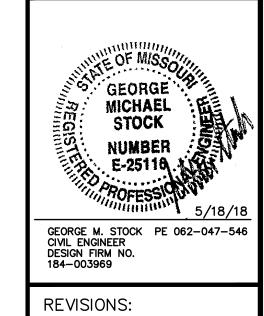
APPROPRIATE APPLICATION OF BMP - The proper management and disposal of wastes should be practiced at every construction site to reduce contaminated storm water runoff. Use waste management practices to properly locate refuse piles, to cover materials that might be displaced by rainfall or storm water runoff, and to prevent spills and leaks from hazardous materials that were

### • Designate a waste collection area on the site that does not receive a substantial amount of

- runoff from upland areas and does not drain directly to a water body. • Ensure that containers have lids so they can be covered before periods of rain, and keep
- Schedule waste collection to prevent the containers from overfilling. • Clean up spills immediately. For hazardous materials, follow cleanup instructions on the
- During the demolition phase of construction, provide extra containers and schedule more
- Collect, remove, and dispose of all construction site wastes at authorized disposal areas. Contact a local environmental agency to identify these disposal sites.
- Pesticides and Fertilizers
- Follow all federal, state, and local regulations that apply to the use, handling, or disposal of pesticides and fertilizers.
- Do not handle the materials any more than necessary. Store pesticides and fertilizers in a dry, covered area.
- Construct berms or dikes to contain stored pesticides and fertilizers in case of spillage.
- Follow the recommended application rates and methods.
- Have equipment and absorbent materials available in storage and application areas to immediately contain and clean up any spills that occur.

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MO-00 **SWPPP DETAIL** SHEET

PHYSICAL DESCRIPTION - A woven fabric barrier braced around an area inlet or drop in type filter designed to prevent sediment from entering the storm sewer. Shallow temporary ponding during and after rainfall should be expected. Use an alternate method if flooding of driving lanes, adjacent property, etc. is possible.

WHERE BMP IS TO BE INSTALLED - At inlets designed to drain a small gently sloping area with

CONDITIONS FOR EFFECTIVE USE OF BMP

Type of Flow: Shallow sheet flow.

Contributing Area: Maximum of 2 cfs flowing to inlet.

WHEN BMP IS TO BE INSTALLED - Immediately after placement of inlet and before construction

aximum grade of 5%. Overflow capacity is limited on standard area inlets.

INSTALLATION / CONSTRUCTION PROCEDURES

Backfill, compact and uniformly grade area around inlet.
 Construct downstream berm, if required. Rock bags or sand bags may be used to construct

Derm.
✓ Drive posts or wood frame close to inlet sill so overflow will fall directly on the structure and not on unprotected soil.
✓ Dig trench around inlet for fabric to be buried.

✓ Cut required length of fabric from one roll to eliminate joints. Fasten fabric tightly around posts/frame to enhance stability.

✓ Backfill and compact trench.
 ✓ Install drop in type filter per manufacturer specifications.

### O&M PROCEDURES

✓ Inspect every week and after every storm.
 ✓ Remove trash accumulation and sediment once it reaches depth of 6" at inlet.

✓ Replace loose, torn or clogged fabric.
 ✓ Repair any erosion or settlement of temporary berm downstream of inlet.
 ✓ Maintain drop in type filter per manufacturer specifications.

SITE CONDITIONS FOR REMOVAL - Remove after contributing drainage areas have been adequately stabilized. Restore area to grade and vegetate.

TYPICAL DETAIL - 806-45.12 (Single Unit) 806-45.13 (Double Unit)

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SILT FENCE

PHYSICAL DESCRIPTION - Silt fences are used as temporary perimeter controls, appropriate to the BMP, at sites where construction activities will disturb the soil. They can also be used on the interior of the site. A silt fence consists of a length of filter fabric stretched between anchoring posts spaced at regular intervals along the site at low and down slope areas. The filter fabric should be entrenched in the ground. When installed correctly and inspected frequently, silt fence can be an effective barrier to silt leaving the site in storm water runoff.

WHERE BMP IS TO BE INSTALLED - Silt fences apply to construction sites with relatively small drainage areas. They are appropriate in areas where runoff will occur as low-level flow, not exceeding 0.5 cfs. The drainage area for silt fences should not exceed 0.25 acre per 100-foot fence length (100 square feet per foot of fence). The slope length above the fence should not exceed 100 feet (NAHB, 1995). The fence should be designed to withstand the runoff from a 10-year peak storm event.

<u>CONDITIONS FOR EFFECTIVE USE OF BMP</u> - Spacing of parallel lengths of silt fence along slopes is relative to slope steepness as follows:

Type of Flow: Sheet flow only.

Contributing Slope Length: 30 foot maximum for 3:1 slopes. 50 foot maximum for slopes between 3:1 and 10:1.

100 foot maximum for slopes under 10%.

For additional information see Section 806.70 of St. Louis County's Standard Specification for Highway

WHEN BMP IS TO BE INSTALLED - Prior to disturbance of natural vegetation and at intervals during construction of fill slopes. Install on the perimeter of the site (where storm water exits the site) prior to disturbance of natural vegetation, around material stock piles and interior to the site along slopes, at the base of slopes and at intervals during construction of slopes.

INSTALLATION / CONSTRUCTION PROCEDURES

✓ Drive post for fence line.✓ Dig trench to required dimensions in front of posts for fabric burial.

✓ Attach wire mesh to posts.
 ✓ Attach fabric to posts, allowing required length below ground level to run fabric along bottom of trench
 ✓ Backfill and compact soil in trench to protect and anchor fabric.

If a standard-strength fabric is used, it can be reinforced with wire mesh behind the filter fabric. This increases the effective life of the fence. The maximum life expectancy for synthetic fabric silt fences is about 6 months, depending on the amount of rainfall and runoff.

The stakes used to anchor the filter fabric should be wood or metal. Wooden stakes should have minimum dimensions of 2 by 2 inches if a hardwood like oak is used. Stakes from soft woods like No. 2 Southern Pine, should have minimum dimensions of 4 by 4 inches. When using steel (standard U, T, L or C shape sections) posts in place of wooden stakes, they should weigh no less than 1.33 lb/linear foot. If metal posts are used, attachment points are needed for fastening the filter fabric with wire ties. Posts should be least 5 feet long and driven or placed at a slight upstream angle into the ground to a

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minimum depth of 18 inches. Depth shall be increased to a minimum of 22 inches if fence is placed on a slope of 3:1 or greater. When the post embedment depth is impossible to obtain, the posts shall be adequately secured to prevent overturning of the fence due to sediment loading.

Erect silt fence in a continuous fashion from a single roll of fabric to eliminate gaps in the fence. If a

continuous roll of fabric is not available, overlap the fabric from both directions only at stakes or posts.

Overlap at least 6 inches.

The Geosynthetic filter fabric and wire mesh (when applicable) shall be no less than 30 inches above ground and are stapled or wired to the upslope side of the post. Staples should be a 17-gauge wire and ½ inch long. Excavate a trench to bury the bottom of the fabric fence in a "J" configuration at least

6 inches below the ground surface. The trench shall be backfilled with native soil and the soil

compacted over the geotextile. This helps to prevent gaps from forming near the ground surface. Gaps would make the fencing useless as a sediment barrier.

The height of the fence posts should be 38 (22-inch embedment) to 42 (18-inch embedment) inches above the original ground surface. If standard-strength fabric is used with 14-gauge steel wire with a mesh spacing of 6 inches by 6 inches (or a prefabricated polymeric mesh of equivalent strength), space the posts no more than 4 feet apart. If extra-strength fabric is used without wire mesh reinforcement, space the posts no more than 4 feet apart with woven or 6 feet apart with non-woven geosynthetic.

Alternate Construction: Install fence by slicing it into ground with specialized equipment

Install posts at reduced spacing indicated on detail.

LIMITATIONS - Do not install silt fences along areas where rocks or other hard surfaces will prevent you from uniformly anchoring the fence posts and entrenching the filter fabric. Installing fences in such an area greatly reduces their effectiveness and can create runoff channels leading offsite. Silt fences are not suitable for areas where large amounts of concentrated runoff are likely. Fence shall not be used when slope is 1:1 or greater and water flow rates exceed 2 cubic feet per minute. Open, windy areas present a maintenance challenge, too, because high winds can make the filter fabric deteriorate

When the pores of the fence fabric become clogged with sediment, pools of water are likely to form on the uphill side of the fence. Setting and design of the silt fence should account for this. Take care to avoid unnecessarily diverting stormwater from these pools, causing further erosion damage.

faster. Do not install silt fences across streams, ditches, or waterways (Smolen et al., 1988).

MAINTENANCE CONSIDERATIONS - Inspect silt fences regularly and frequently, as well as after each rainfall event, to make sure that they are intact and that there are no gaps where the fence meets the ground or tears along the length of the fence. If you find gaps or tears, repair or replace the fabric immediately. Remove accumulated sediments from the fence base when the sediment reaches one-third to one-half the fence height. Remove sediment more frequently if accumulated sediment is creating noticeable strain on the fabric and the fence might fail from a sudden storm event. When you remove the silt fence, remove the accumulated sediment, dress the area disturbed to give it a pleasing appearance and vegetate all bare areas as well.

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O&M PROCEDURES

✓ Inspect every week and after every storm.
 ✓ Remove sediment buildup deeper than ½ the fence height or 12", whichever is less.

Replace torn of clogged fabric; repair loose fabric.
 Repair unstable or broken posts.
 Stabilize any areas susceptible to undermining.

✓ Extend fence or add additional row(s) of fence if necessary to provide adequate protection.

SITING AND DESIGN CONSIDERATIONS - The material for silt fences should be a pervious sheet of synthetic fabric such as polypropylene, nylon, and polyester or polyethylene yarn. Choose the material based on the minimum synthetic fabric requirements shown in Table 1 below.

Table 1- Temporary Silt Fence Property Requirements

			MARV G	eotextile Requ	irements
				Unsupporte	ed Silt Fence
			Supported	Woven	Non-Wov
Physical Property	Test Method	<u>Units</u>	Silt Fence 2	Elongation ≥ 50% <sup>1</sup>	Elongatio <u>≤ 50%</u> <sup>1</sup>
Post Spacing (Maximum)		feet	4	4	6
Height of Wire / Polymer Fence (Minimum)		inches	30		
Grab Strength (Minimum): Machine Direction Cross Machine Direction	ASTM D 4632	pounds	90 90	125 100	125 100
Permittivity (Minimum)	ASTM D 4491	sec ·1	0.05	0.05	0.05
Apparent Opening Size (AOS) 3	ASTM D 4751	Sieve Number	30	30	30
Ultraviolet Stability (Minimum) (retained strength)	ASTM D 4355		70% after 500	h of exposure	

Notes:

MARV Minimum Average Roll Value

1 Elongation measured in accordance with ASTM D 4632

Silt Fence Support - 14-gauge steel wire with a mesh spacing of 6 inches by 6 inches (or a prefabricated polymeric mesh of equivalent strength)
 Maximum Average Roll Value

<u>SITE CONDITIONS FOR REMOVAL</u> - After permanent vegetation of slope is established. Remove fence and post, regrade trench area and vegetate.

<u>TYPICAL DETAIL</u> - 806-70.0

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### CONSTRUCTION ENTRANCE

PHYSICAL DESCRIPTION - A stabilized entrance to a construction site designed to minimize the amount of sediment tracked from the site on vehicles and equipment. Stabilization generally consists of aggregate over geogrid and geosynthetic material. Mud and sediment fall off of tires as they travel along the stabilized entrance; however, additional measures in the form of a washdown area should also be included on site. The stabilized entrance also distributes the axle load of vehicles over a larger area; thereby mitigating the rutting impact vehicles normally have on unpaved areas. See additional in the "Construction Site Access Requirements" section of this manual.

WHERE BMP IS TO BE INSTALLED - At locations where it is safe for construction vehicles and equipment to access existing streets – preferably at location of future streets or drives.

Drainage: Ditches or pipes, if needed, sized for 15 year, 20 minute storm; HGL 6" below surface of entrance

WHEN BMP IS TO BE INSTALLED - First order of work, along with washdown area, prior to vehicles or equipment accessing unpaved areas.

CONDITIONS FOR EFFECTIVE USE OF BMP

O&M PROCEDURES:

✓ Repair settled areas.

INSTALLATION / CONSTRUCTION PROCEDURES

✓ Grade and compact area of construction entrance

✓ Install culvert under entrance if needed to maintain positive drainage.
 ✓ Place geosynthetic material next to compacted soil, lay geogrid on top of this, and cover with aggregate, forming diversion across entrance if needed to direct runoff away from roadway.
 ✓ See Washdown Station BMP for additional steps.

✓ Immediately remove any mud or debris tracked onto paved surfaces.
 ✓ Remove sediment and clods of dirt from construction entrance continuously.

Replace rock if necessary to maintain clean surface.

<u>SITE CONDITIONS FOR REMOVAL</u> - Remove when vehicles and equipment will no longer access unpaved areas.

<u>TYPICAL DETAIL</u> - 806-46.01

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### WASHDOWN STATION

PHYSICAL DESCRIPTION - An area located at construction entrances designed to wash sediment from the tires and undercarriage of exiting vehicles and prevent sediment from being tracked onto existing roadways.

WHERE BMP IS TO BE INSTALLED - Across or immediately adjacent to exit paths from unpaved

CONDITIONS FOR EFFECTIVE USE OF BMP

Drainage: Downstream BMP sized to treat dirty runoff from washdown station

# <u>WHEN BMP IS TO BE INSTALLED</u> - First order of work, along with construction entrance, prior to vehicles or equipment accessing unpaved areas.

INSTALLATION/CONSTRUCTION PROCEDURES

✓ Grade and compact area for drainage under washdown pad.

✓ Grade and compact area for drainage under washdown pad.
 ✓ Install steel-ribbed plate on frame or other support to allow a 2" drain space.
 ✓ Grade and vegetate downstream BMP (V-ditch shown on detail).
 ✓ Install water supply and becen

✓ Install water supply and hose.
 ✓ Post sign in advance of station indicating that all exiting vehicles and equipment must use station prior to exiting site.
 O&M PROCEDURES:

✓ Remove sediment daily.

✓ Repair settled areas.
 ✓ Replace rock if necessary to maintain clean surface.

SITE CONDITIONS FOR REMOVAL - Remove when vehicles and equipment will no longer access unpaved areas.

<u>TYPICAL DETAIL</u> - 806-46.00

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### CONCRETE WASTE MANAGEMENT

**<u>DESCRIPTION</u>** - The purpose of this specification is to set forth procedures and practices designed to eliminate the discharge of concrete waste materials to storm drainage systems, drainage areas, streets or watercourses, which shall be required of the contractor.

<u>APPROPRIATE APPLICATION OF BMP</u> - Concrete waste management procedures and practices will be implemented on construction projects as follows:

 Where concrete is used as a construction material or where concrete dust and debris result from demolition activities.

Where slurries containing Portland cement concrete (PCC), asphaltic concrete (AC) or bituminous concrete (BC) are generated, such as from saw cutting, coring, grinding, grooving and hydro-concrete demolition.
 Where concrete trucks and other concrete-coated equipment are washed on-site, when

approved by the Resident Engineer or Construction Inspector.Where mortar-mixing station exist.

Contractor's and / or permit holder's superintendent or representative shall oversee and enforce concrete waste management procedures.

 Discuss the concrete management techniques described in this BMP (such as handling of

concrete waste and washout) with the ready-mix concrete supplier before any deliveries

The site superintendent shall make drivers aware of the presence of the concrete waste management facilities. The site superintendent should post signage indicating the location and designated use of the concrete waste management areas, and provide careful oversight to inspect for evidence of improper dumping of concrete waste and wash water.

# inspect for evidence

Contractors, private individuals, public agencies, etc. using concrete material, shall incorporate
requirements for concrete waste management into material supplier and subcontractor
agreements. Include requirements in contracts with concrete delivery companies that drivers

must use designated concrete washout facilities.Store dry and wet materials under cover, away from drainage areas.

Avoid mixing excess amounts of fresh concrete.
Do not allow excess concrete to be dumped on-site, except in designated areas.

Cover the structures before predicted rainstorms to prevent overflows.
Monitor on site concrete waste storage and disposal procedures at least weekly or as directed by the Resident Engineer or Construction Inspector.

monitored for safety purposes and to prevent nuisances. The confractor / permittee shall apply reasonable measures to control dust and particulate matter (of any size or source) due to roadway / construction traffic, grading, clearing and grubbing, building demolition, saw-cutting etc. from migrating off the site of origin. Operations residue from grinding, saw-cutting etc. should be picked up (cleaned-up) by means of a vacuum device or swept up. Compressed or blown air may be used to clean negligible residual dust that the vacuum or sweeping did not clean up, as long as the above dust control procedures (and law and ordinance) are met. Saw cutting residue, slurry or dry, should not be allowed to enter storm drains or watercourses. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement when traffic is present, when precipitation is anticipated before cleanup or overnight. In approved locations, saw-cut slurry may flow into the dirt (where it can soak into the ground) adjacent to the saw-cutting operation and be buried, on site, 2' minimum below finished grade. Other dust control and clean-up procedures may be acceptable as approved by the Engineer or St. Louis County. See additional Concrete Waste Management requirements in this Manual.

• In St. Louis County, the contractor is required by Missouri State Law (10 CSR 10-6.170) and

County Ordinance (612.340) to control fugitive dust blown from the construction site, signal

installation, etc. Dust control, including saw-cut material etc., on the construction site shall be

### WASHOUT AREA PROTOCOL

Contain concrete washout on site or take it offsite for disposal in designated areas only.
Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.

For onsite washout:

drains to nearby waterways.

