SPECIAL USE PERMIT APPLICATION

TOWN OF CHAPEL HILL
Planning Department
405 Martin Luther King Jr. Blvd.
Chapel Hill, NC 27514
phone (919) 969-5066 *fax* (919) 969-2014
www.townofchapelhill.org

Parcel Identifier Number (PIN): 9787-29-6199, 9787-29-7266, 9787-29-9047, 9787-39-0045 Date: December 22, 2017

Section A: Project Information

Project Name: Chapel Hill Cooperative Preschool

Property Address: 108 Mt. Carmel Church Road, Chapel Hill, NC Zip Code: 27516

Use Groups (A, B, and/or C): B Existing Zoning District: R-1

Project Description: Construction of +/- 9,000 sf Preschool building and associated site improvements including but not limited to a fenced play area, off-street parking, stormwater management systems, lighting, landscaping and supporting utility services.

Section B: Applicant, Owner, and/or Contract Purchaser Information

Applicant Information (to whom correspondence will be mailed):

Name: Chapel Hill Cooperative Preschool (Maria Dickinson)

Address: 106 Purefoy Road

City: Chapel Hill State: NC Zip Code: 27514

Phone: (919) 942-3955 Email: chapelhillcooperativepreschool@gmail.com

The undersigned applicant hereby certifies that, to the best of their knowledge and belief, all information supplied with this application and accurate.

Signature: Maria D Date: 12/22/2017

Owner/Contract Purchaser Information:

☒ **Owner** ☐ **Contract Purchaser**

Name: Chapel Hill Cooperative Preschool (Maria Dickinson)

Address: 106 Purefoy Road

City: Chapel Hill State: NC Zip Code: 27514

Phone: (919) 942-3955 Email: chapelhillcooperativepreschool@gmail.com

The undersigned applicant hereby certifies that, to the best of their knowledge and belief, all information supplied with this application and accurate.

Signature: Maria D Date: 12/22/2017

Click here for application submittal instructions.

Section A: Project Information

Use Type: *(check/list all that apply)*

☐ Office/Institutional ☐ Residential ☐ Mixed-Use ☒ Other: Pre-school

Overlay District: *(check all that apply)*

☐ Historic District ☐ Neighborhood Conservation District ☐ Airport Hazard Zone

Section B: Land Area

Net Land Area (NLA): Area within zoning lot boundaries		NLA=	172,960	sq. ft.
Choose one, or both, of the following (a or b), not to exceed 10% of NLA	a) Credited Street Area (total adjacent frontage) x ½ width of public right-of-way	CSA=	10% NLA	sq. ft.
	b) Credited Permanent Open Space (total adjacent frontage) x ½ public or dedicated open space	COS=	10% NLA	sq. ft.
TOTAL: NLA + CSA and/or COS = Gross Land Area (not to exceed NLA + 10%)		GLA=	190,256	sq. ft.

Section C: Special Protection Areas, Land Disturbance, and Impervious Area

Special Protection Areas: *(check all those that apply)*

☐ Jordan Buffer ☒ Resource Conservation District ☐ 100 Year Floodplain ☐ Watershed Protection District

Land Disturbance	**Total (sq. ft.)**
Area of Land Disturbance (Includes: Footprint of proposed activity plus work area envelope, staging area for materials, access/equipment paths, and all grading, including off-site clearing)	172,960
Area of Land Disturbance within RCD	492
Area of Land Disturbance within Jordan Buffer	0

Impervious Areas	**Existing (sq. ft.)**	**Demolition (sq. ft.)**	**Proposed (sq. ft.)**	**Total (sq. ft.)**
Impervious Surface Area (ISA)	7,618	7,352	29,436	29,702
Impervious Surface Ratio: Percent Impervious Surface Area of Gross Land Area (ISA/GLA)%	4.00%	3.86%	15.47%	15.61%
If located in Watershed Protection District, % of impervious surface on 7/1/1993	4.00%	N/A	N/A	N/A

Section D: Dimensions

Dimensional Unit (sq. ft.)	Existing (sq. ft.)	Demolition (sq. ft.)	Proposed (sq. ft.)	Total (sq. ft.)
Number of Buildings	4 (3,053)	3 (2,787)	1 (9,000)	9,266
Number of Floors	1 Each	3	1 Each	2 (1 Each)
Recreational Space	N/A	N/A	N/A	N/A

Residential Space				
Dimensional Unit (sq. ft.)	**Existing (sq.ft.)**	**Demolition (sq. ft.)**	**Proposed (sq. ft.)**	**Total (sq. ft.)**
Floor Area (all floors – heated and unheated)	3,053	2,787	0	266
Total Square Footage of All Units	3,053	2,787	0	266
Total Square Footage of Affordable Units	N/A	N/A	N/A	N/A
Total Residential Density	1	1	0	0
Number of Dwelling Units	1	1	0	0
Number of Affordable Dwelling Units	N/A	N/A	N/A	N/A
Number of Single Bedroom Units	N/A	N/A	N/A	N/A
Number of Two Bedroom Units	N/A	N/A	N/A	N/A
Number of Three Bedroom Units	N/A	N/A	N/A	N/A

Non-Residential Space *(Gross Floor Area in Square Feet)*					
Use Type	**Existing**	**Proposed**	**Uses**	**Existing**	**Proposed**
Commercial	0	9,000			
Restaurant	N/A	N/A	**# of Seats**	N/A	N/A
Government	N/A	N/A			
Institutional	N/A	N/A			
Medical	N/A	N/A			
Office	N/A	N/A			
Hotel	N/A	N/A	**# of Rooms**	N/A	N/A
Industrial	N/A	N/A			
Place of Worship	N/A	N/A	**# of Seats**	N/A	N/A
Other	N/A	N/A			

Dimensional Requirements		Required by Ordinance	Existing	Proposed
Setbacks (minimum)	Street	28'	47'	104' +/-
	Interior (neighboring property lines)	14'	18'	43' +/-
	Solar (northern property line)	17'	120'	144' +/-
Height (maximum)	Primary	29'		17
	Secondary	40'		N/A
Streets	Frontages	64'	>64'	>64'
	Widths	80'	>80'	>80'

Section F: Adjoining or Connecting Streets and Sidewalks

Note: For approval of proposed street names, contact the Engineering Department.

Street Name	Right-of-Way Width	Pavement Width	Number of Lanes	Existing Sidewalk*	Existing Curb/Gutter
Mt. Carmel Church Road	Varies	Varies	Varies 2 to 4	☐ Yes	☐ Yes
				☐ Yes	☐ Yes

List Proposed Points of Access (Ex: Number, Street Name):

*If existing sidewalks do not exist and the applicant is adding sidewalks, please provide the following information:

Sidewalk Information			
Street Names	**Dimensions**	**Surface**	**Handicapped Ramps**
			☐ Yes ☐ No ☑ N/A
			☐ Yes ☐ No ☑ N/A

Section G: Parking Information

Parking Spaces	Minimum	Maximum	Proposed
Regular Spaces	20	25	42
Handicap Spaces	2	2	2
Total Spaces	22	27	44
Loading Spaces	N/A	N/A	N/A
Bicycle Spaces	8	8	4
Surface Type	Asphalt		

Section H: Landscape Buffers

Location (North, South, Street, Etc.)	Minimum Width	Proposed Width	Alternate Buffer	Modify Buffer
North	20'	20'	☐ Yes	☐ Yes
South (Street)	20'	20'	☐ Yes	☐ Yes
East	20'	20'	☐ Yes	☐ Yes
West (Street)	30'	30'	☐ Yes	☐ Yes

Section I: Land Use Intensity

Existing Zoning District:
Proposed Zoning Change *(if any)*:

Zoning – Area – Ratio			Impervious Surface Thresholds			Minimum and Maximum Limitations	
Zoning District(s)	**Floor Area Ratio (FAR)**	**Recreation Space Ratio (RSR)**	**Low Density Residential (0.24)**	**High Density Residential (0.50)**	**Non-Residential (0.70)**	**Maximum Floor Area (MFA) = FAR x GLA**	**Minimum Recreation Space (MSR) = RSR x GLA**
R-1	0.0564	N/A	N/A	N/A	0.156	10,730 SF	
TOTAL	0.0564			N/A	0.156	10,730 SF	
RCD Streamside	0.076	0.01					
RCD Managed	0.076	0.019					
RCD Upland							

Section J: Utility Service

Check all that apply:

Water	☒ OWASA	☐ Individual Well	☐ Community Well	☐ Other
Sewer	☒ OWASA	☐ Individual Septic Tank	☐ Community Package Plant	☐ Other
Electrical	☒ Underground	☐ Above Ground		
Telephone	☒ Underground	☐ Above Ground		
Solid Waste	☐ Town	☒ Private		

The following must accompany your application. Failure to do so will result in your application being considered incomplete. For assistance with this application, please contact the Chapel Hill Planning Department (Planning) at (919) 969-5066 or at planning@townofchapelhill.org.

NA	**Application fee** (including Engineering Review fee) (refer to fee schedule)	Amount Paid $ Exempt
X	**Pre-application meeting** –with appropriate staff	
X	**Digital Files –** provide digital files of all plans and documents	
X	**Recorded Plat or Deed of Property**	
X	**Project Fact Sheet**	
Town	**Traffic Impact Statement** – completed by Town's consultant (or exemption)	
NA	**Description of Public Art Proposal**	
X	**Statement of Justification**	
NA	**Response to Community Design Commission and Town Council Concept Plan comments**	
NA	**Affordable Housing Proposal, if applicable**	
NA	**Provide existing Special Use Permit, if Modification**	
X	**Mailing list of owners of property within 1,000 feet perimeter of subject property** (see GIS notification tool)	
X	**Mailing fee for above mailing list (mailing fee is double due to 2 mailings)**	Amount Paid $ 179.20
X	**Written Narrative describing the proposal**	
X	**Resource Conservation District, Floodplain, & Jordan Buffers Determination** – necessary for all submittals	
NA	**Jurisdictional Wetland Determination – if applicable**	
NA	**Resource Conservation District Encroachment Exemption or Variance (determined by Planning)**	
NA	**Jordan Buffer Authorization Certificate or Mitigation Plan Approval (determined by Planning)**	
X	**Reduced Site Plan Set (reduced to 8.5" x 11")**	

Stormwater Impact Statement (1 copy to be submitted)

a) Written narrative describing existing & proposed conditions, anticipated stormwater impacts and management structures and strategies to mitigate impacts
b) Description of land uses and area (in square footage)
c) Existing and proposed impervious surface area in square feet for all subareas and project area
d) Ground cover and uses information
e) Soil information (classification, infiltration rates, depth to groundwater and bedrock)
f) Time of concentration calculations and assumptions
g) Topography (2-foot contours)
h) Pertinent on-site and off-site drainage conditions
i) Upstream and/or downstream volumes
j) Discharges and velocities
k) Backwater elevations and effects on existing drainage conveyance facilities
l) Location of jurisdictional wetlands and regulatory FEMA Special Flood Hazard Areas
m) Water quality volume calculations
n) Drainage areas and sub-areas delineated
o) Peak discharge calculations and rates (1, 2, and 25-year storms)
p) Hydrographs for pre- & post-development without mitigation, post-development with mitigation
q) Volume calculations and documentation of retention for 2-year storm

r) 85% TSS removal for post-development stormwater runoff
s) Nutrient loading calculations
t) BMP sizing calculations
u) Pipe sizing calculations and schedule (include HGL & EGL calculations and profiles)

Plan Sets (10 copies to be submitted no larger than 24" x 36")

Plans should be legible and clearly drawn. All plan set sheets should include the following:

- Project Name
- Legend
- Labels
- North Arrow (North oriented toward top of page)
- Property boundaries with bearing and distances
- Scale (Engineering), denoted graphically and numerically
- Setbacks
- Streams, RCD Boundary, Jordan Riparian Buffer Boundary, Floodplain, and Wetlands Boundary, where applicable
- Revision dates and professional seals and signatures, as applicable

Cover Sheet

a) Include Project Name, Project fact information, PIN, and Design Team

Area Map

a) Project name, applicant, contact information, location, PIN, & legend
b) Dedicated open space, parks, greenways
c) Overlay Districts, if applicable
d) Property lines, zoning district boundaries, land uses, project names of site and surrounding properties, significant buildings, corporate limit lines
e) Existing roads (public & private), rights-of-way, sidewalks, driveways, vehicular parking areas, bicycle parking, handicapped parking, street names
f) 1,000' notification boundary

Existing Conditions Plan

a) Slopes, soils, environmental constraints, existing vegetation, and any existing land features
b) Location of all existing structures and uses
c) Existing property line and right-of-way lines
d) Existing utilities & easements including location & sizes of water, sewer, electrical, & drainage lines
e) Nearest fire hydrants
f) Nearest bus shelters and transit facilities
g) Existing topography at minimum 2-foot intervals and finished grade
h) Natural drainage features & water bodies, floodways, floodplain, RCD, Jordan Buffers & Watershed boundaries

Detailed Site Plan

a) Existing and proposed building locations
b) Description & analysis of adjacent land uses, roads, topography, soils, drainage patterns, environmental constraints, features, existing vegetation, vistas (on and off-site)
c) Location, arrangement, & dimension of vehicular parking, width of aisles and bays, angle of parking, number of spaces, handicapped parking, bicycle parking. Typical pavement sections & surface type.
d) Location of existing and proposed fire hydrants
e) Location and dimension of all vehicle entrances, exits, and drives
f) Dimensioned street cross-sections and rights-of-way widths
g) Pavement and curb & gutter construction details
h) Dimensioned sidewalk and tree lawn cross sections
i) Proposed transit improvements including bus pull-off and/or bus shelter
j) Required landscape buffers (or proposed alternate/modified buffers)
k) Required recreation area/space (including written statement of recreation plans)
l) Refuse collection facilities (existing and proposed) or shared dumpster agreement
m) Construction parking, staging, storage area, and construction trailer location
n) Sight distance triangles at intersections
o) Proposed location of street lights and underground utility lines and/or conduit lines to be installed
p) Easements
q) Clearing and construction limits
r) Traffic Calming Plan – detailed construction designs of devices proposed & associated sign & marking plan

Stormwater Management Plan

a) Topography (2-foot contours)
b) Existing drainage conditions
c) RCD and Jordan Riparian Buffer delineation and boundary (perennial & intermittent streams; note ephemeral streams on site)
d) Proposed drainage and stormwater conditions
e) Drainage conveyance system (piping)
f) Roof drains
g) Easements
h) BMP plans, dimensions, details, and cross-sections
i) Planting and stabilization plans and specifications

Landscape Protection Plan

a) Rare, specimen, and significant tree survey within 50 feet of construction area
b) Rare and specimen tree critical root zones
c) Rare and specimen trees proposed to be removed
d) Certified arborist tree evaluation, if applicable
e) Significant tree stand survey
f) Clearing limit line
g) Proposed tree protection/silt fence location
h) Pre-construction/demolition conference note
i) Landscape protection supervisor note
j) Existing and proposed tree canopy calculations, if applicable

Planting Plan

a) Dimensioned and labeled perimeter buffers
b) Off-site buffer easement, if applicable
c) Landscape buffer and parking lot planting plan (including planting strip between parking and building, entryway planting, and 35% shading requirement

Steep Slope Plan

a) Classify and quantify slopes 0-10%, 10-15%, 15-25%, and 25% and greater
b) Show and quantify areas of disturbance in each slope category
c) Provide/show specialized site design and construction techniques

Grading and Erosion Control Plan

a) Topography (2-foot contours)
b) Limits of Disturbance
c) Pertinent off-site drainage features
d) Existing and proposed impervious surface tallies

Streetscape Plan, if applicable

a) Public right-of-way existing conditions plan
b) Streetscape demolition plan
c) Streetscape proposed improvement plan
d) Streetscape proposed utility plan and details
e) Streetscape proposed pavement/sidewalk details
f) Streetscape proposed furnishing details
g) Streetscape proposed lighting detail

Solid Waste Plan

a) Preliminary Solid Waste Management Plan
b) Existing and proposed dumpster pads
c) Proposed dumpster pad layout design
d) Proposed heavy duty pavement locations and pavement construction detail
e) Preliminary shared dumpster agreement, if applicable

Construction Management Plan

a) Construction trailer location
b) Location of construction personnel parking and construction equipment parking
c) Location and size of staging and materials storage area
d) Description of emergency vehicle access to and around project site during construction
e) Delivery truck routes shown or noted on plan sheets

Energy Management Plan

a) Description of how project will be 20% more energy efficient than ASHRAE standards
b) Description of utilization of sustainable forms of energy (Solar, Wind, Hydroelectric, and Biofuels)
c) Participation in NC GreenPower program
d) Description of how project will ensure indoor air quality, adequate access to natural lighting, and allow for proposed utilization of sustainable energy
e) Description of how project will maintain commitment to energy efficiency and reduced carbon footprint over time
f) Description of how the project's Transportation Management Plan will support efforts to reduce energy consumption as it affects the community

Exterior Elevations

a) An outline of each elevation of the building, including the finished grade line along the foundation (height of building measured from mean natural grade)

401 Providence Road
Suite 200
Chapel Hill, NC 27514
T: 919-929-1173
F: 919-493-6548
Firm License #: F-1267

www.pennoni.com

Proposed Chapel Hill Cooperative Preschool

Town of Chapel Hill

Orange County, North Carolina

STATEMENT OF JUSTIFICATION

LIMITED SPECIAL USE PERMIT

Prepared By:

Pennoni

401 Providence Road, Suite 200

Chapel Hill, NC 27514

(919) 929-1173

Firm License: F-1267

Project #CHCP1601

Date: December 22, 2017

Table of Contents

General Project Description

The subject property which is approximately four (4) acres is located along the northerly side of Mt. Carmel Church Road at the southeasterly quadrant of the US Hwy 15/501 intersection is in the R-1 residential zoning district. The existing site consists of a residential dwelling and three (3) accessory structures. The owner/applicant, Chapel Hill Cooperative Preschool (CHCP) which is a non-profit childcare center proposes to redevelop the site (PIN: 9787-29-6199, 9787-29-7266, 9787-29-9047 & 9787-39-0045) by removing two (2) of the accessory structures and the residential dwelling (in a phased approach) and constructing a one-story preschool building (approximately 9,000 sf in area), up to forty-four (44) parking spaces, an enclosed (fenced) play area, a stormwater management system, utilities (necessary to support the development), landscaping and site lighting. Site access will be provided via a new driveway which will permit only right turns in and out of the site (a raised island will be installed within Mt. Carmel Church Road as required by NCDOT); it should be noted that the existing site driveway will be abandoned. The CHCP presently operates two (2) preschool sites in Chapel Hill, (one of which was established (in the town) in 1960), this project will enable the CHCP to combine their existing sites into one facility and remain in Chapel Hill where they have been part of the community for almost sixty (60) years.

CHCP was granted Site Plan Approval by the Planning Commission on January 25, 2017. The Site Plan approval was appealed and was sent to the Board of Adjustment for consideration on April 26, 2017. The Board of Adjustment (BOA) denied the objector's appeal and confirmed the Planning Commission's approval with conditions. Based upon the conditions attached by the BOA in their approval, CHCP appealed (the BOA approval) to the Superior Court to dismiss the BOA approval and reinstate the Planning Commission approval. The Superior Court subsequently vacated the BOA decision and reinstated the Planning Commission's approval. In an effort to address the key areas of the objector's concerns (on-site parking and area of disturbance), CHCP has agreed to commence with a "limited" Special Use Permit application subject to the understandings set out in a May 24, 2017 letter between CHCP and the Town.

Project Surroundings

The site is zoned R-1 – Residential. The project area consists of Morgan Creek to the north, US Highway 15-501 to the west and residential developments to the south and east.

Findings of Fact

The applicant hereby justifies the request for a Limited Special Use Permit application as per the Town of Chapel Hill's Land Use Management Ordinance, Appendix A, section 4.5.2(a):

- ***Finding #1: That the use or development is located, designed, and proposed to be operated so as to maintain or promote the public health, safety, and general welfare.***

  General Statement – The Chapel Hill Cooperative Preschool is a non-profit preschool within the Town for local families and provides tuition assistance to a percentage of families who have economic challenges. The CHCP provides a nurturing environment for children while introducing them to the beauty of the environment, which this site is uniquely suited for. Furthering the Town's plan of Greenway expansion and connectivity by providing the necessary easement(s) needed through this site to connect to existing trails along Morgan Creek. Minimizing disturbance of the site, especially within environmentally sensitive areas to preserve the natural beauty of the property.

  Emergency Services – The nearest fire station (Station #5) is located less than 1 mile from the proposed development site. It is anticipated that fire protection and first responder response will be provided by the Town of Chapel Hill. The preschool building will include provisions for a sprinkler system and will be designed in accordance with applicable safety and fire codes as part of the building permit review and approval.

Utilities – The existing residential development is served by public water and sewer services of Orange County Water & Sewer Authority (OWASA). Water and sewer services in the area will be adequate to support the proposed development. The development has been designed in accordance with the OWASA regulations and requirements. To minimize the impact on the site, recycling pickup will be accomplished by either a private company and/or preschool families taking the recyclables off-site to an Orange County facility. will be collected by a private carrier and the recycling will be collected by the Orange County Solid Waste Management. Regarding trash pickup, the CHCP is proposing to compost on-site to reduce the volume generated by the school; a preliminary composting plan has been prepared by the CHCP and has been attached to this narrative. The remaining trash from the site will need to be picked up. The CHCP would request to discuss the possibility with the Town of an alternative trash collection vehicle serving this site; if this is not possible then the CHCP will contract this service with a private collector.

Transportation and Pedestrian Movements – Access to the site will be restricted to right turns into the site and right turns out of the site. This will be accomplished using a raised brick median within Mt. Carmel Church Road. CHCP staff and families will be instructed to access the site via Bennett Road and not utilize the surrounding residential street such as Old Bridge Lane for any of their traffic movements (i.e.: U-turns). CHCP is also proposing to construct a dedicated 100-foot right turn deceleration taper along Mt. Carmel Church Road as well as providing an easement along Mt. Carmel Church Road site frontage to connect to the Morgan Creek Greenway system.

Parking – The development proposes to construct forty-four (44) on-site parking spaces, which exceeds the minimum thirty-one (31) on-site parking spaces required by NCDOT. Eight (8) bicycle parking spaces are required for the proposed development. After review of the Site Plan Application, the Planning Commission granted approval to construct four (4) bicycle parking spaces on site in connection with the development.

Stormwater – The area being developed on the site is located in Zone X as shown on FIRM Map 43710978700J). A Stream Determination for this property was issued by the Town of Chapel Hill on April 6, 2016. The proposed on-site stormwater will maintain existing drainage patterns. The stormwater conveyance is proposed to be connected to the existing stormwater conveyance facilities that exist along Mt. Carmel Church Road. The development proposed a minor increase in overall impervious surfaces associated with the development. Therefore, peak flow attenuation, TSS and Nutrient requirements will be met through the implementation of stormwater management controls associated with the development.

- ***Finding #2: That the use or development complies with all required regulations and standards of this chapter, including all applicable provisions of articles 3 and 5, the applicable specific standards contained in the supplemental use regulations (article 6), and with all other applicable regulations.***

  General – It is intended that all improvements will be coordinated to meet or exceed, to the best of the development's capabilities, the intent of the Town of Chapel Hill Design Manual, dated 2005; and the Chapel Hill Land Use Management Ordinance. The proposed development has consented to applying for a Limited Special Use Permit in conjunction with the Site Plan Approval previously granted by the Planning Commission. It is intended that the proposed development will be in accordance with the following LUMO criteria:

  - Building setbacks and coverage

- Tree canopy coverage
- Stormwater will be designed to mimic the existing drainage patterns
- All utilities will be underground

The following modification are necessary as part of the development:

Modifications to Landscape Requirements – The following modification(s) to the landscape requirements for Interior planting and buffers are requested:

1. To maximize on-site parking in the area of the existing dwelling (to be removed), a modified buffer along the southeasterly property line.

Sustainability – The new building and infrastructure improvements will be designed and implemented to enhance the existing environmental impact. The development will include the use of a cistern for rainwater harvesting and composting.

Demolition and Construction Waste – The development requires the demolition of the existing buildings and infrastructure in order to clear the site. Waste materials associated with the demolition will be handled in accordance with local and State requirements.

