BUILD: SANDY SPRINGS

Let’s build something great together

BUILD: SANDY SPRINGS

Let's build something great together

- "BUILD: SANDY SPRINGS" is a series of seminars presented by the Community Development department of the City of Sandy Springs, GA.
- It is intended to educate the public on the current policies, procedures and expectations of the City of Sandy Springs, GA as it relates to construction within the jurisdiction.
- The information presented in these seminars is subject to change with new Code adoptions, changes in City ordinances and zoning, and changes in office policy as it relates to current construction trends.

Residential

Stormwater Management

SANDY SPRINGS™
GEORGIA

August 29, 2023

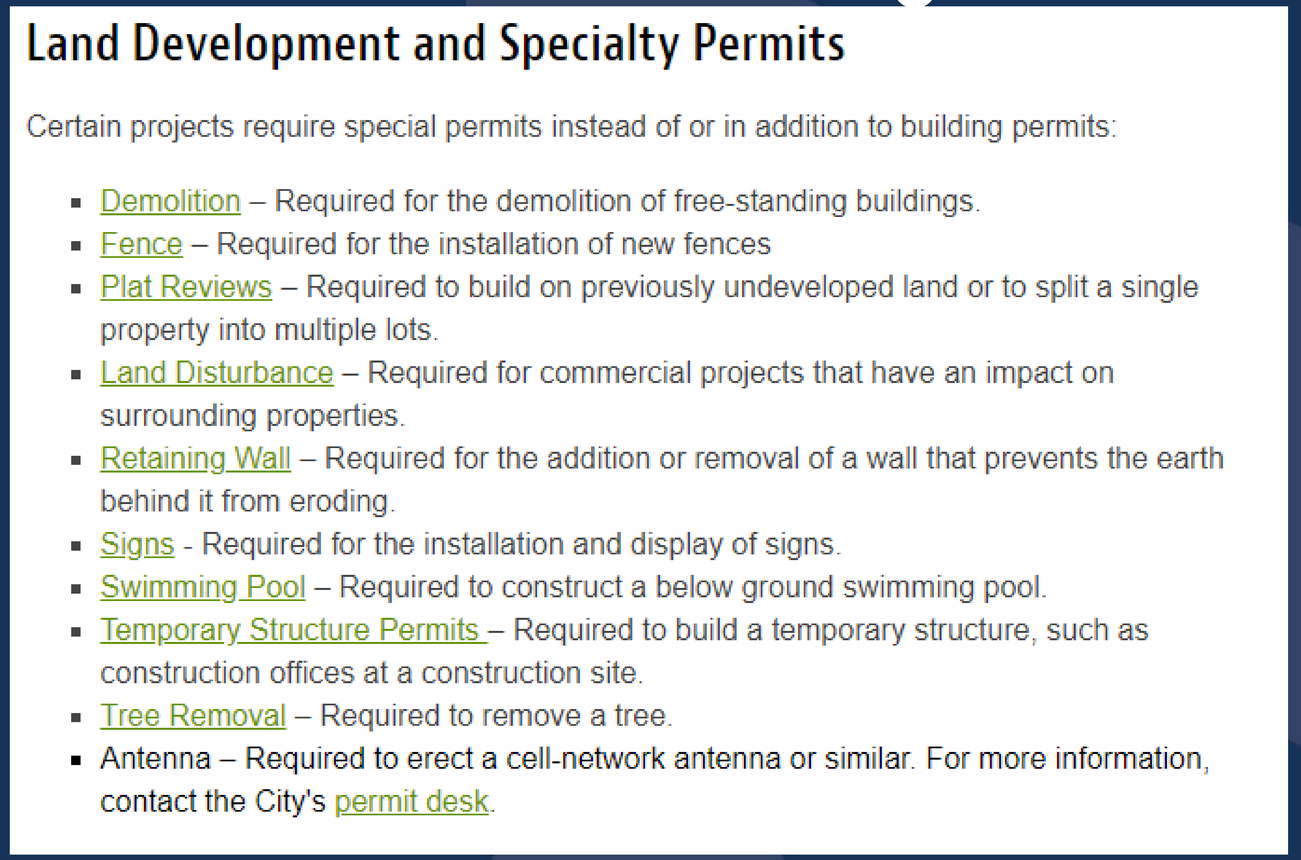
Jon Amsberry, PE

City Engineer
City of Sandy Springs

Land Development Team

Land Development Manager:	Jesus Davila, CFM
Building Official:	Jonathan Livingston, P.E.
City Engineer:	Jon Amsberry, P.E.
Civil Plans Reviewer:	Jinny Chung
Site/Land Development Plan Review:	Wayne Eleton
Chief Environmental Compliance Officer:	James Sanders
Arborist:	Layton Rideout
Arborist:	Roger Bledsoe
Storm Water Coordinator:	William Lipscomb
Land Development Supervisor:	German Medina
Land Development Inspectors:	Barry Bozeman
	Lawrence Sullivan

Visit the Sandy Springs Building and Construction Page at:



Land Development and Specialty Permits

Certain projects require special permits instead of or in addition to building permits:

- Demolition – Required for the demolition of free-standing buildings.
- Fence – Required for the installation of new fences
- Plat Reviews – Required to build on previously undeveloped land or to split a single property into multiple lots.
- Land Disturbance – Required for commercial projects that have an impact on surrounding properties.
- Retaining Wall – Required for the addition or removal of a wall that prevents the earth behind it from eroding.
- Signs - Required for the installation and display of signs.
- Swimming Pool – Required to construct a below ground swimming pool.
- Temporary Structure Permits – Required to build a temporary structure, such as construction offices at a construction site.
- Tree Removal – Required to remove a tree.
- Antenna – Required to erect a cell-network antenna or similar. For more information, contact the City's permit desk.

http://www.sandyspringsga.gov/business/building-and-construction/construction-utility-permits

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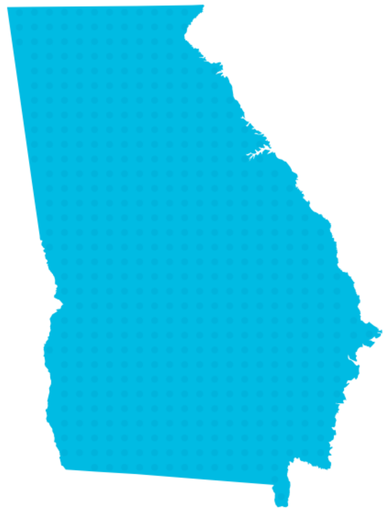
Purpose

City of Sandy Springs Development Code & Georgia Stormwater Management Manual

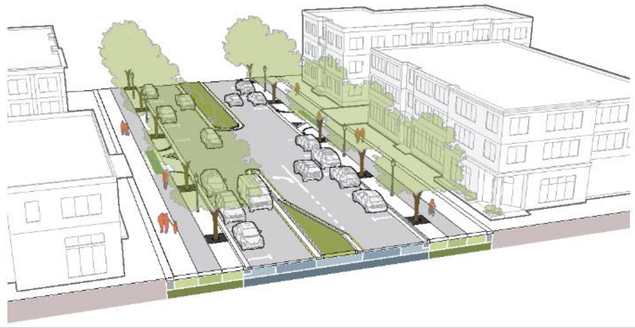


GEORGIA
STORMWATER MANAGEMENT MANUAL
2016 EDITION

VOLUMES 1

DEVELOPMENT CODE

SANDY SPRINGS™
GEORGIA



DEVELOPMENT CODE

CITY COUNCIL ADOPTED
August 15, 2017

Published: 2018

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P.O. Box 2235 Tallahassee, FL 32316

ORDINANCE NO. 2017-08-17

City of Sandy Springs Green Infrastructure Manual

Single Unit Residences

Last update: January 2021

SANDY SPRINGS DEVELOPMENT CODE

DIVISION 9.6 – STORMWATER MANAGEMENT

SECTION 9.6.1 – PURPOSE

The purpose of this Division is to protect, maintain and enhance the public health, safety, environment and general welfare by establishing minimum requirements and procedures to control the adverse effects of increased post-development stormwater runoff and non-point source pollution associated with new development and redevelopment by focusing on the types of frequently occurring storm events that generate the most water quality impacts.