Locate washout area on-site at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough to contain liquid and solid waste. Locate it in a dirt area where the liquid portion of the washout can soak into the ground. They are preferably built below-grade to prevent breaches and reduce the likelihood of runoff. Discontinue use of the washout once it reaches 75% capacity. Washouts should be sized to handle solids and wash water to prevent overflow. It is estimated that 7 gallons of wash water are used to wash one

truck chute and 50 gallons are used to wash out the hopper of a concrete pump. Implement a maintenance schedule for washout areas.

> Temporary washout facilities should have pit or bermed areas of sufficient volume to

completely contain all liquid and waste concrete materials generated during washout

procedures.Wash out wastes into the pit where the concrete can set, be broken up, and used on site;

or buried on site; or disposed of properly.
Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose of in the trash.

• Do not place concrete wash water in a pit that is connected to the storm drain system or that

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• Locate concrete washout facilities in an area that allows convenient access for concrete trucks, preferably near the area where the concrete is being poured. Appropriate gravel or rock should cover paths to concrete washout facilities if the facilities are located on undeveloped property. These areas should be far enough away from other construction traffic to reduce the likelihood of accidental damage and spills. The number of facilities you install should depend on the expected demand for storage capacity. On large sites with extensive concrete work, place washouts in multiple locations for ease of use. If the dried concrete washout is buried on the site it shall have a 2-foot cover minimum. The 2-foot cover shall match with surrounding finished grade.

Concrete washed out in areas other than those designated for such activity, shall be cleaned up by the contractor.

Install signage adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
Perform washout of concrete mixers, delivery trucks and other delivery systems in designated areas only.

Wash out concrete from concrete pumper bins into concrete pumper trucks and discharge into designated washout area.
Equipment that cannot be easily moved, such as concrete pavers, shall only be washed in designated assess that do not design to washed in the contract of the contract o

cannot be within 50 feet of a storm or sanitary sewer; or water course; or where it can drain off

Backfill and repair holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities.
 Wash out concrete on site into a future designated final concrete pour location. This location

site. The washout cannot jeopardize the integrity of the final concrete pour. Concrete to be removed from the site shall be disposed of in conformance with the provisions in Standard Specification Manual, Section 202, all as directed by the Engineer. No additional payment will be made for complying with the above specification.

• A self-contained and watertight container may be used to control, capture, and contain concrete wastewater and wash-out material. The container must be portable and temporary, damage resistant, protect against spills and leaks, and sized to handle solids and wash water to prevent overflow. The container should be emptied and cleaned when 75% of its capacity is reached. After all liquids evaporate or are pumped or vacuumed, and the remaining slurry solidified, the Contractor may bury the solids on site. On County Highway Projects the solids may be buried

on site if approved by the Engineer. In either case, solids shall be buried a minimum of 2 feet

below finished grade. Disposal of container contents that are removed from the site shall be

made at an approved landfill. In order to prevent overflows caused by natural occurrences and

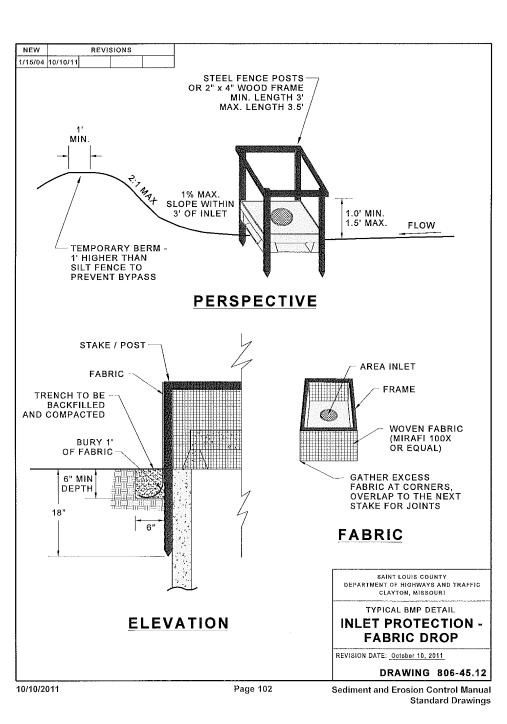
to provide security for safety purposes and against acts of vandalism, the container shall be

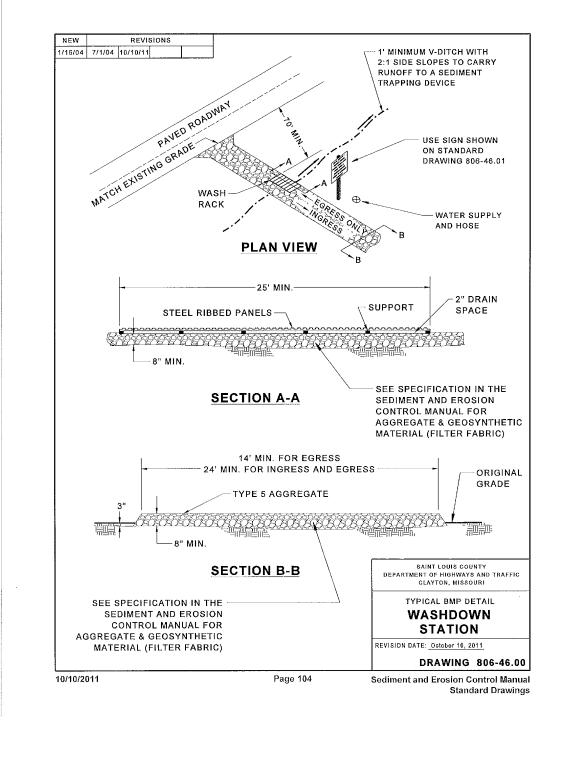
covered at the end of each workday and remain covered until the beginning of the next

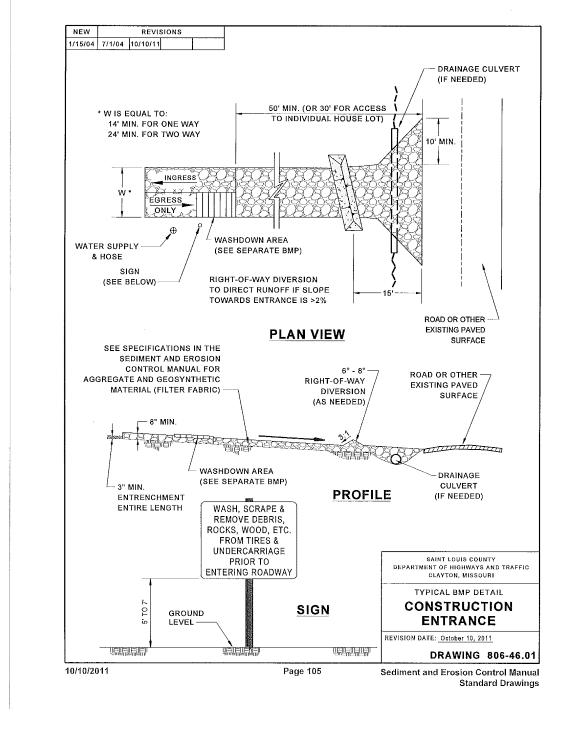
workday. The cover shall remain on site with the container at all times. Container shall be free of liquids during any on-site relocation process or transport to another site. On County Highway projects, location(s) for the container shall be approved by the Engineer.

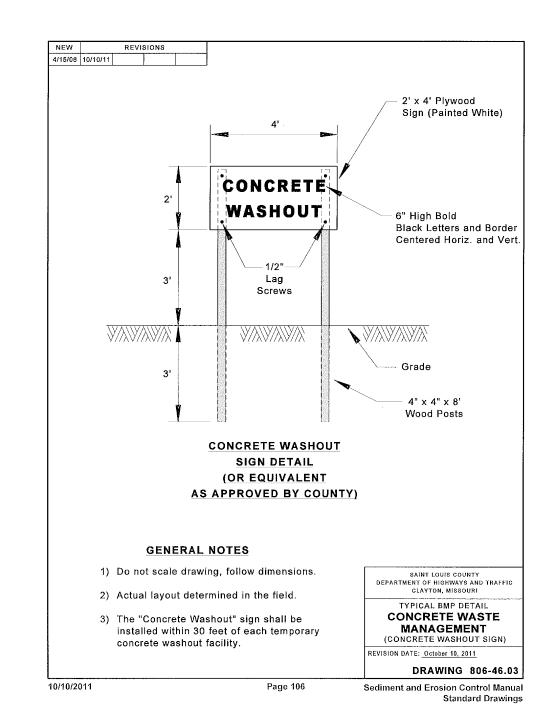
**TYPICAL DETAIL** - 806-46.03

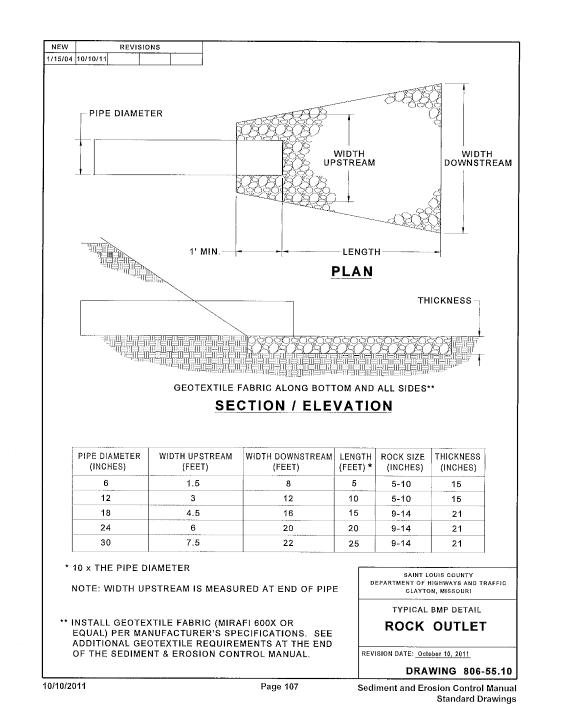
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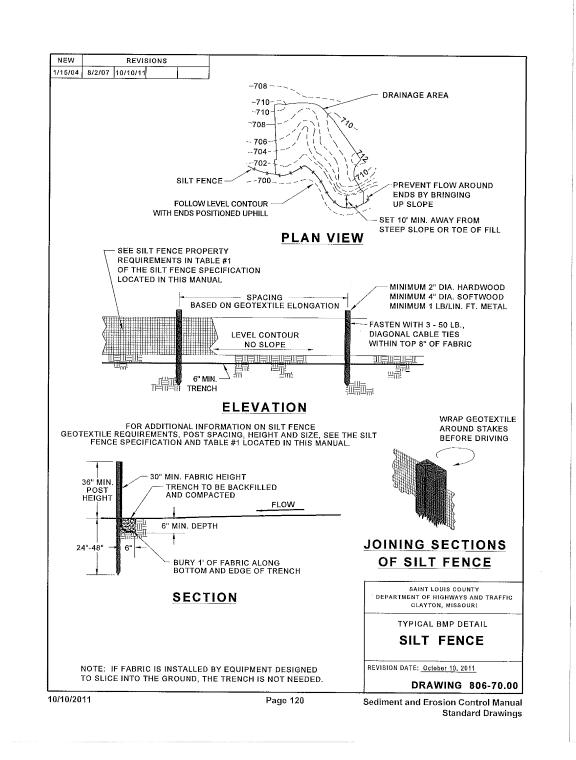


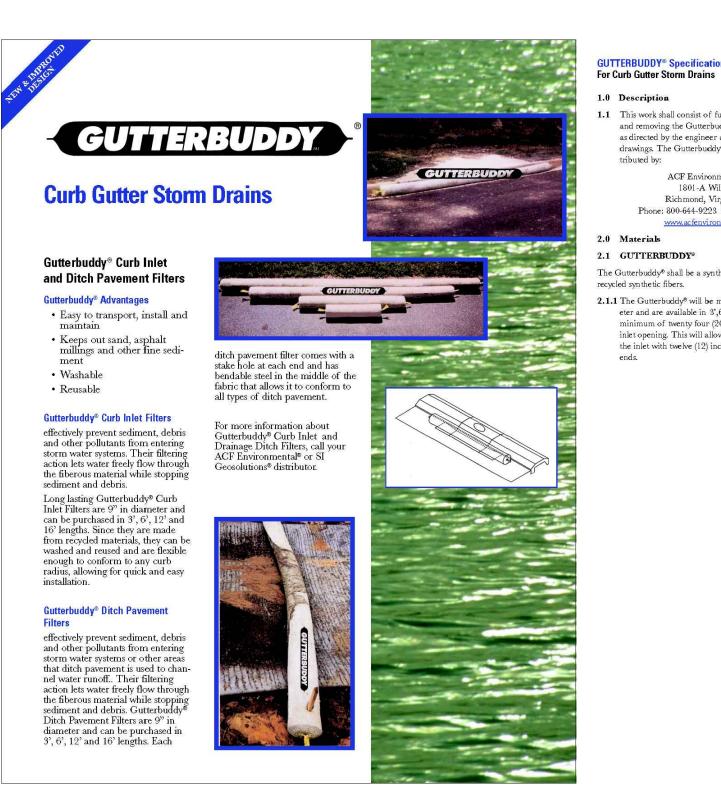


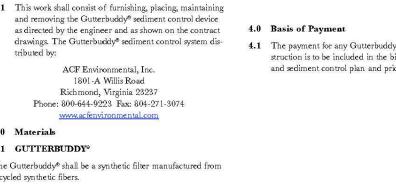












4.0 Basis of Payment
4.1 The payment for any Gutterbuddy<sup>®</sup> used during the construction is to be included in the bid of the overall erosion and sediment control plan and priced by the linear foot.

3.1.5 Ponding is likely if sediment is not removed regularly. Inspection of Gutterbuddy<sup>6</sup> should be on a regular basis

the GuttreBuddy<sup>®</sup> shall be a synthetic filter manufactured from ecycled synthetic fibers.

1.1.1 The Gutterbuddy<sup>®</sup> will be manufactured to be 9" in diameter and are available in 3',6',12' and 16' lengths and a minimum of twenty four (24) inches longer than the curb inlet opening. This will allow for sufficient length to cover the inlet with twelve (12) inches beyond the inlet on both

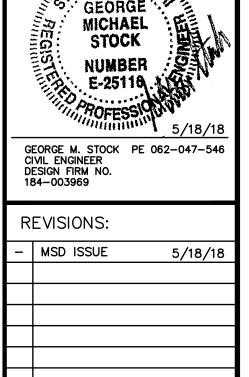
3.0 Construction Sequence
3.1 General
3.1.1 Install the Gutterbuddy® in front of the curb inlet open-

ing Each end of the Gutterbuddy® should overlap the curb inlet approximately 12°.

3.1.2 The Gutterbuddy® should be cleaned if a visual inspection shows silt and debris build up around the Gutterbuddy®.

3.1.3 To remove the Gutterbuddy<sup>®</sup>, lift out of the opening.
3.1.4 The Gutterbuddy<sup>®</sup> is reusable, once the construction pro ect is complete and it is no longer needed for sediment control, remove, clean and store out of the sunlight until needed on the next project.