- ***Finding #3: That the use or development is located, designed, and proposed to be operated so as to maintain or enhance the value of contiguous property, or that the use or development is a public necessity.***

  The proposed preschool development has been designed to minimize disturbance/impacts to sensitive areas on-site (steep slope and RCD). The proposal will also further the Town's Greenway expansion and connectivity by providing the necessary easement(s) needed through the subject property to connect to the existing trails along Morgan Creek.

- ***Finding #4: That the use or development conforms with the general plans for the physical development of the town as embodied in this appendix and in the comprehensive plan.***

  The Chapel Hill 2020 Comprehensive Plan adopted six (6) themes. Below is a list of each theme and how it is integrated within the proposed development:

  1. **A Place for Everyone** – The Chapel Hill Cooperative Preschool is a non-profit organization which has been part of the community for over sixty (60) years. Their mission "is to partner with families of children from diverse backgrounds to respect and honor childhood, celebrate independence and support children as they learn to grow through play". The CHCP provides a nurturing environment for children while introducing them to the beauty of the environment, which this site is uniquely suited for. Additionally, CHCP also provides tuition assistance to a percentage of families who have economic challenges.

  2. **Community Prosperity and Engagement** – The proposed development will allow CHCP to consolidate their facilities from two (2) locations down to one (1). This new facility will enable CHCP to better control their operational costs and provide them with a more stable opportunity for financial health.

Energy Management Plan for Proposed Chapel Hill Cooperative Preschool

Building Efficiency – efforts to improve the efficiency beyond ASHRAE standards:

- Heat pumps serving this project will be 15 SEER
- Upgraded wall insulation to R19 mineral wool in the wall cavity + R7.5 continuous on exterior face of the wall (R13 + R3.8 required by energy code)
- LED lighting in all rooms
- Occupancy Sensors
- Reflective roof material – galvalume and light color TPO

Sustainable Energy Forms:

- At this time, we do not have plans for utilization of sustainable energy.

Participation in NC Greenpower Program:

- No participation in NC Greenpower at this time.

Building Environment - indoor air quality, natural lighting:

- Every classroom is designed to maximize natural light, reducing the need for artificial lighting during daylight hours
- Every classroom has operable windows to allow for natural ventilation as required or desired.

Commitment to Energy Efficiency and Reduced Carbon Footprint

- The lighting specified in the project is LED. The natural daylighting will reduce the amount of artificial lighting required each day. Both of these factors improve the electrical demand of the project.
- Vegetable and flower gardens and other landscaping will be planted by staff and students on site.
- Composting on site
- Higher SEER HVAC equipment
- Low flow plumbing fixtures will be utilized
- Majority of siding will be fiber cement – durable and inert

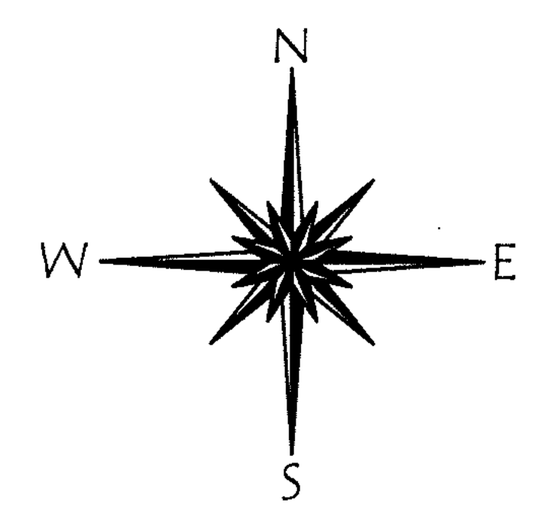
Transportation Management Plan

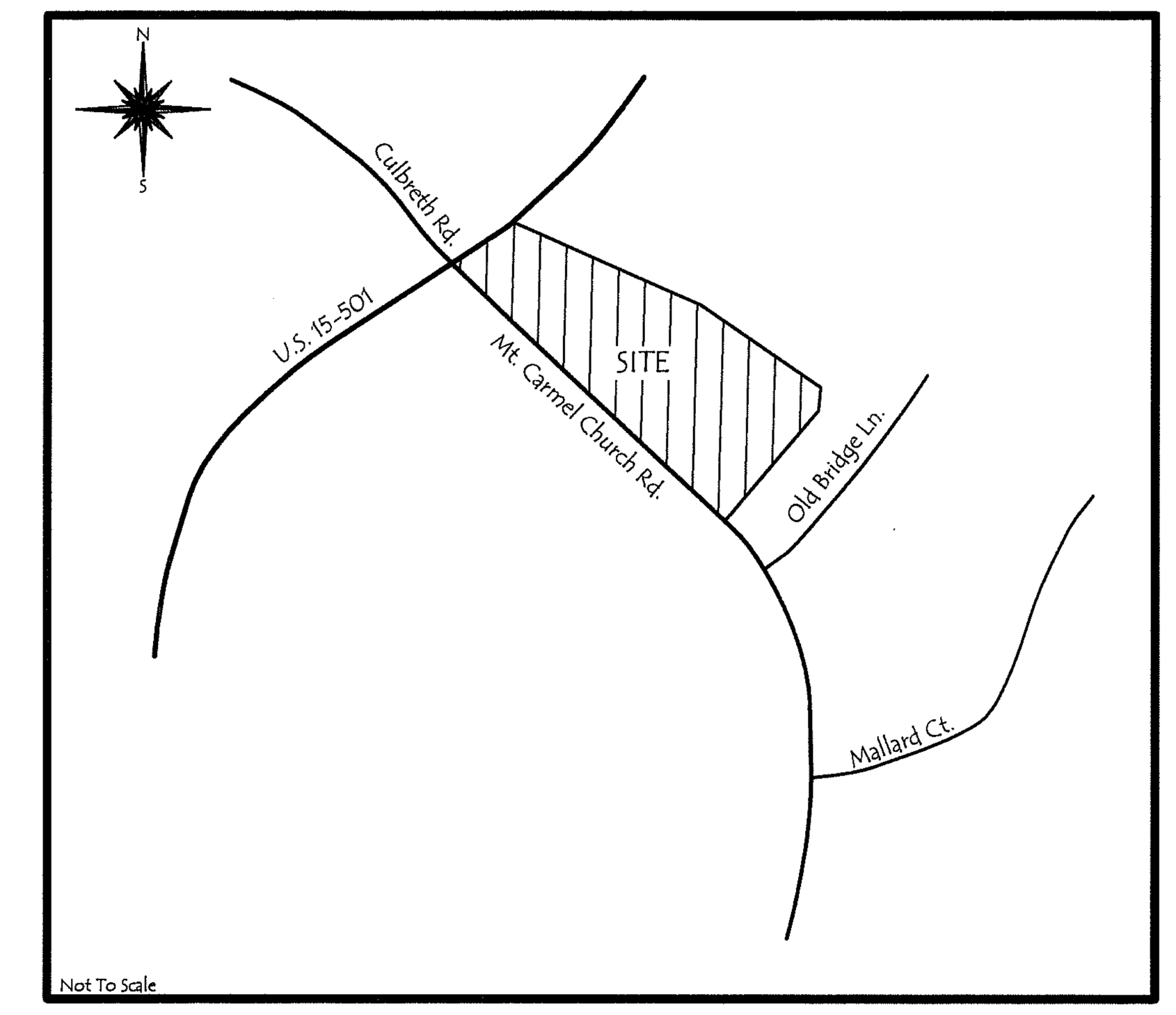
- The project is consolidating two schools into one – two schools that have siblings that attend both schools. By consolidating, the project is reducing car travel and traffic impact of a parent driving to two separate schools.
- Staff and teachers will receive carpool credits as an incentive to ride-share or use public and alternative transportation to/from work.

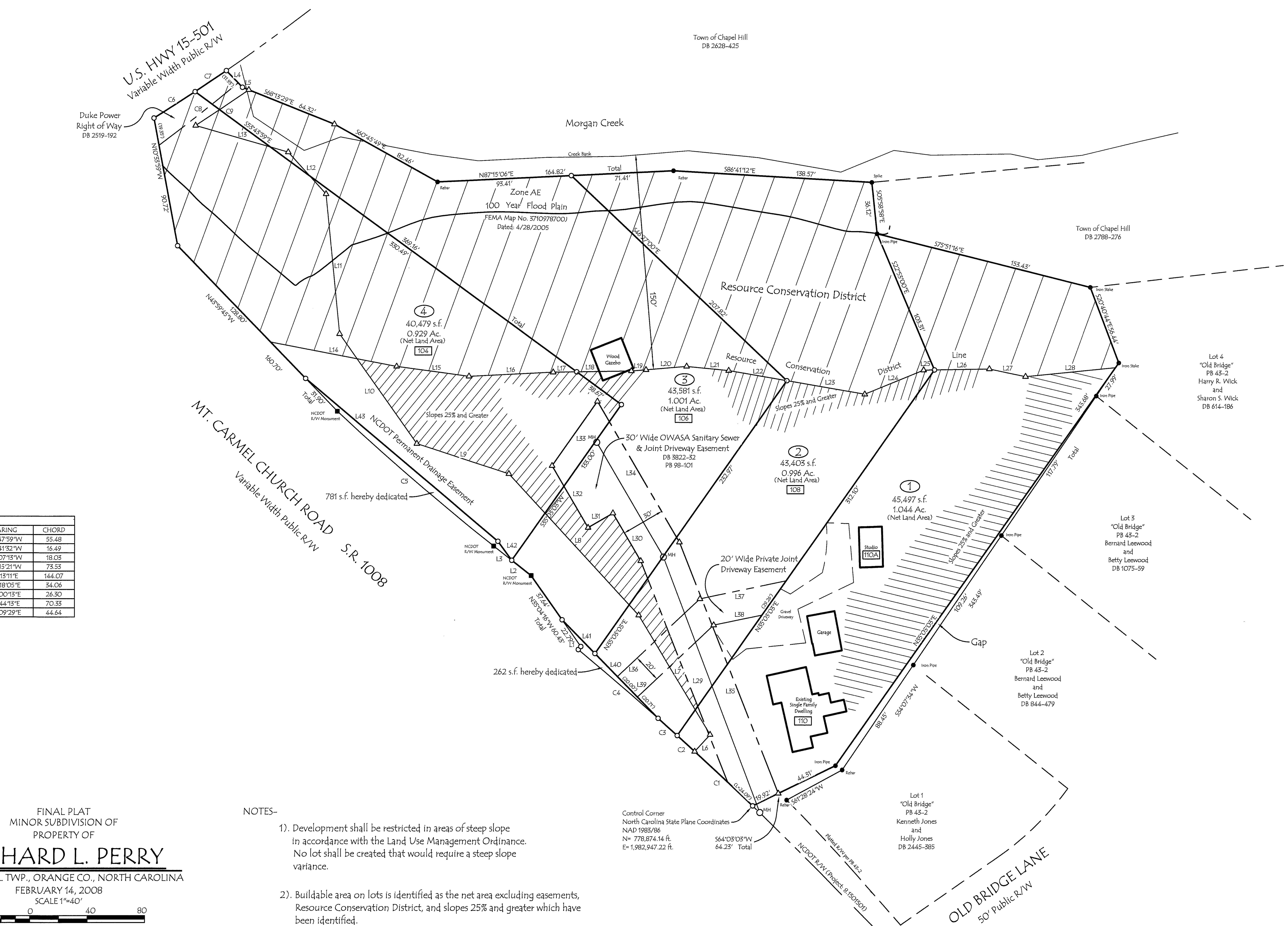
December 22, 2017

FILED Joyce H. Pearson
Register of Deeds, Orange Co,NC
Recording Fee: $21.00
NC Real Estate TX: $.00

20080228000047060 PLAT
Bk:PL103 Pg:93
02/28/2008 11:45:03 AM 1/1







LINE TABLE		
LINE	BEARING	DISTANCE
L1	S39°49'56"W	2.74
L2	S51°36'11"E	17.26
L3	S51°36'11"E	16.05
L4	N44°03'31"W	16.23
L5	N68°13'29"W	4.78
L6	S42°30'41"W	15.92
L12	N42°06'57"W	39.37
L13	N73°59'08"W	67.27
L14	S79°06'20"E	89.50
L15	S82°16'18"E	50.94
L16	N87°10'37"E	58.74
L17	N89°01'58"E	16.46
L18	N89°01'58"E	38.10
L19	N85°11'12"E	10.22
L20	N85°11'12"E	28.54
L21	S84°21'48"E	29.50
L22	S80°07'16"E	41.22
L23	S80°07'16"E	55.16
L24	N67°43'37"E	44.45
L25	N89°05'48"E	7.51
L26	N89°05'48"E	38.27
L27	S78°04'31"E	25.76
L28	N84°18'12"E	63.03
L29	S21°30'25"E	165.99
L30	S30°15'21"E	38.61
L31	N59°44'39"E	20.00
L32	S30°15'21"E	50.00
L33	N35°03'03"E	55.03
L34	S30°15'21"E	113.89
L35	S21°30'25"E	188.59
L36	N46°40'27"E	79.22
L37	S78°10'01"W	61.38
L38	S78°10'01"W	34.38
L39	N46°40'27"E	73.25
L40	N44°16'59"W	63.19
L41	N44°16'59"W	32.85
L42	N35°52'46"W	16.44
L43	N49°43'36"W	175.88

CURVE DATA						
CURVE	DELTA	RADIUS	ARC	TANGENT	BEARING	CHORD
C1	1°22'34"	2310.18	55.49	27.74	N46°47'59"W	55.48
C2	0°24'33"	2310.18	16.49	8.25	N47°41'32"W	16.49
C3	0°26'50"	2310.18	18.03	9.01	N48°07'13"W	18.03
C4	1°49'26"	2310.18	73.54	36.77	N49°15'21"W	73.53
C5	4°45'59"	1732.28	144.11	72.10	S49°13'11"E	144.07
C6	1°27'52"	1332.81	34.07	17.03	N57°18'05"E	34.06
C7	1°07'51"	1332.81	26.30	13.15	N56°00'13"E	26.30
C8	3°13'48"	1247.81	70.34	35.18	N51°44'13"E	70.33
C9	1°53'27"	1352.81	44.64	22.32	N56°09'29"E	44.64

FINAL PLAT
MINOR SUBDIVISION OF
PROPERTY OF

RICHARD L. PERRY

CHAPEL HILL TWP., ORANGE CO., NORTH CAROLINA
FEBRUARY 14, 2008
SCALE 1"=40'

40 0 40 80

Existing Corner (as noted)
Iron Stake Set
Mathematical Point
Areas by Coordinate Computation

XXX Denotes Site Address

1= 9787-39-0045
2= 9787-29-9047
3= 9787-29-7266
4= 9787-29-6199
MAB

OWNER:
Richard L. Perry
486 Walnut Branch
Chapel Hill, NC 27516
SITE REFERENCES:
DB 3144-575; PB 98-101
PIN 9787-29-8200; TM 7.126.D.10 (PARENT PIN) MAB
CURRENT ZONING: R-1

NOTES-

1). Development shall be restricted in areas of steep slope in accordance with the Land Use Management Ordinance. No lot shall be created that would require a steep slope variance.

2). Buildable area on lots is identified as the net area excluding easements, Resource Conservation District, and slopes 25% and greater which have been identified.

3). No additional driveway access shall be allowed on Mount Carmel Church Road.

4). The lots shown hereon are within the Watershed Protection District and subject to the regulations of the Land Use Management Ordinance.

5). The impervious surface of each lot shown hereon shall not exceed 50 percent of the gross land area for each lot.

Provided that this plat be recorded within 30 days of final approval;
Approved by [signature] 2-27-08
Town Manager Date

Certification of Dedication and Maintenance

The undersigned owner hereby freely dedicates all rights-of-way easements, streets, recreation area, open space, common area, utilities, and other improvements to public or private common use as notedon this plat, and further assumes full responsibility for the maintenance and control by an appropriate public body or, by an incorporated neighborhood or homeowner's association or similar legal entity.

Richard L Perry 2/14/08
Owner Date

Owner Date

North Carolina, Chatham County
I Karen V Byrd a Notary Public
of the County and State aforesaid certify that
Richard R Perry
personally appeared before me this day and acknowledged the execution of the foregoing certificate.
Witness my hand and seal, this the
14 day of February, 2008.
Karen V Byrd Karen V. Byrd
Notary Public
My commision expires: 5.4.2012

KAREN V. BYRD NOTARY PUBLIC CHATHAM COUNTY, NC

REVIEW OFFICER CERTIFICATION
State of North Carolina
County of Orange

I, MICHAEL A BURTON SR, Review Officer of Orange County, certify that the map or plat to which this certification is affixed meets all statutory requirements for recording for which the Review Officer has responsibility as provided by law.

[signature]
Review Officer - Orange County Land Records/GIS

Date of Certification 02/28/2008

I, Terry L. Westendorf, L-3232, certify that this plat was drawn from an actual field survey performed under my direction and supervision; the ratio of precision is 1:25,000+, lines not surveyed are shown broken, and plotted from the referenced information; this map was prepared in accordance with G.S. 47-30, as amended; this survey creates a subdivision of land within a area of a county or municipality that has an ordinance that regulates parcels of land.

Witness my original signature, license number, and seal
February 14th 2008.

Terry L. Westendorf, PLS

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-3232 TERRY L. WESTENDORF

MITCHELL WESTENDORF, PA
ENGINEERING & SURVEYING
1709 LEGION ROAD, SUITE 201 - CHAPEL HILL, NC 27517
(919)932.4567-WWW.MITCHELLWESTENDORF.COM

TFB 2/14/08

Bk 103 pg 93

PUBLIC WORKS DEPARTMENT
STORMWATER MANAGEMENT DIVISION
405 Martin Luther King, Jr. Blvd.
Chapel Hill, NC 27514-5705
Telephone (919) 969-7246
Fax (919) 969-7276
www.townofchapelhill.org

4/6//2016

Rick Perry
486 Walnut Branch Rd.
Chapel Hill, NC 27516

Dear Mr. Perry:

As requested, the Town Public Works Department has performed a stream determination on the property identified on the attached forms. This determination indicates whether different types of streams (perennial, intermittent, and/or ephemeral) or perennial waterbodies are present on the property in question or nearby properties. These streams and their classifications are shown on the accompanying map. Stream segments regulated by the Jordan Lake Stream Buffer ordinance are highlighted. **Locations of all features on the map are approximate and must be field surveyed for precise location.**

This stream determination information is used to determine the location and extent of the Resource Conservation District and Jordan Lake Stream Buffer. Specific land use regulations and restrictions apply within the boundaries of these protected areas. If you are considering any kind of work on your property, including clearing vegetation, paving, grading, or building, please consult with the Town Planning Department to determine the possible extent of the Resource Conservation District and Jordan Lake Stream Buffer on your property and corresponding regulations.

This classification will remain in effect for five years from the date of the site visit before a request for reclassification will be considered, unless the stream channel characteristics are significantly altered as a result of watershed changes.

In accordance with the Town's procedures, you may appeal this administrative decision to the Town Manager. If you wish to do so, you must file your written appeal accompanied by any materials you believe support your appeal, within **30** days of receipt of this letter.

If you have questions regarding stream determinations, please contact me at (919) 969-5083. If you have questions regarding the Town's Resource Conservation Districts or the Jordan Riparian Buffer regulations, please contact the Planning Department at (919) 968-2728, or view information online at http://www.townofchapelhill.org/index.aspx?page=1615.

Regards,

Dave Milkereit
Stormwater Specialist

Stream Determination Area Map

- Unclassified Stream
- Ephemeral Stream
- Intermittent Stream
- Perennial Stream
- Culverts
- 2-foot Contours
- 10-foot Contours
- Buildings
- Parcels
- Site visited
- Non-regulated Waterbody
- Non-perennial Waterbody
- Wide Perennial Stream
- Perennial Waterbody
- Approximate Jordan Buffer
- Ephemeral Breakpoint
- Intermittent Breakpoint
- Perennial Breakpoint

Wider RCD Buffers may apply

Address: 104, 406, 108 Mt. Carmel Church Rd.

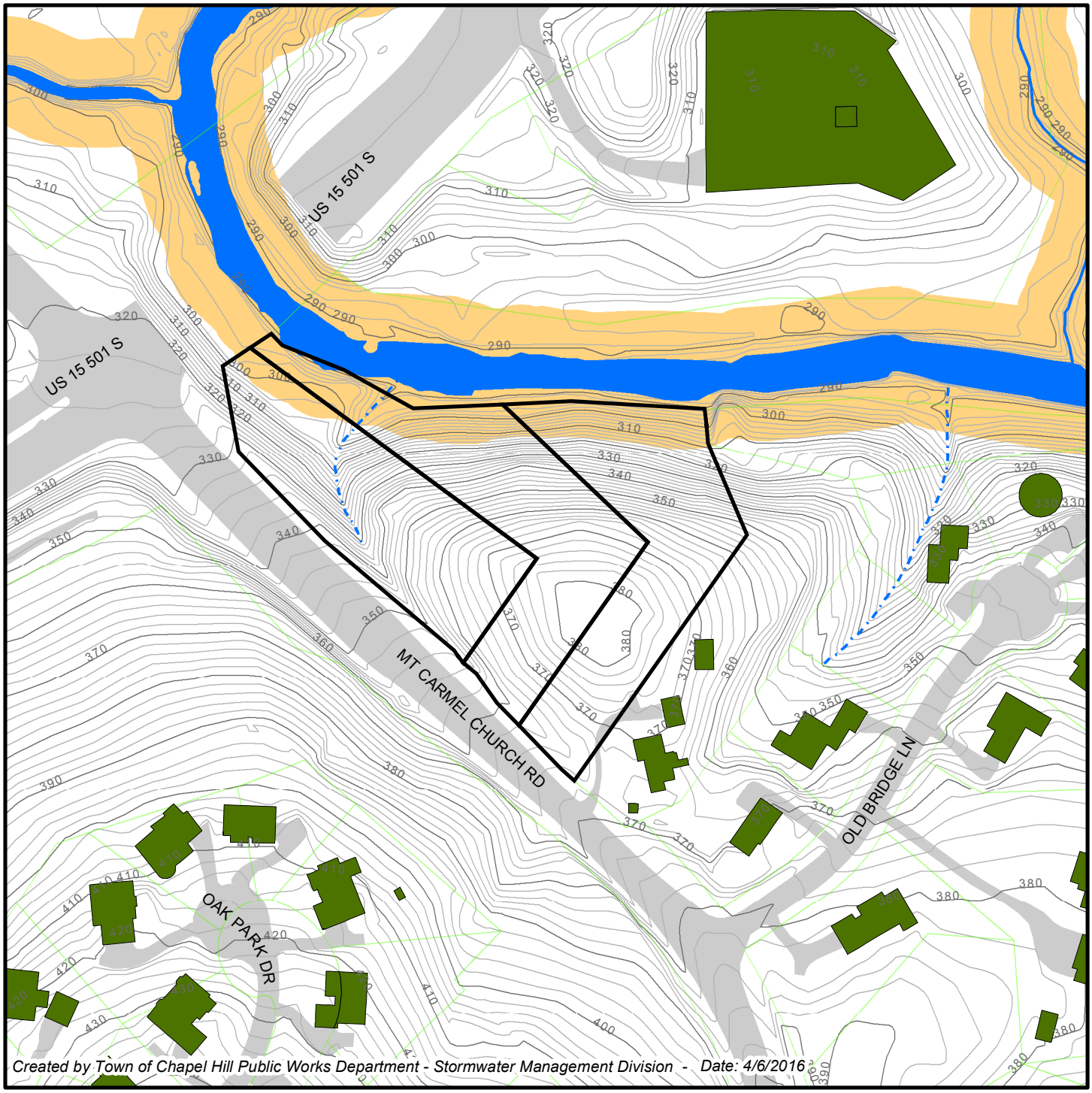
Parcel ID: 9787-29-6199, 9787-29-7266, 9787-29-9047

N

0 75 150 300 Feet

1 inch = 150 feet

Stream locations are approximate and must be verified by survey.



Created by Town of Chapel Hill Public Works Department - Stormwater Management Division - Date: 4/6/2016

PUBLIC WORKS DEPARTMENT
STORMWATER MANAGEMENT DIVISION
405 Martin Luther King, Jr. Blvd.
Chapel Hill, NC 27514-5705
Telephone (919) 969-7246
Fax (919) 969-7276
www.townofchapelhill.org

STREAM DETERMINATION RECORDS REVIEW

Property Information	
Parcel ID Number (PIN)	Address / Location Description
9787-29-9047	108 Mt. Carmel Church Rd.