B. Require that new development and redevelopment maintain the pre-development hydrologic response in their post-development state as nearly as practicable in order to reduce flooding, stream bank erosion, non-point source pollution and increases in stream temperature, and maintain the integrity of stream channels and aquatic habitats;

Sec. 9.6.1

C. Establish minimum post-development stormwater management standards and design criteria for the regulation and control of stormwater runoff quantity and quality and to preserve and/or restore natural hydrologic conditions on development sites;

D. Establish design and application criteria for the construction and use of structural stormwater control facilities that meet the minimum post-development stormwater management standards;

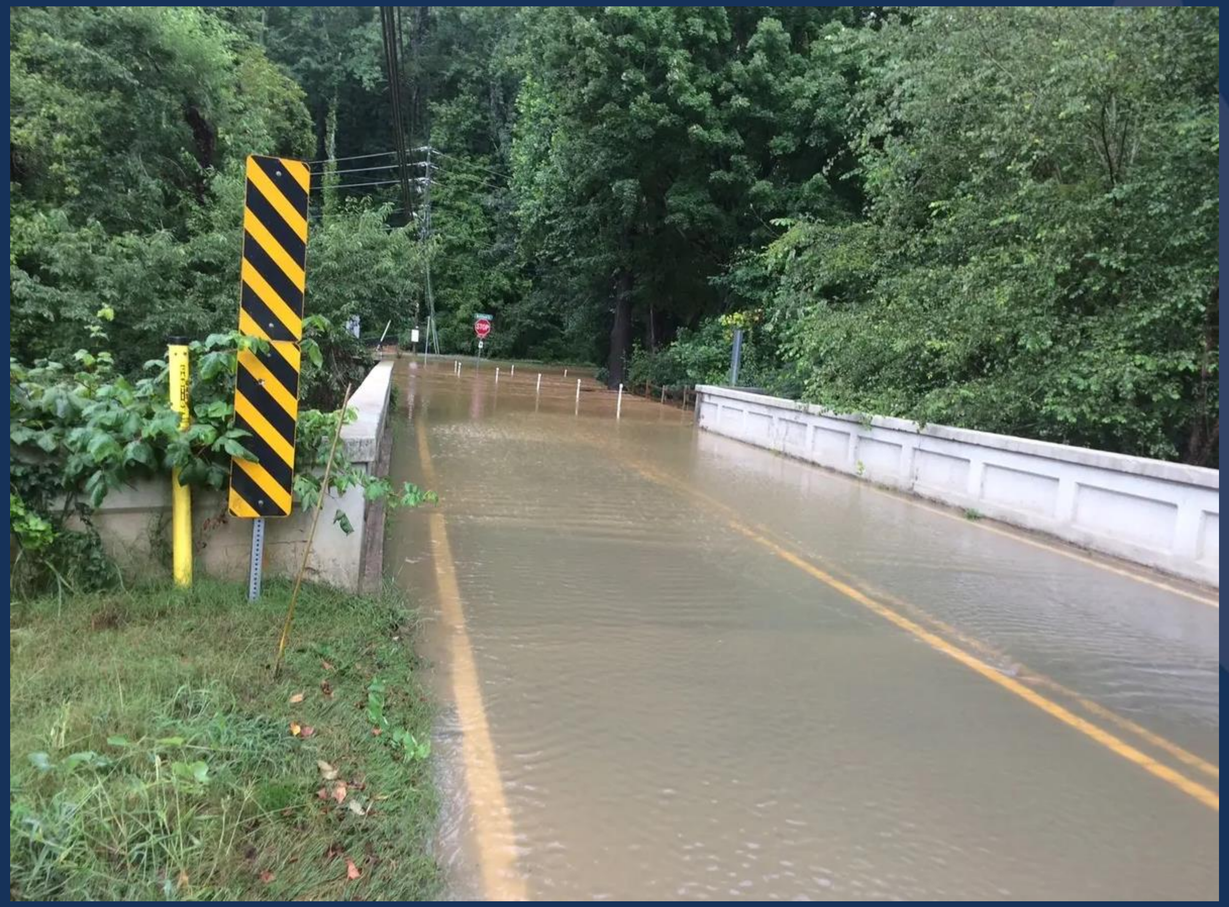
E. Encourage the use of nonstructural stormwater management and stormwater better site design practices, peak rate and/or runoff reduction, and the preservation of greenspace and other conservation areas, by establishing minimum post-development stormwater management standards and design criteria for the regulation and control of stormwater runoff quantity and quality. Coordinate site design plans, which include greenspace, with the City's greenspace protection plan;

G. Establish administrative procedures for the submission, review, approval and disapproval of stormwater management plans, and for the inspection of approved active projects, and long-term compliance; and

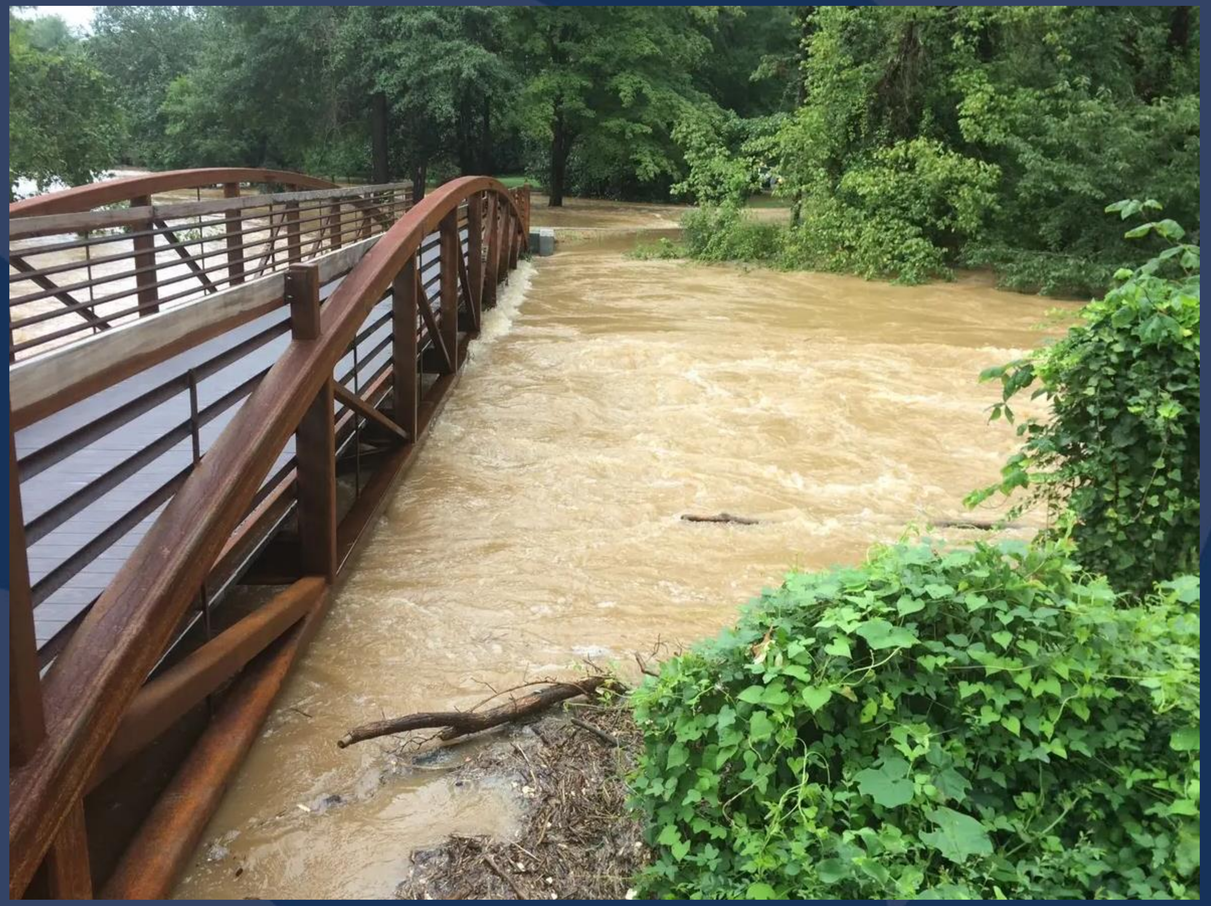
H. Protect public health and safety by reducing the risk of localized flooding and reducing the amount of runoff entering streets.

It all boils down to the need to balance growth and redevelopment ....

with protecting our resources.....



And mitigating catastrophic flooding conditions



Photos courtesy of The Patch @ www.patch.com

EXEMPTIONS – NOTE THAT SFR IS NOT ONE OF THEM!!