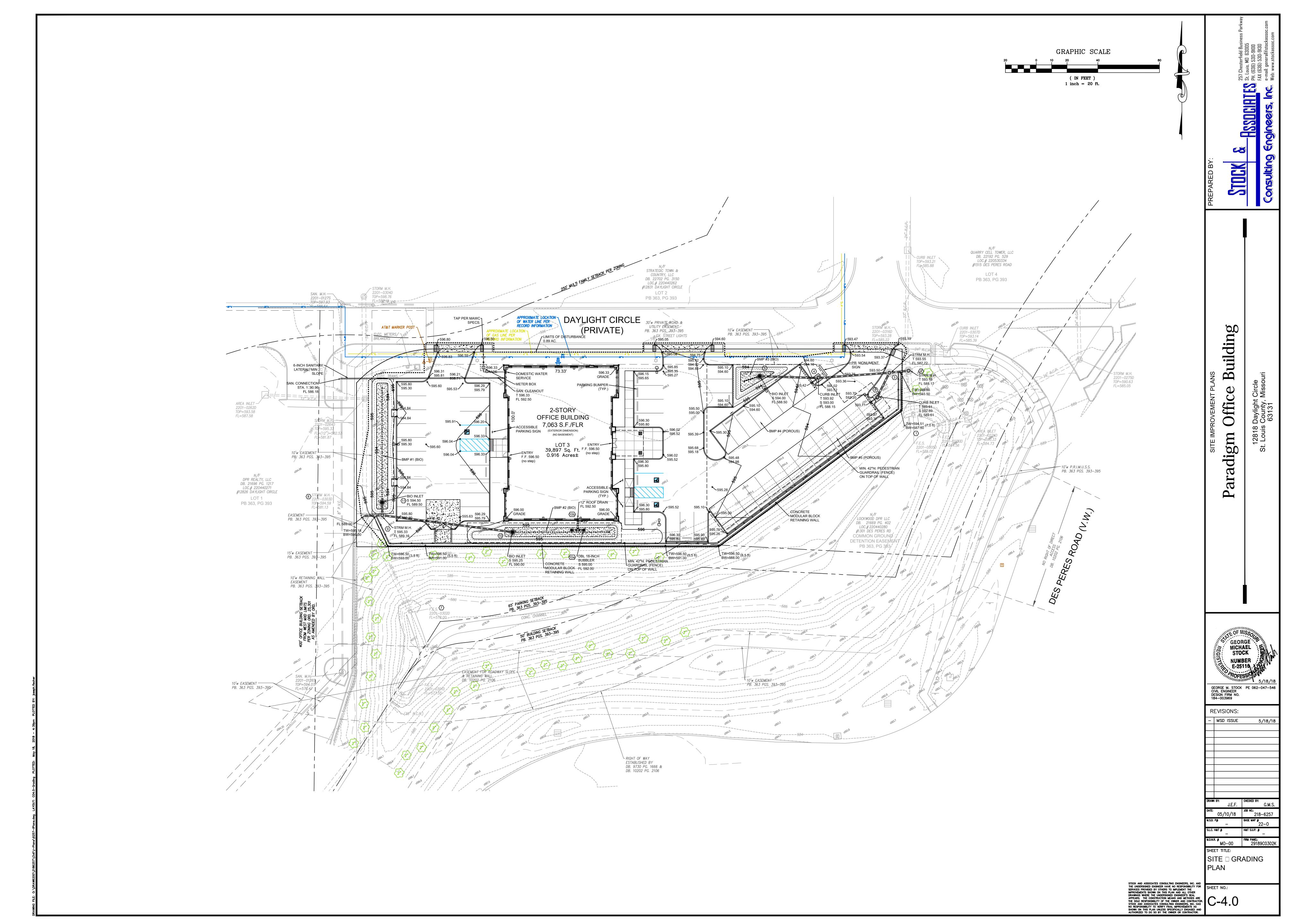


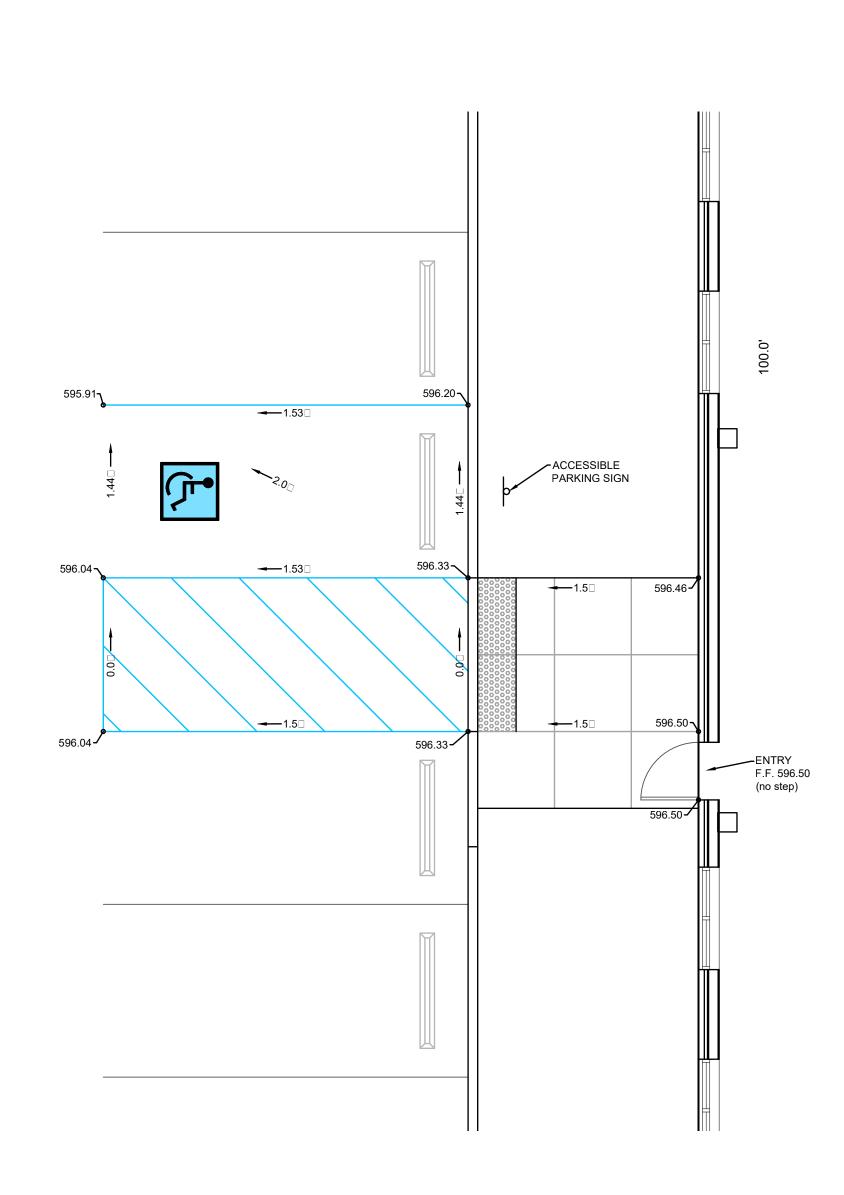


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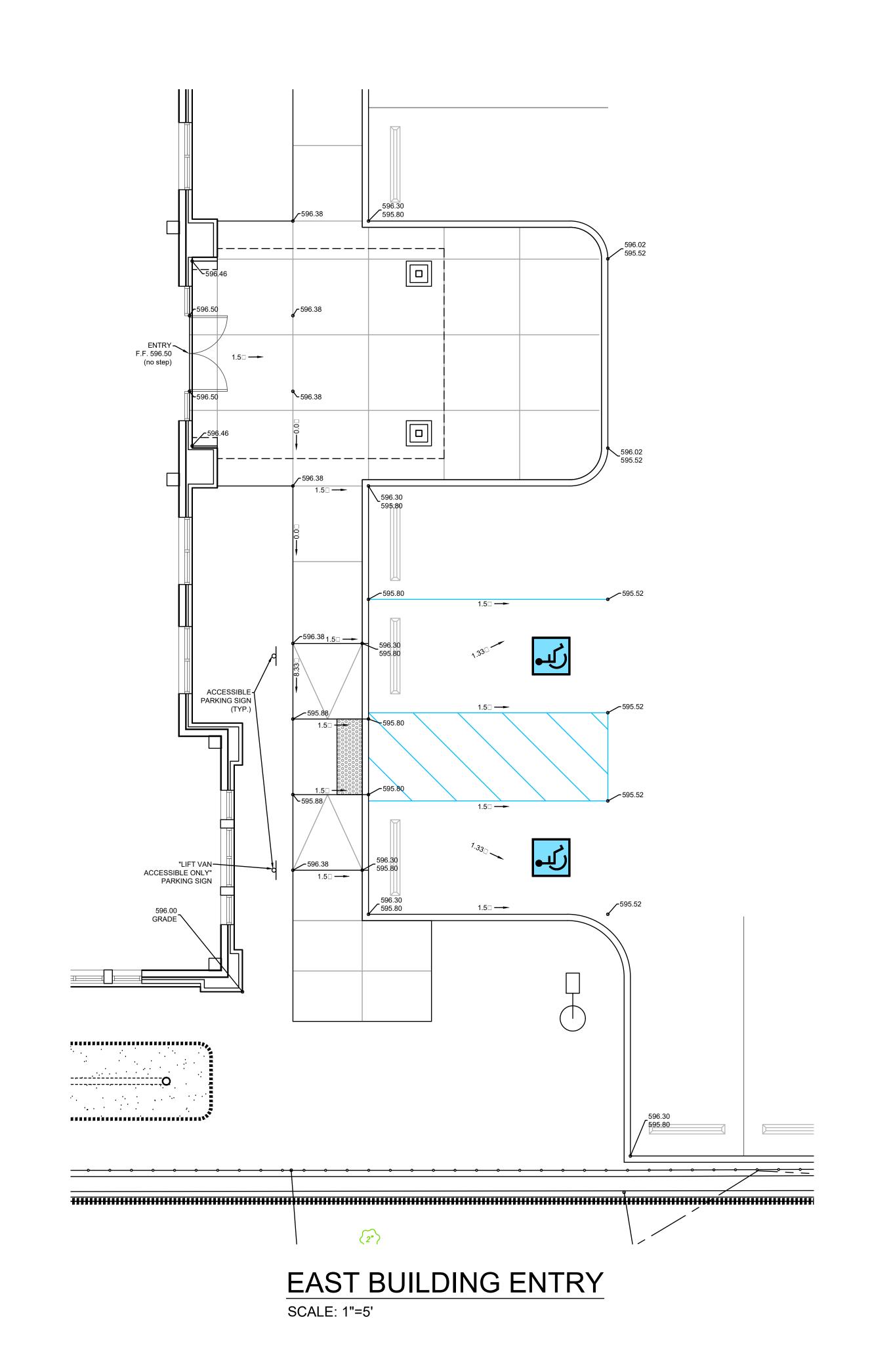
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WEST BUILDING ENTRY
SCALE: 1"=5'



Paradigm Office Buildir

GEORGE MICHAEL STOCK
NUMBER E-25116.

GEORGE M. STOCK PE 062-047-546 CIVIL ENGINEER DESIGN FIRM NO. 184-003969

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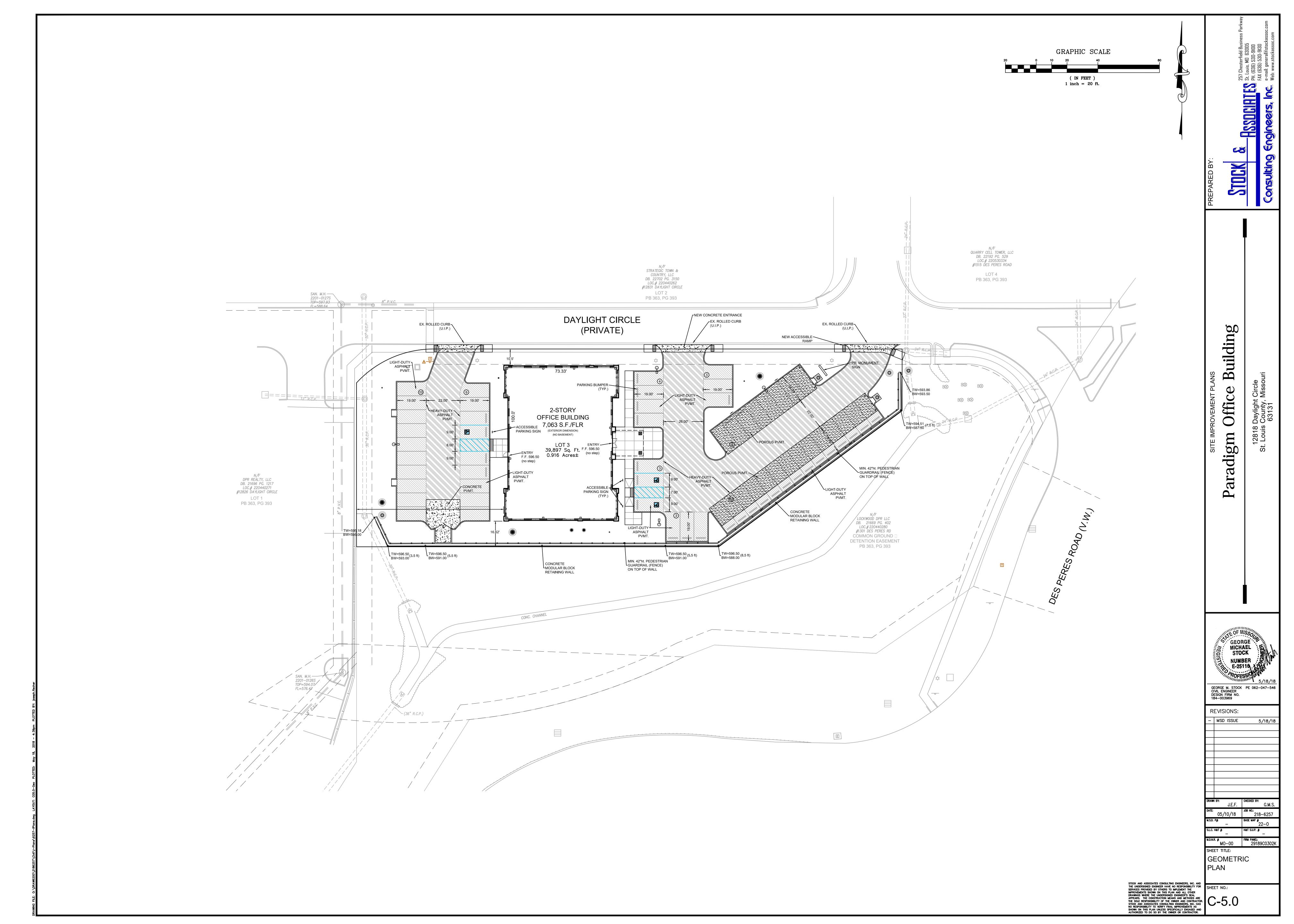
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3. IF  $QV_{h(in)} > QV_{h(out)}$ , NO JUNCTION LOSES TO BE CALCULATED.

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	LINE	Ε	FLOW	LINE					$10^0 = 0.11$	$25^0 = 0.30$	$40^0 = 0.43$	$55^0 = 0.52$	$70^0 = 0.60$	$85^0 = 0.67$		HEAD LO	oss		Hydi	aulic Elevat	tions				
			ELEVA'	TIONS					$15^0 = 0.18$	$30^0 = 0.35$	$45^0 = 0.47$	$60^0 = 0.55$	$75^0 = 0.62$	$90^0 = 0.70$								Structure	ТОР	Free	
tructure	Upper	Lower	Upper	Lower	Length	Flowline	Pipe Size	Full Flow	Total (Q)	Mean Full Flow	+	Velocity	QVh	Pipe Coef.	Hf	Junction	Bend	Total	Upper F.L	Lower H.E.	Lower H.E.	1	Structure		Struct
Number		structure	**	Structure	(ft)	Grade ft/ft	(in.)	Cap. (cfs)	\ \ -'	Vel.(V) (ft/s)	Coef	Head (V <sub>h</sub> ) (ft)	$(\mathbf{ft}^4/\mathbf{s})$	(n)	(ft)	(ft)	(ft)	Hmt	+ Dia.	+Hf		H.E. + H <sub>mt</sub>	Elevation		Numb
varioer ,	3ti uctui e	<del>structure</del>	structure	Structure	(10)	Grade 10/10	(111.)	Cap. (C13)	(CIS)	ven.(v)(14/3)	Coci	Tieud (VII) (II)	(10 / 5)	(11)	(10)	(10)		TAIIt	. 1214.	• 1.11		IIII IIII	Lacvation	•	Titalino
5	5	4	588.50	588.12	37.80	0.0101	12	3.58	0.30	0.38	0.00	0.00	0.00	0.013	0.00	0.00	0.00	0.00	589.50	589.15	589.15	589.50	594.00	4.50	5
4	4	3	588.12	587.65	46.40	0.0101	12	3.60	0.60	0.76	0.24	0.01	0.01	0.013	0.01	0.01	0.00	0.01	589.12	589.14	589.13	589.15	593.92	4.77	4
3	3	2	587.65	587.52	12.50	0.0104	12	3.64	0.97	1.24	0.11	0.02	0.02	0.013	0.01	0.02	0.00	0.03	588.65	589.10	589.09	589.13	593.55	4.42	3
2	2	1	585.17	585.01	29.30	0.0055	30	30.39	23.92	4.87	0.70	0.70	16.74	0.013	0.10	0.93	0.49	1.42	587.67	587.61	587.51	589.09	593.16	4.07	2
1	1		585.01										HYDRAULI	C GRADE =	100YR H	IGH WAT	ER (P#218	21-03)				587.28			1
6	6	3	589.61	587.65	18.00	0.1089	12	11.79	0.37	0.47	0.47	0.00	0.00	0.013	0.00	0.00	0.00	0.01	590.61	589.13	589.13	590.62	593.61	2.99	6
3	3		587.65										HYDRAULI	C GRADE								589.13			3
10	10	9	590.00	589.15	85.30	0.0100	12	3.57	0.66	0.84	0.00	0.01	0.01	0.013	0.03	0.01	0.00	0.01	591.00	590.24	590.21	591.01	595.25	4.24	
9	9	8	589.15	588.50	11.50	0.0565	12	8.49	1.29	1.64	0.30	0.04	0.05	0.013	0.02	0.05	0.01	0.06	590.15	589.61	589.59	590.21	595.33	5.12	
8	8	7	581.13	578.00	69.60	0.0450	30	87.22	36.67	7.47	0.70	0.87	31.78	0.013	0.56	1.15	0.61	1.76	583.63	587.84	587.28	589.59	594.59	5.00	
7	7		578.00										HYDRAULI	C GRADE =	100YR H. T	IGH WAT. T	ER (P#218 T	21-03)				587.28			7
11	11	9	589.50	589.15	8.40	0.0417	12	7.29	0.63	0.80	0.70	0.01	0.01	0.013	0.00	0.01	0.01	0.02	590.50	590.21	590.21	590.52	594.33	3.81	11
9	9		589.15	003.10	0.10	0.0117			0.02	0.00	0.70	0.01	HYDRAULI		0.00	0.01	0.01		0,0.00	0,0.21	0>0.21	590.21	05 1.00	0.01	9
																	1							1	+

