Erosion Control Calculations

401 WEST GANNON AVENUE
Zebulon, North Carolina

July 10, 2023
Revised: April 15, 2024

Prepared By:
The Nau Company, PLLC
PO Box 810
Rolesville, North Carolina, 27571
(919) 625-3090
tnau@thenauco.com
NCBELS License # P-0751

INTRODUCTION AND GENERAL INFORMATION

This report presents the erosion control design for the land disturbance for the proposed 401 West Gannon Avenue project located at the intersection of West Gannon Avenue and North Rotary Drive in Zebulon, North Carolina.

BACKGROUND

The proposed development is comprised of approximately 0.99 acres of land and is currently vacant. At full build out the project will consist of 11 condominium units with infrastructure to support the proposed development as well as one SCM to meet the Town's stormwater requirements.

EROSION CONTROL REQUIREMENTS

All sediment and erosion control devices were designed in accordance with requirements and specifications by Wake County and in the North Carolina Erosion and Sediment Control Planning and Design Manual.

Sediment and erosion control devices used for this project include sediment traps with a Faircloth skimmer, silt fence, silt fence outlets, diversion berms, and construction entrances. Diversion berms should be located as shown on the plans to divert surface flow into the sediment traps. Silt fence will be utilized where the drainage area is less than ¼ acre per 100 linear feet of silt fence. Silt fence outlets will be located at low points along the silt fence to prevent high flow velocities from blowing out the silt fence while still allowing for the sediment to settle out of the surface flow. The construction entrances will be located at various locations for access to the areas of the project.

CALCULATIONS

The following equations were used in developing the calculated values in shown in the appendices to this report.

Sediment Traps and Basins

- Peak flow to the basins were determined using the rational formula
- The required volume was calculated based on 1800 cubic feet per acre draining to the basin
- The required surface area was calculated based on 435 square feet of surface area per cfs for the 10-year storm
- The sediment basin volume provided was calculated by the average end area method applied vertically
- The sediment basin surface area was taken from contour areas taken from the proposed basin grading, or interpolated between contours if necessary.
- The volume to dewater was set equal to the required volume of the sediment basin
- Skimmer orifice sizes were determined by the orifice equation based on the head available for the selected skimmer size
- The depth of flow over the spillway was calculated with the weir equation using the selected spillway length and peak flow from the 10-year storm

SEDIMENT TRAP DRAINAGE AREA MAP

GANNON AVENUE

N. ROTARY DRIVE

WEST SYCAMORE STREET

N/F
BILLY EUGENE CREECH HEIRS
BM 1885, PG 68
DB 5455, PG 149
PIN: 2705.13-14-4555
ZONING: DTP
USE: RESIDENTIAL

N/F
JOHN ZEBULON DAVIS & JANET STEVENS DAVIS
DB 10004, PG 1060
PIN: 2705.13-14-4383
ZONING: DTP
USE: RESIDENTIAL

N/F
NAEEMAH AL AZAWI
DB 18669, PG 427
PIN: 2705.13-14-0239
ZONING: DTP
USE: RESIDENTIAL

N/F
STEWART A. SPRAGUE & DONNA E. SPRAGUE
DB 17658, PG 175
PIN: 2705.13-14-2262
ZONING: R4
USE: RESIDENTIAL

TRAP DRAINAGE AREA
23,900 SF
0.55 AC

20 0 10 20 40
SCALE: 1"=20'

PRELIMINARY DRAWING - NOT RELEASED FOR CONSTRUCTION

The Nau Company
Consulting Civil Engineers
PO Box 810 Rolesville, NC 27571
919-435-6395
NCBELS License P-0751

OWNER/DEVELOPER:
MERIDIAN PROPERTIES GROUP, LLC
4030 WAKE FOREST ROAD, SUITE 100
RALEIGH, NC 27609
919-621-4648

REVISIONS

401 GANNON AVENUE
EROSION CONTROL DRAINAGE AREA MAPS
ZEBULON, NC

EROSION CONTROL DRAINAGE AREA MAP

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 34942 JOSEPHAN P. EAKINS
7/10/2023

PROJECT NO: ---
DESIGN BY: JPE
DRAWN BY: JPE
SCALE: 1"=20'
DATE: 7/10/2023
SHEET NO: EC1.0

SEDIMENT TRAP CALCULATIONS

The Nau Company
Consulting Civil Engineers

401 West Gannon Avenue
August 24, 2023

SKIMMER BASIN DESIGN

Location ID SCM/Trap

Drainage Area Data

Disturbed area	0.6 acres
Design storm for surface area calcs	10-year
Runoff for surface area calcs	2.0 cfs
Design storm for spillway calcs	10-year
Runoff for spillway calcs	4.0 cfs
Calculation methodology	Software/rational calcs

