

DETAIL - GUTTER COLLECTION SYSTEM
NOT TO SCALE

STORMWATER CALCULATIONS:

STORMWATER MANAGEMENT CALCULATIONS:	
DESIGN DATA	DESIGN STORM: 4.3 INCH RAINFALL EVENT OVER A 2 HOUR PERIOD
	INFILTRATION RATE = 20 INCHES PER HOUR
	INTERSTITIAL SOIL VOID (POROSITY): 20%
	GRAVEL VOID (POROSITY): 40%
	RUNOFF COEFFICIENT = 1.0
	SHWT ELEVATION = 4.3' +/-
	REFERENCE SOILS REPORT PREPARED BY PROTOCOL SAMPLING SERVICE, INC., DAVID E. MEYER, N.C.L.S.S.. THE REPORT IS DATED APRIL 10, 2020

DA1 - WEST PORTIONS OF BREWERY BUILDING ROOF

DRAINAGE AREA 1: BUILT UPON AREA	
DA-1 ROOF AREA	3,590 sq. ft.
TOTAL BUILT UPON AREA	3,590 sq. ft.

STORMWATER GENERATED BY DA 1 BUILT UPON AREA:
3,590 sq. ft. X 4.3/12 = 1,286 cu. ft.

DRAINAGE AREA 1 DRAINS TO THE AREA NORTH OF THE BREWERY BUILDING (OUTDOOR DINING ACTIVITY AREA) BY DIRECT ROOF RUNOFF OR ROOF GUTTERING WITH PERFORATED SOCK PIPE COLLECTION AND DISCHARGE.

RECEIVING AREA DATA:
TOP ELEVATION = 9.0', TOP AREA = 1,700 sq. ft.
BOTTOM ELEVATION = 8.5', BOTTOM AREA = 1,300 sq. ft.
SOIL DEPTH = TOP ELEVATION - SHWT ELEVATION = 9.0' - 4.3' = 4.7'

OPEN STORAGE VOLUME = ((1,700 + 1,300)/2) X 0.5' = 750 cu. ft.
(TOP AREA + BOTTOM AREA)/2 X 0.5'

INTERSTITIAL SOIL STORAGE VOLUME = 7,240 cu. ft. X 0.2 = 1,448 cu. ft.
((1,700 sq. ft. x 4.7') - 750 cu. ft.) x 0.2 = 1,448 cu. ft.

TOTAL STORAGE AVAILABLE IN RECEIVING AREA = 750 cu. ft. + 1,448 cu. ft. = 2,198 cu. ft.

DA-1 STORAGE VOLUME REQUIRED = 1,286 cu.ft.
DA-1 STORAGE VOLUME PROVIDED = 2,198 cu.ft.
DA-1 STORAGE VOLUME REQUIREMENT MET

DA2 - EAST PARKING AND DRIVES INCLUDING SIDEWALK AND EAST PORTION OF BREWERY BUILDING.

DRAINAGE AREA 2: BUILT UPON AREA	
DA-2 ROOF AREA, CONCRETE SIDEWALK, CONCRETE DRIVE	5,392 sq. ft.
DA-2 TURFSTONE OR P/CP PAVERS	4,230 sq. ft.
TOTAL BUILT UPON AREA	10,162 sq. ft.

STORMWATER GENERATED BY DA 2 BUILT UPON AREA:
10,162 sq. ft. X 4.3/12 = 3,641 cu. ft.

DRAINAGE AREA 2 DRAINS TO THE EAST PARKING AREA WHERE THE RUNOFF WILL BE INTERCEPTED BY THE VOID SPACE IN THE PAVERS, GRAVEL BASE AND UNDERLYING SANDY SOILS. AN OVERFLOW IS PROVIDED FOR EXTREME RAINFALL WHICH DRAIN TO A SWALE TO BE CONSTRUCTED ALONG THE RIGHT OF WAY ON VA. DARE TRAIL.