VELOCITY HEAD:  $V_h = V^2/2g$ 

roject nai		Paradigm			Calculat		J.E.F.																		
roject nu	mber:	218-6257			Checked	l By:	G.M.S.				Bend Coef	<u>ficients :</u>			Revision	ns:									
roject Lo	cation:	Frontenac	, <i>MO</i>		Date:		5/15/2018		$5^0 = 0.06$	$20^0 = 0.24$	$35^0 = 0.4$	$50^0 = 0.50$	$65^0 = 0.57$	$80^0 = 0.65$											
	LINI	E	FLOW	LINE					$10^0 = 0.11$	$25^0 = 0.30$	$40^0 = 0.43$	$55^0 = 0.52$	$70^0 = 0.60$	$85^0 = 0.67$		HEAD LO	OSS		Hydr	aulic Elevat	tions				
			ELEVA'	TIONS					$15^0 = 0.18$	$30^0 = 0.35$	$45^0 = 0.47$	$60^0 = 0.55$	$75^0 = 0.62$	$90^0 = 0.70$								Structure	TOP	Free	
tructure	Upper	Lower	Upper	Lower	Length	Flowline	Pipe Size	Full Flow		Mean Full Flow	Bend	Velocity	QVh	Pipe Coef.	Hf	Junction	Bend	Total	Upper F.L	Lower H.E.	Lower H.E.		Structure		Stru
Number		structure		Structure		Grade ft/ft	(in.)	Cap. (cfs)	(cfs)	Vel.(V) (ft/s)	Coef	Head (V <sub>h</sub> ) (ft)	$(ft^4/s)$	(n)	(ft)	(ft)	(ft)	Hmt	+ Dia.	+Hf		H.E. + H <sub>mt</sub>	Elevation		Nur
variabet .	, ucture	structure,	<del>ou acture</del>	Structure	(10)	Grade 10/10	(111.)	Cupi (CIS)	(CIS)	ven(v)(ies)	Coci	Tiener ( v ii) (it)	(10 / 2)	(11)	(10)	(11)	(It)	AAIII	1 2100			TALLS . TAIRL	Lievation		1141
5	5	4	588.50	588.12	37.80	0.0101	12	3.58	0.40	0.51	0.00	0.00	0.00	0.013	0.00	0.01	0.00	0.01	589.50	589.21	589.20	589.51	594.00	4.49	†
4	4	3	588.12	587.65	46.40	0.0101	12	3.60	0.81	1.03	0.24	0.02	0.01	0.013	0.02	0.02	0.00	0.02	589.12	589.18	589.15	589.20	593.92	4.72	
3	3	2	587.65	587.52	12.50	0.0104	12	3.64	1.31	1.67	0.11	0.04	0.06	0.013	0.02	0.04	0.00	0.05	588.65	589.10	589.09	589.15	593.55	4.40	
2	2	1	585.17	585.01	29.30	0.0055	30	30.39	24.26	4.94	0.70	0.70	16.98	0.013	0.10	0.93	0.49	1.42	587.67	587.61	587.51	589.09	593.16	4.07	
1	1		585.01										HYDRAULI	C GRADE =	100YR H	IGH WATI	ER (P#218	321-03)				587.28			
6	6	3	589.61	587.65	18.00	0.1089	12	11.79	0.49	0.62	0.47	0.01	0.00	0.013	0.00	0.01	0.00	0.01	590.61	589.16	589.15	590.62	593.61	2.99	
3	3		587.65										HYDRAULI	C GRADE								589.15			
10	10	9	590.00	589.15	85.30	0.0100	12	3.57	0.89	1.13	0.00	0.02	0.02	0.013	0.05	0.03	0.00	0.03	591.00	590.31	590.26	591.03	595.25	4.22	
9	9	8	589.15	588.50	11.50	0.0565	12	8.49	1.74	2.22	0.30	0.08	0.13	0.013	0.03	0.09	0.02	0.11	590.15	589.68	589.65	590.26	595.33	5.07	
8	8	7	581.13	578.00	69.60	0.0450	30	87.22	37.12	7.56	0.70	0.89	32.96	0.013	0.57	1.18	0.62	1.80	583.63	587.85	587.28	589.65	594.59	4.94	
7	7		578.00										HYDRAUL	C GRADE =	100YR H	IGH WATI	ER (P#218	321-03)				587.28			
11	11	9	589.50	589.15	8.40	0.0417	12	7.29	0.85	1.08	0.70	0.02	0.02	0.013	0.00	0.02	0.01	0.04	590.50	590.27	590.26	590.54	594.33	3.79	1
9	9		589.15	307.13	0.10	0.0117	12	7.29	0.05	1.00	0.70	+	HYDRAULI		0.00	0.02	0.01	0.01	370.50	370.21	370.20	590.26	371.33	3.77	+ '
																									1
•			/ \/EL 6.3		1.0		III NOTION: 1	2050 (11:11:	0) [0	\/I. 0 //	0 1/ 11 4 4	20/50		NI - 1 -	4 15 55	ODE T.: 4	N ONE !	NOOBBLY			DEND LO	20 4115 4	DD T0.05		
				$V = Q_{AC1}$ Hf = 2.87			1			<sub>t</sub> Vh <sub>out</sub> - Sum ( GLE COEFFICIE		53/[Q <sub>out</sub> ]		Note:					•		BEND LOS	S AND A	יסט ו OGE	HER.	
		N LOSS (I Y HEAD :	.,	$V_h = V^2/2$	•	<i>u )</i>	DEND LOSES	(DEND) =	(V) ANG		EIN I				2. NO S	SIKUCIU	KE LUS	ES IO BI	E CALCUL.	AIEDAI	א טאטף				

ALL DETAILS SHOWN ON THIS SHEET ARE FOR THE CONVENIENCE OF THE CONTRACTOR. THE DETAILS ARE TO BE VERIFIED PER MSD'S STANDARD CONSTRUCTION SPECIFICATIONS, 2009. ALL METHODS, MEANS AND MATERIALS SHALL CONFORM TO MSD CURRENT STANDARD CONSTRUCTION SPECIFICATION, 2009.

LINETYPE LEGEND

EXISTING GRADE..... -----PROPOSED GRADE... 15yr. HYDRAULIC GRADE...—··—··— PROPOSED PAVEMENT.... GRANULAR BACKFILL... COMPACTED FILL... AMENDED SOILS...

(PUMI)=PRIVATE UNDER MSD INSPECTION

**CONSTRUCTION NOTES:** 

1. ALL R.C.P. SHALL BE CLASS III UNLESS NOTED OTHERWISE. 2. ALL P.V.C. SHALL BE SDR 35 UNLESS NOTED OTHERWISE.

ATTENTION SEWER CONTRACTOR

For Sewer Pipe (storm, sanitary and combined) with a design grade less than one percent (1%), verification of the pipe grade will be required for each installed reach of sewer, prior to any surface restoration or installation of any surface improvements. The Contractor's field supervisor will be required to provide daily documentation verifying that the as-built pipe grade meets the design grade through the submittal of signed cut sheets to the MSD Inspector upon request.

Field surveyed verification must be made under the direction of a licensed land surveyor or registered engineer. The Contractor will be required to remove and replace any sewer reach having an asbuilt grade which is flatter than the design grade by more than 0.1%. Sewers with grade greater than the design slope may be left in place, provided no other sewer grade is reduced by this variance in the as—built grade.

MSD also reserves the right to require the Contractor to remove and replace any sewer (at any time prior to construction approval) for which the as—built grade does not comply with the grade tolerance stated in the above paragraph.

The Sewer Contractor shall be responsible for any costs associated with the field verification of the sewer grade, or removal and replacement of the sewer pipe or associated appurtenances.

MAINTENANCE OF THE SEWERS DESIGNATED AS "PUBLIC" SHALL BE THE RESPONSIBLITY OF THE METROPOLITAN ST. LOUIS SEWER DISTRICT UPON DEDICATION OF THE SEWERS TO THE DISTRICT.

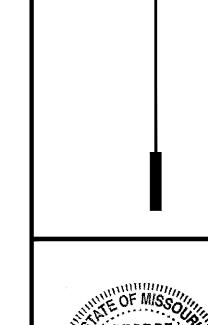
MANHOLES MAY BE RAISED USING COURSES OF BRICK OR APPROVED GRADE RING(S), PROVIDED THE TOTAL ADJUSTMENT OF THE MANHOLE DOES NOT EXCEED 12 INCHES (INCLUDING EXISTING RINGS OR COURSES OF BRICK). FOR MANHOLES WHICH EXCEED THE MAXIMUM OF 12 INCHES, THE TRANSITION SECTION OF THE STRUCTURE SHALL BE REMOVED AND THE BOTTOM SECTION RAISED USING THE SAME MATERIAL AS THE EXISTING STRUCTURE.

MANHOLES MAY BE LOWERED BY REMOVING THE TRANSITION SECTION, AND LOWERING THE EXISTING BOTTOM SECTION BY SAWCUTTING THE EXISTING CAST-IN-PLACE CONCRETE, REMOVING THE REQUIRED COURSES OF BRICK, OR BY REMOVING THE PRE-CAST RISER SECTION AS APPROPIATE. STANDARD MANHOLE SPLITTER NOTE: CONTRACTOR MUST VERIFY THE DIMENSIONS BETWEEN THE DIVERSION PIPE AND THE OVERFLOW PIPE PRIOR TO BACKFILL OF THE STRUCTURE AND NOTIFY

ON THE APPROVED PLANS. STRUCTURES BUILT INCORRECTLY WILL REQUIRE REMOVAL AND REPLACEMENT. STANDARD CONSTRUCTION:

ALL STORM AND SANITARY SEWER STRUCTURES AND APPURTENANCES TO BE DEDICATED TO MSD, OR TO BE PRIVATE UNDER MSD INSPECTION, SHALL CONFORM TO THE METROPOLITAN ST. LOUIS SEWER DISTRICT, STANDARD CONSTRUCTION SPECIFICATIONS FOR SEWERS AND DRAINAGE FACILITIES, 2009. THAT WILL INCLUDE STANDARD DETAILS SHOWN THEREIN, AND SHALL INCLUDE ALL SUBSEQUENT CHANGES MADE THERETO.

THE DESIGN ENGINEER IMMEDIATELY OF ANY DISCREPANCY WITH THE DIMENSIONS



MICHAEL STOCK

E-25116

STOCK

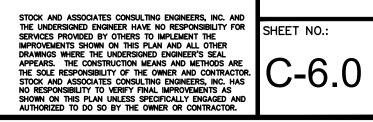
Building

Office

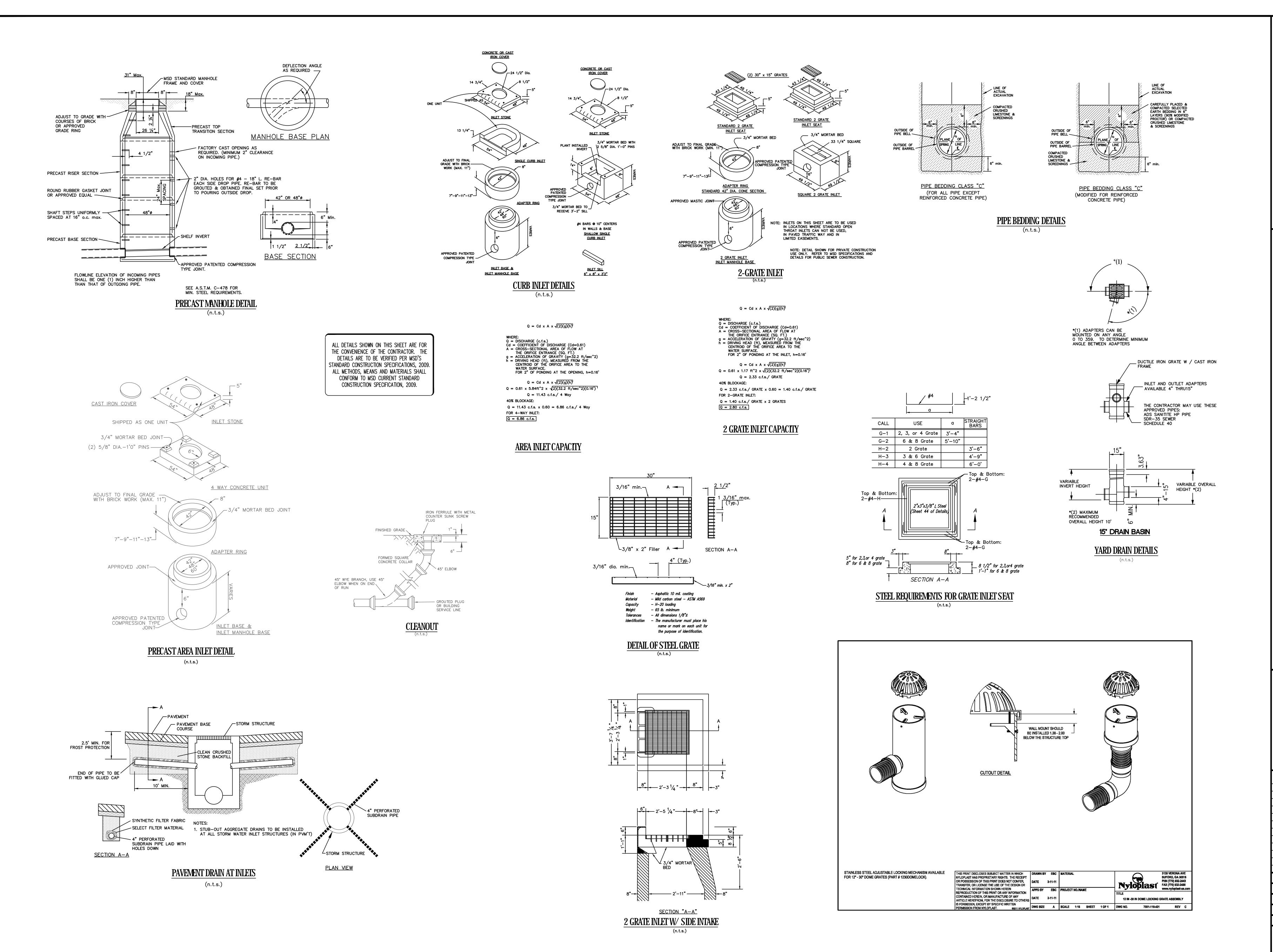
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GEORGE M. STOCK PE 062-047-546 CIVIL ENGINEER DESIGN FIRM NO. 184-003969 **REVISIONS:** MSD ISSUE 05/10/18 FIRM PANEL: 29189C0302K MO-00 SHEET TITLE: SEWER



**PROFILES** 



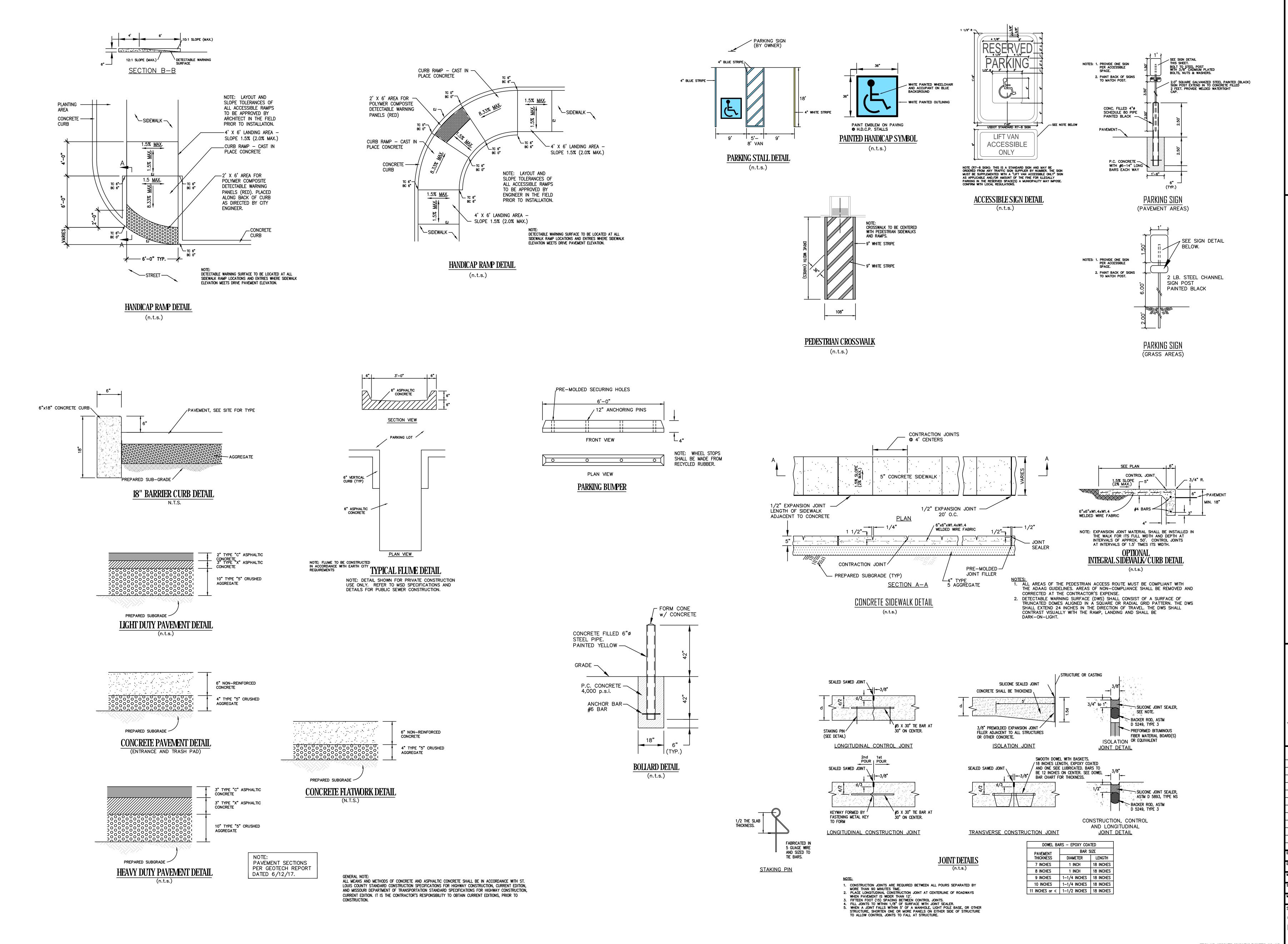
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GEORGE MICHAEL STOCK GEORGE M. STOCK PE 062-047-546 CIVIL ENGINEER DESIGN FIRM NO. 184-003969

**REVISIONS:** - MSD ISSUE 5/18/18

N.R. # FIRM PANEL: 29189C0302K SHEET TITLE: CONSTRUCTION **DETAILS** 



Paradigm Office Building

12818 Daylight Circle
St. Louis County, Missouri

**HSSOCIATES** 

STOCK

GEORGE
MICHAEL
STOCK
NUMBER
E-25116

S/18/18

GEORGE M. STOCK
CIVIL ENGINEER
DESIGN FIRM NO.
184-003969

REVISIONS:

- MSD ISSUE

5/18/18

RAWN BY:

J.E.F.

CHECKED BY:

G.M.S.