Sec. 9.6.3. - STANDARDS

A. 2. The following activities are exempt from this Division:

a. Agricultural or silvicultural land management activities within areas zoned for these activities; and

b. Repairs to any stormwater management facility or practice deemed necessary by the Director.

c. Minor improvements to public parks involving less than 5,000 square feet of land disturbance and less than 1,000 square feet of impervious surface.

d. Utility installations, repairs or modifications outside of stream buffers.

e. Installations or modifications to existing structures to accommodate Americans with Disability Act (ADA) requirements.

f. Installation of pervious pavers (City detail) less than 5,000 square feet.

g. Maintenance, repair and resurfacing of existing paved surfaces, except within a Declared Sensitive Area.

h. Addition of sidewalks along streets.

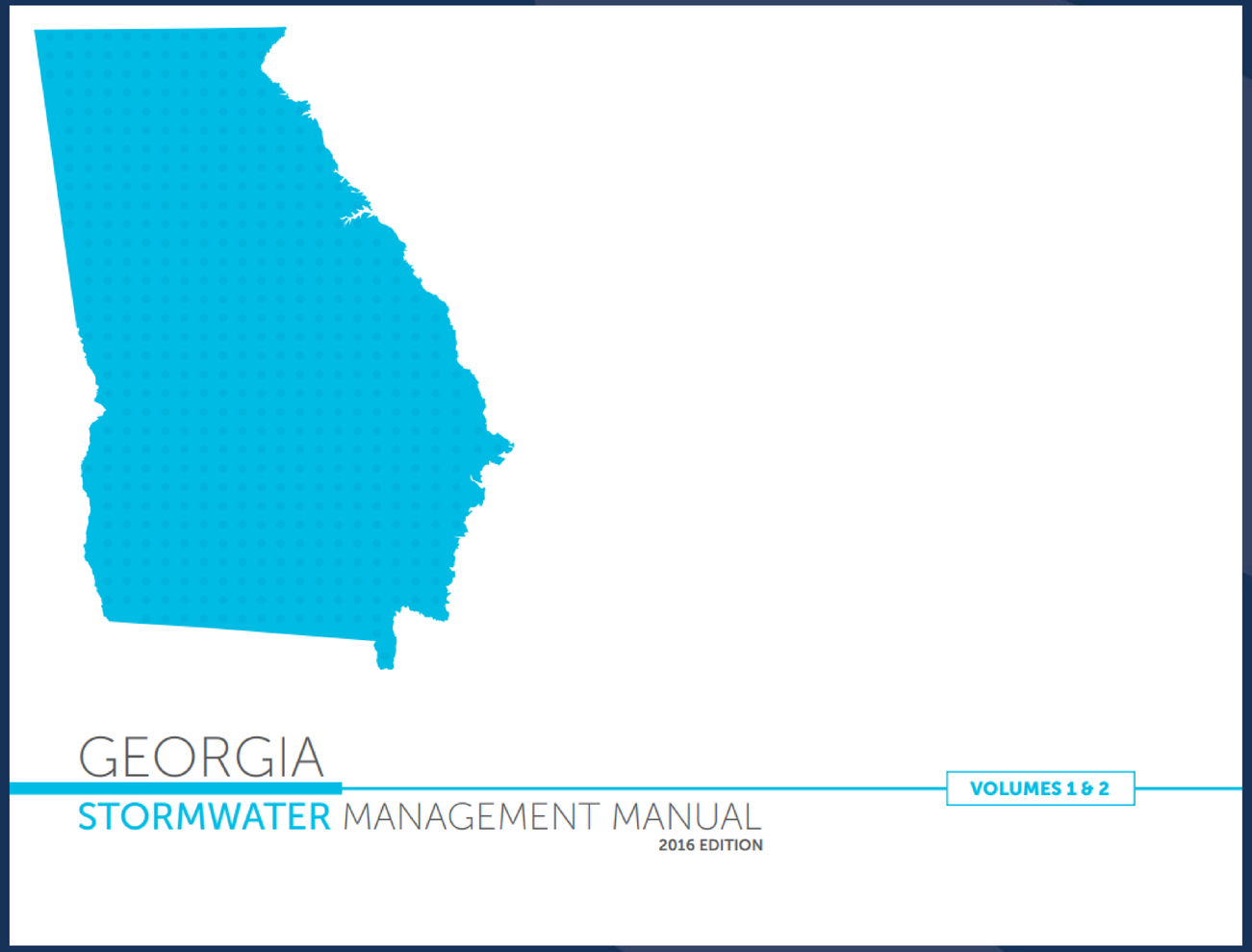
i. Stream bank stabilization or restoration.

j. Land disturbance required for environmental cleanup or remediation.

k. Residential driveway replacement, except within a Declared Sensitive Area.

Sec. 9.6.4. - STORMWATER DESIGN MANUAL

The City will utilize the policy, criteria and information including technical specifications and standards in the latest edition of the 2016 Georgia Stormwater Management Manual and any relevant City addenda (or equivalent City stormwater management design manual) for the proper implementation of the requirements of this Division. The manual may be updated and expanded periodically, based on improvements in science, engineering, monitoring and local maintenance experience.



Sec. 9.6.5 – PERMIT APPLICATION REQUIREMENTS

A. No owner or developer shall perform any land development activities without first meeting the requirements of this Division prior to commencing the proposed activity.

B. Unless specifically exempted by this Division, any owner or developer proposing a land development activity shall submit to the Department a permit application on a form provided by the City for that purpose.

PERMIT TYPES:

BR – BUILDING PERMITS FOR NEW SINGLE FAMILY OR ADDITIONS
POOL – RESIDENTIAL POOL PERMITS
LDP – MINOR LDP FOR SINGLE FAMILY RESIDENTIAL

Sec. 9.6.5

C. Unless otherwise exempted by this Division, a permit application is accompanied by the following items in order to be considered:

1. Stormwater concept plan and consultation meeting certification in accordance with Sec. 9.6.7; **WAIVED FOR SFR**
2. Stormwater management plan in accordance with Sec. 9.6.8;
3. Green Infrastructure Feasibility Form in accordance with Sec 9.6.7; **ONLY REQUIRED IF SITE = or > 1.0 ACRE**
4. Inspection and maintenance agreement in accordance with Sec. 9.6.8, if applicable; **WAIVED FOR SFR**
5. Performance bond, if applicable; and **WAIVED FOR SFR**
6. Permit application and plan review fees in accordance with Sec. 9.6.10.

D. The approved stormwater management plan shall obligate the responsible party to accomplish all land clearing, construction, development and drainage in accordance with the stormwater management plan. Any and all permits for development activities may be revoked at any time if the construction of stormwater management facilities is not conducted in substantial conformity with approved plans.

F. Upon completion of the project the applicant or responsible party shall submit the engineer-of-record's certification and as-built plan that includes the global positioning system coordinates of the stormwater management facilities. If the as-built plan differs substantially from the approved plan but is still acceptable to the City, then the applicant or responsible party shall update the recorded inspection and maintenance agreement upon approval by the City.

SEC. 9.6.12 – PERFORMANCE CRITERIA

A. For new developments, the following performance criteria shall be applied to the area of the site impacted by the proposed work. For redevelopment, the following performance criteria shall be applied to the area of the site impacted by the proposed work, provided that the impacted area does not exceed 35 percent of the previously developed area. If the impacted area exceeds 35 percent of the previously developed area, the following performance criteria shall be applied to the entire development, including previously developed area:

1. **Water Quality/Runoff Reduction:** All stormwater runoff generated from a site shall provide runoff reduction of the first 1.2 inches of rainfall or shall be adequately treated for water quality before discharge. With the exception of single lot residential developments that are not part of a common development, this shall be accomplished by the use of Green Infrastructure Best Management Practices unless determined to be infeasible in accordance with Sec. 9.6.7.B.4. of this code.

2. **Stream Channel Protection:** Protection of stream channels from bank and bed erosion and degradation is provided by using all of the following three approaches:

a. Preservation, restoration and/or reforestation (with native vegetation) of the applicable stream buffer;

b. Twenty-four-hour extended detention storage of the one-year, 24-hour return frequency storm event;

c. Erosion prevention measures such as energy dissipation and velocity control.

d. For redevelopment projects that create, add, or demolish and replace less than 5,000 square feet of impervious surface and meet the performance criteria of this section, stream channel protection is not required.