After reviewing Town GIS information, USGS 1:24,000 Topographic maps, and County Soil Survey maps, I have determined no new stream determination will be required for the property(ies) listed above for the following reason(s):

☐ No unclassified streams or waterbodies, streams or waterbodies identified as requiring a new classification or determination, or unidentified flowlines (possible streams) are shown within 150 feet of the property in question on the Town's GIS, the USGS 1:24,000 Topographic map, or the County Soil Survey map for the area.

☐ A Resource Conservation District boundary was set on a recorded final plat for the property in question, and there are no streams or waterbodies shown on the USGS 1:24,000 Topographic map or County Soil Survey within 150 feet of the property.

☒ A stream determination has been done for this property, a property uphill or upstream, or a nearby property as of April 6, 2011 or later, and that stream determination applies to this property.

Relevant PIN(s): 9787-39-1185

A map showing water features, their Town flow classifications, presence of Jordan Riparian Buffers, and their approximate locations is attached. Origins or breakpoints that have been flagged in the field are marked on the map.

Other conditions exist which may affect the location of the Resource Conservation District or Jordan Stream Buffer:

☒ FEMA floodzone is mapped in the area. Precise location of the Base Flood Elevation and associated Resource Conservation District must be determined by a field survey commissioned by the owner or a representative.

☐ Segments of perennial or intermittent stream are piped in the area. These segments do not have an associated Jordan Stream Buffer.

☐ Possible Jurisdictional Wetlands have been identified in the area. A formal review by a professional certified in Jurisdictional Wetland Delineation is recommended.

_____ 4/6/2016
Town Staff signature date

PUBLIC WORKS DEPARTMENT
STORMWATER MANAGEMENT DIVISION
405 Martin Luther King, Jr. Blvd.
Chapel Hill, NC 27514-5705
Telephone (919) 969-7246
Fax (919) 969-7276
www.townofchapelhill.org

STREAM DETERMINATION SITE VISIT RESULTS

Property Information	
Parcel ID Number (PIN)	Address / Location Description
9787-29-6199	104 Mt. Carmel Church Rd.
9787-29-7266	106 Mt. Carmel Church Rd.

These are the results of a site visit to the properties listed above for a stream determination conducted on 04/06/2016 by Town Staff:

☐ No perennial, intermittent, or ephemeral streams or perennial waterbodies were identified on or near the property(ies) in question.

☒ Perennial, intermittent, or ephemeral streams, or perennial waterbodies, were identified on or near the property(ies) in question and shown on the attached map(s).

A map showing water features, their Town flow classifications, presence of Jordan Riparian Buffers, and their approximate locations is attached. Origins or breakpoints that have been flagged in the field are marked on the map. Stream classification forms and additional site visit notes and maps are also attached.

Other conditions exist which may affect the location of the Resource Conservation District or Jordan Stream Buffer:

☒ FEMA floodzone is mapped in the area. Precise location of the Base Flood Elevation and associated Resource Conservation District must determined by a field survey commissioned by the owner or a representative.

☐ Segments of perennial or intermittent stream are piped in the area, as shown on the map. These segments do not have an associated Jordan Stream Buffer.

☐ Possible Jurisdictional Wetlands have been identified in the area. A formal review by a professional certified in Jurisdictional Wetland Delineation is recommended.

Town Staff signature _____ date 04/06/2016

USGS 24K Topographic / County Soil Survey Maps

Site Parcel Boundary

0 75 150 225 300 Feet

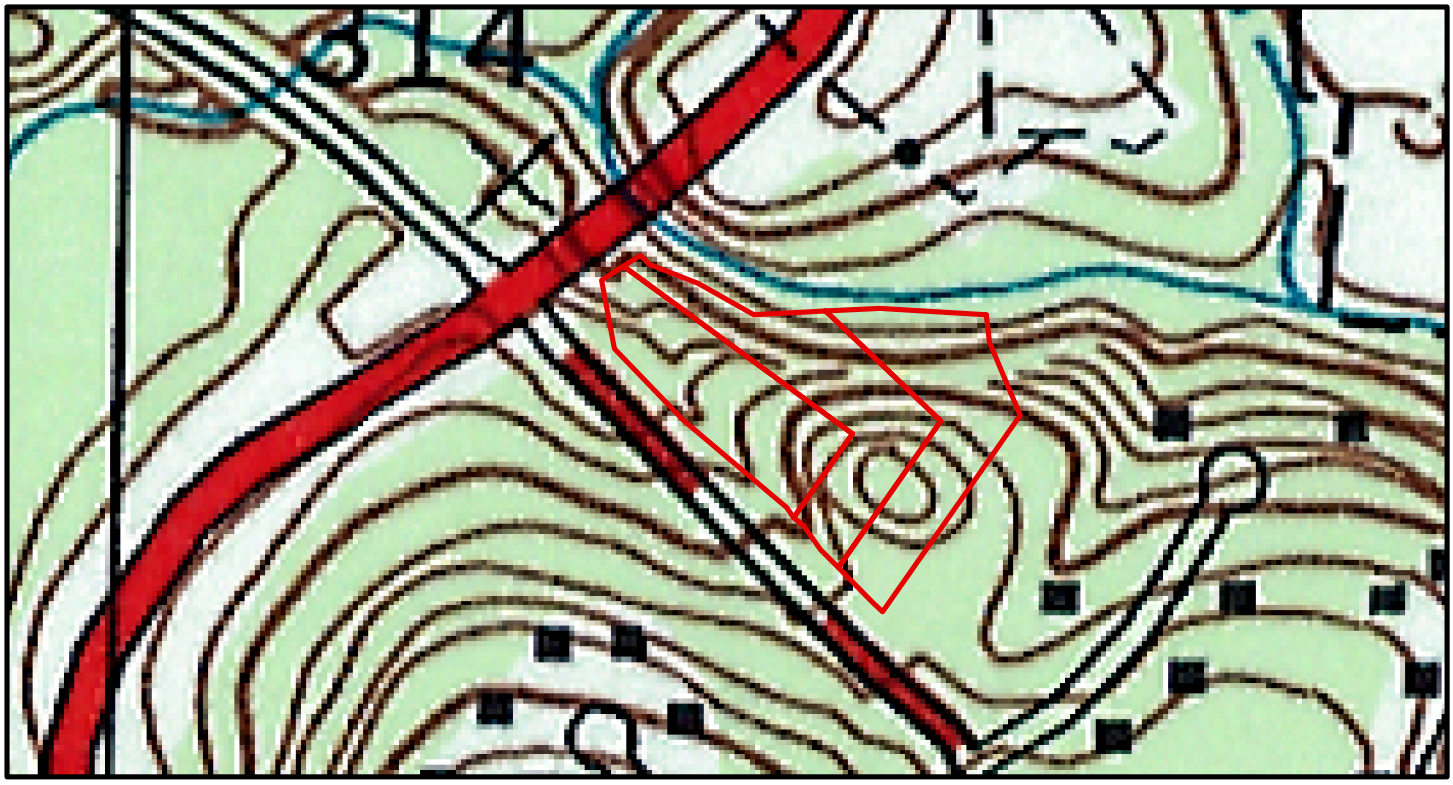
1 inch = 250 feet

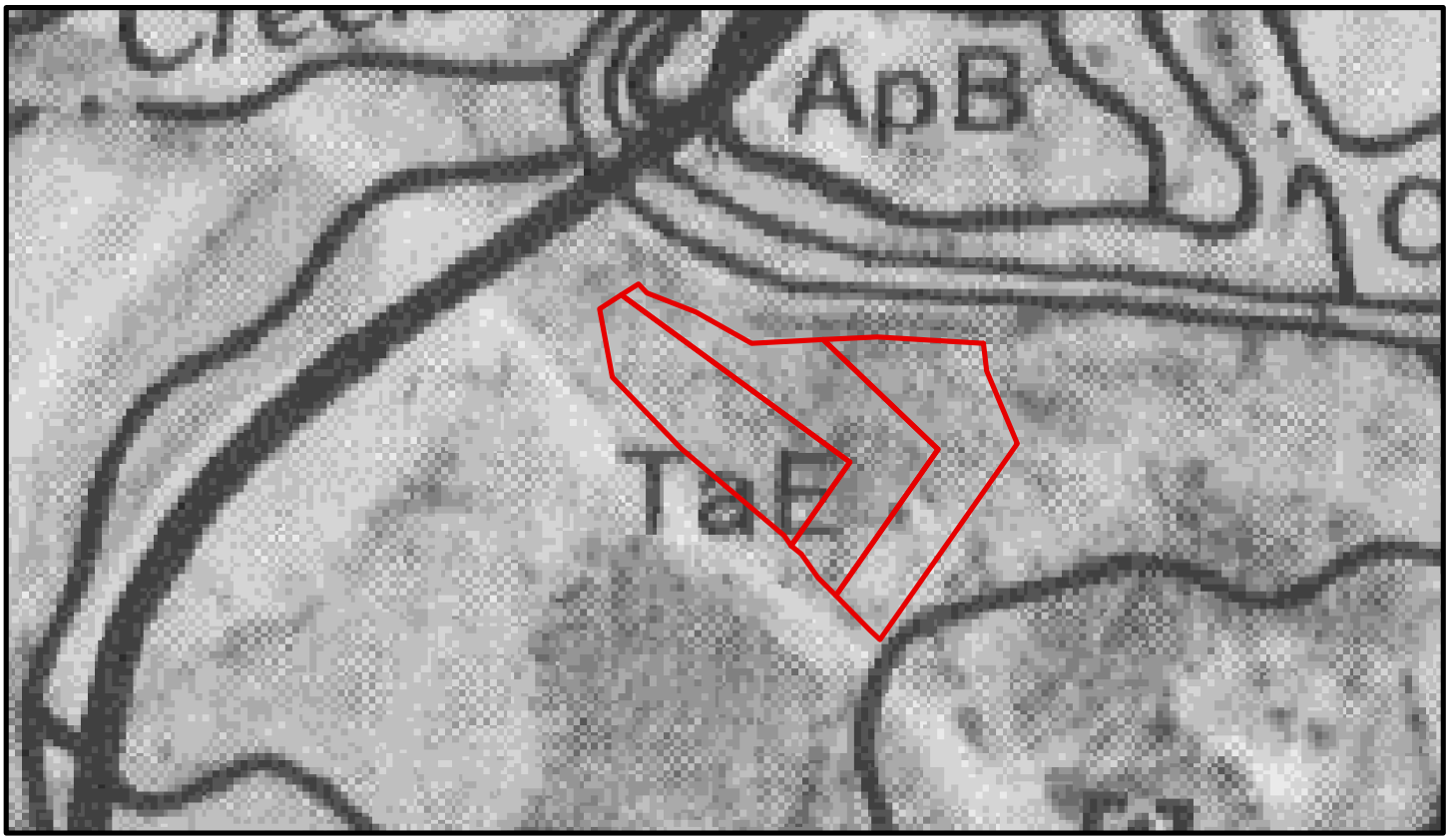
Address: 104,106,108 Mt. Carrmel Church Rd.

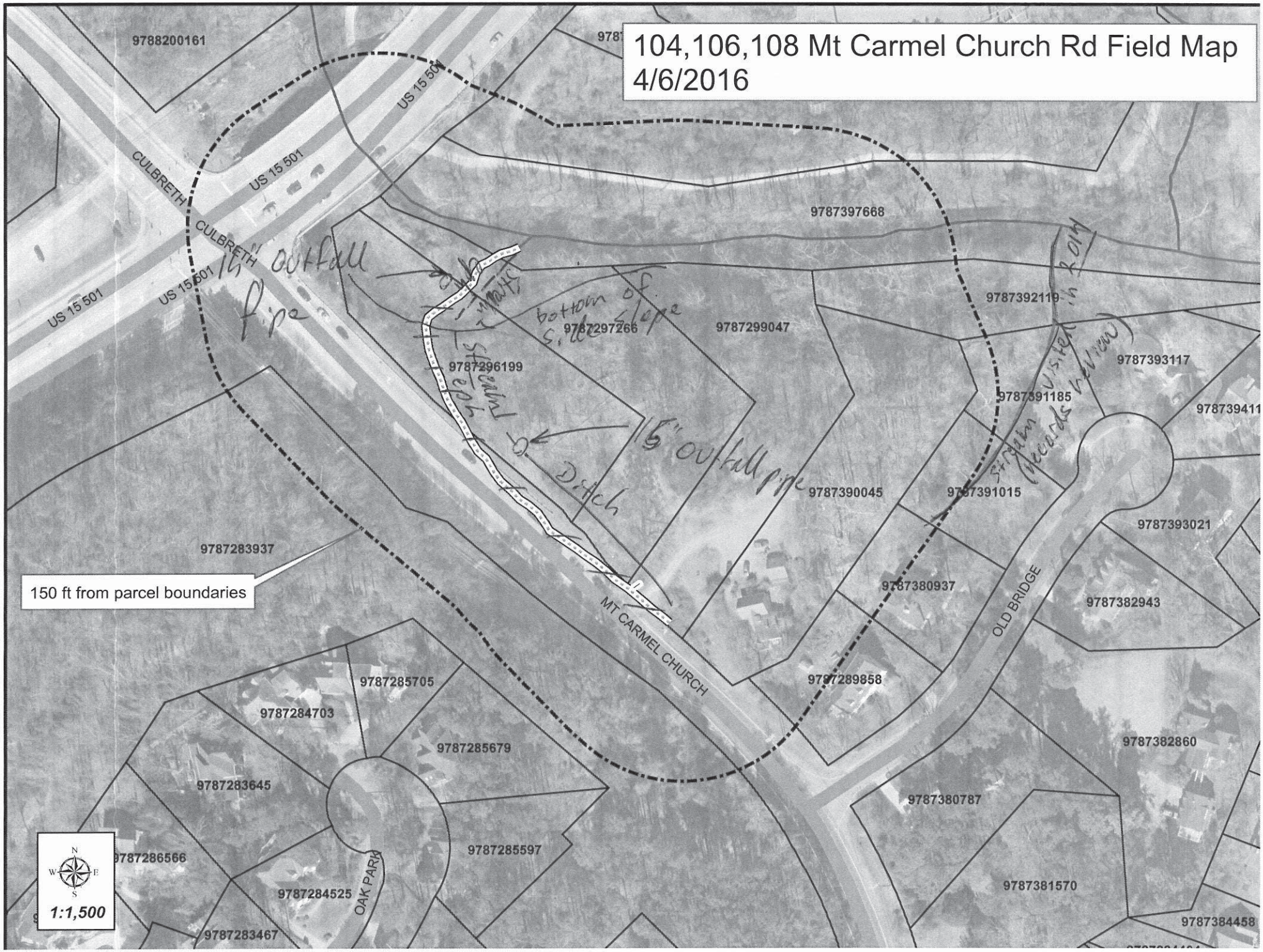
Parcel ID: 9787-29-6199, 9787-29-7266, 9787-29-9047

N

Created by Town of Chapel Hill Public Works Department - Stormwater Management Division- 4/6/2016






104,106,108 Mt Carmel Church Rd Field Map
4/6/2016
9788200161
US 15 501
CULBRETH
US 15 501
CULBRETH
US 15 501
15" outfall pipe
9787397668
9787392119
9787297266
9787299047
9787296199
9787393117
9787391185
978739411
9787390045
9787391015
9787393021
9787283937
150 ft from parcel boundaries
9787380937
9787382943
MT CARMEL CHURCH
OLD BRIDGE
9787289858
9787285705
9787284703
9787285679
9787382860
9787283645
9787380787
9787285597
9787286566
9787284525
OAK PARK
9787381570
9787283467
9787384458
N
W
E
S
1:1,500

20160406092O Stream 2

NC DWQ Stream Identification Form Version 4.11

Date: 4/6/2016	Project/Site: Mt Carmel Ch	Latitude:
Evaluator: Milkereit	County:	Longitude:
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 18	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other *e.g. Quad Name:*

A. Geomorphology (Subtotal = 9.5)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	(1)	2	3
2. Sinuosity of channel along thalweg	(0)	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	(0.5)	1	1.5
11. Second or greater order channel	No = (0)		Yes = 3	

[a] artificial ditches are not rated: see discussions in manual

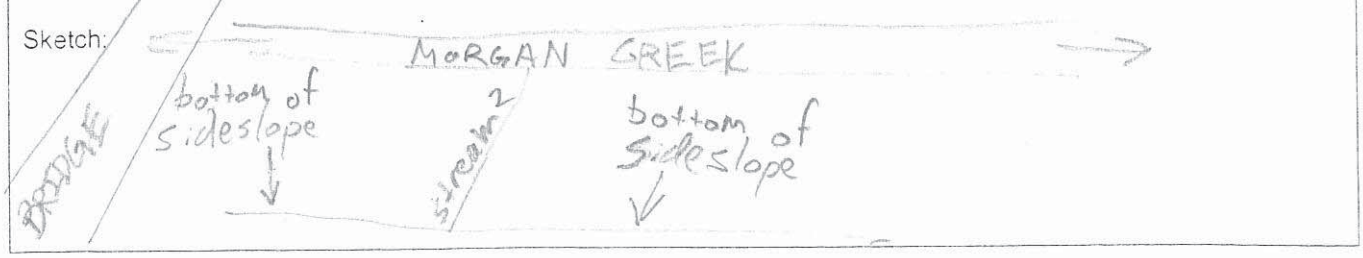
B. Hydrology (Subtotal = 4.5)				
12. Presence of Baseflow	0	(1)	2	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	0.5	(1)	1.5
17. Soil-based evidence of high water table?	No = (0)		Yes = 3	

C. Biology (Subtotal = 4)				
18. Fibrous roots in streambed	3	2	(1)	0
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:



2016 0406 0937 Stream 1

NC DWQ Stream Identification Form Version 4.11

Date: 4/6/2016	Project/Site: Mt Carmel Ch	Latitude:
Evaluator: Milkereit	County:	Longitude:
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 15.5	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other *e.g. Quad Name:*

A. Geomorphology (Subtotal = 9)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	(0)	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	(2)	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	(0)	1	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	0	1	(2)	3
8. Headcuts	0	(1)	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	(0.5)	1	1.5
11. Second or greater order channel	No = (0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

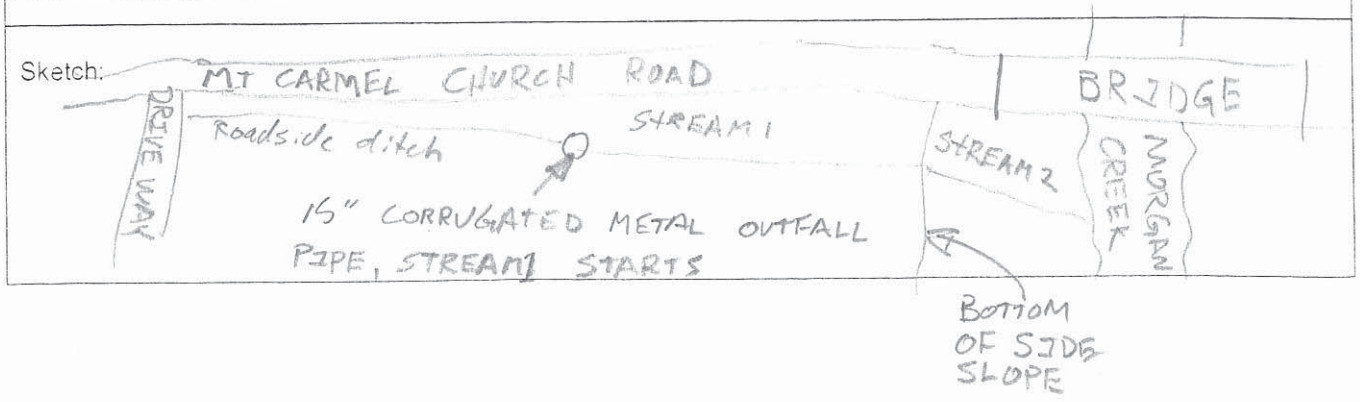
B. Hydrology (Subtotal = 3.5)				
12. Presence of Baseflow	0	(1)	2	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	1	(0.5)	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = (0)		Yes = 3	

C. Biology (Subtotal = 3)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	3	2	(1)	0
20. Macrobenthos (note diversity and abundance)	(0)	1	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	(0)	0.5	1	1.5
24. Amphibians	(0)	0.5	1	1.5
25. Algae	(0)	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = (0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

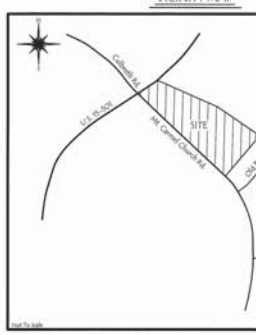


FILED Joyce H. Pearson
Register of Deeds, Orange Co. NC
Recording Fee: $21.00
NC Real Estate TX: $ 0.00

BK:PL103 Pg:93
02/29/2008 11:40:03 AM 1/1

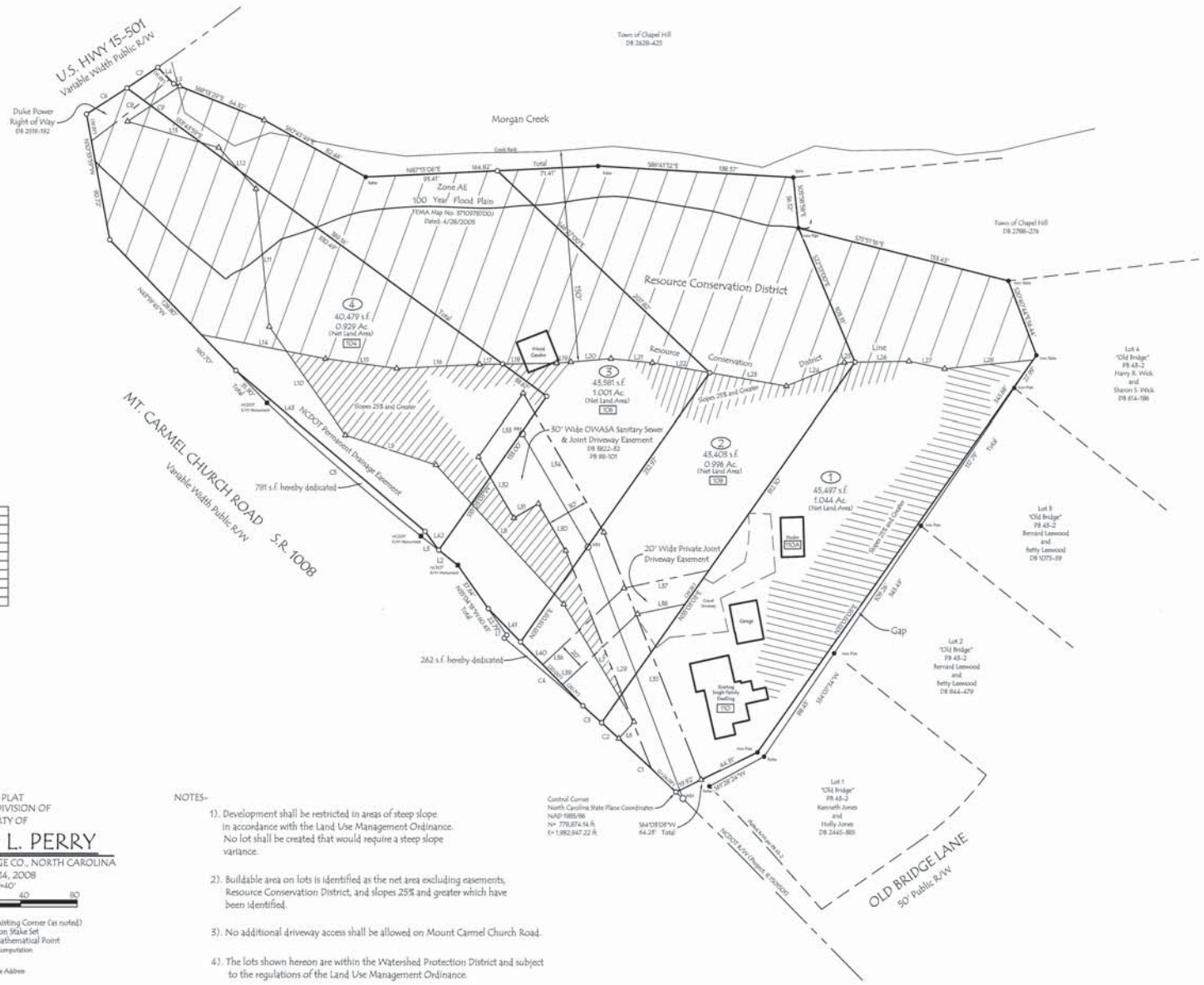
North Carolina
Grid North

VICINITY MAP



LINE TABLE		
LINE	BEARING	DISTANCE
L1	S89°48'56"W	2.74
L2	S31°36'11"E	17.26
L3	S31°36'11"E	16.05
L4	N44°08'31"W	16.23
L5	N68°13'29"W	4.78
L6	S62°30'41"W	11.92
L12	N42°06'57"W	39.87
L13	N77°59'08"W	67.27
L14	S79°06'20"E	89.50
L15	S82°16'19"E	50.94
L16	N85°10'57"E	58.74
L17	N89°01'58"E	16.46
L18	N89°01'58"E	38.50
L19	N85°11'12"E	50.22
L20	N85°11'12"E	28.54
L21	S84°21'48"E	29.50
L22	S80°07'16"E	41.22
L23	S80°07'16"E	53.16
L24	N67°48'57"E	44.45
L25	N89°01'48"E	7.51
L26	N89°01'48"E	80.27
L27	S78°04'31"E	25.76
L28	N84°59'12"E	68.09
L29	S21°30'25"E	165.99
L30	S80°15'21"E	38.61
L31	N59°44'39"E	20.00
L32	S80°15'21"E	50.00
L33	N85°08'08"E	55.08
L34	S80°15'21"E	113.89
L35	S21°30'25"E	188.59
L36	N48°40'27"E	79.22
L37	S78°03'01"W	61.88
L38	S78°03'01"W	54.38
L39	N48°40'27"E	78.25
L40	N44°16'39"W	65.19
L41	N44°16'39"W	82.85
L42	N75°12'48"W	15.44
L43	N49°43'56"W	175.88

CURVE DATA						
CURVE	DELTA	RADIUS	ARC	TANGENT	BEARING	CHORD
C1	1°22'34"	2310.18	55.49	27.74	N46°47'59"W	55.48
C2	0°24'38"	2310.18	16.49	8.25	N47°41'52"W	16.49
C3	0°26'50"	2310.18	18.08	9.04	N48°07'18"W	18.08
C4	1°49'26"	2310.18	73.54	36.77	N49°51'21"W	73.53
C5	4°45'39"	1782.28	144.11	72.10	S49°18'11"E	144.07
C6	1°27'52"	1882.81	34.09	17.08	N57°18'05"E	34.06
C7	1°07'01"	1882.81	26.90	13.51	N56°00'13"E	26.90
C8	3°19'48"	1347.81	70.34	35.18	N57°44'15"E	70.33
C9	1°58'27"	1852.81	44.64	22.32	N56°09'29"E	44.64



FINAL PLAT
MINOR SUBDIVISION OF
PROPERTY OF

RICHARD L. PERRY

CHAPEL HILL TWP., ORANGE CO., NORTH CAROLINA
FEBRUARY 14, 2008
SCALE 1"=40'

40 0 40 80

Existing Corner (as noted)
Iron Stake Set
Mathematical Point
Areas by Coordinate Computation

XXX Denotes Site Address

NOTES-

1). Development shall be restricted in areas of steep slope in accordance with the Land Use Management Ordinance. No lot shall be created that would require a steep slope variance.