ATE:

05/10/18

JOB NO.:

218-6257

I.S.D. P#:

BASE MAP #:

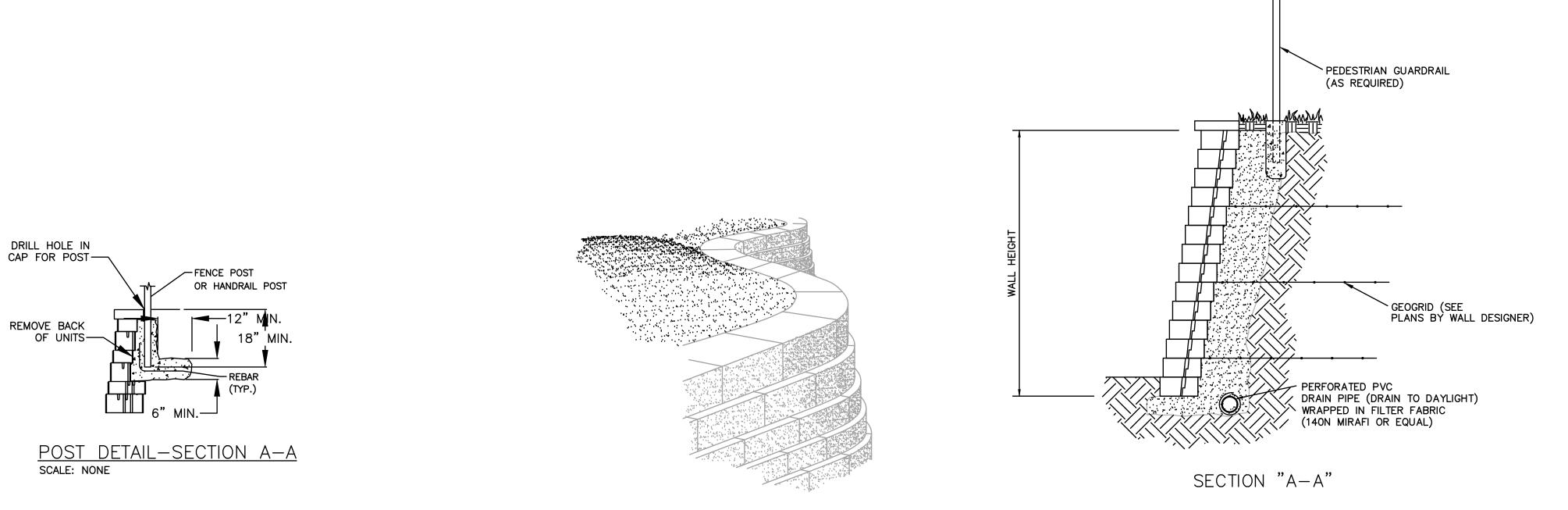
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H&T S.U.P. #

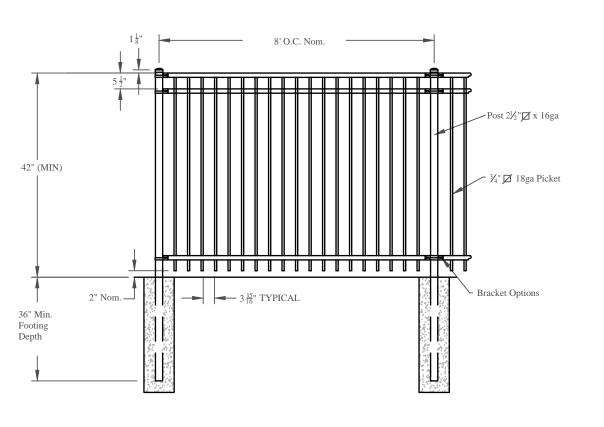
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M.D.N.R. # MO-00 FIRM PANEL:
29189C0302K
SHEET TITLE:
CONSTRUCTION
DETAILS

# CONCRETE MODULAR BLOCK RETAINING WALL PROFILE SCALE: 1"=20' HORIZONTAL 1"=5' VERTICAL



ISOMETRIC VIEW



DRILL HOLE IN CAP FOR POST—

POST DETAIL—PLAN VIEW SCALE: NONE

—BREAK OFF BACK OF UNITS TO INSTALL POST

PEDESTRIAN GUARDRAIL

### **RETAINING WALL NOTES:**

- 1.) ALL CONSTRUCTION SHALL BE PER THE MANUFACTURERS RECOMMENDATION. 2.) SHOP DRAWINGS BEARING THE SEAL OF A REGISTERED ENGINEER IN THE
- STATE OF MISSOURI TO BE SUPPLIED TO THIS ENGINEER FOR APPROVAL.
- 3.) ACCEPTED ALTERNATE WALL SYSTEM: KEYSTONE OR HERCULES 4.) TW= TOP OF RETAINING WALL, BW= GRADE AT BASE OF WALL.
- 5.) RETAINING WALL DESIGN WILL BE SUBMITTED TO THE GOVERNING AGENCY.
- 6.) THE WALL PROFILE INFORMATION IS FOR CONCEPT ONLY. ACTUAL DESIGN OF RETAINING WALL SHALL BE BY A LICENSED PROFESSIONAL ENGINEER & SUBMITTED TO STOCK AND ASSOCIATES FOR GENERAL COMPLIANCE W/
- GRADING PLAN. 7.) THE WALL DESIGNER SHALL INCLUDE A "GLOBAL STABILITY ANALYSIS"

WITH THE SUBMISSION OF PERMIT PLANS.

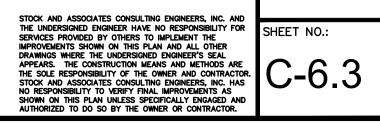
D.N.R. **#** FIRM PANEL: 29189C0302K SHEET TITLE: RETAINING WALL **DETAILS** 

**REVISIONS:** 

MSD ISSUE

Office

aradigm



NEENAH R-2560-E BEHIVE GRATE

SILL=594.50

A-LOK GASKETED OPENING

6" SOLID PIPE

6" 90" ELBOW

#11 TRAPPED

INVERT ELEVATION SHALL
NOT BE ABOVE THE BOTTOM
OF THE PERMEABLE SOIL.

WQv <u>▼ El.=593.73</u>

SURFACE=594.00

2" PEA GRAVEL

🐫 30" PERMEABLE SOIL

-----6" NATURAL SAND

6" PERFORATED PIPE

EL=591.33

CP<sub>▼</sub> El.=594.50

STORM STRUCTURE

NOTE:

 CONSTRUCTION SITE RUNOFF SHALL NOT FLOW INTO BMP AREAS. ALL STORMWATER FLOW TO BMP AREAS SHALL BE DIVERTED, PLUGGED OR DISCONNECTED UNTIL THE CONSTRUCTION SITE IS STABLE AND THE MSD DEDICATION INSPECTOR PROVIDES APPROVAL TO PLACE THE BMP ON-LINE.

	Bio	retentio	on Bas	in Desi	gn and	As-Bui	lt Verifi	cation	Informa	ation Ta	able	
								Design	As-built	Designed	Required	As-bui
	Design	Required	As-built	Design	As-built	Design	As-built	Bypass/	Bypass/	WQ	WQ	WQ
	Filter	Filter	Filter	Filter	Filter	Overflow	Overflow	Spill Point	Spill Point	Surface	Surface	Surfac
	Surface	Surface	Surface	Surface	Surface	Sill Elev.	Sill Elev.	Elev.	Elev.	Volume		Volum
Basin ID	Area (ft²)	Area (ft2)	Area (ft²)	Elev. (ft.)	Elev. (ft.)	(ft)*	(ft)*	(ft)**	(ft)**	(ft <sup>3</sup> )	(ft3)	(ft <sup>3</sup> )
NW-03	1,372	648		607.00		607.75		609.00		2,568	2241	
SE-01	726	275		606.00		607.25		609.00		1,715	1074	

\* Overflow Sill Elevation = Maximum Water Quality Storage Elevation.

\*\* Bypass/Spill Point Elevation = Lowest adjacent elevation on the basin perimeter where overland flow would be directed.

As-Built portion of table to be certified by a Professional Engineer or Professional Land Surveyor licensed in Missouri.

**VARIES** 18" MAX. PONDING -NOTCHED CURB AND GUTTER WQ STORM 36" MAX. PONDING GREATER STORMS SLOPE /PAVÉMENT AGGREGATE BASE 2" THICK PEA GRAVEL ∽MSD TYPE 4 GEOTEXTILE FABRIC └3/4"ø (OR LARGER) EXTENDED UNDER CURB/ 30" (min.) THICK GRAVEL, TYP. PAVEMENT MIN. 24" BIORETENTIÓN SOIL ─MSD TYPE 4 GEOTEXTILE FABRIC (SIDES ONLY) MSD TYPE GEOTEXTILE FABRIC (SIDES ONLY) -6" THICK SAND (ASTM C-33 FINE AGGREGATE) ∽6" THICK 3/8"ø GRAVEL (ASTM C-33 NO. 8)~8" THICK 3/4"ø GRAVEL (ASTM C-33 NO. 6 OR 67) 6"ø SCHEDULE 40 PVC OR SDR 35 -PERFORATED PIPE, 3/8" HOLES, TWO ► EXISTING SOIL SUBGRADE, SIDES, FACING DOWN, 2" MIN. OFF TILLED OR RIPPED 12" DEEP BEFORE BACKFILL

TYPICAL SECTION BIO-RETENTION

N.T.S.

TE MSD LANDSCARE CHIDE FOR PROPETENTION SOIL SPECIFICATIONS

(1) SEE MSD LANDSCAPE GUIDE FOR BIORETENTION SOIL SPECIFICATIONS.
(2) AS SHOWN, MAXIMUM DRAINAGE AREA=0.5 AC. ADDITIONAL PRETREATMENT (FOREBAY OR VERTICAL SAND LAYER AND COBBLE

DIAPHRAGM) REGUIRED FOR LARGER DRAINAGE AREAS.

(3) VEGETATION NOT SHOWN FOR CLARITY. SEE MSD LANDSCAPE GUIDE FOR MULCH AND SUGGESTED PLANT LIST. SEE PREPARED AND

MSD APPROVED LANDSCAPE PLAN IF SUPPLIED.

(4) ALL SAND AND GRAVEL TO BE NATURAL, UNCRUSHED.
(5) SLOPES SHOWN ARE MAXIMUM. 12" WIDE BENCHES ARE ALLOWED IN LIEU OF 1:1 SUBGRADE SIDE SLOPE.

(6) MUST BE PROVIDED WITH OVERFLOW INLET OR OVERLAND FLOW PATH (WIER).

SHOP DRAWINGS MUST BE SUBMITTED TO MSD FOR THE BIORETENTION SOIL AND MATERIALS PRIOR TO CONSTRUCTION.
MSD CONTACT: BRIAN DUNN (314) 335-2072.

1. DURING CONSTRUCTION SITE RUNOFF SHALL NOT FLOW INTO BIORETENTION AND PERVIOUS ASPHALT AREAS.
ALL STORMWATER FLOW TO BIORETENTION AREAS SHALL BE DIVERTED, PLUGGED, OR DISCONNECTED UNTIL THE CONSTRUCTION SITE IS STABLE AND THE MSD INSPECTOR PROVIDES APPROVAL TO PLACE THE BMPS ONLINE.

BMPS ONLINE.

2. SEE MSD LANDSCAPE GUIDELINES FOR DETAILS ON PLANTINGS TO BE PROVIDED IN BIORETENTION AREAS.

IT IS IMPORTANT TO MINIMIZE COMPACTION OF BOTH THE BASE OF THE BIORETENTION AND THE REQUIRED BACKFILL. WHEN POSSIBLE, USE EXCAVATION HOES TO REMOVE ORIGINAL SOIL. IF BIORETENTION AREAS ARE EXCAVATED USING A LOADER, THE CONTRACTOR SHOULD USE WIDE TRACK OR MARSH TRACK EQUIPMENT, OR LIGHT EQUIPMENT WITH TURF TYPE TIRES. USE OF EQUIPMENT WITH NARROW TRACKS OR NARROW TIRES, RUBBER TIRES WITH LARGE LUGS, OR HIGH PRESSURE TIRES WILL CAUSE EXCESSIVE COMPACTION RESULTING IN REDUCED INFILTRATION RATES AND IS NOT ACCEPTABLE. COMPACTION WILL SIGNIFICANTLY CONTRIBUTE TO

COMPACTION CAN BE ALLEVIATED AT THE BASE OF THE BIORETENTION FACILITY BY USING A PRIMARY TILLING OPERATION SUCH AS A CHISEL PLOW, RIPPER, OR SUBSOILER. THESE TILLING OPERATIONS ARE TO REFRACTURE THE SOIL PROFILE THROUGH THE 12 INCH COMPACTION ZONE. SUBSTITUTE METHODS MUST BE APPROVED BY THE DESIGN OR GEOTECHNICAL ENGINEER. ROTOTILLERS TYPICALLY DO NOT TILL DEEP ENOUGH TO REDUCE THE EFFECTS OF COMPACTION FROM HEAVY EQUIPMENT.

THE PERMEABLE SOIL USED IN THE BIORETENTION FACILITY SHOULD BE TESTED BEFORE PLACING IT IN THE FIELD TO ENSURE IT MEETS THE PERFORMANCE SPECIFICATIONS OUTLINED IN THE PLANS AND STORMWATER MANAGEMENT FACILITIES REPORT. THE PERMEABLE SOIL MUST HAVE AN INFILTRATION RATE OF 2 FEET/DAY. FURTHERMORE, AND INFILTRATION TEST MUST BE PERFORMED ONCE THE SOIL IS PLACED IN THE BIORETENTION FACILITY TO CONFIRM THAT THE INFILTRATION RATE DID NOT GO DOWN.

WHEN BACKFILLING THE BIORETENTION FACILITY, PLACE SOIL IN LIFTS OF 12 TO 18 INCHES. DO NOT USE HEAVY EQUIPMENT WITHIN THE BIORETENTION BASIN. HEAVY EQUIPMENT CAN BE USED AROUND THE PERIMETER OF THE BASIN TO SUPPLY SOILS AND SAND. GRADE BIORETENTION MATERIALS WITH LIGHT EQUIPMENT SUCH AS A COMPACT LOADER OR A DOZER/LOADER WITH MARSH TRACKS. THE LANDSCAPER AND OR GEOTECHNICAL ENGINEER SHOULD BE PRESENT ON SITE DURING THE CONSTRUCTION OF THE BIORETENTION FACILITIES TO ENSURE QUALITY

THE PLANTING SOIL SHOULD BE A SANDY LOAM OR LOAMY SAND (SHOULD CONTAIN A MINIMUM OF 60 PERCENT SAND, BY VOLUME). THE CLAY CONTENT FOR THESE SOILS SHOULD BE LESS THAN 10 PERCENT BY VOLUME. A SATURATED HYDRAULIC CONDUCTIVITY OF AT LEAST 1.0 FEET PER DAY (0.5 INCHES PER HOUR) IS REQUIRED. (WITHOUT POST-CONSTRUCTION VERIFICATION, A CONSERVATIVE DEFAULT VALUE OF 0.5 FEET PER DAY IS ACCEPTABLE. THE DESIGN RATE MAY BE INCREASED TO 2 FEET/DAY IF FIELD OBSERVATION, POST-CONSTRUCTION INFILTRATION TESTING, OR OTHER EQUIVALENT TESTING (AS DETERMINED BY THE DISTRICT) IS PROVIDED TO CONFIRM THE DESIGN RATE IS ACHIEVED.) THE SOIL SHOULD BE FREE OF STONES, STUMPS, ROOTS, OR OTHER WOODY MATERIAL OVER 1 INCH IN DIAMETER. FOR BEST RESULTS, BRUSH OR SEEDS FROM NOXIOUS WEEDS, SUCH AS JOHNSON GRASS, MUGWORT, NUTSEDGE AND CANADIAN THISTLE SHOULD NOT BE PRESENT IN THE SOILS. PLACEMENT OF THE PLANTING SOIL SHOULD BE IN LIFTS OF 12 TO 18 INCHES, LOOSELY COMPACTED (RUBBER WHEELED HEAVY EQUIPMENT AND MECHANICAL TAMPING DEVICES ARE NOT RECOMMENDED FOR COMPACTION). THE SPECIFIC CHARACTERISTICS ARE PRESENT IN THE FOLLOWING

Planting Soil Characteristics

Flanting Soil Characteristic	5
Parameter	Value
pH range	5.2 to 8.00
Organic matter	1.5 to 5.0 □
Magnesium	35 lbs. per acre, minimum
Phosphorous (P2O5)	75 lbs. per acre, minimum
Potassium (K2O)	85 lbs. per acre, minimum
Soluble salts	□ 500 ppm

GEORGE
MICHAEL
STOCK
NUMBER
E-25116

GEORGE M. STOCK PE 062-047-546
CIVIL ENGINEER
DESIGN FIRM NO.
184-003969

din

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III

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18 U.S

REVISIONS:

- MSD ISSUE 5/18/18

J.E.F. CHECKED BY:

J.E.F. G.M.S.

05/10/18

218-6257

D. P#:
- 22-0

C. H&T #:
- H&T S.U.P. #:
- - FIRM PANEL:
29189C0302K

EET TITLE:

SHEET TITLE:
BMP
DETAILS

STOCK AND ASSOCIATES CONSULTING ENGINEERS, INC. AND THE UNDERSIGNED ENGINEER HAVE NO RESPONSIBILITY FOR SERVICES PROVIDED BY OTHERS TO IMPLEMENT THE IMPROVEMENTS SHOWN ON THIS PLAN AND ALL OTHER DRAWINGS WHERE THE UNDERSIGNED ENGINEER'S SEAL APPEARS. THE CONSTRUCTION MEANS AND METHODS ARE THE SOLE RESPONSIBILITY OF THE OWNER AND CONTRACTOR. STOCK AND ASSOCIATES CONSULTING ENGINEERS, INC. HAS NO RESPONSIBILITY TO VERIFY FINAL IMPROVEMENTS AS SHOWN ON THIS PLAN UNLESS SPECIFICALLY ENGAGED AND AUTHORIZED TO DO SO BY THE OWNER OR CONTRACTOR.

BIO-RETENTION #1
SCALE: 1"=5'

595.80 595.30

-RESERVE AREA #1

EXTENTS OF

(427 S.F.)