3. **Overbank Flooding Protection**

a. Downstream overbank flood and property protection is provided by controlling (attenuating) the post-development peak discharge rate to the pre-development rate for the 25-year, 24-hour return frequency storm event. If control of the one-year, 24-hour storm under subsection (a) of this section is exempted, then peak discharge rate attenuation of the two-year through the 25-year return frequency storm event must be provided. For redevelopment projects overbank flood and property protection shall be provided by reducing the peak discharge rate up to the 25-year, 24-hour storm event in accordance with the following formula:

b. %PIC/2 = %PDRR **USE TO DETERMINE ALLOWABLE PEAK DISCHARGE**

c. PIC = Predevelopment Impervious Cover

i. PDRR = Peak Discharge Rate Reduction

d. For sites where previous demolition has removed impervious surfaces, pre-development peak discharge rate calculations and percentage of impervious coverage shall be calculated based on pre-demolition conditions. For sites that have been demolished and have remained fallow and stabilized with vegetation for a minimum of five years, they shall be considered as having pre-development conditions of 20 percent impervious cover for purposes of calculating peak discharge rate reduction.

e. For land development permitted after 2005 and served by appropriate stormwater management facilities, subsequent redevelopment of the same area is not required to further reduce the peak discharge rate, provided that the site continues to meet the reduction previously achieved.

f. For redevelopment projects that create, add, or demolish and replace less than 5,000 square feet of impervious surface and meet the performance criteria of this section, overbank flooding protection is not required.

4. Extreme Flooding Protection

a. Extreme flood and public safety protection is provided by controlling and safely conveying the 100-year, 24-hour return frequency storm event such that flooding is not exacerbated.

b. For redevelopment projects that create, add, or demolish and replace less than 5,000 square feet of impervious surface and meet the performance criteria of this section, extreme flooding protection is not required.

Performance Standards

Water Quality / Runoff Reduction:

Runoff Reduction is required for a 1.2” rainfall event.

An Infiltration Test is required at the BMP location at the design depth.

Green Infrastructure BMP’s are preferred. See City’s GI / LID Manual.

IF Runoff Reduction is not feasible, water quality treatment will be required for the un-reduced RRv Volume at a factor of 1.2.

This equates to a 1.44” rainfall event.

Designer must prepare Green Infrastructure Feasibility Form, regardless of site size.

ALLOWABLE GI/LID PRACTICES FROM GI/LID MANUAL

Table of Contents

Chapter 2

Rainwater Harvesting: Cisterns and Rain Barrels

Cisterns and rain barrels are green infrastructure practices that store rainwater for later use, such as landscape irrigation. Rain runoff from impervious surfaces, typically a roof, is collected from a downspout system, screened to remove trash and leaves and conveyed to a storage container for subsequent use. **Figure 1** and **Figure 2**. When properly sized, they can provide significant reductions in stormwater runoff rates, volumes and pollutant loads. Rain barrels may be part of an overall stormwater management system; however, due to their relatively small size, they may not be sufficient to meet the requirements of the ordinance.

The cistern must be emptied regularly, in particular before a large storm, to allow space for incoming stormwater. Rainwater harvesting makes sense only if a proportionately dimensioned landscaping area will be irrigated.

For additional information, consult Section 4.19 Rain Water Harvesting of the GSMM Vol. 2.

Location Considerations

The preferred location for a cistern meets the following considerations:

- Gutter downspouts can be easily connected to the cistern
- Overflow can be directed to downslope areas
- The selected area is level
- The area where the stored water will be used is within reach
- There are no conflicts with utilities
- An electrical connection is available, if applicable
- Emergency ingress/egress to and from the house remain clear
- Per Development Code Section 6.1.2.B.2.b, rain barrels and cisterns less than 6 feet in height may encroach into a required setback, if it remains at least 3 feet away from any lot line. They must be screened according to the specifications for Ground Mounted Equipment of Section 8.2.9.B.4.

Figure 1 | 1500 gallon cistern (LID Urban Design Tools via City of Atlanta)

Figure 2 | Rain Barrel (City of Atlanta)

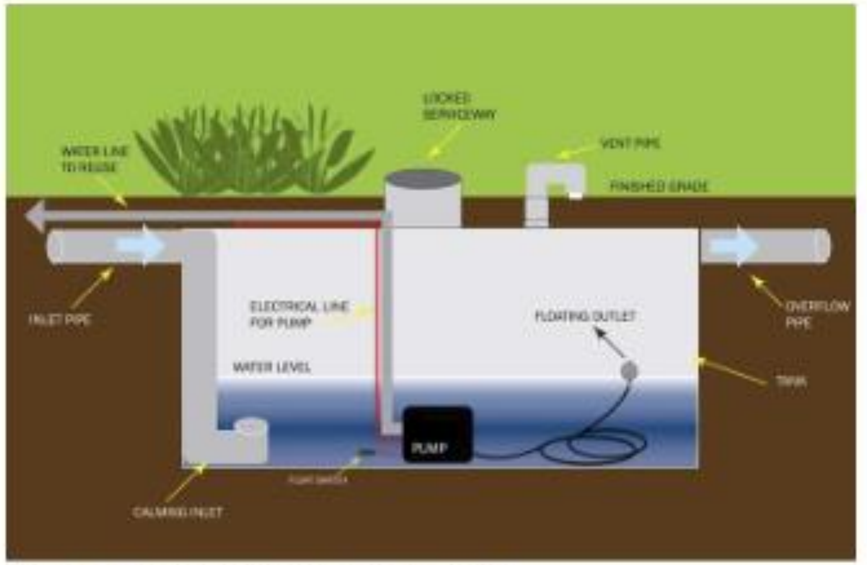


Figure 3 | Underground cistern (Contech ES)

Chapter 5

Rain Gardens

Rain gardens are small, landscaped depressions filled with a mix of native soil and compost and planted with trees, shrubs and other perennials. They are designed to temporarily store stormwater runoff from rooftops, driveways, patios and other impervious areas while reducing runoff rates and pollutant loads into local streams. A rain garden can be a beautiful and functional addition to the landscape. **Figure 18**

Location

- Rain gardens should be located to receive stormwater runoff from impervious surfaces.
- Swales, berms, or downspout extensions may be helpful to route runoff to the rain garden.
- Locate at least 10 feet from building foundations and retaining walls.
- Rain gardens cannot be located:
  - Within the public right-of-way;
  - Over other utility lines;
  - Above a septic field; or
  - At the edge of a steep slope.
- Rain gardens on steep slopes (>10%) may require an alternative design with terracing.

Contributing Impervious Drainage Area (sq ft)	Depth of Amended Soil (in)			
	18	24	30	36
	Required Area of Rain Garden (sq ft)			
100	9.1	7.7	6.7	5.9
250	23	19	17	15
500	45	38	33	29
1000	91	77	67	59
1500	136	115	100	88
2000	182	154	133	118
2500	227	192	167	147

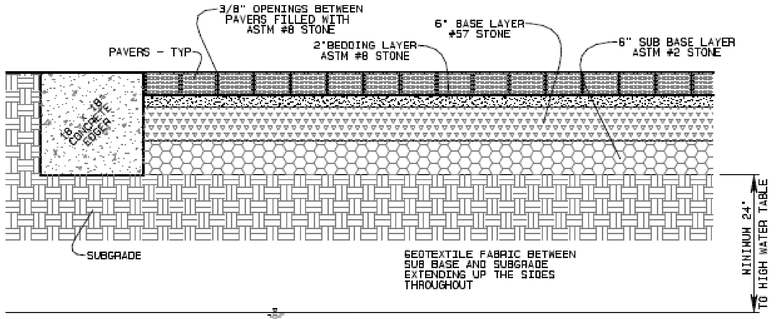
Figure 18 | Rain garden (City of Atlanta)

Figure 19 | Rain garden (City of Atlanta)

PERMEABLE PAVERS & PERMEABLE SYNTHETIC TURF

CAN BE USED TO EXCLUDE AREA FROM IMPERVIOUS AREAS.

NOTE: NO RUNOFF MAY BE DIRECTED TOWARDS PAVERS FROM OUTSIDE ITS SURFACE AREA.