2). Buildable area on lots is identified as the net area excluding easements, Resource Conservation District, and slopes 25% and greater which have been identified.

3). No additional driveway access shall be allowed on Mount Carmel Church Road.

4). The lots shown hereon are within the Watershed Protection District and subject to the regulations of the Land Use Management Ordinance.

5). The impervious surface of each lot shown hereon shall not exceed 50 percent of the gross land area for each lot.

Certification of Dedication and M
The undersigned owner hereby fr
easements, streets, recreation area
utilities, and other improvements
use as noted on this plat, and furth
for the maintenance and control t
by an incorporated neighborhood
similar legal entity.

Richard L. P
Owner

Owner

North Carolina, Chatha
I, Karen V. Byrd
of the County and State aforesaid
Richard L. P
personally appeared before me this
execution of the foregoing certifi
Witness my hand and seal, this the
14 day of Febr
Karen V. Byrd
Notary Public
My commission expires:

KAREN V. BYRD
NOTARY PUBLIC
CHATHAM COUNTY, NC

REVIEW OFFICER CERTIFICATI
State of North Carolina
County of Orange

I, MICHAEL A. BERTH
of Orange County, certify that th
certification is affixed) meets all sta
for which the Review Officer has r
Michael A. Berth
Review Officer - Orange Co

Date of Certification 02/

I, Terry L. Westendorf, L-3232, ce
an actual field survey performed u
the ratio of precision is 1:25,000 ?
broken, and plotted from the refer
prepared in accordance with G.S. 4
a subdivision of land within a area
an ordinance that regulates parcels

Witness my original signature, lice
FEBRUARY 14,
Terry L. W

NORTH CAROLINA PROFESSIONAL SEAL L-3232 LAND SURVEYOR TERRY L. WESTENDORF

MITCHELL WE
ENGINEERING &
1709 LEGION ROAD, SUITE 20
(919)932-4567-www.mit

787-39-0045
787-29-9047
787-29-7266
787-29-6199 MAB

erry
Branch
NC 27516
ENCES:
5; PB 98-101
9-8200; TM 7.126.D.10 (PARENT PIN) MAB
ZONING: R-1

103 pg 93

PUBLIC WORKS DEPARTMENT
STORMWATER MANAGEMENT DIVISION
405 Martin Luther King, Jr. Blvd.
Chapel Hill, NC 27514-5705
Telephone (919) 969-7246
Fax (919) 969-7276
www.townofchapelhill.org

REQUEST FOR STREAM DETERMINATION

Stream determinations are used to determine whether the Resource Conservation District or the Jordan Stream Buffer will apply to a property, and the areas protected if that is the case. There is no fee for stream determinations. By default, we will search records and notify you if a site visit is not needed for a property.

☐ Check here if you want Town staff to conduct a stream determination. A new site visit may not be needed if a determination has been done in the last five years. Turnaround time is within two weeks for single-family lots depending on weather conditions, staff availability, and size of the lots.

Requests may be emailed (DMilkereit@townofchapelhill.org), faxed, dropped off at Town Hall or the Stormwater Office, or mailed to the above address care of "Stormwater Specialist".

Requestor's Name: RICK PERRY

Mailing Address: 486 WALNUT BRANCH RD

City, State, ZIP: CHAPEL HILL, NC 27516

Phone / FAX / Email: 919-730-0673

Check method(s) for report to be sent: ☒ US Mail ☒ Email ☐ FAX ☒ Call for pickup

Signature of property owner or designated legal agent granting permission to Town Staff to enter the property(ies) indicated below for purposes of a Stream Determination:

Rick Perry / John McPhail 4/5/2016
(Signature) (Date)

Owner Name(s): RICK PERRY & JOHN MCPHAIL
(Please print)

Property Information
fill in both columns, *or* fill in Parcel ID Number (PIN) and attach a site map indicating location

Parcel ID Number (PIN)	Address / Location Description
9787-29-6199	104 MT. CARMEL CHURCH RD
9787-29-7266	106 " " " "
9787-29-9047	108 " " " "

Where the **total area** of the property(ies) to visit is **over 3 acres** please attach an as-built drawing or a topographic map with current landmarks.

401 Providence Road
Suite 200
Chapel Hill, NC 27514
T: 919-929-1173
F: 919-493-6548
Firm License #: F-1267

www.pennoni.com

Chapel Hill Cooperative Preschool Development

Town of Chapel Hill

Orange County, North Carolina

GENERAL PROJECT DESCRIPTION AND SUPPLEMENTAL STORMWATER MANAGEMENT CALCULATIONS

Prepared By:

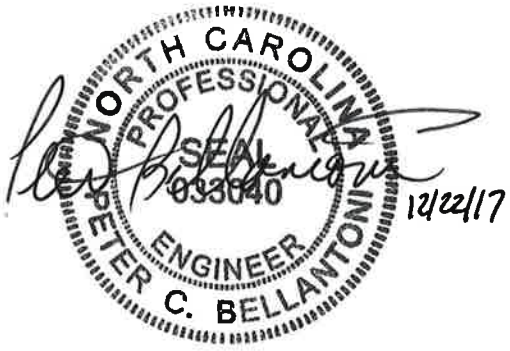
Pennoni Associates, Inc

401 Providence Road, Suite 200

Chapel Hill, NC 27514

(919) 929-1173

Firm License: F-1267



Project #CHCP1601

August 24, 2016

Revised: December 22, 2017

Professional Engineer: Peter Bellantoni

NC License #033040

Table of Contents

General Project Description/Stormwater Management

GENERAL PROJECT DESCRIPTION

The Chapel Hill Cooperative Preschool (CHCP) proposes to develop an residential property (Parcel Identification Numbers: 9787-39-0049, 9787-29-9047, 9787-29-7266 & 9787-29-6199) located along the north side of Mt. Carmel Church Road at the northeasterly side of the intersection with 15-501 in Orange County, North Carolina. The existing site consists of a wooded lot with one (1) existing residence and three (3) accessory structures. The proposed CHCP project area is approximately 3.97 acres and will include the construction of an approximate 9,000 SF one-story pre-school building and 44 parking spaces. The development will also include the construction of playground, landscaping, lighting, stormwater management system, and the utilities necessary to support the development. Access to the site will be provided by one (1) full access driveway onto Mt. Carmel Church Road. Pertinent data characterizing the existing and proposed site conditions are shown on the accompanying Site Plans.

STORMWATER MANAGEMENT

The pre-development condition of the site consists of one (1) point of interest. POI#1 is at the northeast property line at Morgan Creek. A portion of the stormwater runoff from the subject site will ultimately drain to this low lying area. The point of interest and drainage areas have been depicted on the Pre-development Drainage Area Plan with associated drainage paths and times of concentration for the watershed. Hydrographs have been generated for the 1-, 2-, and 25-year storm events.

The post development condition maintains the same point of interest. A subsurface infiltration system has been designed to intercept flow from the impervious surfaces created by the CHCP development. The subsurface infiltration system will discharge to the existing ditch along the north side of Mt. Carmel Chapel Road and ultimately reach POI#1.

In accordance with the Town of Chapel Hill's Design Manual, the subsurface detention system has been designed to provide stormwater runoff rate control by reducing the post-development peak flows rates for the 1-, 2-, and 25-year storm events to at or below the corresponding pre-development peak flow rates. An emergency spillway has been incorporated as part of the outlet structure. 85% TSS removal will be provided by two (2) Contech Filterra Bioretention Systems.

The USDA NRCS Hydrologic Urban Hydrology for Small Watersheds was utilized for calculating the peak runoff rates and generating hydrographs for the pre-development and post-development as defined in the computer watershed software "Hydraflow Hydrographs Extension for AutoCAD Civil 3D 2015". The hydrographs were generated based upon the precipitation amounts provided by NOAA Atlas 14, Volume 2, Version 3 for each storm event.

STORMWATER CONVEYANCE

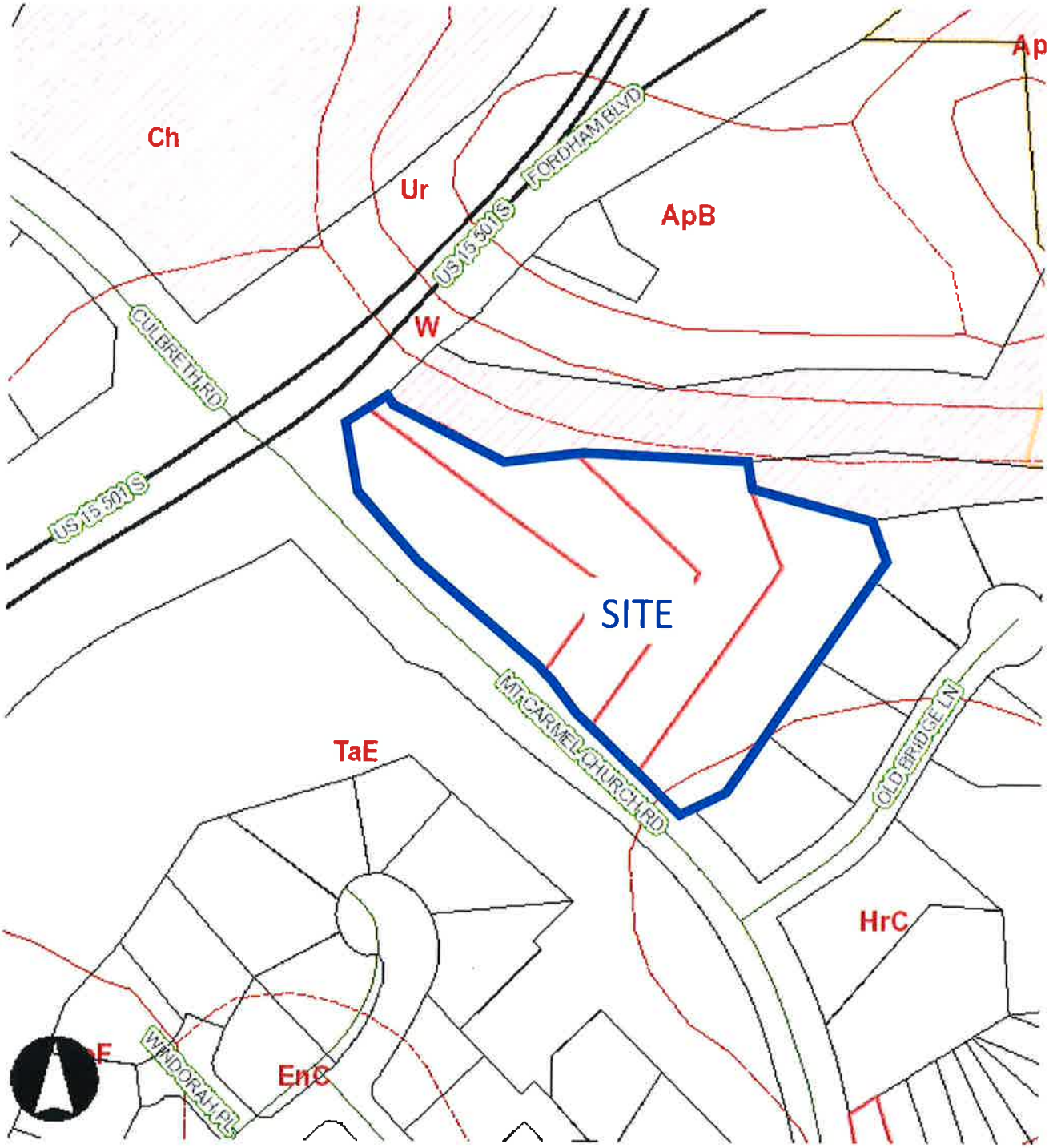
The storm drainage system was designed to intercept runoff at topographic low points and areas of significant runoff quantities and convey the stormwater runoff to the bioretention areas. Autodesk Storm and Sanitary Analysis 2015 has been utilized for designing the stormwater conveyance system, which takes into account the flow from the outlet structure discharge point of the underground infiltration basin. Conveyance design precipitation amounts are based upon NOAA Atlas 14, Volume 2, Version 3 for the 10- and 25-year storm events.

STORMWATER MANAGEMENT BMPs

Subsurface Infiltration Bed – Subsurface infiltration beds provide temporary storage and infiltration of stormwater runoff by placing storage media of varying types beneath the proposed surface grades. Stormwater runoff from nearby impervious areas can be conveyed to the subsurface storage media, where it is then distributed via a network of perforated piping. Subsurface infiltration is generally less maintenance intensive than other practices of its type. Maintenance activities required for the subsurface bed are similar to thos of any infiltration system and focus predominantly on regular sediment and debris removal. All upstream catch basins and inlets should be inspected and cleaned on a regular basis.

Filterra Bioretention System – To address water quality on site, the Filterra Bioretention System developed by Contech is proposed on site. Two seperate systems will be utilized to collect approximately 0.65 acres of stormwater runoff prodiminently from roof and parking lot sources on site to filter pollutants such as nutirents and total suspended solids from the effluent. The system uses a biofiltration media to filter the stormwater runoff prior to discharge from the site. Details for these units are included within this report for review.

SOILS MAP


Ch
Ur
W
ApB
Ap
FORDHAM BLVD
US 15 501 S
CULBRETH RD
SITE
MT CARMEL CHURCH RD
OLD BRIDGE LN
TaE
HrC
EnC
WINDORAH PL

USGS MAP


NC 54
54
Channing Ln
Culbreth Rd
15
US 15 501 S
SITE
Mt Carmel Church Rd
Old Bridge Ln
Park Dr

NOAA Atlas 14, Volume 2, Version 3
Location name: Chapel Hill, North Carolina, USA*
Latitude: 35.8908°, Longitude: -79.0582°
Elevation: 354.67 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.411 (0.377-0.450)	0.484 (0.444-0.530)	0.557 (0.511-0.609)	0.616 (0.563-0.672)	0.676 (0.615-0.737)	0.719 (0.652-0.783)	0.757 (0.683-0.825)	0.790 (0.708-0.862)	0.824 (0.733-0.901)	0.852 (0.750-0.932)
10-min	0.657 (0.602-0.718)	0.775 (0.710-0.847)	0.893 (0.818-0.975)	0.985 (0.900-1.07)	1.08 (0.981-1.18)	1.15 (1.04-1.25)	1.20 (1.08-1.31)	1.25 (1.12-1.37)	1.30 (1.16-1.43)	1.34 (1.18-1.47)
15-min	0.821 (0.752-0.898)	0.974 (0.893-1.06)	1.13 (1.03-1.23)	1.25 (1.14-1.36)	1.37 (1.24-1.49)	1.45 (1.31-1.58)	1.52 (1.37-1.66)	1.58 (1.42-1.72)	1.64 (1.46-1.79)	1.68 (1.48-1.84)
30-min	1.13 (1.03-1.23)	1.34 (1.23-1.47)	1.60 (1.47-1.75)	1.80 (1.65-1.97)	2.02 (1.84-2.21)	2.18 (1.98-2.38)	2.33 (2.10-2.54)	2.46 (2.20-2.68)	2.61 (2.32-2.85)	2.73 (2.40-2.98)
60-min	1.40 (1.29-1.53)	1.69 (1.55-1.85)	2.06 (1.89-2.25)	2.35 (2.15-2.56)	2.69 (2.45-2.94)	2.96 (2.68-3.22)	3.21 (2.89-3.50)	3.45 (3.09-3.76)	3.75 (3.33-4.09)	3.98 (3.51-4.36)
2-hr	1.68 (1.53-1.84)	2.02 (1.85-2.22)	2.49 (2.27-2.73)	2.86 (2.60-3.14)	3.33 (3.01-3.64)	3.70 (3.33-4.05)	4.05 (3.62-4.44)	4.41 (3.92-4.83)	4.87 (4.28-5.33)	5.25 (4.57-5.76)
3-hr	1.78 (1.63-1.96)	2.15 (1.98-2.37)	2.66 (2.43-2.92)	3.08 (2.81-3.37)	3.61 (3.27-3.94)	4.04 (3.64-4.41)	4.46 (3.99-4.88)	4.90 (4.35-5.35)	5.48 (4.80-5.99)	5.96 (5.17-6.54)
6-hr	2.14 (1.97-2.35)	2.58 (2.38-2.83)	3.19 (2.93-3.49)	3.71 (3.39-4.04)	4.37 (3.97-4.75)	4.92 (4.44-5.35)	5.47 (4.89-5.95)	6.04 (5.35-6.57)	6.81 (5.94-7.41)	7.47 (6.43-8.14)
12-hr	2.54 (2.34-2.77)	3.06 (2.82-3.33)	3.79 (3.49-4.13)	4.43 (4.05-4.82)	5.27 (4.79-5.72)	5.98 (5.39-6.47)	6.71 (5.98-7.24)	7.47 (6.59-8.06)	8.53 (7.39-9.21)	9.45 (8.05-10.2)
24-hr	2.96 (2.77-3.16)	3.57 (3.35-3.82)	4.46 (4.18-4.76)	5.16 (4.83-5.51)	6.11 (5.69-6.53)	6.86 (6.38-7.33)	7.62 (7.07-8.16)	8.41 (7.77-9.02)	9.50 (8.73-10.2)	10.4 (9.47-11.2)
2-day	3.46 (3.24-3.69)	4.16 (3.90-4.45)	5.16 (4.84-5.52)	5.94 (5.55-6.35)	6.98 (6.50-7.46)	7.80 (7.25-8.35)	8.64 (8.00-9.26)	9.49 (8.75-10.2)	10.7 (9.79-11.5)	11.6 (10.6-12.5)
3-day	3.66 (3.43-3.91)	4.40 (4.12-4.70)	5.43 (5.09-5.80)	6.24 (5.83-6.67)	7.33 (6.82-7.83)	8.18 (7.60-8.76)	9.06 (8.38-9.72)	9.96 (9.18-10.7)	11.2 (10.3-12.1)	12.2 (11.1-13.1)
4-day	3.86 (3.62-4.13)	4.63 (4.34-4.95)	5.70 (5.34-6.08)	6.53 (6.11-6.98)	7.67 (7.14-8.21)	8.57 (7.95-9.18)	9.48 (8.77-10.2)	10.4 (9.61-11.2)	11.7 (10.7-12.6)	12.8 (11.6-13.8)
7-day	4.44 (4.18-4.72)	5.29 (4.99-5.64)	6.43 (6.06-6.85)	7.33 (6.90-7.81)	8.56 (8.03-9.13)	9.53 (8.91-10.2)	10.5 (9.80-11.3)	11.6 (10.7-12.4)	13.0 (11.9-13.9)	14.1 (12.9-15.1)
10-day	5.04 (4.77-5.36)	5.99 (5.66-6.37)	7.20 (6.79-7.65)	8.14 (7.66-8.65)	9.41 (8.84-10.0)	10.4 (9.74-11.1)	11.4 (10.7-12.2)	12.5 (11.6-13.3)	13.9 (12.8-14.8)	14.9 (13.8-16.0)
20-day	6.75 (6.38-7.14)	7.96 (7.53-8.42)	9.40 (8.88-9.94)	10.5 (9.95-11.2)	12.1 (11.4-12.8)	13.3 (12.5-14.1)	14.5 (13.6-15.5)	15.8 (14.7-16.8)	17.5 (16.2-18.7)	18.8 (17.4-20.1)
30-day	8.38 (7.94-8.86)	9.86 (9.34-10.4)	11.5 (10.8-12.1)	12.7 (12.0-13.4)	14.3 (13.5-15.1)	15.6 (14.7-16.5)	16.8 (15.8-17.8)	18.1 (16.9-19.2)	19.8 (18.4-21.0)	21.0 (19.5-22.4)
45-day	10.7 (10.2-11.2)	12.5 (11.9-13.1)	14.3 (13.6-15.0)	15.7 (14.9-16.5)	17.5 (16.6-18.4)	18.9 (17.9-19.9)	20.3 (19.1-21.3)	21.6 (20.4-22.8)	23.4 (21.9-24.7)	24.8 (23.1-26.2)
60-day	12.8 (12.3-13.4)	14.9 (14.3-15.6)	16.9 (16.1-17.7)	18.3 (17.5-19.2)	20.2 (19.3-21.2)	21.7 (20.6-22.8)	23.1 (21.9-24.2)	24.4 (23.1-25.7)	26.2 (24.7-27.6)	27.5 (25.9-29.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