PERMEABLE SOIL

→BMP #1 (BIO)

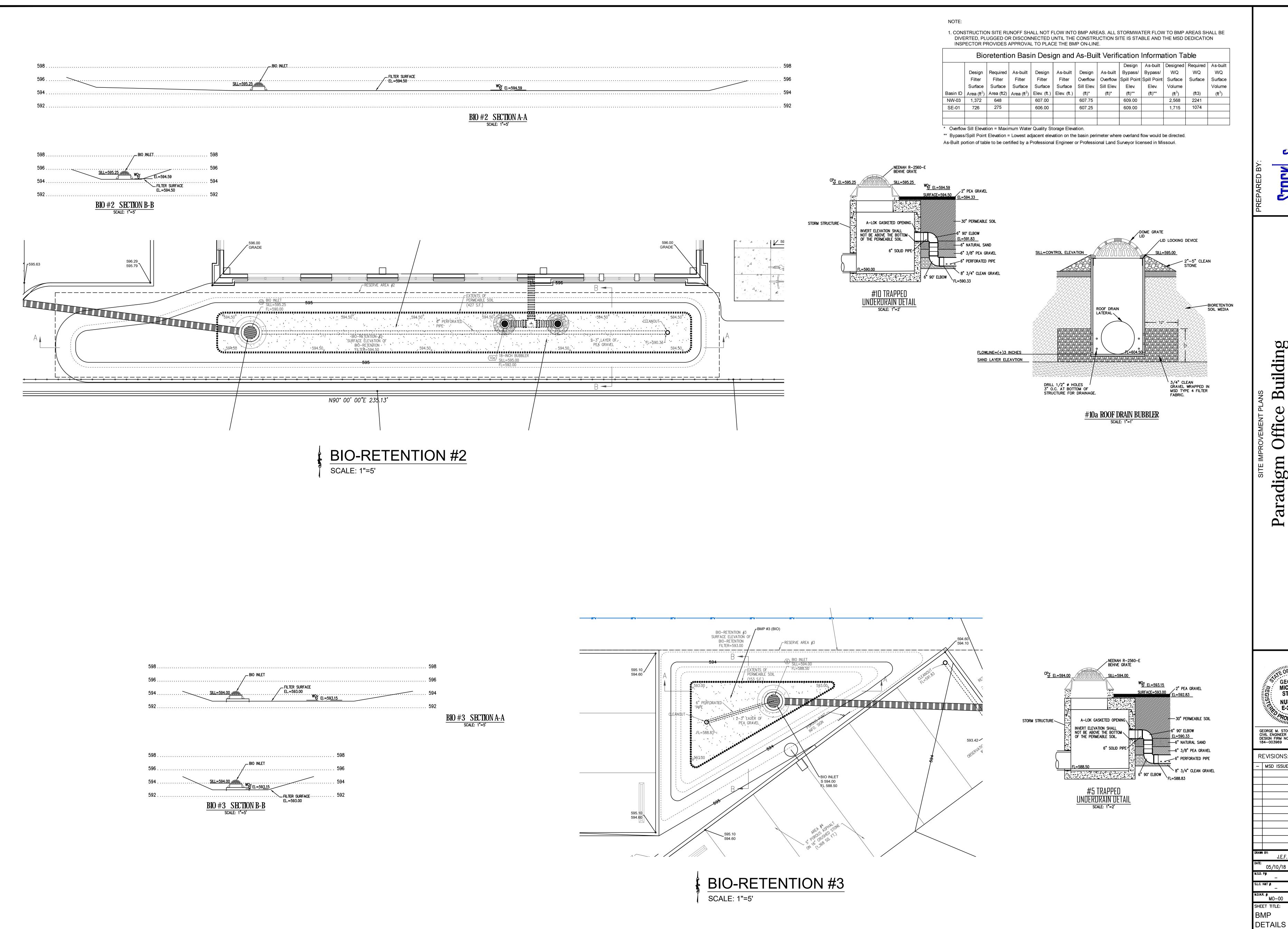
**594.84** 

2"-5" DIA. CLEAN FILTER AT END CF

FILTER AT END OF FLUME

BIO—RETENTION #1 SURFACE ELEVATION OF BIO—RETENTION

FILTER=594.00



Building

**REVISIONS:** MSD ISSUE

N53° 25' 37"E 148.21'

POROUS PAVEMENT AREA #5

SCALE: 1"=5'

6" VERTICAL CURB -

STORM SEWER STRUC. #6

FL. 594.31

\_5" THICK POROUS ASPHALT PVMT.

\_\_\_\_\_\_BTTM=591.36

-6" PERFORATED

AREA #4 - UNDERDRAIN DETAIL SCALE: 1"=5'

PIPE, 2" OFF BOTTOM FL=591.52

### Porous Asphalt Producer's Prequalification:

The Porous Asphalt manufacturer shall be responsible for establishing and maintaining a quality control program. Prior to use on projects requiring MSD approval, the manufacture shall submit five (5) copies of a completed pervious paving application as well as documentation describing the quality control program. The completed application and other documentation shall be submitted to:

### MSD BMP Committee Metropolitan St. Louis Sewer District

2350 Market Street

St. Louis, Missouri 63103-2555 Material Certification and Quality Control:

The contractor shall obtain the Porous Asphalt manufacturer's certification that the Porous Asphalt has been approved by MSD. This certification shall be provided to the MSD Division Inspector. The certification shall include the manufacturer's name, and state that the Porous Asphalt has been approved by MSD and that the paving materials meet all requirements as evaluated under the manufacturer's quality control program.

### Contractor Prequalification:

6" PERFORATED PIPE, — 2" OFF BOTTOM FL=591.52

RESERVE AREA #3 -

Prior to obtaining a construction permit from MSD to construct the Porous Asphalt for a given project, the engineer providing as—built certification shall verify that the installing contractor has past history demonstrating experience and/or training in installing Porous Asphalt.

- As-Built Certification: At completion of the project, prior to final dedication, an as—built certification, signed and sealed by a Missouri Professional Engineer, shall be provided certifying:
- 1. The Porous Asphalt system was built as designed.
- 2. The Porous Asphalt system was installed by a qualified contractor.
- 3. The Porous Asphalt system installation was witnessed by the certifying engineer or a representative under his direct supervision.

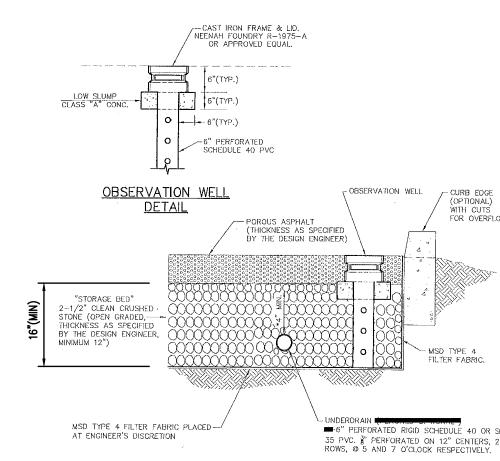
- POROUS ASPHALT CONSTRUCTION NOTES:
- 1. The contractor shall verify that the porous asphalt producer that will supply the Porous Asphalt for this project has been prequalified by MSD. The name of the producer and their facility location shall be provided to the MSD Division
- inspector prior to construction. 2. If porous pavement area is used for temporary sediment basin during construction, the bed shall be excavated at least one foot above the final
- elevation of the bed. After the sediment is removed, the bed shall be excavated to final grade before the installation of the porous pavement system. 3. Construct porous pavement late in the project schedule so that all of the dirty work such as grading and landscaping is completed first. Porous pavement and
- the stone bed shall not be installed until all areas tributary to it are established. 4. Porous pavements must be protected from sediment during and after the paving
- process. At no time shall sediment or other material capable of clogging the surface be allowed to contact the pavement.
- 5. Any grade adjusting requiring fill shall be done using an open—graded material, such as the stone sub-base.
- 6. MSD Type 4 filter fabric shall be used on the sides of the stone bed and between the sub-base and the storage bed to prevent sediment entry. The filter fabric shall not be installed between layers of aggregate.
- 7. Stone for storage bed shall be 2.5" clean crushed stone with minimum 12" thick storage bed. 8. Place aggregate for the stone recharge bed with care (not to damage the filter
- fabric). Aggregate should be dumped at the edge of the bed and placed in layers of 8 to 12 inches using track equipment. Compact each lift with a single pass of a static steel wheel roller. Vibrator plate compactor may be used for areas that cannot be compacted with the steel wheel roller.
- 9. A thin choker course layer evenly placed over the storage bed is optional. The gradation of the choker course should be selected based on the gradation of the storage bed. If AASHTO No. 3 is used for the storage bed, then AASHTO
- No. 57 is acceptable for the choker course. 10. Porous asphalt shall be transported in covered, clean dump beds that have been sprayed with a non-petroleum release agent or soap solution to prevent the
- mixture from adhering to the dump beds. Mineral filler, fine aggregate, slag dust, etc. shall not be used to dust truck beds.
- 11. Haul distances shall be limited such that porous asphalt shall be placed within 90 minutes of being loaded.
- 12. The porous asphalt is placed in 2-inch to 4-inch thick lifts using track pavers and normally compacted with only a few (1-4) passes of a 10-ton static roller. 13. Traffic shall be restricted for the first 48 hours or until the placed material has

been allowed to cool below 100 F. Use of water to cool the pavement is not

- 14. Porous asphalt shall not be placed when the ambient air temperature of the pavement site in the shade away from artificial heat is below 60 F or when the actual ground temperature is below 50 F. The contractor shall not pave on days
- when rain is forecasted. 15. The full permeability of the pavement surface shall be tested by application of clean water at the rate of 5 gpm over the surface, using a hose or other distribution device. All applied water shall infiltrate directly without large puddle
- formation or surface runoff and shall be observed by the certifying engineer or his representative. 16. Do not clean the Porous Asphalt pavement surface with high pressure hoses or
- abrasives. When cleaning is necessary, combination cleaning machines that combine a wet spray and vacuum process has been found to be effective. 17. A permanent sign shall be posted warning that care should be taken during
- snow plowing; and prohibit the following: resurfacing, the use of sand abrasives for winter tire traction, and the use of power washers. 18. At completion of the project, prior to final dedication, an as—built certification, signed and sealed by a Missouri Professional Engineer shall be provided.

POROUS ASPHALT PAVEMENT POWER WASHING, RESURFACING AND THE USE OF SAND ABRASIVES FOR WINTER TIRE

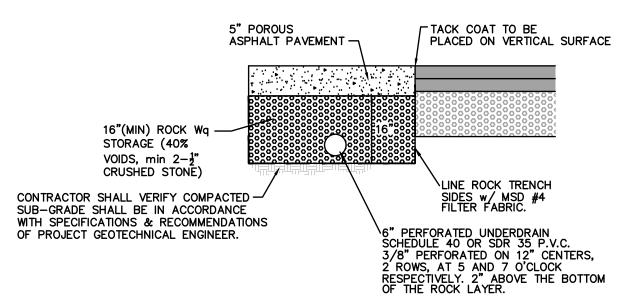
### POROUS PAVEMENT INFORMATION SIGN



# OBSERVATION WELL DETAIL

SHOP DRAWINGS MUST BE SUBMITTED TO MSD FOR THE POROUS ASPHALT PRIOR TO CONSTRUCTION. MSD CONTACT: BRIAN DUNN (314) 335-2072.

> NOTE: A QUALIFIED ENGINEER MUST BE PRESENT DURING THE INSTALLATION OF THE POROUS ASPHALT TO CERTIFY THE INSTALLATION.



### POROUS ASPHALT PAVEMENT DETAIL

NOTE:

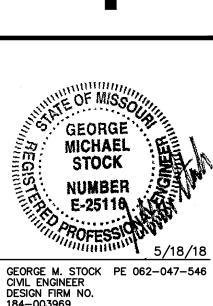
1. CONSTRUCTION SITE RUNOFF SHALL NOT FLOW INTO BMP AREAS. ALL STORMWATER FLOW TO BMP AREAS SHALL BE DIVERTED, PLUGGED OR DISCONNECTED UNTIL THE CONSTRUCTION SITE IS STABLE AND THE MSD DEDICATION INSPECTOR PROVIDES APPROVAL TO PLACE THE BMP ON-LINE.

STOCK AND ASSOCIATES CONSULTING ENGINEERS, INC. AND THE UNDERSIGNED ENGINEER HAVE NO RESPONSIBILITY FOR SERVICES PROVIDED BY OTHERS TO IMPLEMENT THE IMPROVEMENTS SHOWN ON THIS PLAN AND ALL OTHER DRAWINGS WHERE THE UNDERSIGNED ENGINEER'S SEAL APPEARS. THE CONSTRUCTION MEANS AND METHODS ARE THE SOLE RESPONSIBILITY OF THE OWNER AND CONTRACTOR. STOCK AND ASSOCIATES CONSULTING ENGINEERS, INC. HAS NO RESPONSIBILITY TO VERIFY FINAL IMPROVEMENTS AS SHOWN ON THIS PLAN UNLESS SPECIFICALLY ENGAGED AND AUTHORIZED TO DO SO BY THE OWNER OR CONTRACTOR.

STANDARD 18"x12"x0.080" ALUMINUM SIGN din FACE WITH BLACK 0.625 SERIES 2000 STANDARD ALPHABET ON WHITE BACKGROUND GALVANIZED STEEL POST 9'-6" LONG. SET BOTTOM OF SIGN 5'-0" ABOVE GRADE. SET TRACKING ARE PROHIBITED. CARE SHALL BE TAKEN DURING

SNOW PLOWING.