PLAN
SCALE: NTS

PERMEABLE PAVER SYSTEMS

Design Criteria
- Intended for low traffic areas, or for residential or overflow parking applications, not ideal for areas with a tree canopy
- Aesthetically pleasing
- Americans with Disabilities Act (ADA) compliant
- Should be a minimum of two feet above the natural water table
- Should be a minimum of 15 feet away from buildings

Limitations
- Potential for high failure rate if not adequately maintained or used in unstabilized areas
- Geotechnical analysis of soils required; Minimum Infiltration 0.5 In/Hr
- Ineffective under tree canopy, due to clogging

Maintenance Requirements
- High maintenance requirements
- Weed and remove grass out of bricks / blocks as necessary (unless concrete grid pavers are used)
- Sweep or vacuum the pavers as necessary

Pollutant Removal
- 80% TSS Removal

Suitability
- Runoff Reduction
  - 100% of the runoff reduction credit if an underdrain is not used
  - 75% of the runoff reduction credit if an upturned underdrain is used
  - 50% of the runoff reduction credit if an underdrain is used
- Water Quality
- Channel Protection ? May provide partial benefits
- Overbank Flood Protection ? May provide partial benefits
- Extreme Flood Protection ? May provide partial benefits

PERMEABLE PAVERS MAINTENANCE

Common Problems
- Sediment Build-Up and clogging between Pavers
- Settling
- Pavers cracking or splitting

Monthly during dry weather
- Keep the pavers free of trash, debris, and sediment.
- Make sure that there is no standing water in the pavers between storms.
- Remove weeds and grass growing between pavers (unless concrete grid pavers are being used).
- Mow grass within the pavers (only for concrete grid with grass).
- Mow / trim grass or vegetation near the pavers and remove clippings from area.
- Visually inspect the pavers after large storms to ensure the overflow drainage system is working.
- Inspect the pavers for damage and repair.
- Vacuum sweep the paver surface to keep free of sediment.
- After cleaning, additional aggregate may need to be added between the pavers. Replace aggregate between the pavers as necessary.

As Needed Typical Routine Maintenance Activities
- Keep the contributing drainage area and surface of the pavers clear of debris, trash, and sediment.
- Ensure that areas surrounding the practice are stabilized and mowed, remove grass clippings.

Semi-annually in Spring and Fall
- Remove sediment, dirt, leaves, and any debris.
- Replace any joint material that has eroded or washed away.
- Observe the system during a rain event.
- Areas should be routinely inspected for settling and loss of water flow through the system. Repair settled areas.

As Needed in Winter
- Organic deicers may be used to melt ice and snow.
- Snow plows may be used when necessary under the following conditions:
  1. The edges of the plow are beveled.
  2. The blade of the snow plow is raised 1-2 inches.
  3. The snow plow is equipped with snow shoes which allow the blade to glide across uneven surfaces.

Annual Routine Maintenance Activities
- Inspect the surface for deterioration or breaking into fragments.
- Flush the underdrain system to check for clogging (if applicable).

Upon Failure Routine Maintenance Activities
- Remove the Permeable Pavers; include the top and base layers of the practice. Clean pavers and base aggregate, and replace as needed.

Record Keeping
Records of maintenance activities are required for Non-Residential Properties.
Records of maintenance activities are recommended and should be maintained by Homeowners or residential properties.

NOTE: REPLACEMENT WITH NON-PERMEABLE SURFACE REQUIRES APPROVAL FROM THE CITY OF SANDY SPRINGS AND INSTALLATION OF ADDITIONAL BMPs.

SHEET	OF	DRAWING NO.
1	1	SS DETAILS - BMP-01

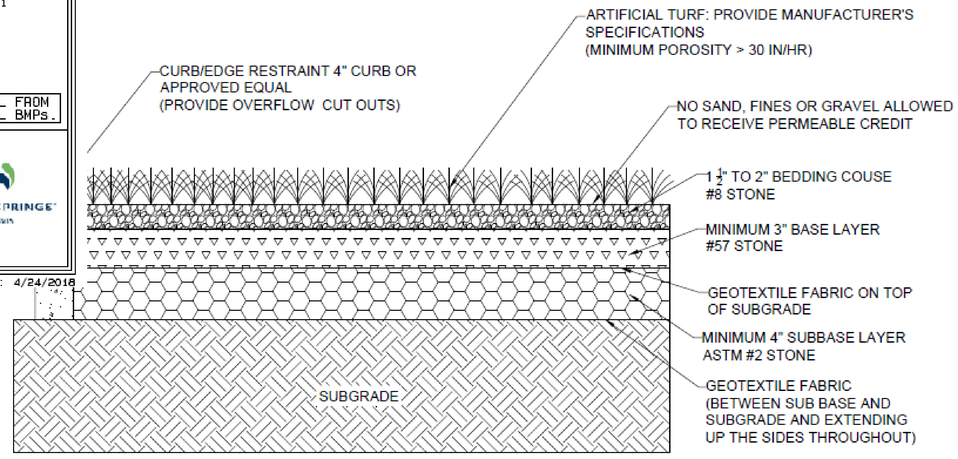
DATE: 4-24-2018	REVISIONS
SCALE: AS NOTED	NO. / DESCRIPTION / DATE
DRAWN: G.E.Q.	
DESIGN: G.E.Q.	
APPROVED: G.E.Q.	
CITY: SANDY SPRINGS	
COUNTY: FULTON	
STATE: GEORGIA	

STANDARD DETAILS
PERMEABLE PAVERS

CITY OF SANDY SPRINGS
1 GALAMBOS WAY
SANDY SPRINGS, GA 30350
(770) 730-5600
www.sandyspringsga.gov

SANDY SPRINGS GEORGIA

Printed: 4/24/2018



PERMEABLE SYNTHETIC TURF
N.T.S.

SUBGRADE SHALL NOT BE COMPACTED.

SHEET	OF	DRAWING NO.
1	1	SS DETAILS - BMP-10

DATE: 8-22-2023	REVISIONS
SCALE: AS NOTED	NO. / DESCRIPTION / DATE
DRAWN: JGA	
DESIGN: JGA.	
APPROVED: JGA	
CITY: SANDY SPRINGS	
COUNTY: FULTON	
STATE: GEORGIA	

STANDARD DETAILS
PERMEABLE SYNTHETIC TURF

CITY OF SANDY SPRINGS
1 GALAMBOS WAY
SANDY SPRINGS, GA 30350
(770) 730-5600
www.sandyspringsga.gov

SANDY SPRINGS GEORGIA

Channel Protection:

Channel Protection will not be required for a developed 1-year design storm of less than 2 cfs in accordance with GSMM Section 2.2.4.2

Zoning	AREA	AREA	Lot Coverage Max	Maximum Impervious	Permeable	Cw	I-1yr	Q = clA
	SF	AC		C=0.95	C=0.25		in/hr	cfs
RD-15	15,000	0.34	38%	5,700	9,300	0.52	4.87	0.9
RD-18	18,000	0.41	35%	6,300	11,700	0.50	4.87	1.0
RD-27	27,000	0.62	30%	8,100	18,900	0.46	4.87	1.4
RD-27	30,000	0.69	30%	9,000	21,000	0.46	4.87	1.5
RD-27	35,000	0.80	30%	10,500	24,500	0.46	4.87	1.8
RD-27	39,000	0.90	30%	11,700	27,300	0.46	4.87	2.0
RE-1	40,000	0.92	25%	10,000	30,000	0.43	4.87	1.9
RE-1	43,560	1.00	35%	15,246	28,314	0.50	4.87	2.4
RE-1	55,000	1.26	35%	19,250	35,750	0.50	4.87	3.0

Overbank Flood Control

Any project of 5,000 square feet or more impervious shall provide Overbank Flood Protection. Analysis of pre-development and proposed developed conditions for the 2-yr, 5-yr, 10-yr, and 25-year design storms.

Utilize NOAA-14 Atlas for current rainfall depths and intensities.

Existing conditions ALLOWABLE FLOWS may assume “virgin forest” conditions or utilize the Peak Rate Reduction method in Development Code Section 9.6.12

Design Professional may use the following modeling methodologies:

NRCS TR-55 method
Modified Rational Method.

Extreme Flood Control

Design Professional must perform analysis for the 50-year and 100-year design storm event.

For Single Family Residential projects less than 1 acre in size, it is assumed that the project will not have adverse downstream impacts if the Allowable flows are met for ALL design storm events.

Hydrology Study Requirements

HYDROLOGY STUDY REQUIREMENTS

Required for ANY project creating or replacing 5,000 square feet of Impervious Surface.

MUST BE PREPARED BY A REGISTERED DESIGN PROFESSIONAL IN THE STATE OF GEORGIA (i.e. PE, RLS, RLA)

May be separate report or included within the Construction Plans for Single Family projects.