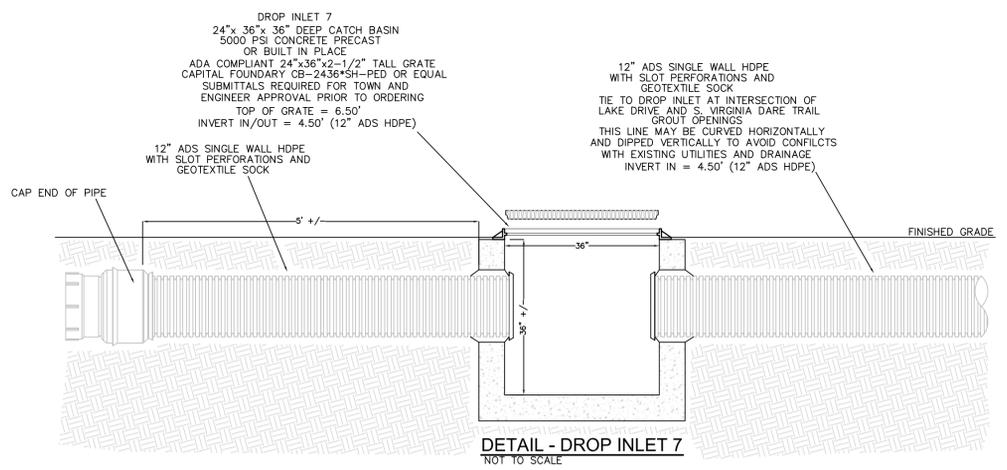
STORMWATER STORAGE VOLUME IN TURFSTONE/P/CP PAVERS, GRAVEL AND SOILS:
TURFSTONE/P/CP PAVER SURFACE = 0.052 cu. ft. open
(0.052 cu. ft. open x 0.20 = 0.0104 cu. ft.)
2" SAND LEVELING COURSE AT 20% VOID = 0.034 cu. ft. open
(0.17 cu. ft. x 0.20 = 0.034 cu. ft.)
7" GRADED STONE BASE AT 40% VOID = 0.233 cu. ft. open
(0.56 cu. ft. x 0.40 = 0.233 cu. ft.)
SAND SOILS TO SHWT AT 20% VOID = 0.432 cu. ft. open
(2.16 cu. ft. x 0.20 = 0.432 cu. ft.)

TOTAL STORAGE VOLUME PER sq. ft. OF PAVING SURFACE = 0.751 cu. ft. PER sq. ft.
TURFSTONE PAVING AREA = 4,230 sq. ft.
TOTAL STORAGE VOLUME IN TURFSTONE PAVING SURFACE = 4,230 x 0.751 = 3,177 cu. ft.

TURFSTONE STORAGE VOLUME IN TURFSTONE SATURATED AREA:
SATURATED AREA = 6,527 cu. ft.
(3.3' OFFSET OF TURFSTONE AREA LESS TURFSTONE AREA X 3.17)
(6,289 sq.ft. - 4,230 sq.ft. X 3.17' = 6,527 cu. ft.)
SATURATED AREA STORAGE VOLUME AT 20% VOID = 1,305 cu. ft.
(6,527 cu. ft. x 0.20 = 1,305 cu. ft.)

TOTAL STORAGE AVAILABLE IN TURFSTONE PAVEMENT AREA = 3,177 cu. ft.
TOTAL STORAGE AVAILABLE IN SATURATED AREA = 1,305 cu. ft.
TOTAL STORAGE AVAILABLE IN PARKING AREA = 4,482 cu. ft.

DA-2 STORAGE VOLUME REQUIRED = 3,641 cu.ft.
DA-2 STORAGE VOLUME PROVIDED = 4,482 cu.ft.
DA-2 STORAGE VOLUME REQUIREMENT MET



DETAIL - DROP INLET 7
NOT TO SCALE

STORMWATER CALCULATIONS CONTINUED:

DA3 - SOUTH PARKING AND DRIVES INCLUDING ENTRANCES UP TO DROP INLETS

DRAINAGE AREA 3: BUILT UPON AREA	
DA-3 CONCRETE DRIVES, BORDERS AND ENTRANCES	2,311 sq. ft.
DA-2 TURFSTONE OR P/CP PAVERS	1,213 sq. ft.
TOTAL BUILT UPON AREA	3,524 sq. ft.

STORMWATER GENERATED BY DA 3 BUILT UPON AREA:
3,524 sq. ft. X 4.3/12 = 1,263 cu. ft.

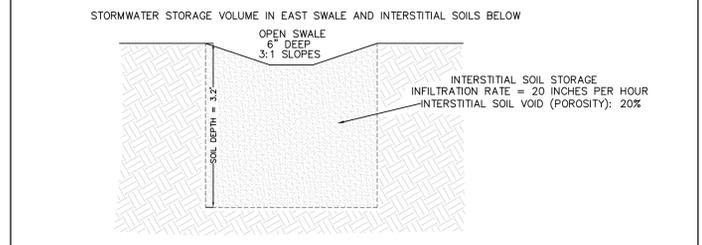
DRAINAGE AREA 3 CONSISTS OF TURFSTONE/P/CP PAVERS AND CONCRETE PAVING. THE PAVERS, GRAVEL AND SOIL WILL MANAGE THE RAINFALL ONTO THE PAVEMENT SURFACE. THE RAINFALL ONTO THE CONCRETE SURFACES WILL FLOW ACROSS THE PAVING WHERE IT WILL BE INTERCEPTED BY CATCH BASINS AND DIRECTED TO A SHALLOW SWALE ALONG VA. DARE TRAIL.