BOTTOM OF POST 3'-0" BELOW GRADE. **=** B (n.t.s.) (See plan for locations) digm

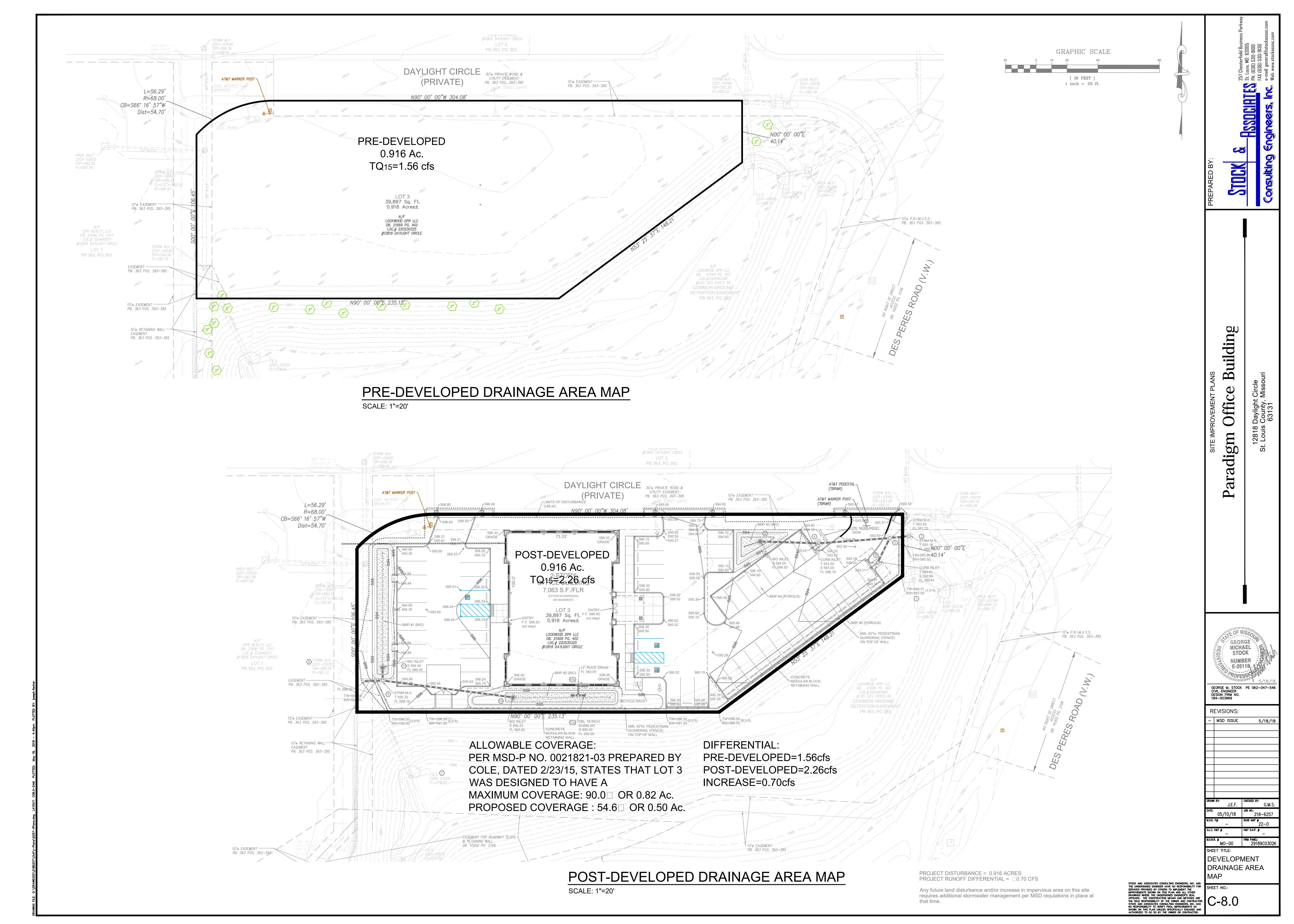


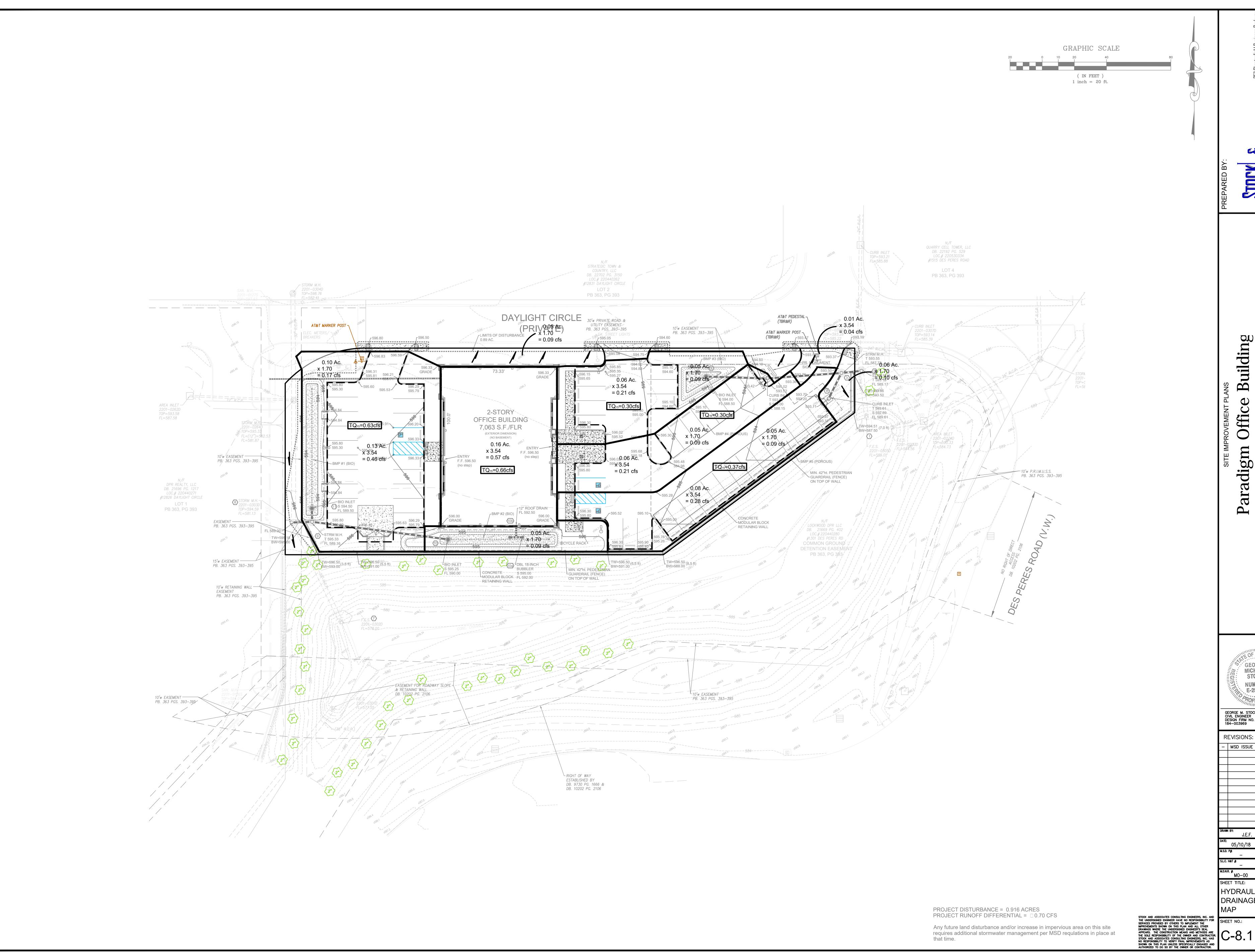
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**REVISIONS:** MSD ISSUE

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BMP DETAILS



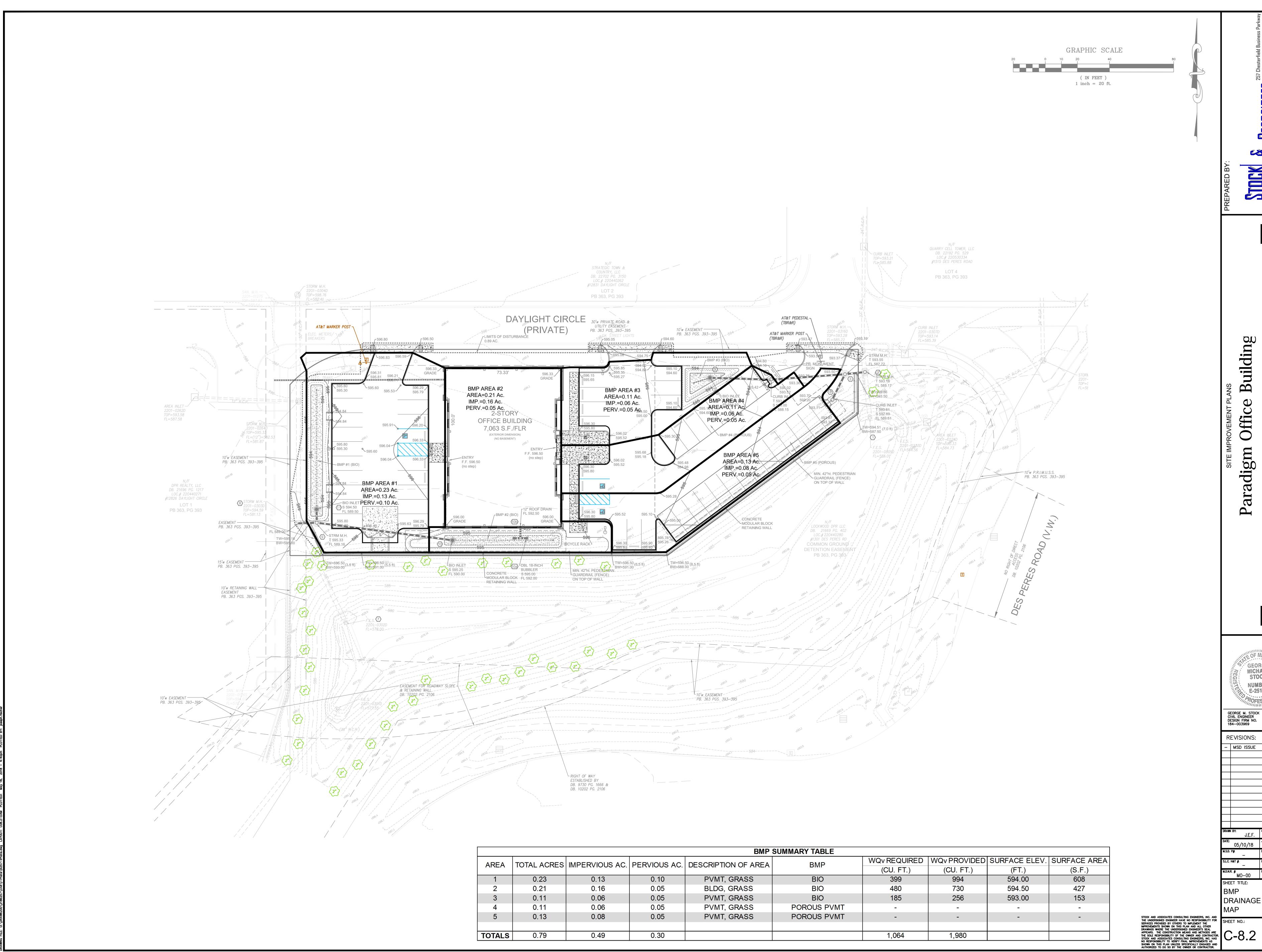


Building aradigm

MICHAEL STOCK NUMBER E-25116

**REVISIONS:** - MSD ISSUE

HYDRAULIC DRAINAGE AREA



Building Office 12818 Daylight ( t. Louis County, l 63131 digm

MICHAEL STOCK NUMBER . E-25116 GEORGE M. STOCK PE 062-047-546 CIVIL ENGINEER DESIGN FIRM NO.

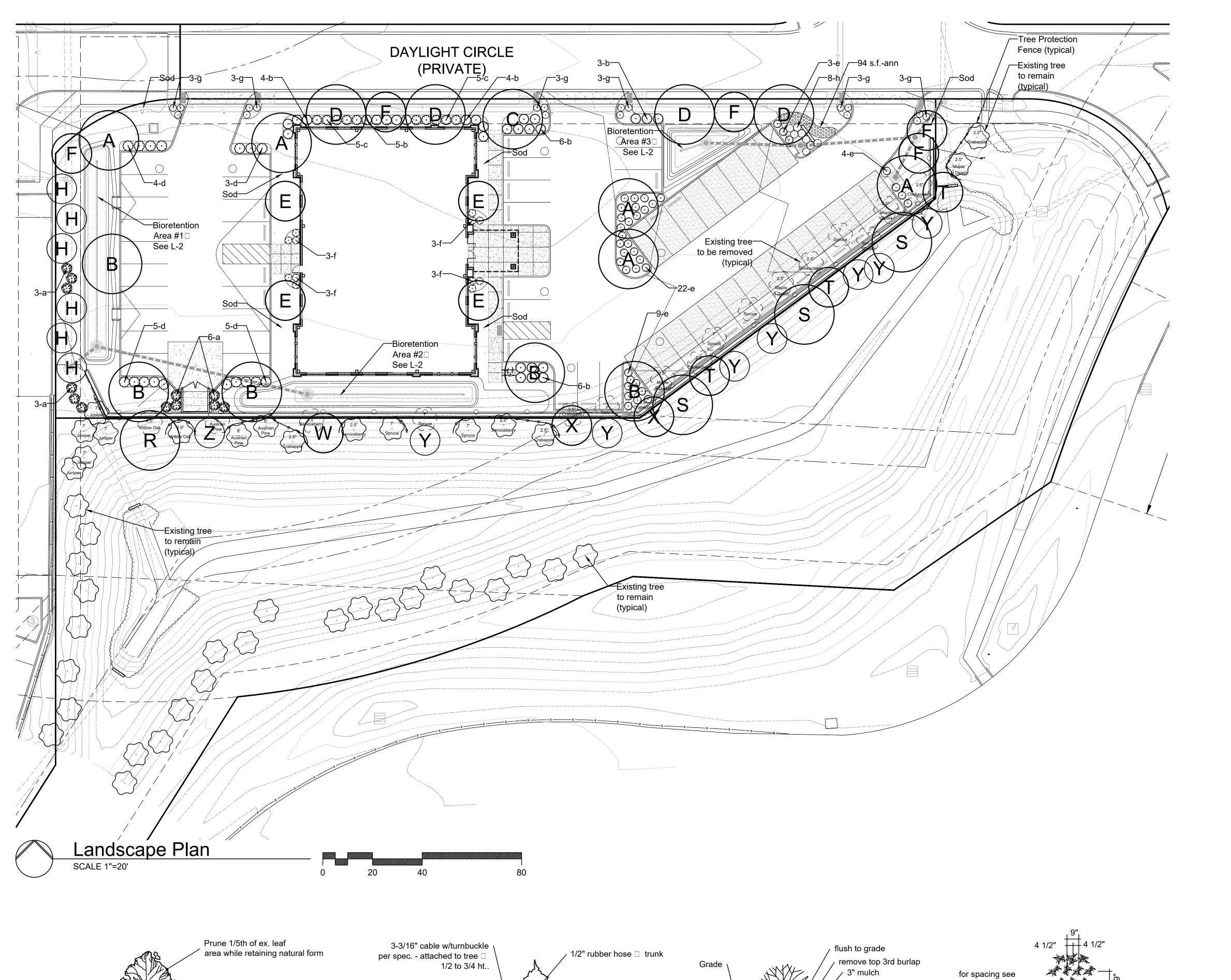
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-	MSD ISSUE	5/18/18

awn by: J.E.F.	CHECKED BY: G.M.S.
те: 05/10/18	JOB NO.: 218-6257
S.D. P <b>#</b> —	BASE MAP <b>#</b> 22−0
.C. H&T # —	H&T S.U.P. # —
D.N.R. # MO-00	FIRM PANEL: 29189C0302K
HEET TITLE:	
RIMD	

DRAINAGE AREA

uildin

aradigm



1/2" rubber hose □ trunk

loosened subsoil

DETAIL PLAN VIEW

remove top 3rd burlap

CANOPY TREE PLANTING

lowest branches

tree wrap —

3" bark mulch

flagging tape

STA

TYPICAL EVERGREEN PLANTING

4" earth saucer

loosened subsoil

flush to grade \

2x3x3" hardwood stake-

3-2x2" hardwood

		PLANTIN	G SCHEDULE (REPLACEMENT TREES)		
SYMBOL	QUANTITY	BOTANICAL NAME	COMMON NAME	SIZE	REMARKS
CAN	OPY-SHA	ADE TREES	·		
R	1	Quercus phellos	Willow Oak	2.5" cal.	B□B
S	3	Acer saccharum	Sugar Maple	2.5" cal.	В□В
UND	ERSTOR	Y-ORNAMENTAL TREES			
Т	3	Prunus virginiana	Chokecherry	2.5" cal.	В□В
W	1	Amelanchier arborea	Serviceberry	2.5" cal.	В□В
Χ	2	Malus 'Spring Snow'	Spring Snow Crabapple (fruitless)	2.5" cal.	В□В
EVER	RGREEN	TREES			
Υ	7	Picea glauca	White Spruce	6' h.	В□В
Ζ	1	Pinus nigra	Austrian Pine	6' h.	B□B

		PLAN	ITING SCHEDULE		
SYMBOL	QUANTITY	BOTANICAL NAME	COMMON NAME	SIZE	REMARKS
CAN	OPY-SHA	ADE TREES			
Α	5	Quercus alba	White Oak	2.5" cal.	B□B
В	5	Quercus bicolor	Swamp White Oak	2.5" cal.	B□B
С	1	Quercus × warei 'Long' Regal Prince	Regal Prince Oak	2.5" cal.	B□B
D	4	Gleditsia triacanthos f. inermis 'Skycole' Skyline	Skyline Honeylocust (thornless)	2.5" cal.	B□B
UND	ERSTOR'	Y-ORNAMENTAL TREES			
Е	4	Malus 'Spring Snow'	Spring Snow Crabapple (fruitless)	2.5" cal.	B□B
F	2	Amelanchier arborea	Serviceberry	2.5" cal.	B□B
G	3	Cercis canadensis 'Forest Pansy'	Forest Pansy Redbud	2.5" cal.	B□B
EVE	RGREEN	TREES		•	
Н	6	Juniperus virginiana	Eastern Red Cedar	6' h.	B□B
SHR	UBS-GRA	ASSES-PERENNIALS-ANNUALS-GROUNDCOVER	8	•	
а	12	Juniperus × pfitzeriana 'Sea Green'	Sea Green Juniper	24"	Containe
b	28	Buxus sempervirens 'Vardar Valley'	Vardar Valley Boxwood	24"	Containe
С	10	Rhododendron 'Autumn Angel'	Autumn Angel Azalea	24"	Containe
d	17	Viburnum dentatum 'Christom' Blue Muffin	Blue Muffin Viburnum	24"	Containe
е	38	Rhus aromatica 'Gro-low'	Gro-low Fragrant Sumac	24"	Containe
f	12	Weigela florida 'Bramwell' Fine Wine	Fine Wine Weigela	24"	Containe
g	18	Juniperus horizontalis 'Plumosa'	Plumosa Creeping Juniper	1 gal.	Containe
h	8	Pennisetum alopecuroides 'Hameln'	Hameln Fountain Grass	1 gal.	Containe
ann	94 s.f.	Annuals	To be selected	2" c.p.	12" o.c.

planting schedule

till bed per spec \

with amendments

loosened subsoil

SCARIFY ROOT BALL OF ALL CONTAINER STOCK

TYPICAL SHRUB PLANTING

<u>PLAN VIEW</u>

SECTION VIEW

TYPICAL PERENNIAL PLANTING

perennial/ annuals

subgrade per spec

Notes:

1. Refer to L-2 for Bioretention Planting Plan.

2. Sod to be turf-type Fescue.

### St. Louis County Municipal Code Section 1003.162 Landscaping Regulations.

7. Tree protection during construction. Tree protection and retention is as approved on the site development plan. If tree preservation is

proposed, the developer shall take responsibility for protecting trees during construction.

(1) Owner's responsibility. During development, the owner or developer shall be responsible for the erection of any and all barriers necessary to protect any existing or installed trees from damage both during and after construction in accordance with the standards of this subsection. (2) Tree protection fencing.

(a) All significant trees intended for tree protection shall be fenced in accordance with this subsection before grading or other land-disturbing activity begins. Fencing shall extend at least one (1) foot in distance from the edge of the tree for each inch of diameter at breast height (DBH) to a maximum of ten (10) feet, but in no case closer than five (5) feet to the trunk. The director shall consider existing site conditions in determining the exact location of any tree protection fencing.

(b) The developer shall erect a plastic mesh fence, chain link fence or similar product, a minimum of four (4) feet in height at the drip line around each tree or group of trees to prevent the placement of debris or fill within the drip line of any tree.

(c) The tree protection fencing shall be clearly shown on the site plan or the sketch plan associated with the land disturbance permit. No construction, land disturbance, equipment or material storage, or any other activity shall be allowed within the fenced area.