Existing Conditions Peak Flows / Allowable discharge rate calculations

Developed Conditions un-attenuated flow rate calculations

Water Quality / Runoff Reduction volume calculations and associated BMP Design

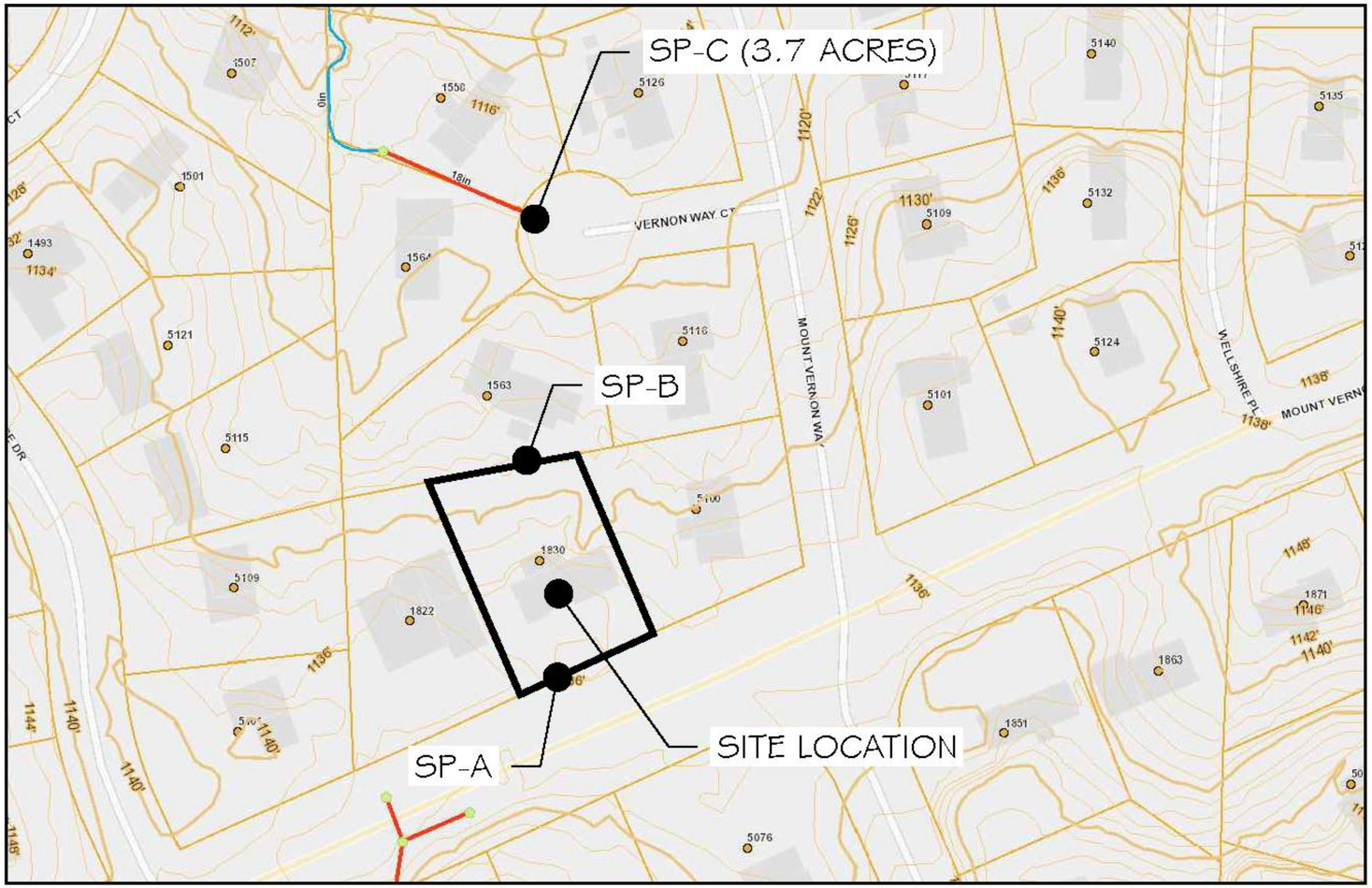
Detention practice calculations and design

Extreme Flood and Downstream Analysis.

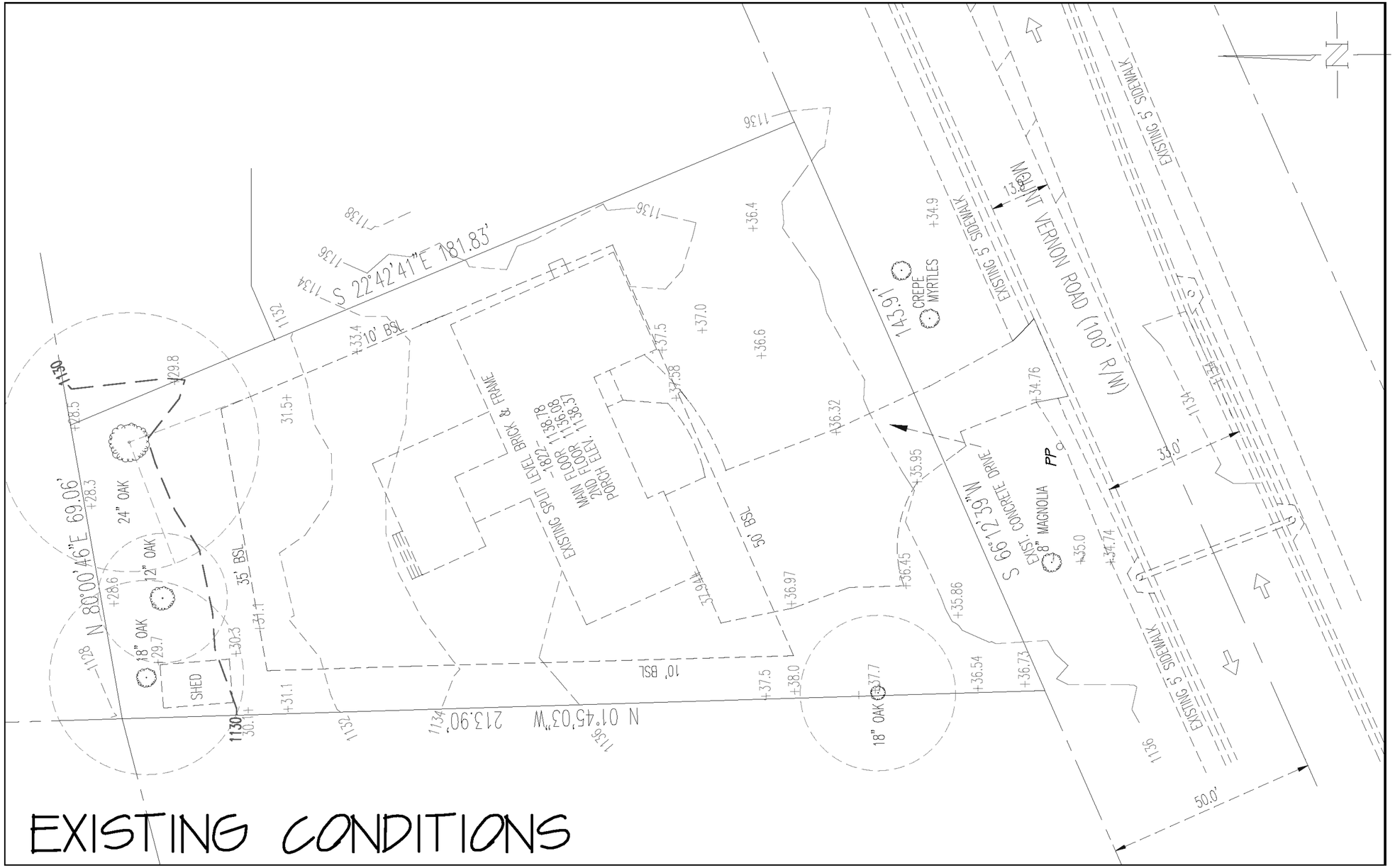
Construction Details

GI/LID Feasibility analysis, if 1 acre in size or more OR if design professional is requesting a determination that Runoff Reduction is infeasible.