Skimmer Basin Design Requirements

Sediment storage per disturbed acre	1800 cubic feet/acre
Surface area per inflow CFS	435 square feet/cfs
Minimum trap dewater time	2 days
Maximum trap dewater time	5 days
Maximum sediment storage depth	3.5 feet
Minimum freeboard from sediment	1.5 feet
Minimum spillway length	10.0 feet
Maximum spillway flow depth	0.50 feet
Minimum freeboard for spillway flow	1.00 feet
Volume to dewater	Required

Skimmer Basin Design Data

Sediment storage depth	2.0 feet
Height to spillway	2.0 feet
Spillway length	20.0 feet
Skimmer size	1.50 in.
Orifice size	0.50 in.

Sediment Trap Contour and Volume Data

Elevation	Stage	Contour area	Incremental Volume	Cumulative volume
342.0	*0.0*	78 sf	*0*	*0*
343.0	*1.0*	691 sf	*385*	*385*
344.0	*2.0*	1,914 sf	*1,303*	*1,687*
345.0	*3.0*	3,746 sf	*2,830*	*4,517*
345.5	*3.5*	4,123 sf	*1,967*	*6,484*

The Nau Company
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401 West Gannon Avenue
August 24, 2023

SKIMMER BASIN DESIGN

Location ID SCM/Trap

Sediment Trap Dewatering

Sediment Trap Dewatering Calculations	
Volume to dewater	*990 CF*
Skimmer size	*1.5 in.*
Orifice diameter	*0.50 in.*
Coefficient of discharge	*0.60*
Orifice area	*0.0014 SF*
Head on orifice	*0.125 ft*
Flowrate	*0.002 cfs*
Dewatering time	*4.9 days*

Head on skimmer orifice	
Skimmer size	Head
1.5 in.	0.125 ft.
2.0 in.	0.167 ft.
2.5 in.	0.208 ft.
3.0 in.	0.250 ft.
4.0 in.	0.333 ft.
5.0 in.	0.333 ft.
6.0 in.	0.417 ft.
8.0 in.	0.500 ft.

CHECK DESIGN REQUIREMENTS

Design criteria	Required	Provided
Sediment storage volume	990 CF	1,687 CF
Sediment surface area	870 CF	1,914 CF
Sediment storage depth	3.5 ft. (max)	2.0 feet
Sediment freeboard	1.5 ft. (min)	1.5 ft
Spillway length	10.0 ft. (min)	20.0 ft
Flow depth over spillway	0.50 ft. (max)	0.15 ft
Freeboard at design discharge	1.0 ft. (min)	1.35 ft
Trap dewatering time	2 to 5 days	4.9 days