STORMWATER STORAGE VOLUME IN TURFSTONE/P/CP PAVERS, GRAVEL AND SOILS:
TURFSTONE/P/CP PAVER SURFACE = 0.052 cu. ft. open
(0.052 cu. ft. open x 0.20 = 0.0104 cu. ft.)
2" SAND LEVELING COURSE AT 20% VOID = 0.034 cu. ft. open
(0.17 cu. ft. x 0.20 = 0.034 cu. ft.)
7" GRADED STONE BASE AT 40% VOID = 0.233 cu. ft. open
(0.56 cu. ft. x 0.40 = 0.233 cu. ft.)
SAND SOILS TO SHWT AT 20% VOID = 0.432 cu. ft. open
(2.16 cu. ft. x 0.20 = 0.432 cu. ft.)

TOTAL STORAGE VOLUME PER sq. ft. OF PAVING SURFACE = 0.751 cu. ft. PER sq. ft.
TURFSTONE PAVING AREA = 1,213 sq. ft.
TOTAL STORAGE VOLUME IN TURFSTONE PAVING SURFACE = 1,213 x 0.751 = 911 cu. ft.

TURFSTONE STORAGE VOLUME IN TURFSTONE SATURATED AREA:
SATURATED AREA = 1,585 cu. ft.
(3.3' OFFSET OF TURFSTONE AREA LESS TURFSTONE AREA X 3.17)
(1,713 sq.ft. - 1,213 sq.ft. X 3.17' = 1,585 cu. ft.)
SATURATED AREA STORAGE VOLUME AT 20% VOID = 317 cu. ft.
(1,585 cu. ft. x 0.20 = 317 cu. ft.)

TOTAL STORAGE AVAILABLE IN TURFSTONE PAVEMENT AREA = 911 cu. ft.
TOTAL STORAGE AVAILABLE IN SATURATED AREA = 317 cu. ft.



STORMWATER STORAGE VOLUME IN EAST SWALE AND INTERSTITIAL SOILS BELOW

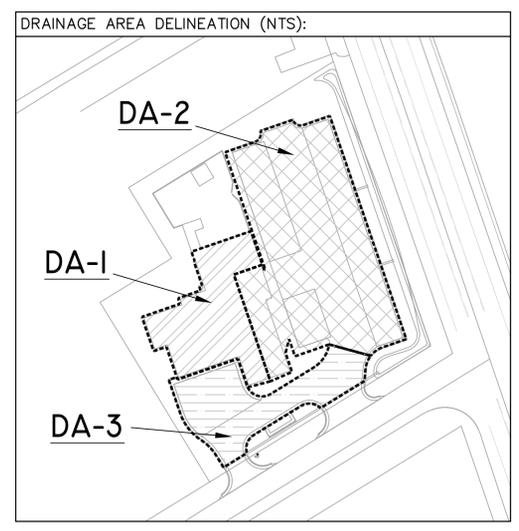
STORMWATER STORAGE VOLUME IN EAST SWALE:
STORMWATER SWALE TOP ELEVATION = 7.0'
STORMWATER SWALE TOP AREA = 1,200 sq. ft.
STORMWATER SWALE BOTTOM ELEVATION = 6.5'
STORMWATER SWALE BOTTOM AREA = 550 sq. ft.
OPEN VOLUME = 438 cu. ft.
(TOP AREA + BOTTOM AREA)/2 X 0.5'

INTERSTITIAL SOIL STORAGE VOLUME = 680 cu. ft.
(TOP AREA X SOIL DEPTH - OPEN VOLUME) X 0.2
(1,200 sq. ft. x 3.2' - 438 cu. ft.) X 0.2 = 680 cu. ft.

TOTAL STORAGE VOLUME IN EAST SWALE = 1,118 cu. ft.

TOTAL STORAGE VOLUME IN PAVERS AND EAST SWALE = 2,346 cu. ft.

DA-3 STORAGE VOLUME REQUIRED = 1,263 cu.ft.
DA-3 STORAGE VOLUME PROVIDED = 2,346 cu.ft.
DA-3 STORAGE VOLUME REQUIREMENT MET



DRAINAGE AREA DELINEATION (NTS)

MICHAEL W. ROBINSON, P.E., P.L.S.
ENGINEERING AND SURVEYING
P.O. BOX 2852
KILL DEVIL HILLS, NC 27948
PHONE: 252-255-8026
EMAIL: mrobinson@bwengineering.com

TOWN REVIEW
DETAIL SHEET 2

SWELL BREWING
NORTH CAROLINA
DARE COUNTY
KILL DEVIL HILLS
1802 S. Virginia Dare Trail

NO.	DATE	DESCRIPTION	BY

DATE: 07-07-20 SCALE: 1"=20'
DESIGNED: MWR DRAWN: MWR
SHEET: D-2 OF 3
CAD FILE:
PROJECT NO: 110717