Example Problem



STUDY BASIN / SITE LOCATION

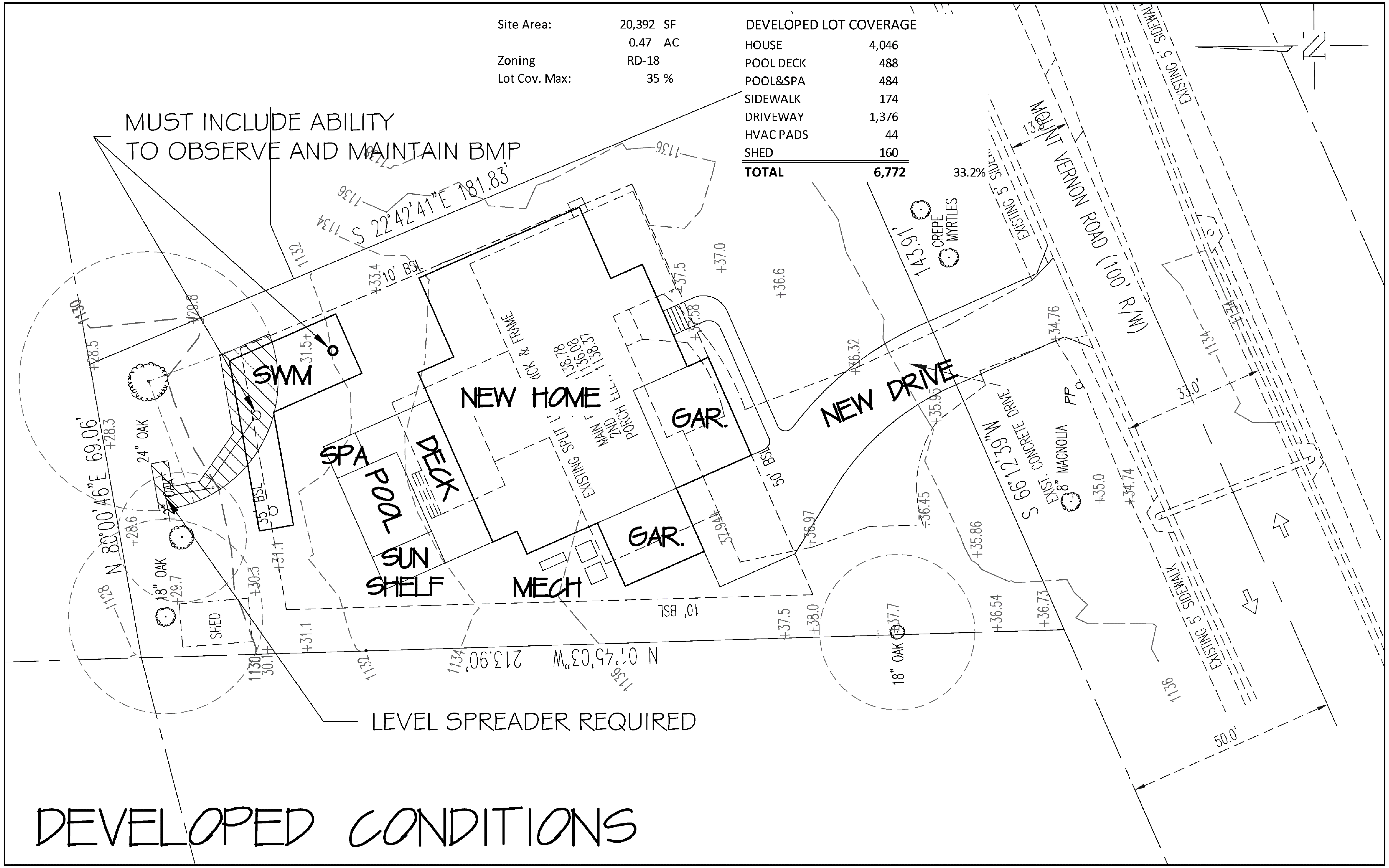


EXISTING CONDITIONS

DEVELOPED CONDITIONS

Site Area:	20,392	SF
	0.47	AC
Zoning	RD-18	
Lot Cov. Max:	35	%

DEVELOPED LOT COVERAGE		
HOUSE	4,046	
POOL DECK	488	
POOL&SPA	484	
SIDEWALK	174	
DRIVEWAY	1,376	
HVAC PADS	44	
SHED	160	
TOTAL	**6,772**	33.2%