Note: data and methodology taken from NC Erosion Control Manual

RATIONAL RUNOFF CALCULATIONS TO TRAPS

Hydrograph Report

Project Name: New Project

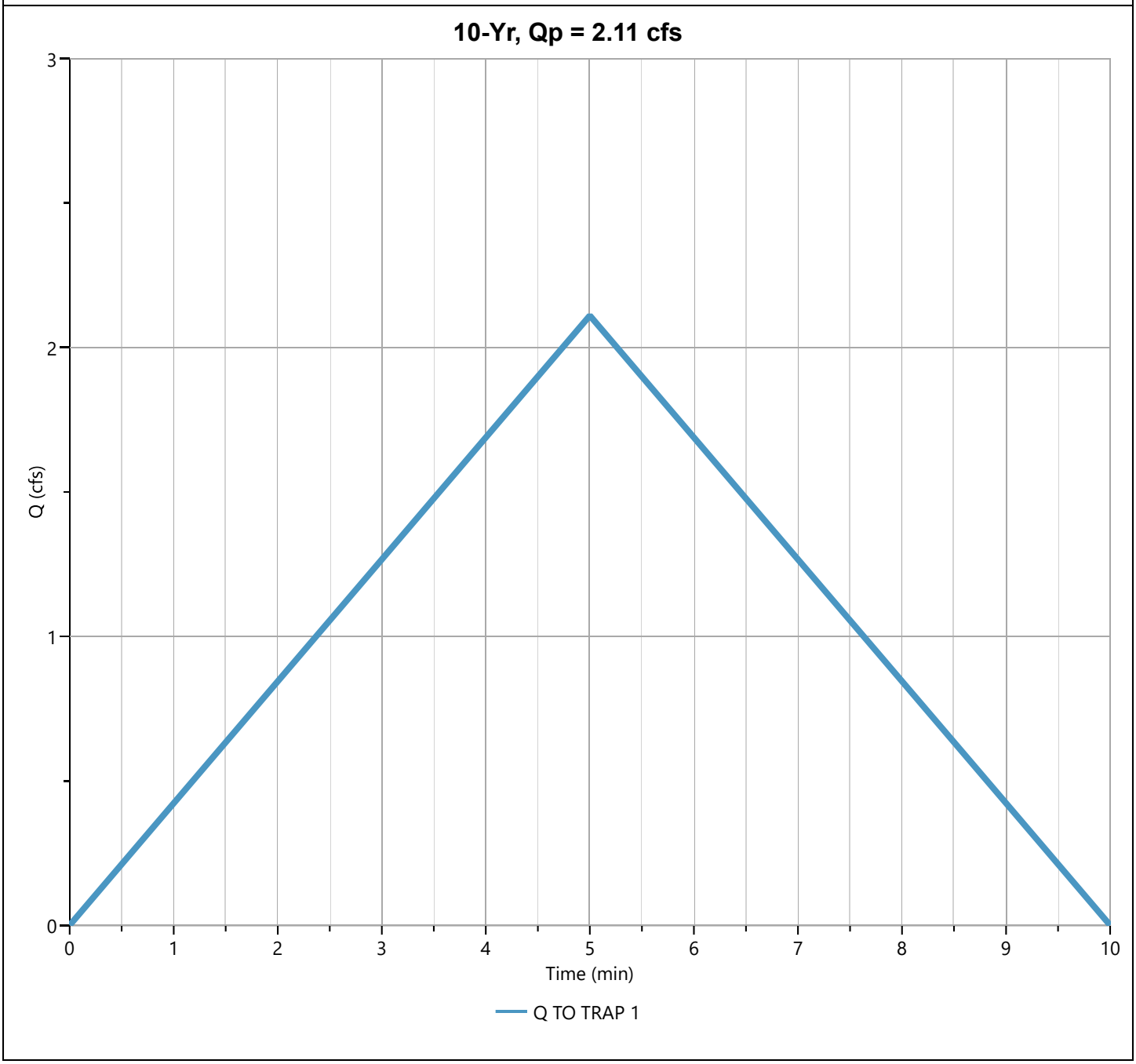
Studio Express by Hydrology Studio v 1.0.0.14

07-10-2023

Q TO TRAP 1

Hyd. No. 1

Hydrograph Type	= Rational	Peak Flow	= 2.111 cfs
Storm Frequency	= 10-yr	Time to Peak	= 5 min
Time Interval	= 1 min	Runoff Volume	= 633 cft
Drainage Area	= 0.6 ac	Runoff Coeff.	= 0.5
Tc Method	= User-Defined	Time of Conc. (Tc)	= 5.0 min
IDF Curve	= RDU-Rainfall Intensity.idf	Intensity	= 7.036 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1



OUTLET PROTECTION/RIPRAP APRON CALCULATIONS

401 WEST GANNON AVENUE

DESIGN OF RIPRAP OUTLET PROTECTION

SCM
July 10, 2023

OUTLET FLOWRATE	1.0	cfs
PIPE DIAMETER	12	inches
OUTLET PIPE SLOPE	1.00	%
NUMBER OF PIPES	1	
PIPE SEPARATION	0	feet
ZONE FROM GRAPH	1	
PIPE AREA	0.79	sq. ft.
FLOW VELOCITY	1.3	ft/sec
MATERIAL	NCDOT Class A riprap	
LENGTH	4.00	feet
WIDTH	3.00	feet
STONE DIAMETER	3	inches
THICKNESS	9	inches

Zone	Material	Diameter	Thickness	Length	Width
1	Class A	3	9	4 x D(o)	3 x D(o)
2	Class B	6	22	6 x D(o)	3 x D(o)
3	Class I	13	22	8 x D(o)	3 x D(o)
4	Class I	13	22	8 x D(o)	3 x D(o)
5	Class II	23	27	10 x D(o)	3 x D(o)
6	Class II	23	27	10 x D(o)	3 x D(o)
7	Special study required				

1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual
2. Outlet velocity based on full-flow velocity