NOAA Atlas 14, Volume 2, Version 3
Location name: Chapel Hill, North Carolina, USA*
Latitude: 35.8908°, Longitude: -79.0582°
Elevation: 354.67 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.93 (4.52-5.40)	5.81 (5.33-6.36)	6.68 (6.13-7.31)	7.39 (6.76-8.06)	8.11 (7.38-8.84)	8.63 (7.82-9.40)	9.08 (8.20-9.90)	9.48 (8.50-10.3)	9.89 (8.80-10.8)	10.2 (9.00-11.2)
10-min	3.94 (3.61-4.31)	4.65 (4.26-5.08)	5.36 (4.91-5.85)	5.91 (5.40-6.44)	6.47 (5.89-7.05)	6.87 (6.23-7.49)	7.22 (6.51-7.87)	7.51 (6.73-8.20)	7.82 (6.95-8.55)	8.05 (7.09-8.81)
15-min	3.28 (3.01-3.59)	3.90 (3.57-4.26)	4.52 (4.14-4.94)	4.98 (4.56-5.44)	5.46 (4.97-5.96)	5.80 (5.26-6.32)	6.08 (5.49-6.63)	6.32 (5.66-6.90)	6.56 (5.84-7.17)	6.74 (5.93-7.37)
30-min	2.25 (2.06-2.46)	2.69 (2.47-2.94)	3.21 (2.94-3.51)	3.61 (3.30-3.94)	4.05 (3.68-4.41)	4.37 (3.96-4.76)	4.66 (4.20-5.08)	4.92 (4.41-5.37)	5.22 (4.64-5.71)	5.46 (4.80-5.97)
60-min	1.40 (1.29-1.53)	1.69 (1.55-1.85)	2.06 (1.89-2.25)	2.35 (2.15-2.56)	2.69 (2.45-2.94)	2.96 (2.68-3.22)	3.21 (2.89-3.50)	3.45 (3.09-3.76)	3.75 (3.33-4.09)	3.98 (3.51-4.36)
2-hr	0.838 (0.764-0.922)	1.01 (0.924-1.11)	1.24 (1.14-1.37)	1.43 (1.30-1.57)	1.66 (1.50-1.82)	1.85 (1.66-2.02)	2.03 (1.81-2.22)	2.21 (1.96-2.41)	2.44 (2.14-2.67)	2.62 (2.29-2.88)
3-hr	0.594 (0.544-0.652)	0.717 (0.658-0.788)	0.885 (0.810-0.971)	1.03 (0.935-1.12)	1.20 (1.09-1.31)	1.34 (1.21-1.47)	1.49 (1.33-1.63)	1.63 (1.45-1.78)	1.82 (1.60-1.99)	1.99 (1.72-2.18)
6-hr	0.358 (0.329-0.392)	0.432 (0.397-0.472)	0.533 (0.489-0.583)	0.619 (0.566-0.676)	0.730 (0.663-0.794)	0.821 (0.741-0.894)	0.914 (0.817-0.993)	1.01 (0.893-1.10)	1.14 (0.993-1.24)	1.25 (1.07-1.36)
12-hr	0.211 (0.194-0.230)	0.254 (0.234-0.277)	0.315 (0.289-0.343)	0.368 (0.337-0.400)	0.438 (0.397-0.475)	0.497 (0.447-0.537)	0.557 (0.497-0.601)	0.620 (0.547-0.669)	0.708 (0.613-0.764)	0.784 (0.668-0.847)
24-hr	0.123 (0.116-0.132)	0.149 (0.140-0.159)	0.186 (0.174-0.199)	0.215 (0.201-0.230)	0.255 (0.237-0.272)	0.286 (0.266-0.306)	0.318 (0.294-0.340)	0.351 (0.324-0.376)	0.396 (0.364-0.425)	0.431 (0.395-0.465)
2-day	0.072 (0.067-0.077)	0.087 (0.081-0.093)	0.108 (0.101-0.115)	0.124 (0.116-0.132)	0.145 (0.135-0.155)	0.163 (0.151-0.174)	0.180 (0.167-0.193)	0.198 (0.182-0.212)	0.222 (0.204-0.239)	0.241 (0.221-0.260)
3-day	0.051 (0.048-0.054)	0.061 (0.057-0.065)	0.075 (0.071-0.081)	0.087 (0.081-0.093)	0.102 (0.095-0.109)	0.114 (0.106-0.122)	0.126 (0.116-0.135)	0.138 (0.127-0.149)	0.155 (0.143-0.167)	0.169 (0.154-0.182)
4-day	0.040 (0.038-0.043)	0.048 (0.045-0.052)	0.059 (0.056-0.063)	0.068 (0.064-0.073)	0.080 (0.074-0.086)	0.089 (0.083-0.096)	0.099 (0.091-0.106)	0.109 (0.100-0.117)	0.122 (0.112-0.132)	0.133 (0.121-0.144)
7-day	0.026 (0.025-0.028)	0.031 (0.030-0.034)	0.038 (0.036-0.041)	0.044 (0.041-0.046)	0.051 (0.048-0.054)	0.057 (0.053-0.061)	0.063 (0.058-0.067)	0.069 (0.064-0.074)	0.077 (0.071-0.083)	0.084 (0.077-0.090)
10-day	0.021 (0.020-0.022)	0.025 (0.024-0.027)	0.030 (0.028-0.032)	0.034 (0.032-0.036)	0.039 (0.037-0.042)	0.043 (0.041-0.046)	0.048 (0.044-0.051)	0.052 (0.048-0.055)	0.058 (0.053-0.062)	0.062 (0.057-0.067)
20-day	0.014 (0.013-0.015)	0.017 (0.016-0.018)	0.020 (0.019-0.021)	0.022 (0.021-0.023)	0.025 (0.024-0.027)	0.028 (0.026-0.029)	0.030 (0.028-0.032)	0.033 (0.031-0.035)	0.036 (0.034-0.039)	0.039 (0.036-0.042)
30-day	0.012 (0.011-0.012)	0.014 (0.013-0.014)	0.016 (0.015-0.017)	0.018 (0.017-0.019)	0.020 (0.019-0.021)	0.022 (0.020-0.023)	0.023 (0.022-0.025)	0.025 (0.023-0.027)	0.027 (0.026-0.029)	0.029 (0.027-0.031)
45-day	0.010 (0.009-0.010)	0.012 (0.011-0.012)	0.013 (0.013-0.014)	0.015 (0.014-0.015)	0.016 (0.015-0.017)	0.018 (0.017-0.018)	0.019 (0.018-0.020)	0.020 (0.019-0.021)	0.022 (0.020-0.023)	0.023 (0.021-0.024)
60-day	0.009 (0.009-0.009)	0.010 (0.010-0.011)	0.012 (0.011-0.012)	0.013 (0.012-0.013)	0.014 (0.013-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.019 (0.018-0.020)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

POINT OF INTEREST #1

TR 55 Worksheet: Time of Concentration (Tc) **PROJECT: Chapel Hill Co-Op** **PN: CHCP (PRE-DEVELOPMENT: POI#1)**

	1	2	3	4	5	6	6	
Sheet Flow								
Surface description (Table 3-1)	WOODS (LIGHT)							
Manning's roughness coeff., n (Table 3-1)	0.40							
Flow length, L (total L < 100 ft) ..... ft	100.00							
Two-year 24-hour rainfall, P2..... in	3.57							
Land slope, S ..... ft/ft	0.1200							
$T_t = (0.007\ (nL)^{0.8})/(P_2^{0.5}\ s^{0.4})$ ..... hr	0.17	0.00	0.00	0.00	0.00	0.00	0.00	
Shallow Concetrated Flow								
Surface description (paved=1 or unpaved=0)	0	0	0	0	0	0	0	
Flow length, L ..... ft	30.0	420.0	0.0	0.0	0.0	0.0	0.0	
Watercourse slope, S ..... ft/ft	0.1650	0.1700	0.0100	0.0100	0.0100	0.0100	0.0100	
Average velocity, V ..... ft/s	-	-	-	-	-	-	-	
Unpaved $V = 16.1345\ (s)^{0.5}$	6.55	6.65	1.61	1.61	1.61	1.61	1.61	
Paved $V = 20.3282\ (s)^{0.5}$								
$T_t = L/3600V$ ..... hr	0.00	0.02	0.00	0.00	0.00	0.00	0.00	
Channel Flow	**CHANNEL**							
Cross sectional flow area, A ..... ft^2	60.00							
Wetted perimeter, Pw..... ft	26.00							
Hydraulic radius, r = A/Pw.....ft	2.31	0.00	0.00	0.00	0.00	0.00	0.00	
Channel slope, s..... ft/ft	0.008							
Manning's roughness coefficient, n.....	0.030	0.035	0.069	0.013	0.013	0.013	0.013	
Velocity, $V=(1.49/n)R^{2/3}s^{1/2}$ ..... ft	7.74	0.00	0.00	0.00	0.00	0.00	0.00	
Flow length, L ..... ft	485.0							
$T_t = L/3600V$ ..... hr	**0.017**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	
Sub Basin Tc = $T_{sheetflow}+T_{shallow\ concentrated}+T_{channel}$ =	0.18 hr	0.02 hr	0.00 hr	0.00 hr	0.00 hr	0.00 hr	0.00 hr	
Sub Basin Tc = $T_{sheetflow}+T_{shallow\ concentrated}+T_{channel}$ =	11.05 min	1.05 min	0.00 min	0.00 min	0.00 min	0.00 min	0.00 min	**12.10 min**

COMPUTATION SHEET : RUNOFF CURVE NUMBER (CN)

PROJECT:	Chapel Hill Co-op	DATE:	12/22/2017
	Mt. Carmel Church Rd.	BY:	WRA
		CHECKED BY:	PCB
		SHEET NO:	1
LOCATION	Pre-Development POI#1	REVISION:	

SOIL GROUP	LAND USE DESCRIPTION	CN (A)	% OF AREA (ACRE) (B)	PRODUCT (A*B) (C)
B	IMPERVIOUS	98	0.08	7.84
	Gravel	85	0.10	8.50
	PERVIOUS			
B	*Open space (fair condition)*	69	0.69	47.61
	Woods (good condition)	55	3.10	170.50
		TOTAL:	3.97	234.45

CN (weighted)	Total (C) / Total (B)	234.45 / 3.97	59.0554	Use CN =	**59**

Notes:

Time of Concentration = 12.10 minutes (see calculations)

Hydrograph Report

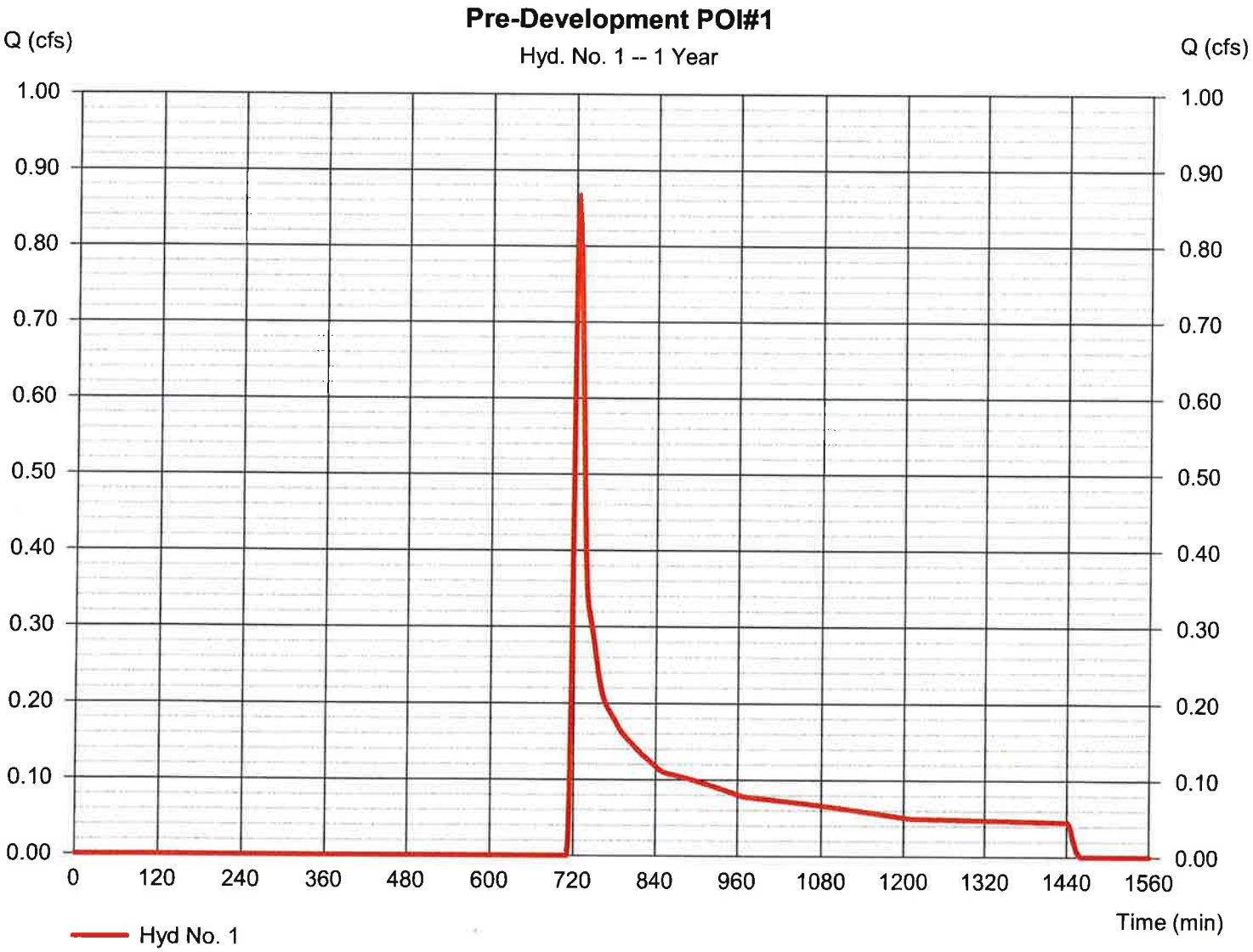
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 1

Pre-Development POI#1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.867 cfs
Storm frequency	= 1 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 4,301 cuft
Drainage area	= 3.970 ac	Curve number	= 59*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.10 min
Total precip.	= 2.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.105 x 85) + (0.070 x 98) + (0.689 x 69) + (3.106 x 55)] / 3.970



Hydrograph Report

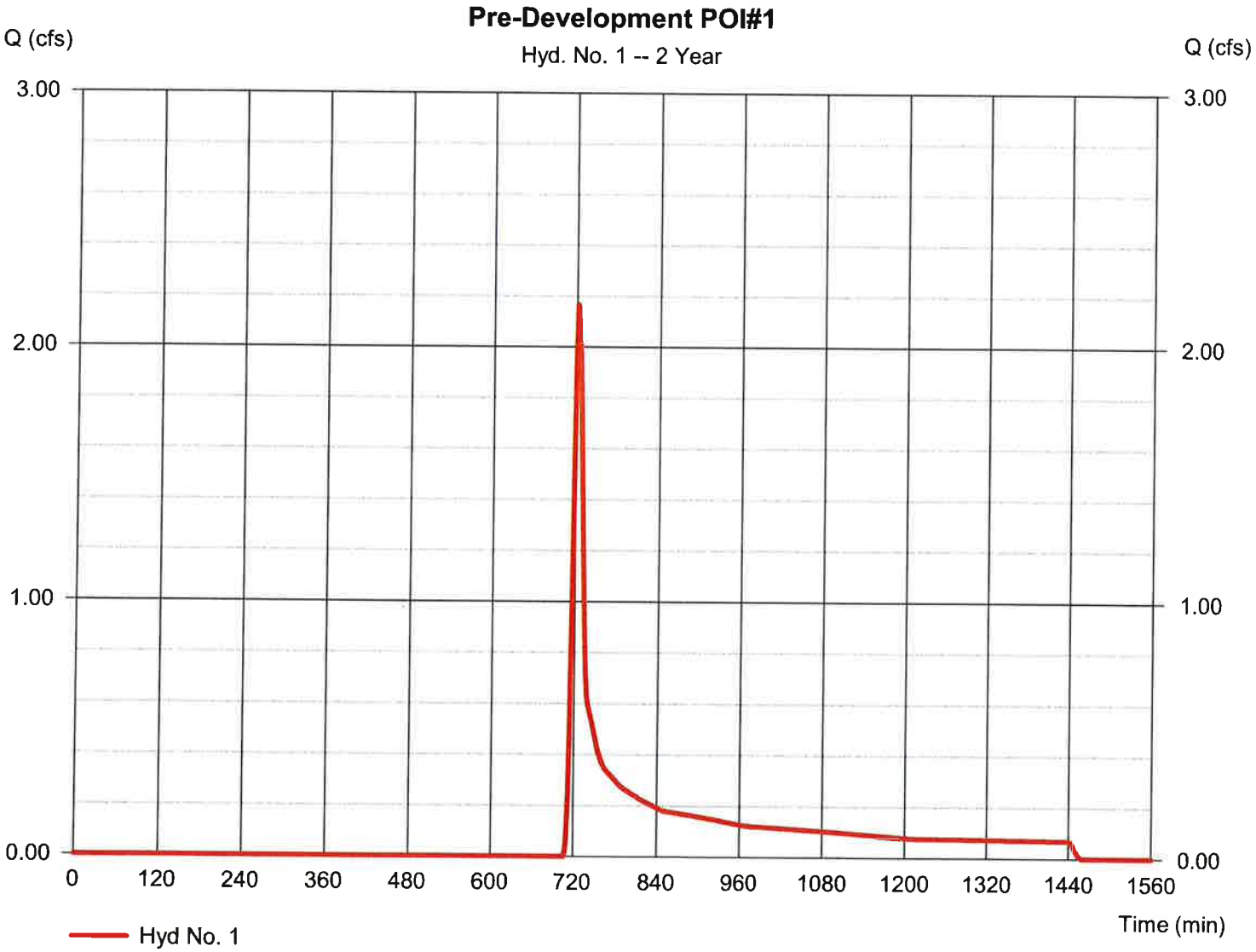
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 1

Pre-Development POI#1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.165 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 7,735 cuft
Drainage area	= 3.970 ac	Curve number	= 59*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.10 min
Total precip.	= 3.57 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.105 x 85) + (0.070 x 98) + (0.689 x 69) + (3.106 x 55)] / 3.970



Hydrograph Report

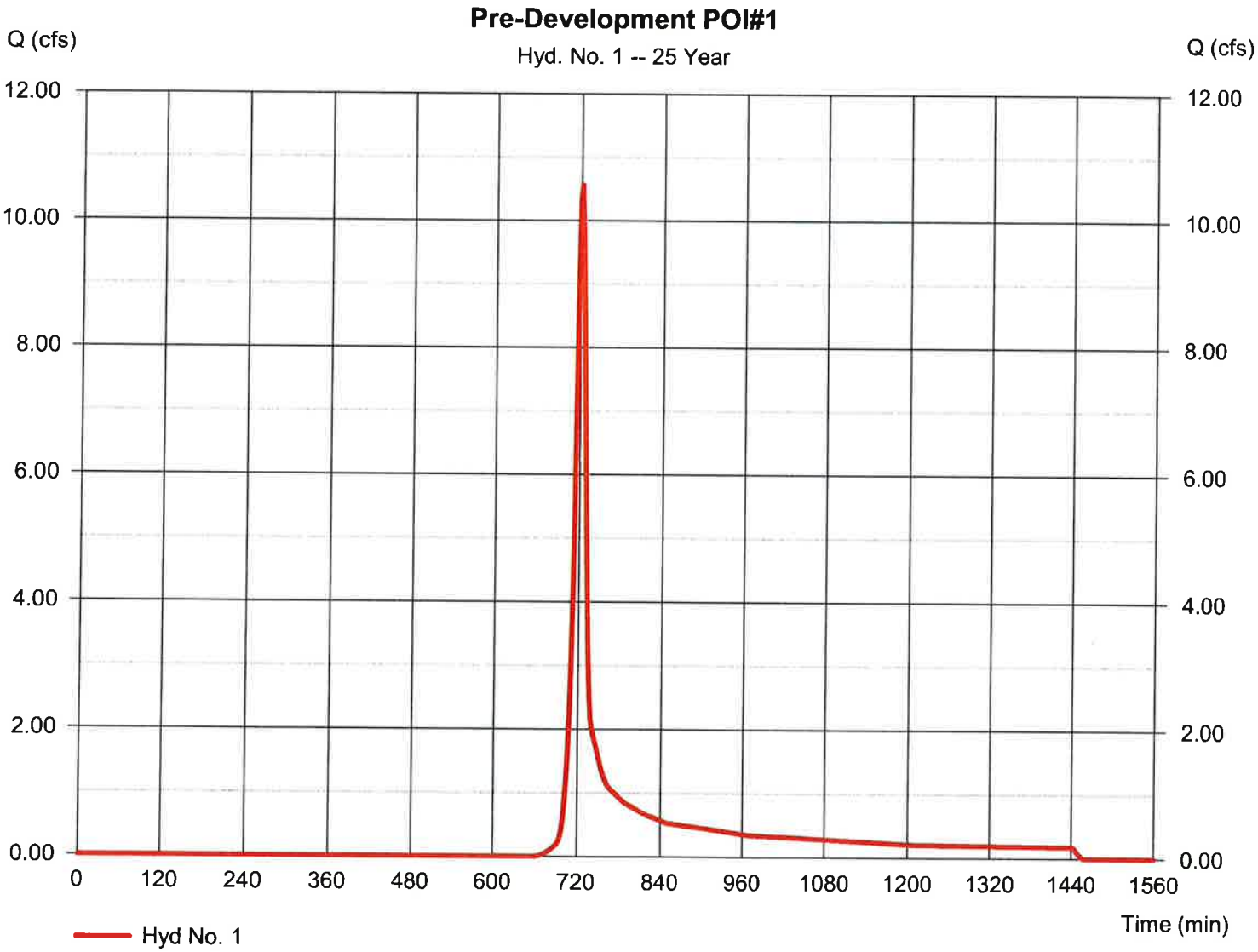
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 1

Pre-Development POI#1

Hydrograph type	= SCS Runoff	Peak discharge	= 10.56 cfs
Storm frequency	= 25 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 28,375 cuft
Drainage area	= 3.970 ac	Curve number	= 59*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.10 min
Total precip.	= 6.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.105 x 85) + (0.070 x 98) + (0.689 x 69) + (3.106 x 55)] / 3.970



TR 55 Worksheet: Time of Concentration (Tc) **PROJECT: Chapel Hill Co-Op** **PN: CHCP (POST-DEV. BYPASS POI#1)**

	1	2	3	4	5	6	6	
Sheet Flow								
Surface description (Table 3-1)	WOODS (LIGHT)							
Manning's roughness coeff., n (Table 3-1)	0.40							
Flow length, L (total L < 100 ft) ..... ft	100.00							
Two-year 24-hour rainfall, P2..... in	3.57							
Land slope, S ..... ft/ft	0.1100							
$T_t = (0.007\ (nL)^{0.8})/(P_2^{0.5}\ s^{0.4})$ ..... hr	0.17	0.00	0.00	0.00	0.00	0.00	0.00	
Shallow Concetrated Flow								
Surface description (paved=1 or unpaved=0)	0	0	0	0	0	0	0	
Flow length, L ..... ft	145.0	0.0	0.0	0.0	0.0	0.0	0.0	
Watercourse slope, S ..... ft/ft	0.5500	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	
Average velocity, V ..... ft/s	-	-	-	-	-	-	-	
Unpaved $V = 16.1345\ (s)^{0.5}$	11.97	1.61	1.61	1.61	1.61	1.61	1.61	
Paved $V = 20.3282\ (s)^{0.5}$								
$T_t = L/3600V$ ..... hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Channel Flow	**CHANNEL**							
Cross sectional flow area, A ..... ft^2	60.00							
Wetted perimeter, Pw..... ft	26.00							
Hydraulic radius, r = A/Pw.....ft	2.31	0.00	0.00	0.00	0.00	0.00	0.00	
Channel slope, s..... ft/ft	0.008							
Manning's roughness coefficient, n.....	0.030	0.035	0.069	0.013	0.013	0.013	0.013	
Velocity, $V=(1.49/n)R^{2/3}s^{1/2}$ ..... ft	7.74	0.00	0.00	0.00	0.00	0.00	0.00	
Flow length, L ..... ft	290.0							
$T_t = L/3600V$ ..... hr	**0.010**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	
Sub Basin Tc = $T_{sheetflow}+T_{shallow\ concentrated}+T_{channel}$ =	0.19 hr	0.00 hr	0.00 hr	0.00 hr	0.00 hr	0.00 hr	0.00 hr	
Sub Basin Tc = $T_{sheetflow}+T_{shallow\ concentrated}+T_{channel}$ =	11.11 min	0.00 min	0.00 min	0.00 min	0.00 min	0.00 min	0.00 min	**11.11 min**

COMPUTATION SHEET : RUNOFF CURVE NUMBER (CN)