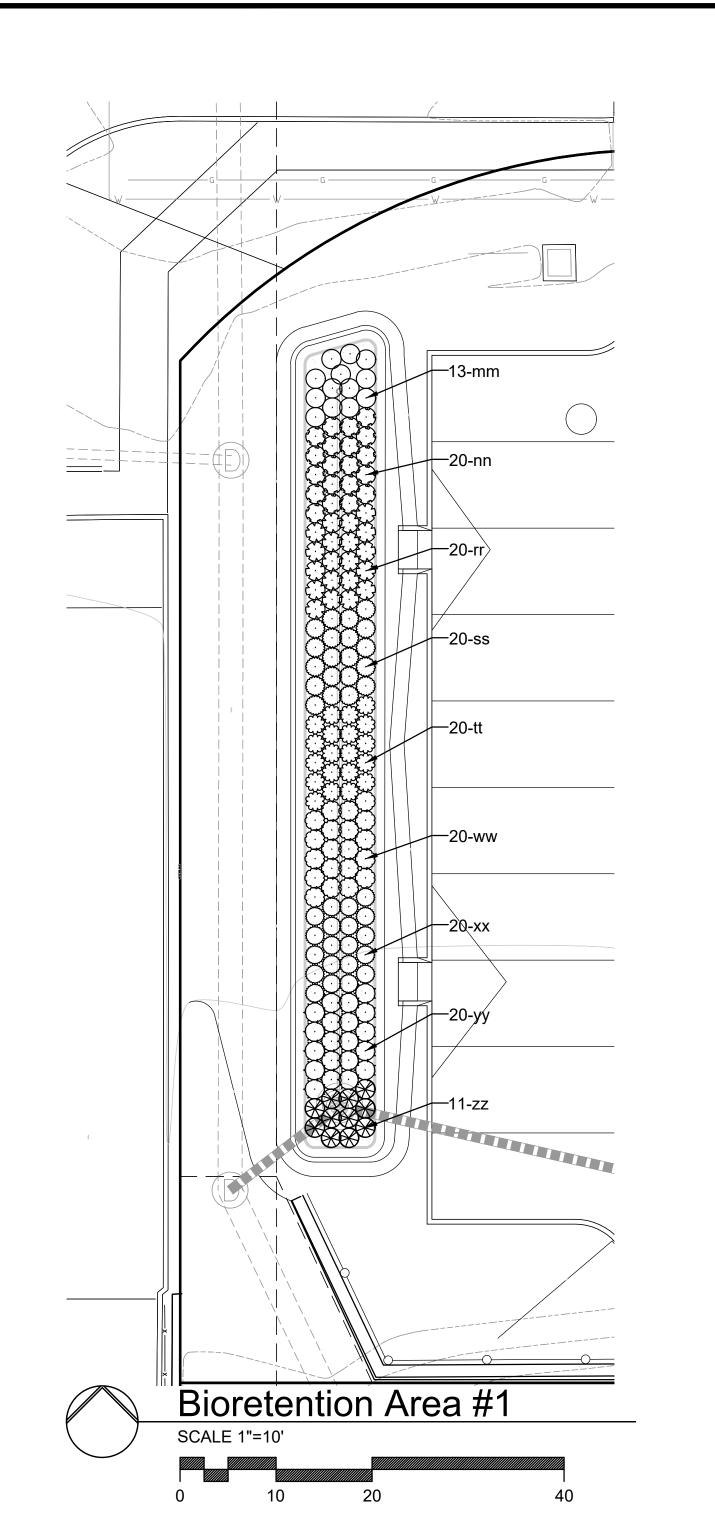
	LEGEND: Symbol	Description
		Tree Protection Fence  Existing Individual Tree
		To Be Removed  Existing Individual Tree To Remain
Locate fence as shown		Canopy Tree
Existing tree to be retained Existing Grade  Construction fence  Limit of grading/ limit of construction  Finish Grade		Understory Tree
Existing Vegetation		Evergreen Tree

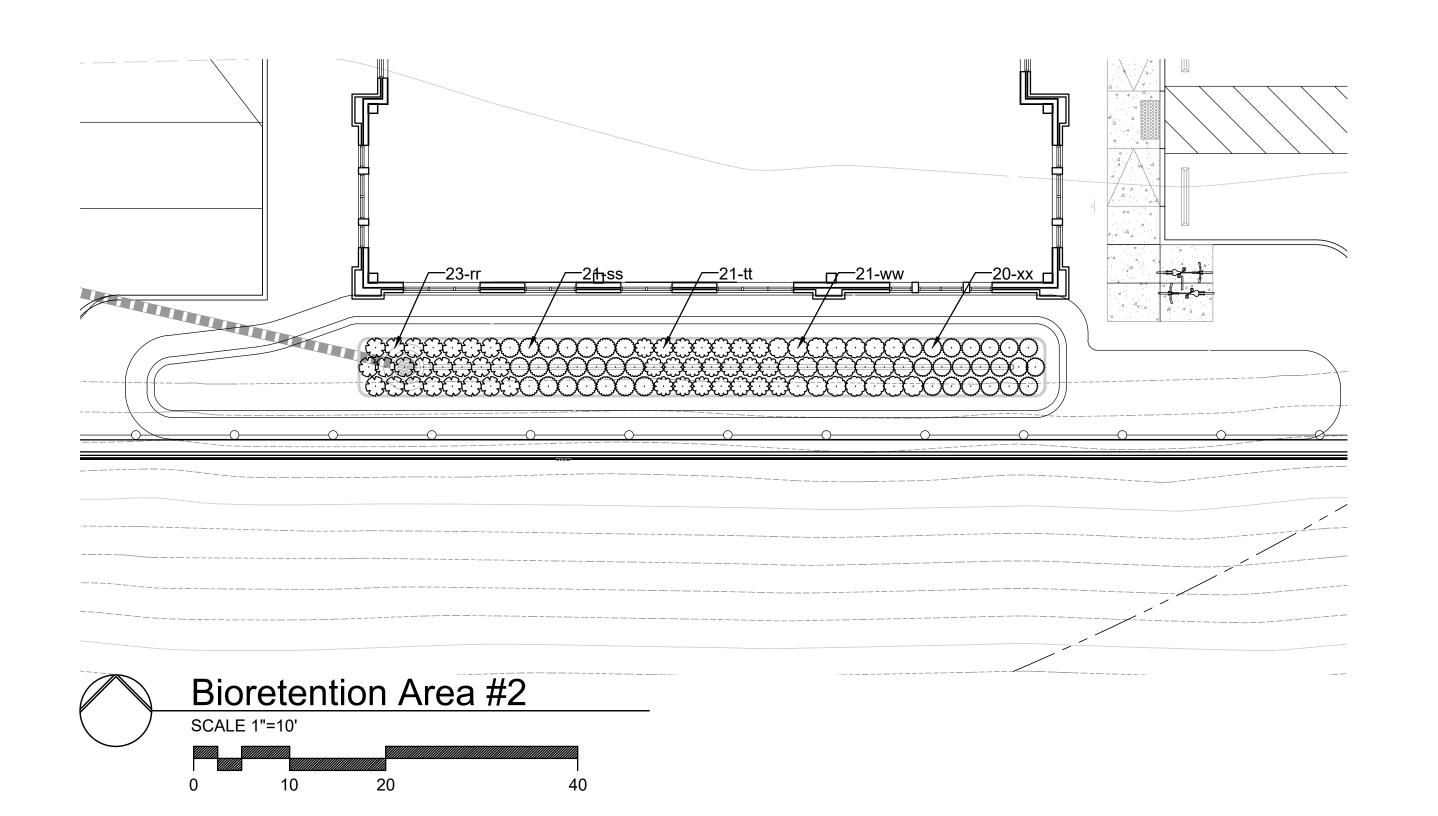
Date	Description	No.
Drawn: Checked:	KP RS	
loomisAssociates	landscapeArchitects/planners 707 Spirit 40 Park Drive, Suite 135 Chesterfield, Missouri 63005-1194 (636) 519-8668 7ax; (636) 519-0797 e-mail: lainfo@loomis-associates.com	oomis Associates Inc. Aissouri State Certificate of Authority #: LAC #000019

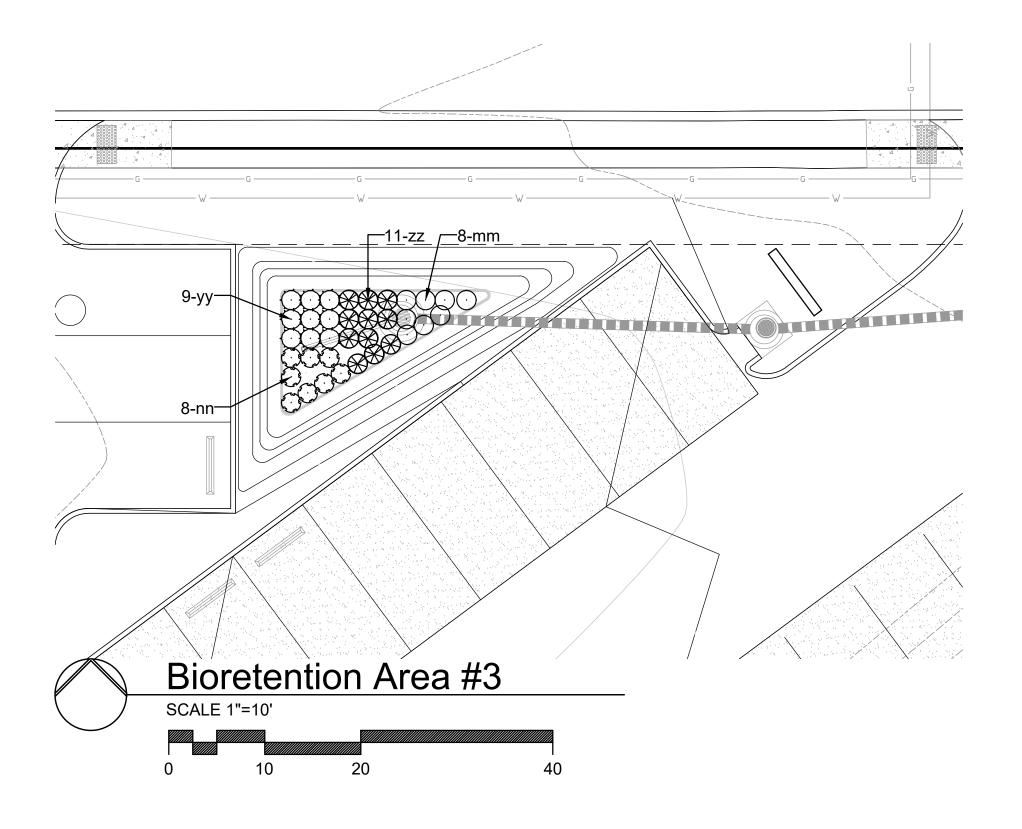
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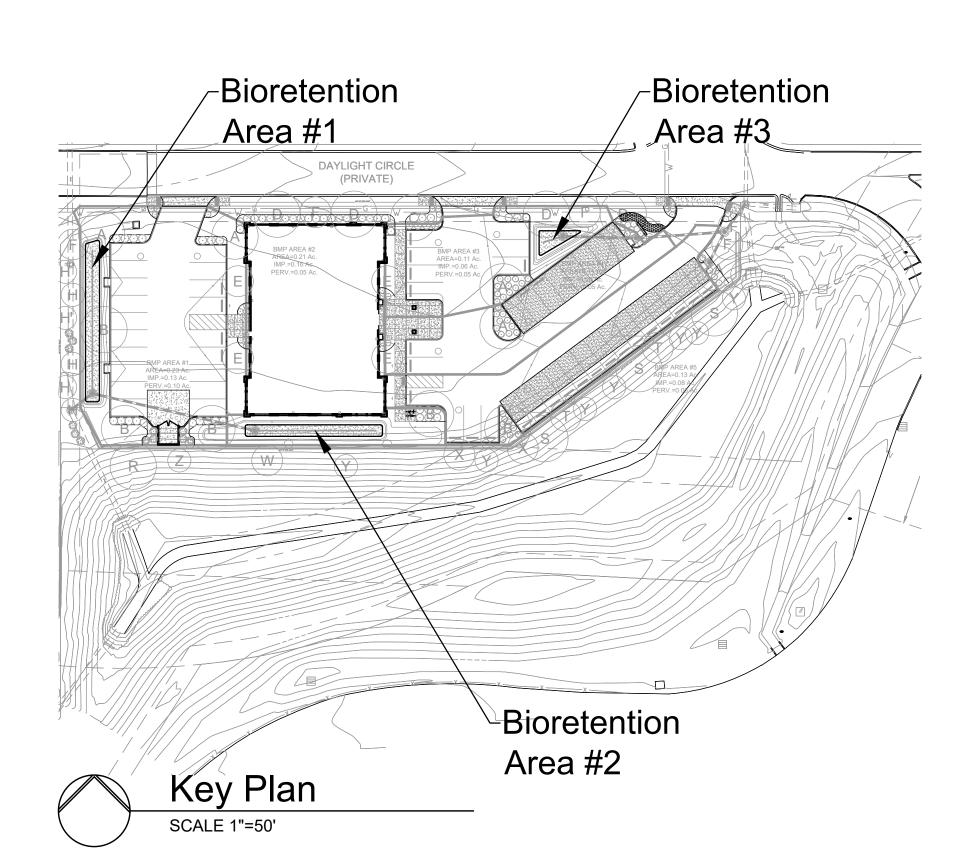
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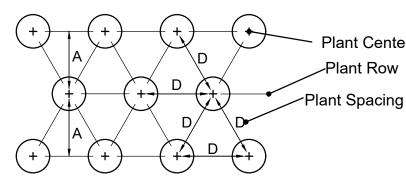
Date: 5/11/18 Job #: 813.072









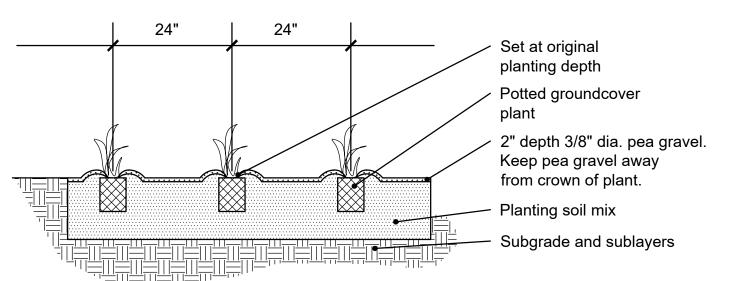


### BIORETENTION PLANT SPACING

PLANT SPACING TABLE

SPACING 'D'	ROW 'A'	NUMBER OF PLANTS/SQ.FT.
30"	26"	.16
24"	20.8"	.25
18"	15.6"	.45
15"	13"	.64
12"	10.4"	1.00
10"	8.66"	1.44
8"	6.93"	2.25

Note: Plant quantities to be determined by multiplying area (sq.ft.) by number of plants/sq.ft. for required spacing. Table and diagram taken from "Landscape Guide for Stormwater Best Management Practice Design" by MSD with a revised date of May 2, 2012.



Notes:
1. Remove spent flowers prior to planting.

Remove spent flowers prior to planting.
 Loosen root mass at bottom of rootball.

3. Top of rootball stripped of 1/4" surface growing media and covered with 1/4" landscape bed mix plus surface mulch.4. See Planting Schedule for plant spacing

BIORETENTION PLANT SPACING SECTION

# TABLE 1: PLANTING. WATER. AND MULCH REQUIREMENTS

TABLE 1. FLANTING, WAT	LIN, AND MOLCH NEQUI	INCIVILIVIS			
WATER AVAILABILITY	REQUIRED PLANTING PERIOD	MINIMUM CONTAINER SIZE	WATER REQUIREMENT FIRST 3 WEEKS	WATER REQUIREMENT AFTER 3 WEEKS*	MAXIMUM MULCH DEPTH****
No ability to water after initial planting	Late FebApril only	2.25"x3.75" or larger (plug)	Water each plug immediately after planting		1.5" for plugs
Manual watering with standard sprinkler	Late FebEarly June SeptOctober	4.5"x5" (quart) or larger in summer and fall	1" (60 min) every 4 days	1" (60 min) every 7 days until plants established***	1.5" for plugs 2.5" for quarts
Automatic irrigation (set to water more frequently than normal during first two months after planting)	Late FebEarly Oct.	2.25"x3.75" (plug) or larger in spring 4.5"x5" (quart) or larger in summer and fall	1" (60 min) every 4 days in spring and fall 1" (60 min) every 3 days in summer)	1" (60 min) every 7 days until plants established***	1.5" for plugs 2.5" for quarts

\*This water amount includes natural rainfall. If you get a  $\frac{1}{2}$  inch of natural rain, then you will need to add a  $\frac{1}{2}$  inch of water to meet the 1 inch requirement.

\*\*Requires transport of water to the planting site in large containers and pouring enough water onto each plant (after planting) to moisten the entire planting pit.

\*\*\*Plants are established when roots have grown out of the container soil and into the native soil by 3-5 inches. This normally takes 3-4 months for most perennials and grasses and up to 6-7 months for trees and shrubs.

\*\*\*\*Shredded leaf compost is recommended for use with perennials and grasses. Mulch is recommended for tree and shrub plantings at a depth of 3 inches.

			PLANTING SCHEDULE		
SYMBOL	QUANTITY	BOTANICAL NAME	COMMON NAME	SIZE	REMARKS
BIOR	ETENTIC	ON PLANTS		•	
mm	21	Carex vulpinoida	Fox Sedge	Type 38 DCP	24" o.c.
nn	28	Carex muskumensis	Palm Sedge	Type 38 DCP	24" o.c.
rr	43	Echinacea pallida	Pale Purple Coneflower	Type 38 DCP	24" o.c.
SS	41	Schizachyrium scoparium	Little Bluestem	Type 38 DCP	24" o.c.
tt	41	Eryngium yuccifolium	Rattlesnake Master	Type 38 DCP	24" o.c.
ww	41	Andropogon virginicus	Broomsedge	Type 38 DCP	24" o.c.
XX	40	Rudbeckia fulgida	Orange Coneflower	Type 38 DCP	24" o.c.
уу	29	Sporobolus heterolepis	Prairie Dropseed	Type 38 DCP	24" o.c.
ZZ	22	Bouteloua curtipendula	Sideoats grama	Type 38 DCP	24" o.c.

Note: Refer to L-1 for Landscape Plan. JERAMAS JERAMAS ARCHITECTURE ATCHITECTURE AT

aradigm Office Building

Revisions:

Date Description N

Drawn: KP Checked: RS

IMISALSSOCIATES

appropriate the park Drive, Suite 135
Chesterfield, Missouri 63005-1194
(636) 519-8668 Fax (636) 519-0797
e-maii: lainfo@loomis-associates.com

Sheet Bioretention Planting Plan
Sheet

L-2

Date: 5/11/18 Job #: 813.072