PROJECT:	Chapel Hill Co-op	DATE:	12/22/2017
	Mt. Carmel Church Rd.	BY:	WRA
		CHECKED BY:	PCB
		SHEET NO:	1
LOCATION	Post Dev. By-Pass	REVISION:	

SOIL GROUP	LAND USE DESCRIPTION	CN (A)	% OF AREA (ACRE) (B)	PRODUCT (A*B) (C)
B	IMPERVIOUS	98	0.19	18.62
	Gravel	85	0.01	0.85
	PERVIOUS			
B	*Open space (good condition)*	61	0.62	37.82
B	*Woods (good condition)*	55	2.61	143.55
		TOTAL:	3.43	200.84

CN (weighted)	Total (C) / Total (B)	200.84 / 3.43	58.5539	Use CN =	**59**

Notes:

Time of Concentration = 11.11 minutes (see calculations)

Hydrograph Report

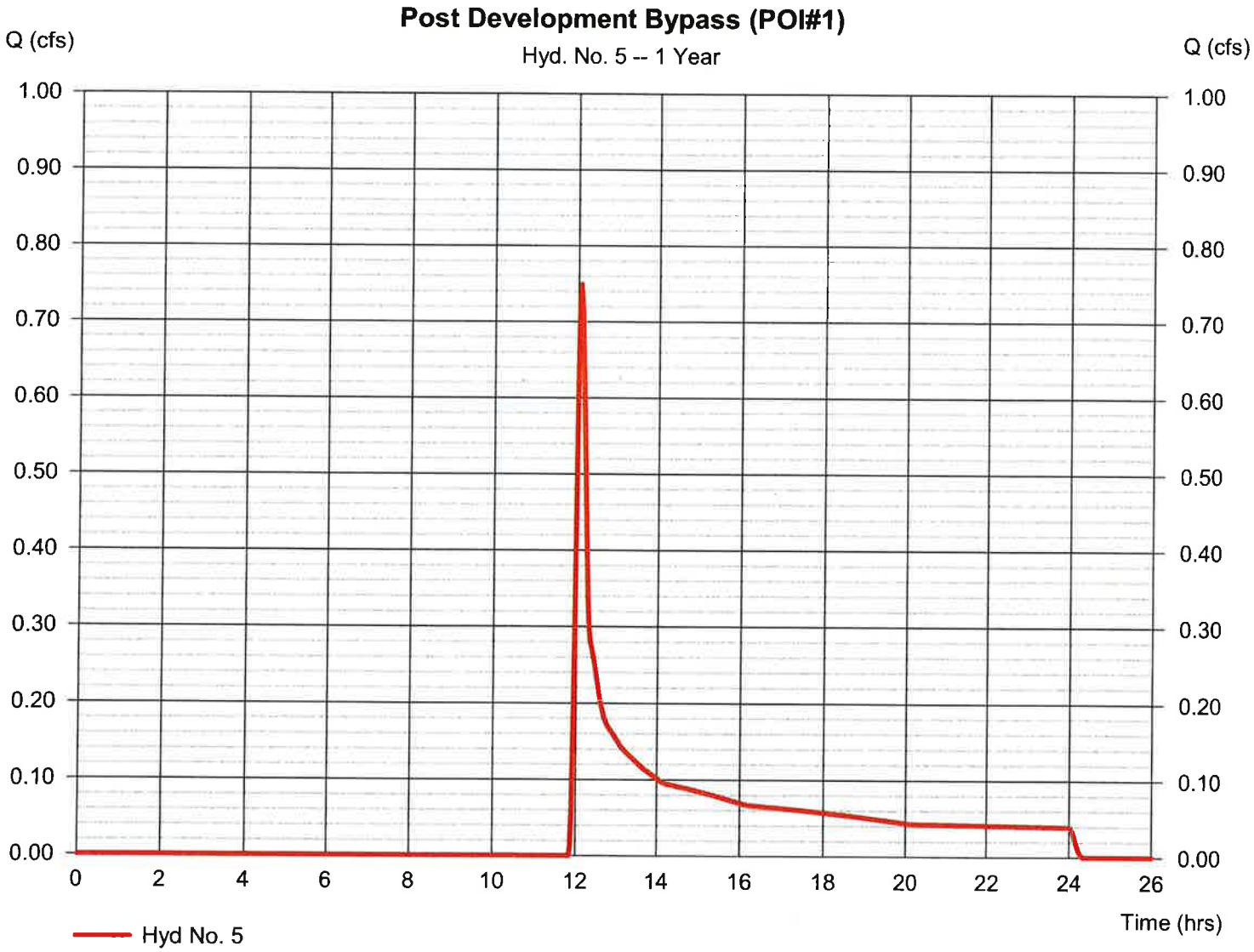
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 5

Post Development Bypass (POI#1)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.749 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 3,716 cuft
Drainage area	= 3.430 ac	Curve number	= 59*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 11.10 min
Total precip.	= 2.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.220 x 61) + (0.140 x 98) + (0.010 x 85) + (3.090 x 55)] / 3.430



Hydrograph Report

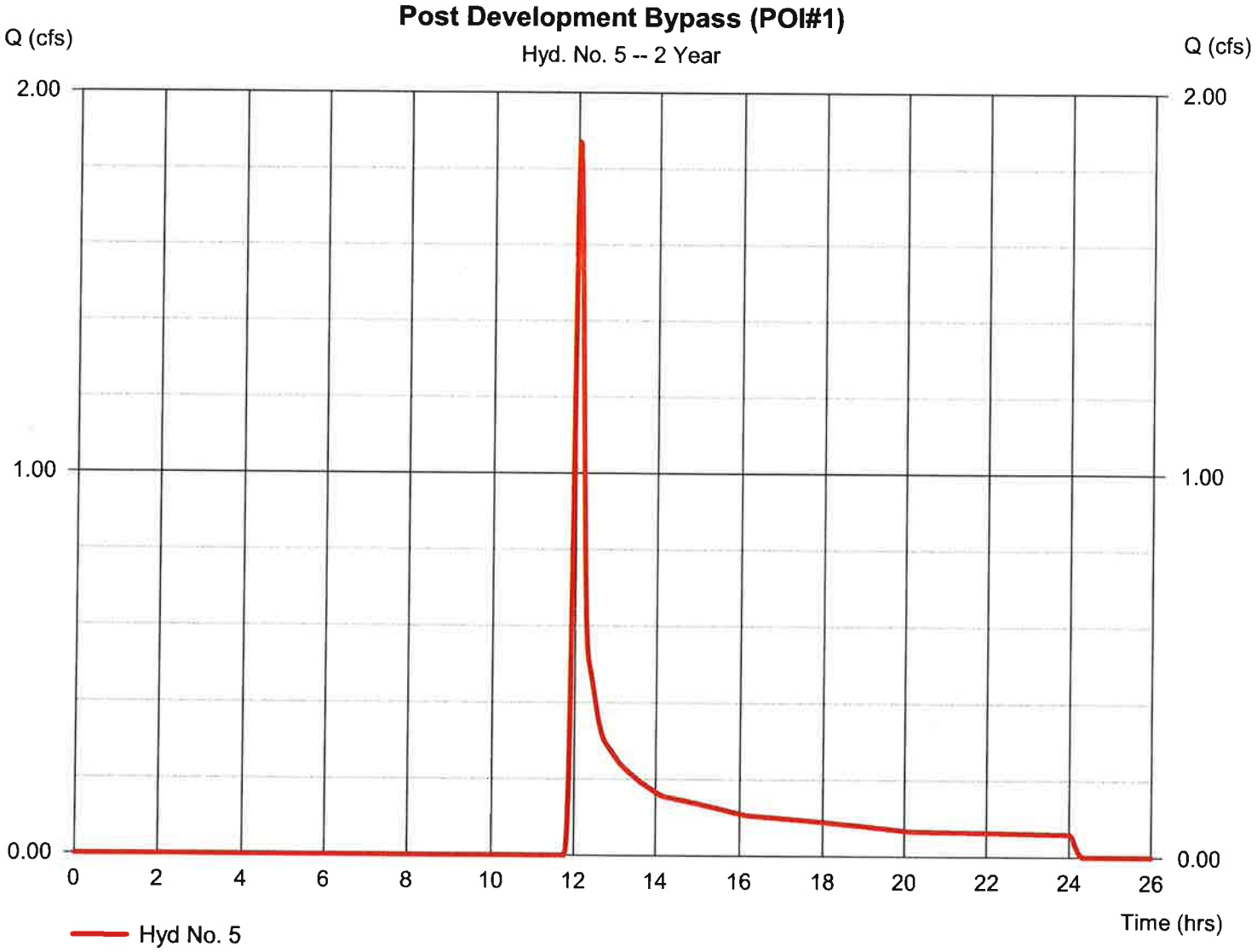
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 5

Post Development Bypass (POI#1)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.870 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 6,683 cuft
Drainage area	= 3.430 ac	Curve number	= 59*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 11.10 min
Total precip.	= 3.57 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.220 x 61) + (0.140 x 98) + (0.010 x 85) + (3.090 x 55)] / 3.430



Hydrograph Report

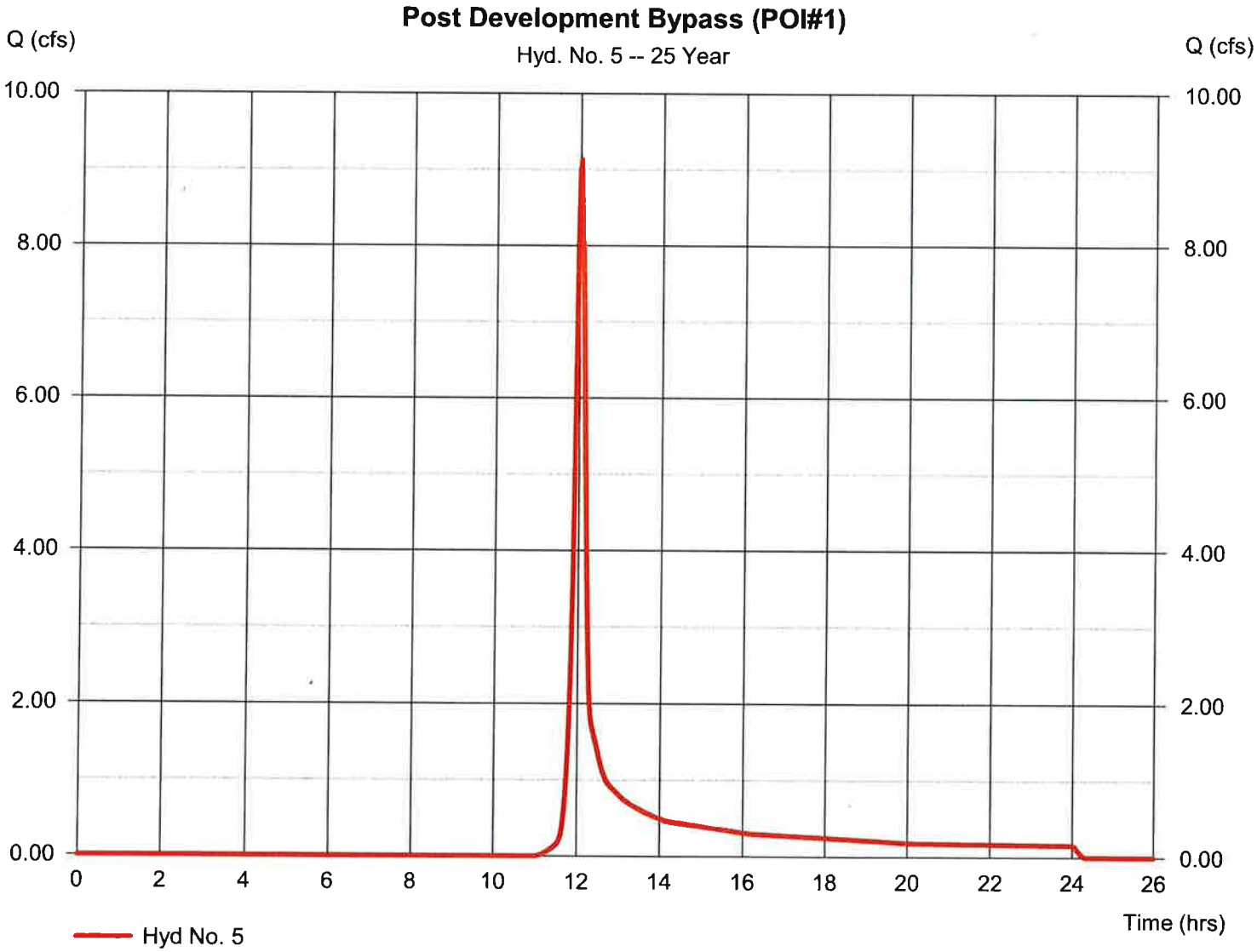
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 5

Post Development Bypass (POI#1)

Hydrograph type	= SCS Runoff	Peak discharge	= 9.127 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 24,515 cuft
Drainage area	= 3.430 ac	Curve number	= 59*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 11.10 min
Total precip.	= 6.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.220 x 61) + (0.140 x 98) + (0.010 x 85) + (3.090 x 55)] / 3.430



COMPUTATION SHEET : RUNOFF CURVE NUMBER (CN)

PROJECT: Chapel Hill Co-op
Mt. Carmel Church Rd.

DATE: 12/22/2017
BY: WRA
CHECKED BY: PCB
SHEET NO: 1
REVISION:

LOCATION Post Dev. Basin Inflow

SOIL GROUP	LAND USE DESCRIPTION	CN (A)	% OF AREA (ACRE) (B)	PRODUCT (A*B) (C)
B	IMPERVIOUS	98	0.41	40.18
	PERVIOUS			
B	*Open space (good condition)*	69	0.09	6.21
B	*Woods (good condition)*	55	0.04	2.20

TOTAL: 0.54 48.59

CN (weighted)	Total (C) / Total (B)	48.59 / 0.54	89.9815	Use CN =	**90**

Notes:

Time of Concentration = 5.00 minutes (Assumed, actual is less)

Hydrograph Report

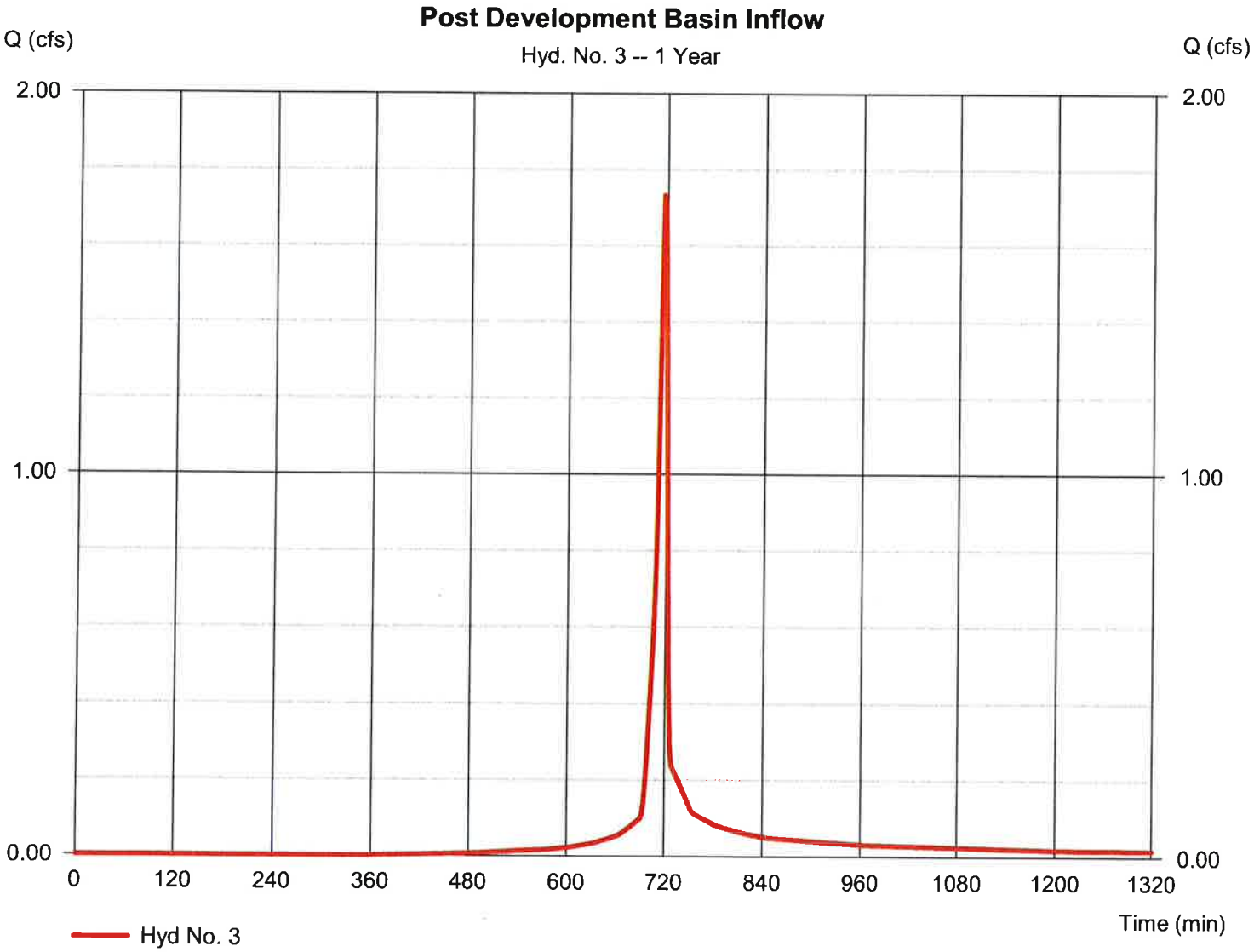
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 3

Post Development Basin Inflow

Hydrograph type	= SCS Runoff	Peak discharge	= 1.733 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 3,579 cuft
Drainage area	= 0.540 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.96 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.123 x 61) + (0.387 x 98)] / 0.540



Hydrograph Report

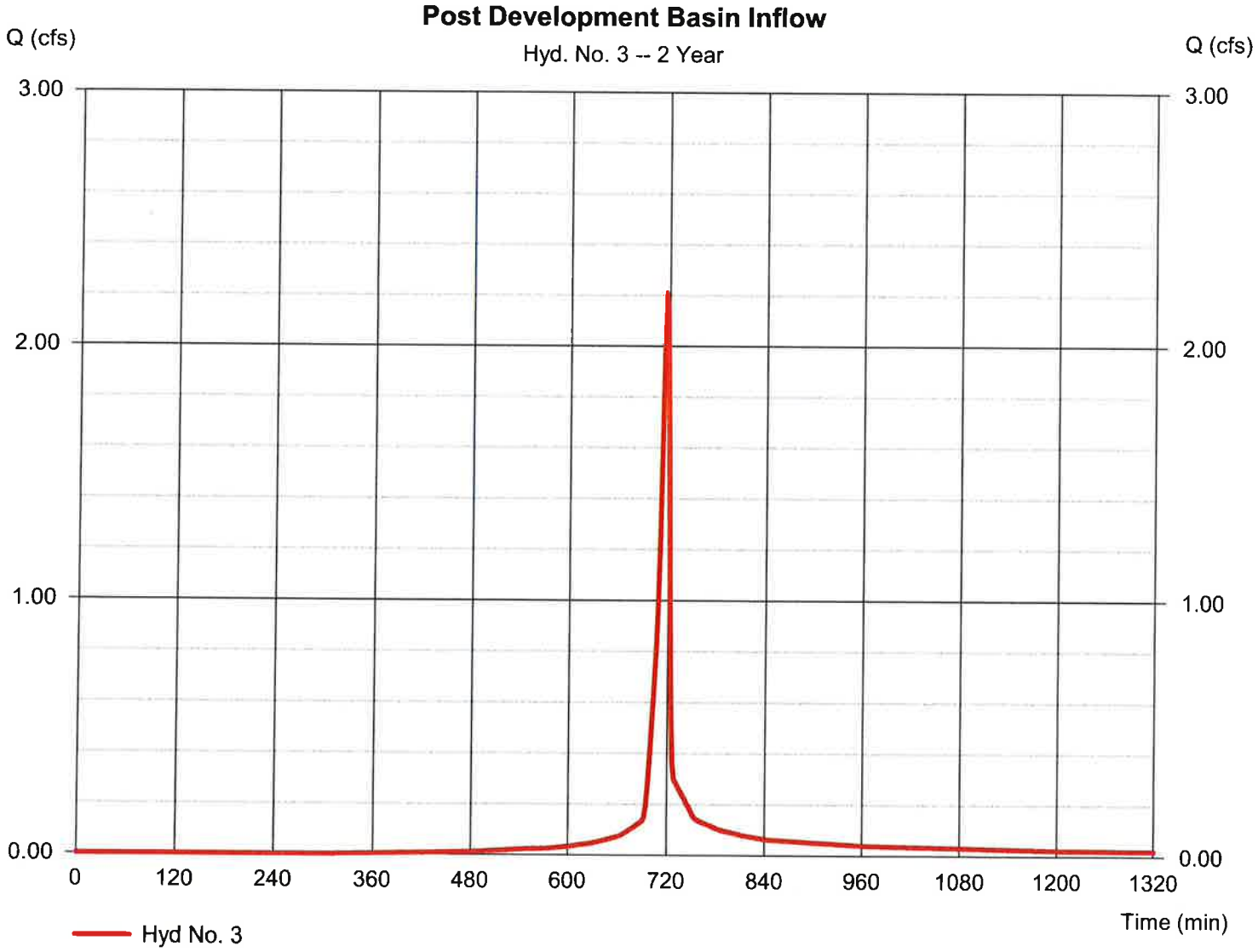
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 3

Post Development Basin Inflow

Hydrograph type	= SCS Runoff	Peak discharge	= 2.208 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 4,619 cuft
Drainage area	= 0.540 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.57 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.123 x 61) + (0.387 x 98)] / 0.540



Hydrograph Report

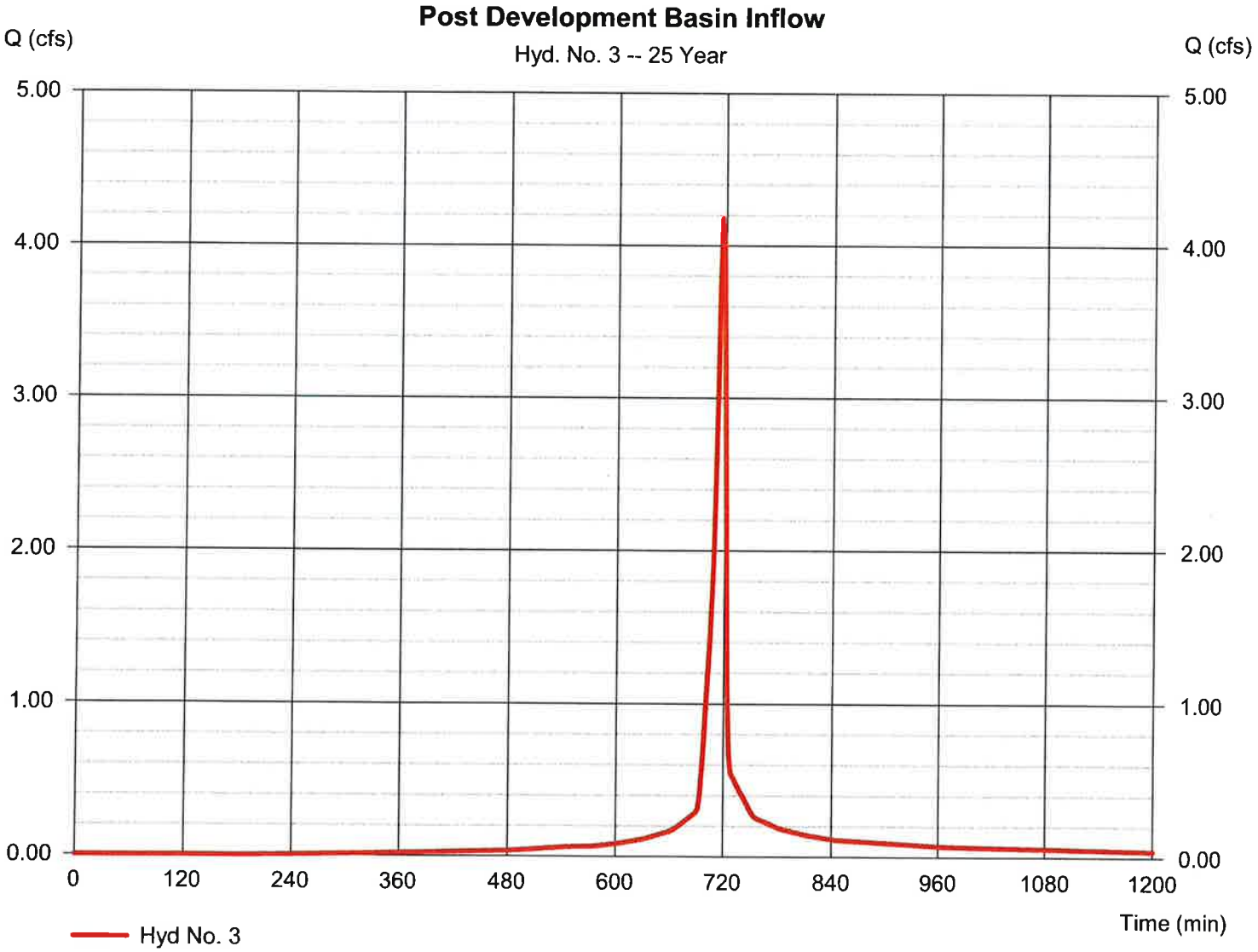
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 3

Post Development Basin Inflow

Hydrograph type	= SCS Runoff	Peak discharge	= 4.176 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 9,102 cuft
Drainage area	= 0.540 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.11 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.123 x 61) + (0.387 x 98)] / 0.540



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Pond No. 1 - UG Basin

Pond Data

UG Chambers -Invert elev. = 368.00 ft, Rise x Span = 3.00 x 3.00 ft, Barrel Len = 80.00 ft, No. Barrels = 3, Slope = 0.50%, Headers = No
Encasement -Invert elev. = 367.50 ft, Width = 12.50 ft, Height = 4.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	367.50	n/a	0	0
0.49	367.99	n/a	348	348
0.98	368.48	n/a	639	987
1.47	368.97	n/a	745	1,732
1.96	369.46	n/a	787	2,519
2.45	369.95	n/a	798	3,317
2.94	370.44	n/a	786	4,103
3.43	370.93	n/a	744	4,847
3.92	371.42	n/a	636	5,483
4.41	371.91	n/a	588	6,071
4.90	372.40	n/a	588	6,659

Culvert / Orifice Structures

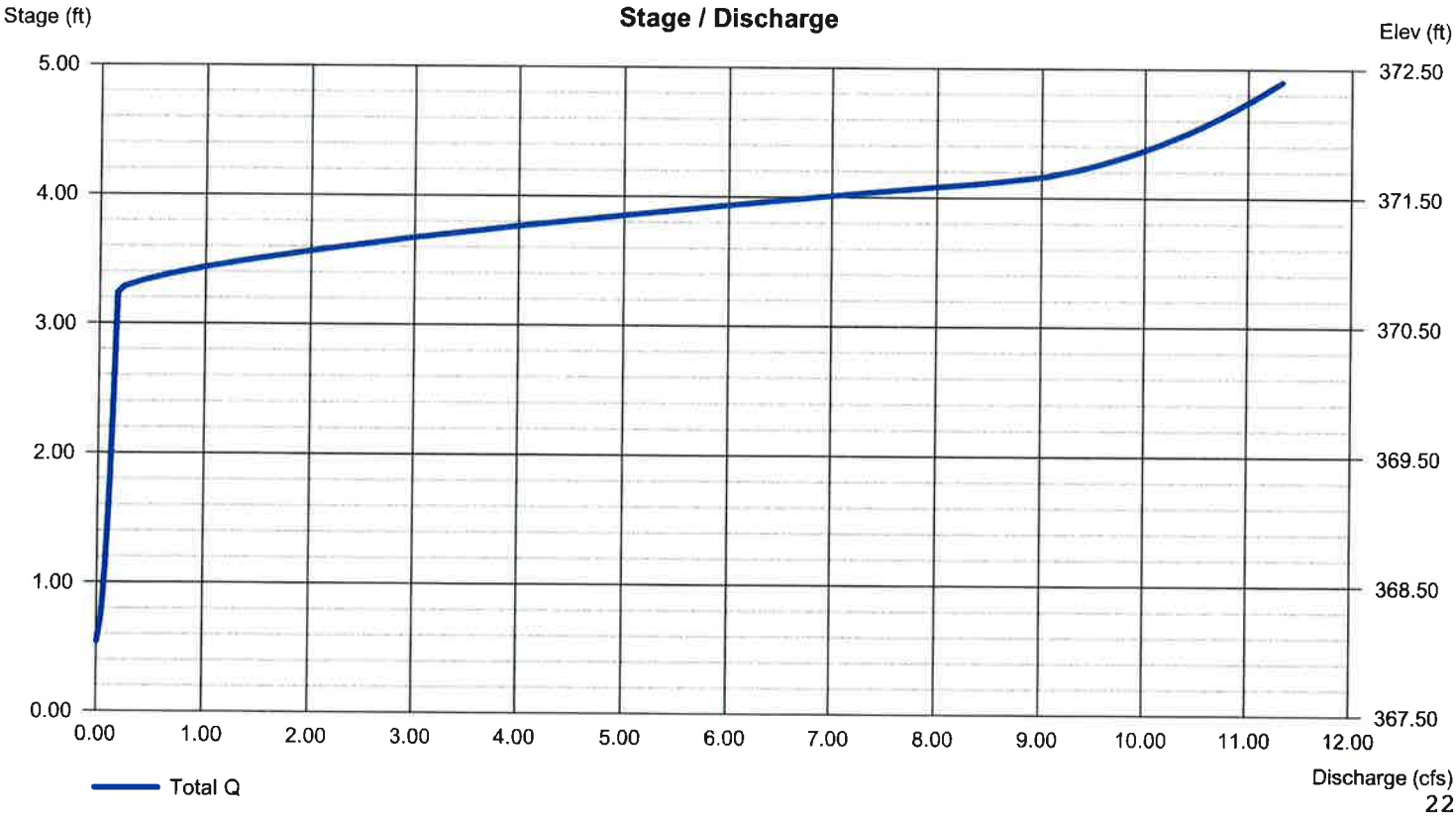
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.00	Inactive	0.00
Span (in)	= 15.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 367.90	368.00	371.00	0.00
Length (ft)	= 32.00	0.50	0.50	0.00
Slope (%)	= 2.80	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	4.00	0.00	0.00
Crest El. (ft)	= 373.00	370.75	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

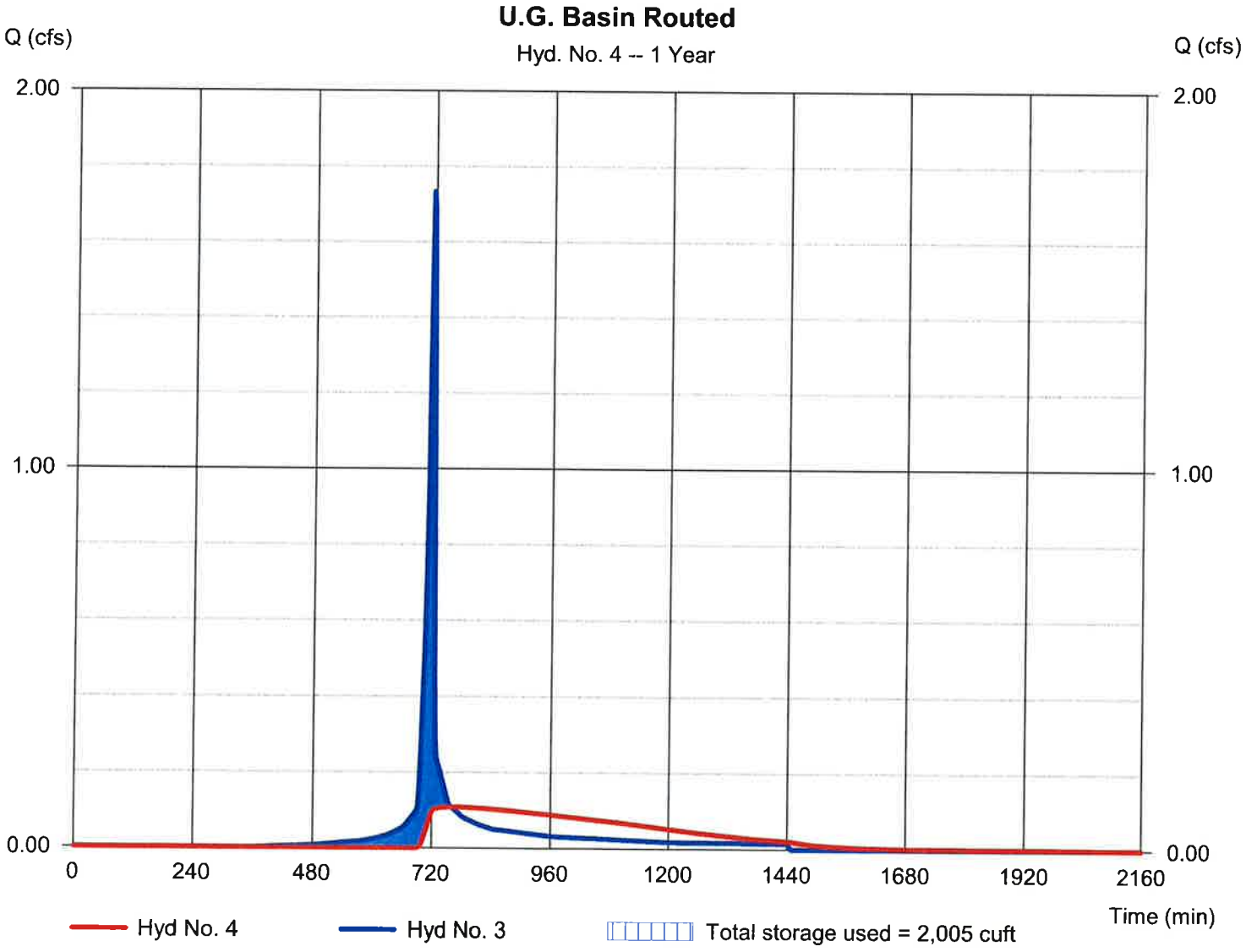
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 4

U.G. Basin Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.108 cfs
Storm frequency	= 1 yrs	Time to peak	= 760 min
Time interval	= 2 min	Hyd. volume	= 3,207 cuft
Inflow hyd. No.	= 3 - Post Development Basin Inflow	Max. Elevation	= 369.14 ft
Reservoir name	= UG Basin	Max. Storage	= 2,005 cuft

Storage Indication method used.



Hydrograph Report

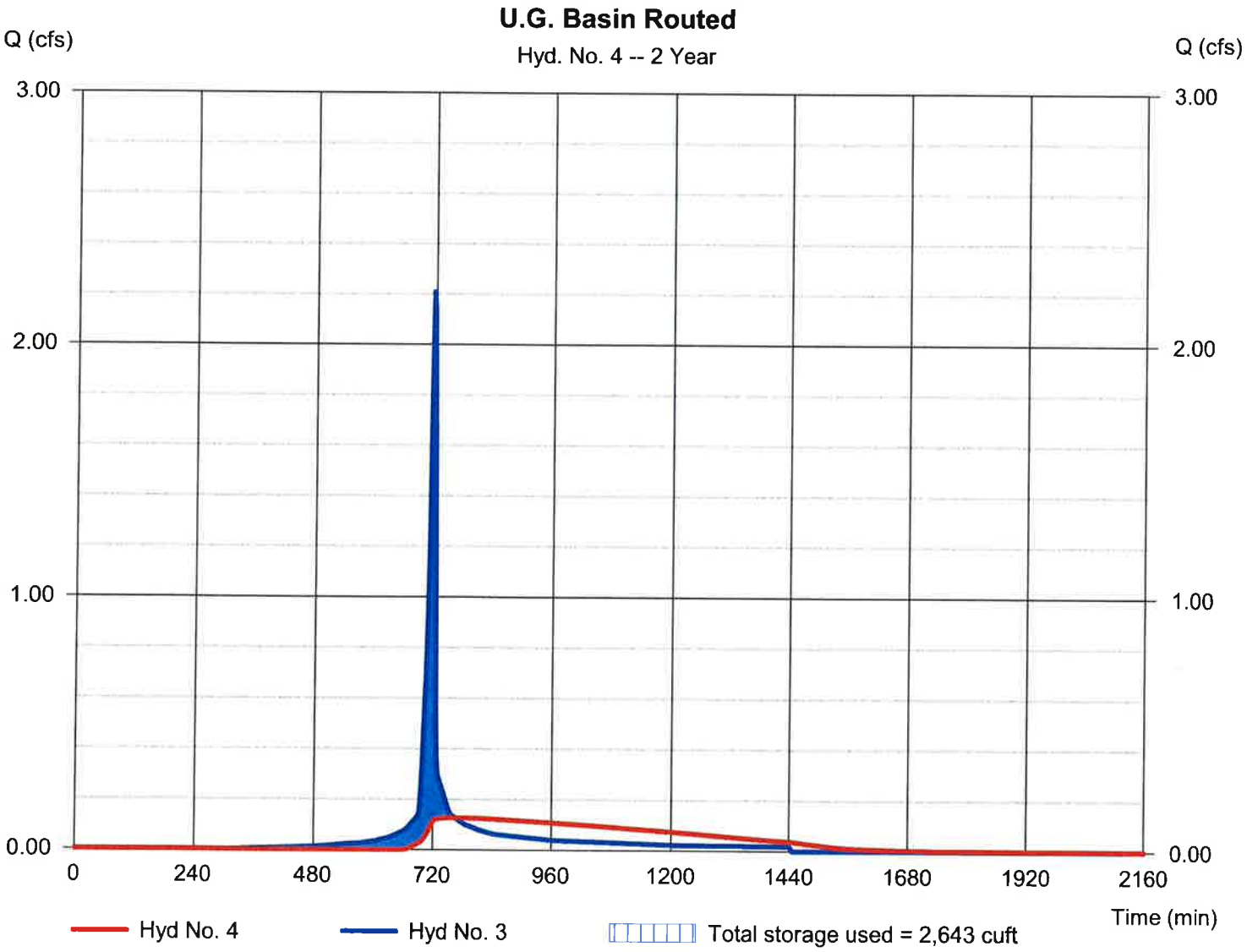
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 4

U.G. Basin Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.127 cfs
Storm frequency	= 2 yrs	Time to peak	= 766 min
Time interval	= 2 min	Hyd. volume	= 4,247 cuft
Inflow hyd. No.	= 3 - Post Development Basin Inflow	Max. Elevation	= 369.54 ft
Reservoir name	= UG Basin	Max. Storage	= 2,643 cuft

Storage Indication method used.



Hydrograph Report

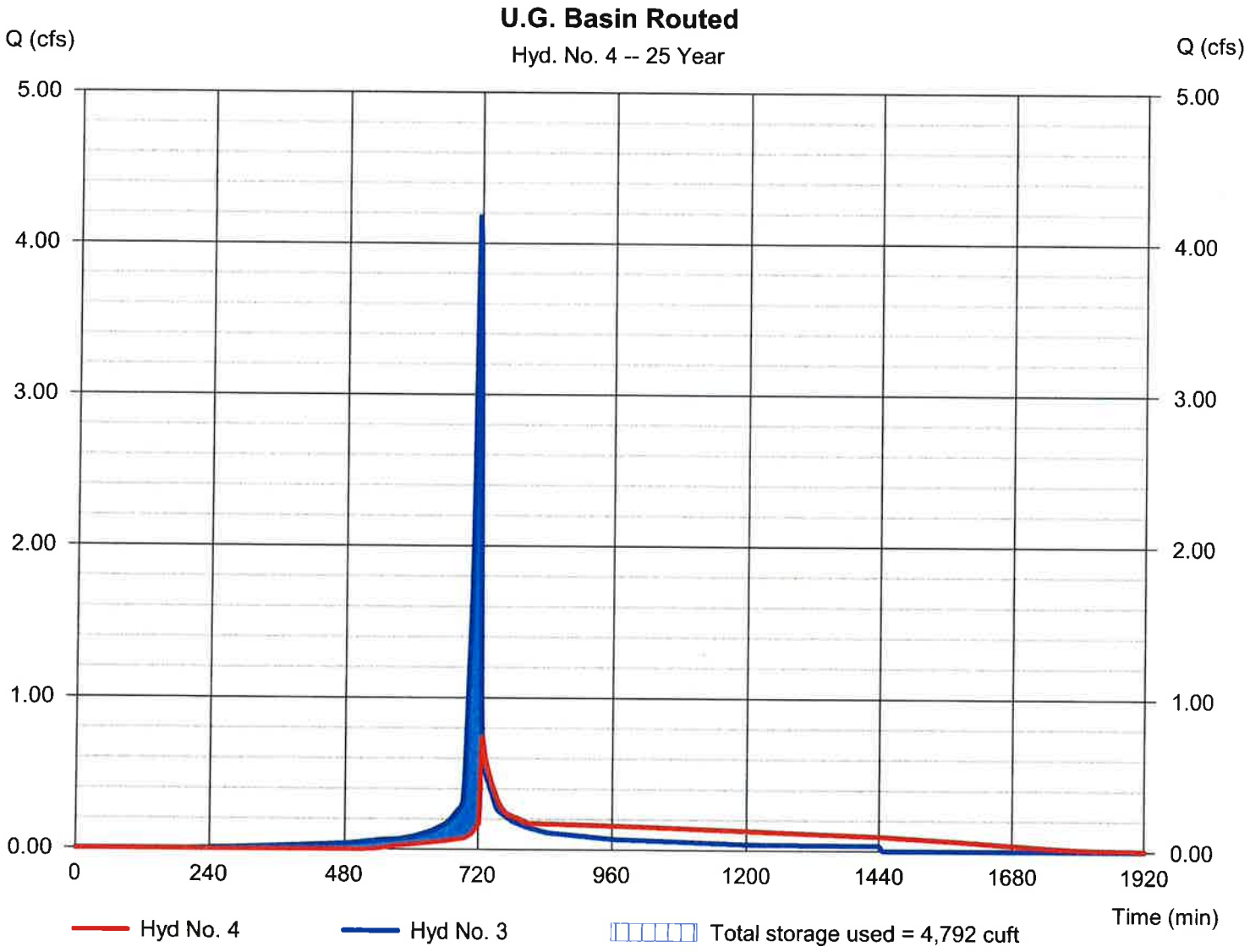
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 4

U.G. Basin Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.745 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 8,730 cuft
Inflow hyd. No.	= 3 - Post Development Basin Inflow	Max. Elevation	= 370.90 ft
Reservoir name	= UG Basin	Max. Storage	= 4,792 cuft

Storage Indication method used.



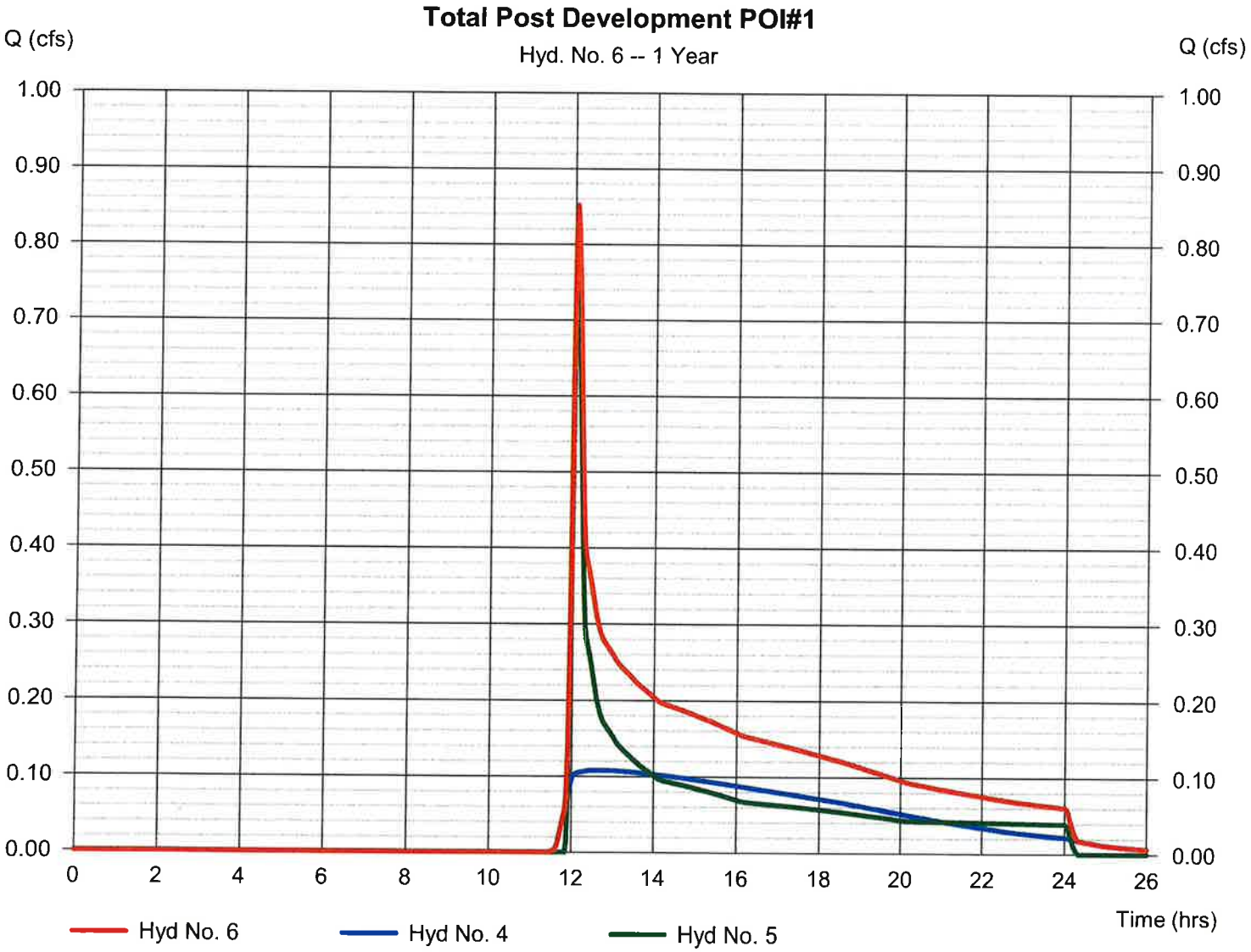
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 6

Total Post Development POI#1

Hydrograph type	= Combine	Peak discharge	= 0.852 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 6,923 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 3.430 ac



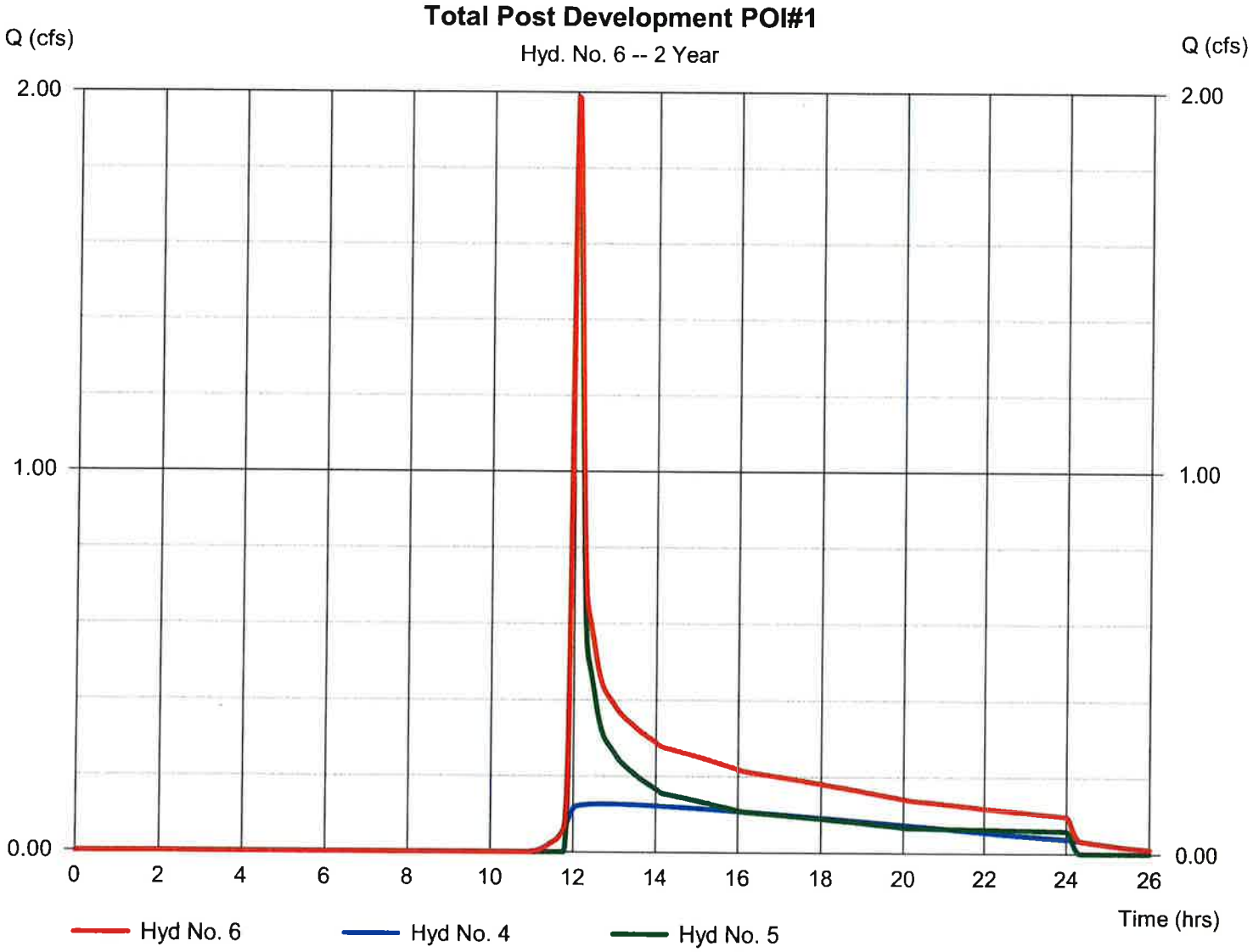
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 Friday, 12 / 22 / 2017

Hyd. No. 6

Total Post Development POI#1

Hydrograph type	= Combine	Peak discharge	= 1.988 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 10,930 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 3.430 ac



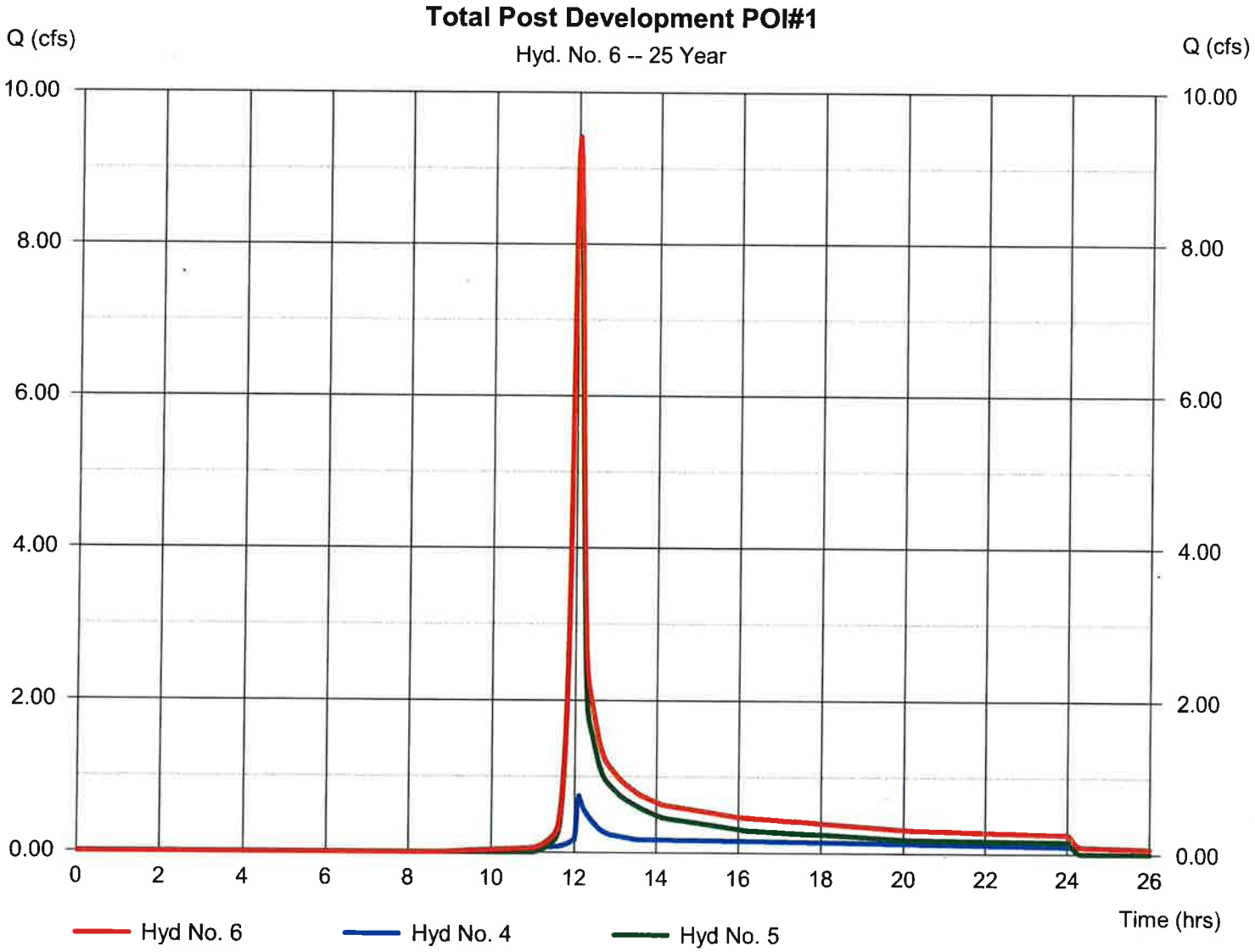
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11 — Friday, 12 / 22 / 2017

Hyd. No. 6

Total Post Development POI#1

Hydrograph type	= Combine	Peak discharge	= 9.418 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 33,245 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 3.430 ac



STORMWATER MANAGEMENT SUMMARY

Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-------
2	69.8703	13.1000	0.8658	-------
3	0.0000	0.0000	0.0000	-------
5	79.2597	14.6000	0.8369	-------
10	88.2351	15.5000	0.8279	-------
25	102.6072	16.5000	0.8217	-------
50	114.8193	17.2000	0.8199	-------
100	127.1596	17.8000	0.8186	-------

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.96	3.57	0.00	4.46	5.16	6.11	6.86	7.62
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	0.867	2.165	-------	------	-------	10.56	------	-------	Pre-Development POI#1
3	SCS Runoff	------	1.733	2.208	------	------	-------	4.176	------	------	Post Development Basin Inflow
4	Reservoir	3	0.108	0.127	-------	-------	-------	0.745	-------	-------	U.G. Basin Routed
5	SCS Runoff	------	0.749	1.870	------	-------	-------	9.127	-------	-------	Post Development Bypass (POI#1)
6	Combine	4, 5	0.852	1.988	-------	-------	-------	9.418	-------	-------	Total Post Development POI#1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.867	2	724	4,301	------	------	------	Pre-Development POI#1
3	SCS Runoff	1.733	2	716	3,579	------	------	------	Post Development Basin Inflow
4	Reservoir	0.108	2	760	3,207	3	369.14	2,005	U.G. Basin Routed
5	SCS Runoff	0.749	2	724	3,716	------	------	------	Post Development Bypass (POI#1)
6	Combine	0.852	2	724	6,923	4, 5	------	------	Total Post Development POI#1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11

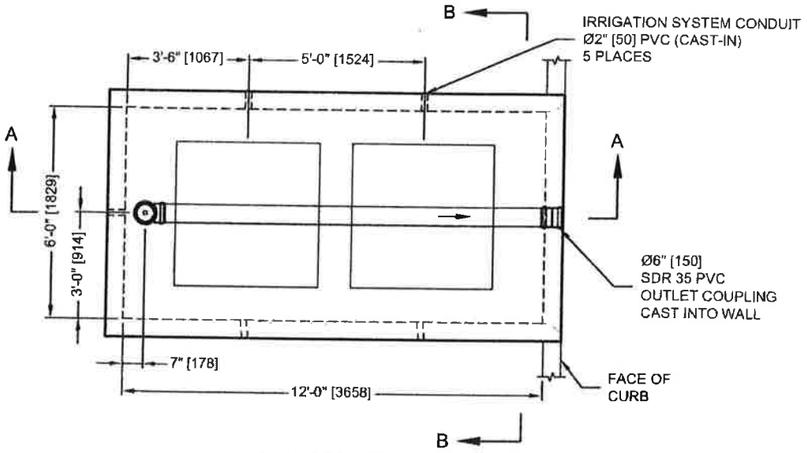
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.165	2	722	7,735	------	------	------	Pre-Development POI#1
3	SCS Runoff	2.208	2	716	4,619	------	------	------	Post Development Basin Inflow
4	Reservoir	0.127	2	766	4,247	3	369.54	2,643	U.G. Basin Routed
5	SCS Runoff	1.870	2	722	6,683	------	------	------	Post Development Bypass (POI#1)
6	Combine	1.988	2	722	10,930	4, 5	------	------	Total Post Development POI#1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v11

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	10.56	2	722	28,375	------	------	------	Pre-Development POI#1
3	SCS Runoff	4.176	2	716	9,102	------	------	------	Post Development Basin Inflow
4	Reservoir	0.745	2	726	8,730	3	370.90	4,792	U.G. Basin Routed
5	SCS Runoff	9.127	2	722	24,515	------	------	------	Post Development Bypass (POI#1)
6	Combine	9.418	2	722	33,245	4, 5	------	------	Total Post Development POI#1

WATER QUALITY DETAILS

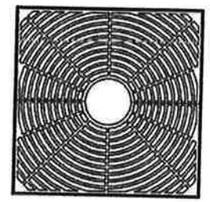


PLAN VIEW

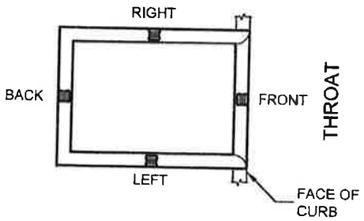
FILTERRA DESIGN NOTES

THE FILTERRA TREATMENT CAPACITY IS DETERMINED BY THE TREATMENT RATE OF THE FILTERRA MEDIA. A SEPARATE INLET STRUCTURE MUST BE INSTALLED DOWNSTREAM OF THE OFFLINE FILTERRA TO CONVEY FLOWS IN EXCESS OF THE SYSTEM DESIGN CAPACITY. SEE THE FILTERRA DESIGN, OPERATION, AND PERFORMANCE GUIDE FOR MORE INFORMATION.

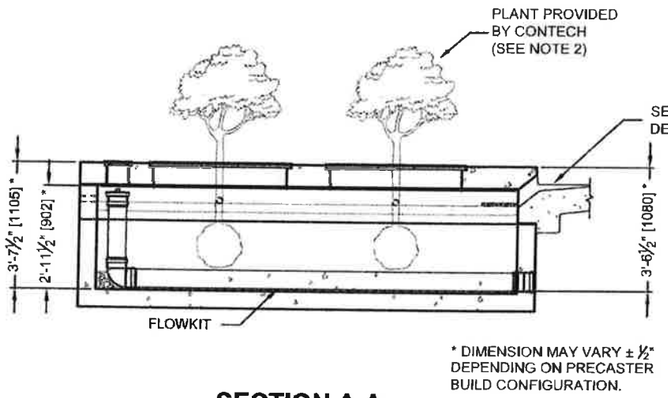
Ø 7" x 8" [178 x 203] CLEANOUT
(ACTUAL PRODUCT MAY VARY)
N.T.S.



48" x 48" [1219 x 1219] TREE GRATE
(ACTUAL PRODUCT MAY VARY)
N.T.S.

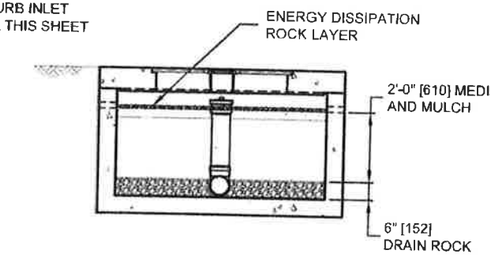


OUTFLOW PIPE ORIENTATION OPTIONS
ORIENTATION REFERENCE IS INLET THROAT

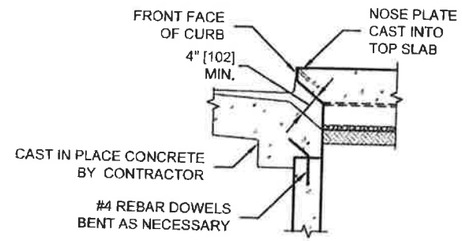


* DIMENSION MAY VARY ± ½" DEPENDING ON PRECASTER BUILD CONFIGURATION.

SECTION A-A



SECTION B-B



CURB INLET DETAIL

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
SYSTEM TREATMENT CAPACITY (CFS / l/s)	*
WATER QUALITY FLOW RATE (CFS / l/s)	*
PEAK FLOW RATE (CFS / l/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
REQUIRED MEDIA INFILTRATION RATE	*

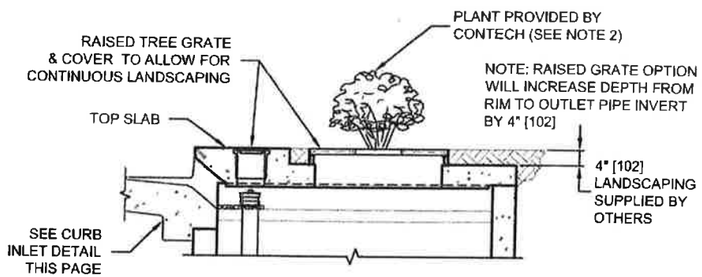
PIPE DATA:	I.E.	MATERIAL	DIAMETER
OUTLET PIPE	*	SCH 40 PVC	6"

CURB OPENING ORIENTATION	*
TOP OF CURB ELEVATION	*

ANTI-FLOTATION BALLAST IF REQUIRED	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD



OPTIONAL RECESSED TOP SLAB DETAIL
(TYPICAL TOP SLAB DETAIL SHOWN IN SECTION B-B)

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. PLANT, MULCH, AND DISSIPATION ROCK ARE SUPPLIED BY CONTECH AND DELIVERED AT TIME OF SYSTEM ACTIVATION. PLANT SELECTION SHALL BE DONE BY THE ENGINEER OF RECORD IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS.
3. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
4. FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
5. FILTERRA WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
6. STRUCTURE DESIGNED FOR PEDESTRIAN LIVE LOAD WITH H5 (4,000 LBS.) WHEEL LOAD MOUNTING THE CURB AND ADJACENT HS-2 LIVE LOAD SURCHARGE ON THE WALLS ON THE STRUCTURE.
7. FILTERRA STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-857, ASTM C-918, AND ACI-318 LOAD FACTOR DESIGN METHOD.

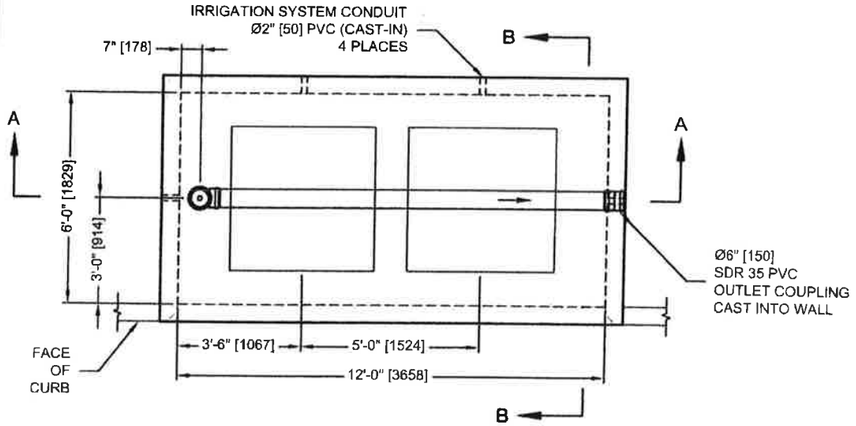
INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE FILTERRA VAULT (LIFTING CLUTCHES PROVIDED). SPREADER BAR WITH SUFFICIENT CABLE IS REQUIRED FOR SAFETY AND REDUCTION OF DAMAGE TO CONCRETE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL VAULT SECTIONS AND ASSEMBLE VAULT.
D. CONTRACTOR TO PROVIDE AND INSTALL OUTLET PIPE. PVC COUPLING CAST-IN TO WALL FOR OUTLET PIPE CONNECTION.
E. CONTRACTOR TO SUPPLY AND INSTALL INLET PROTECTION BAR IF REQUIRED BY LOCAL JURISDICTION.
F. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT FILTERRA MEDIA BAY FROM CONSTRUCTION-RELATED EROSION RUNOFF.
G. CONTECH IS RESPONSIBLE FOR ACTIVATION OF THE SYSTEM AND PLANTING OF THE PLANT THAT IS SPECIFIED. ACTIVATION ONLY OCCURS WHEN THE SITE IS FULLY STABILIZED, FINAL PAVEMENT INSTALLED AND SWEPT CLEAN OF CONSTRUCTION SEDIMENT.
H. ALL FILTERRA UNITS MUST BE WATERED BY IRRIGATION LINES OR SPRINKLER SYSTEMS ON A REGULAR BASIS. EACH FILTERRA UNIT INCLUDES IRRIGATION HOLES FOR NEW OR EXISTING IRRIGATION LINES.

filterra

CONTECH
ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

FILTERRA 6x12 OFFLINE STANDARD DETAIL SHORT SIDE INLET MODEL: FT0612

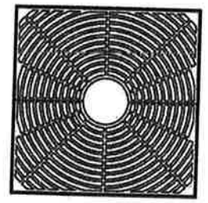


PLAN VIEW

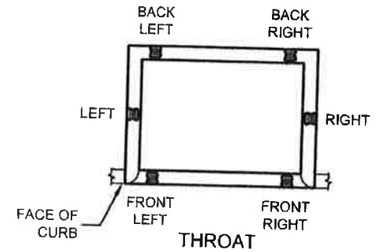
Ø 7" x 8" [178 x 203]
CLEANOUT
(ACTUAL PRODUCT MAY VARY)
N.T.S.

FILTERRA DESIGN NOTES

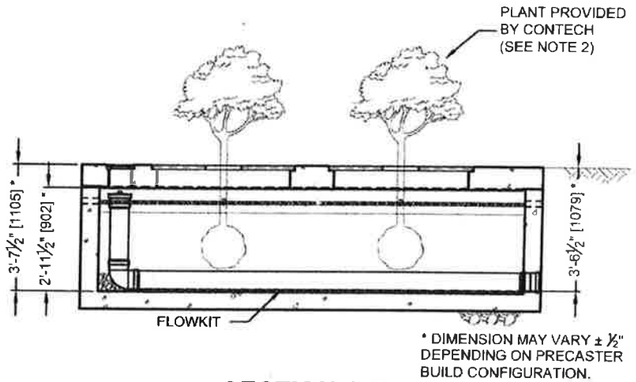
THE FILTERRA TREATMENT CAPACITY IS DETERMINED BY THE TREATMENT RATE OF THE FILTERRA MEDIA. A SEPARATE INLET STRUCTURE MUST BE INSTALLED DOWNSTREAM OF THE OFFLINE FILTERRA TO CONVEY FLOWS IN EXCESS OF THE SYSTEM DESIGN CAPACITY. SEE THE FILTERRA DESIGN, OPERATION, AND PERFORMANCE GUIDE FOR MORE INFORMATION.



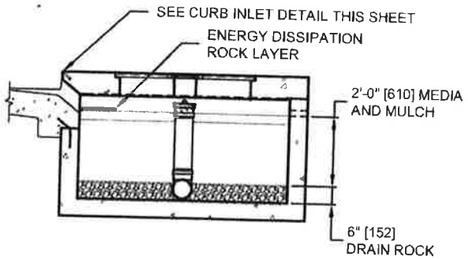
48" x 48" [1219 x 1219]
TREE GRATE
(ACTUAL PRODUCT MAY VARY)
N.T.S.



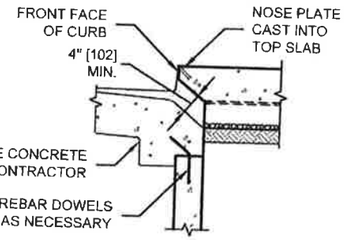
OUTFLOW PIPE ORIENTATION OPTIONS
ORIENTATION REFERENCE IS INLET THROAT



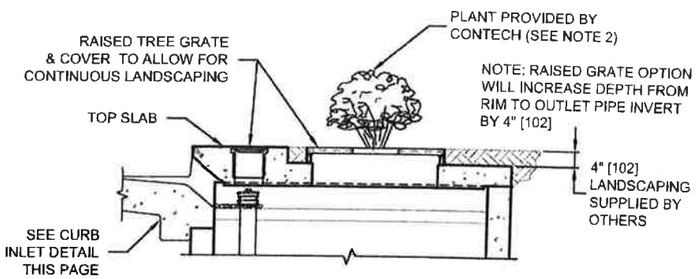
SECTION A-A



SECTION B-B



CURB INLET DETAIL



OPTIONAL RECESSED TOP SLAB DETAIL
(TYPICAL TOP SLAB DETAIL SHOWN IN SECTION B-B)

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
SYSTEM TREATMENT CAPACITY (CFS / l/s)	*
WATER QUALITY FLOW RATE (CFS / l/s)	*
PEAK FLOW RATE (CFS / l/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
REQUIRED MEDIA INFILTRATION RATE	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
OUTLET PIPE	*	SCH 40 PVC	4"

CURB OPENING ORIENTATION	*
TOP OF CURB ELEVATION	*

ANTI-FLOTATION BALLAST IF REQUIRED	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. PLANT, MULCH, AND DISSIPATION ROCK ARE SUPPLIED BY CONTECH AND DELIVERED AT TIME OF SYSTEM ACTIVATION. PLANT SELECTION SHALL BE DONE BY THE ENGINEER OF RECORD IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS.
3. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
4. FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
5. FILTERRA WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
6. STRUCTURE DESIGNED FOR PEDESTRIAN LIVE LOAD WITH H5 (4,000 LBS.) WHEEL LOAD MOUNTING THE CURB AND ADJACENT HS-2 LIVE LOAD SURCHARGE ON THE WALLS ON THE STRUCTURE.
7. FILTERRA STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-857, ASTM C-918, AND ACI-318 LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE FILTERRA VAULT (LIFTING CLUTCHES PROVIDED). SPREADER BAR WITH SUFFICIENT CABLE IS REQUIRED FOR SAFETY AND REDUCTION OF DAMAGE TO CONCRETE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL VAULT SECTIONS AND ASSEMBLE VAULT.
D. CONTRACTOR TO PROVIDE AND INSTALL OUTLET PIPE. PVC COUPLING CAST-IN TO WALL FOR OUTLET PIPE CONNECTION.
E. CONTRACTOR TO SUPPLY AND INSTALL INLET PROTECTION BAR IF REQUIRED BY LOCAL JURISDICTION.
F. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT FILTERRA MEDIA BAY FROM CONSTRUCTION-RELATED EROSION RUNOFF.
G. CONTECH IS RESPONSIBLE FOR ACTIVATION OF THE SYSTEM AND PLANTING OF THE PLANT THAT IS SPECIFIED. ACTIVATION ONLY OCCURS WHEN THE SITE IS FULLY STABILIZED, FINAL PAVEMENT INSTALLED AND SWEPT CLEAN OF CONSTRUCTION SEDIMENT.
H. ALL FILTERRA UNITS MUST BE WATERED BY IRRIGATION LINES OR SPRINKLER SYSTEMS ON A REGULAR BASIS. EACH FILTERRA UNIT INCLUDES IRRIGATION HOLES FOR NEW OR EXISTING IRRIGATION LINES.

filterra

CONTECH
ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

FILTERRA 12x6 OFFLINE STANDARD LONG SIDE INLET MODEL: FT1206

STORMWATER CONVEYANCE SUMMARY

DRAINAGE AREA PLANS