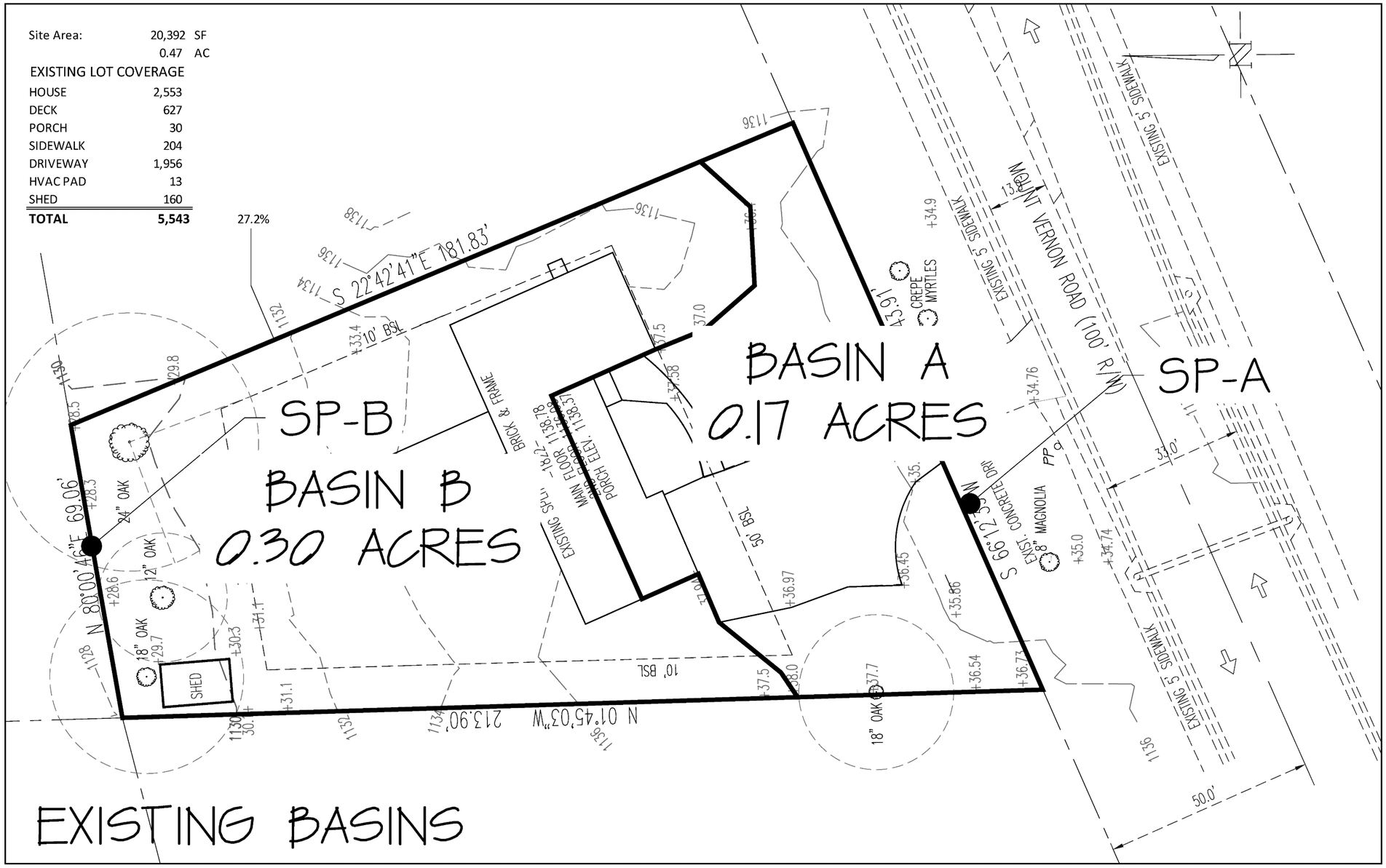


Site Area:	20,392	SF
	0.47	AC

EXISTING LOT COVERAGE

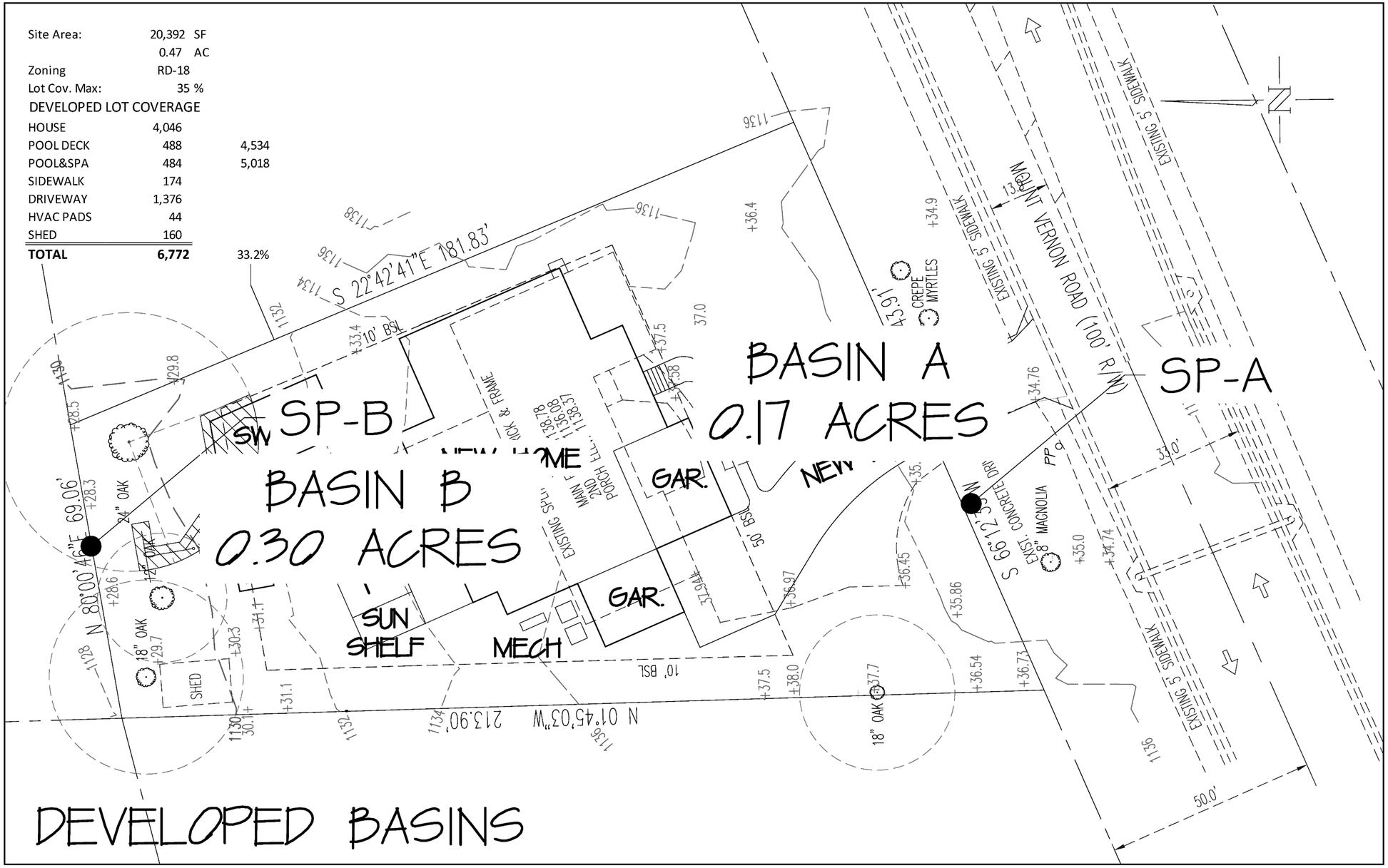
HOUSE	2,553
DECK	627
PORCH	30
SIDEWALK	204
DRIVEWAY	1,956
HVAC PAD	13
SHED	160
TOTAL	**5,543**

27.2%



EXISTING BASINS

Site Area:	20,392 SF	
	0.47 AC	
Zoning	RD-18	
Lot Cov. Max:	35 %	
DEVELOPED LOT COVERAGE		
HOUSE	4,046	
POOL DECK	488	4,534
POOL&SPA	484	5,018
SIDEWALK	174	
DRIVEWAY	1,376	
HVAC PADS	44	
SHED	160	
TOTAL	**6,772**	33.2%



EXISTING CONDITIONS

Basin A (To Road)

Area: 7,379 SF
0.17 AC

Rational Runoff C

Description	Area	C	CA	%	PDRR
Impervious	2,820	0.95	2679	38.2%	19.1%
Landscaped	4,559	0.30	1368		
Natural		0.25	0		
TOTAL	7,379	0.55	4047		
CA =	0.09				

EXISTING FLOW SUMMARY - BASIN A

Storm Frequency (yrs)	CA	I (in/hr)	Q (cfs)	$Q_{ALLOWABLE}$ (cfs)
1	0.09	4.87	0.45	0.37
2	0.09	5.62	0.52	0.42
5	0.09	6.85	0.64	0.51
10	0.09	7.91	0.73	0.59
25	0.09	9.42	0.88	0.71
50	0.09	10.60	0.98	0.80
100	0.09	11.90	1.11	0.89

Basin B (To Rear P/L)

Area: 13,003 SF
0.30 AC

Rational Runoff C

Description	Area	C	CA	%	PDRR
Impervious	2,724	0.95	2588	20.9%	10.5%
Landscaped	10,279	0.30	3084		
Natural		0.25	0		
TOTAL	13,003	0.44	5672		
CA =	0.13				

EXISTING FLOW SUMMARY - BASIN B

Storm Frequency (yrs)	CA	I (in/hr)	Q (cfs)	$Q_{ALLOWABLE}$ (cfs)
1	0.13	4.87	0.63	0.57
2	0.13	5.62	0.73	0.66
5	0.13	6.85	0.89	0.80
10	0.13	7.91	1.03	0.92
25	0.13	9.42	1.23	1.10
50	0.13	10.60	1.38	1.24
100	0.13	11.90	1.55	1.39

EXISTING BASINS CALCS

DEVELOPED CONDITIONS

Basin A (To Road)

Area: 5,824 SF
0.13 AC

Rational Runoff C

Description	Area	C	CA
Impervious	1,074	0.95	1020
Landscaped	4,750	0.30	1425
Natural		0.25	0
TOTAL	5,824	0.42	2445
CA =	0.06		

DEVELOPED FLOW SUMMARY - BASIN A

Storm Frequency (yrs)	CA	I (in/hr)	Q (cfs)	$Q_{ALLOWABLE}$ (cfs)	SWM REQ'D?
1	0.06	4.87	0.27	0.37	NO
2	0.06	5.62	0.32	0.42	NO
5	0.06	6.85	0.38	0.51	NO
10	0.06	7.91	0.44	0.59	NO
25	0.06	9.42	0.53	0.71	NO
50	0.06	10.60	0.60	0.80	NO
100	0.06	11.90	0.67	0.89	NO

Basin B (To Rear P/L - Unattenuated)

Area: 14,568 SF
0.334 AC

Rational Runoff C

Description	Area	C	CA	%	PDRR
Impervious	5,698	0.95	5413	39.1%	19.6%
Landscaped	8,870	0.30	2661		
Natural		0.25	0		
TOTAL	14,568	0.55	8074		
CA =	0.19				

DEVELOPED FLOW SUMMARY - BASIN B

Storm Frequency (yrs)	CA	I (in/hr)	Q (cfs)	$Q_{ALLOWABLE}$ (cfs)	SWM REQ'D?
1	0.19	4.87	0.90	0.73	YES
2	0.19	5.62	1.04	0.84	YES
5	0.19	6.85	1.27	1.02	YES
10	0.19	7.91	1.47	1.18	YES
25	0.19	9.42	1.75	1.40	YES
50	0.19	10.60	1.96	1.58	YES
100	0.19	11.90	2.21	1.77	YES

DEVELOPED BASINS CALCS

Runoff Reduction Calculations

Runoff Reduction Requirements

Site Area	0.47 ac	=	20,392 ft^2	
Impervious Area (I) =	0.16 ac	=	6,772 ft^2	33.2%
R_V =	0.35			
P =	1.20 in			
RR_V =	**711 ft^3**	**Alternate RRv Calc for SFR = 6,772 x 0.1**		
WQ_V =	**854 ft^3**	**RRv = 677 ft^2 would be acceptable!!**		

Volume Calculations

Top of soil Elev. =	1131.0
Minimum Cover =	8 inches
Pond Area. =	635.0 sf
Pond Bottom =	1124.0
Depth of Medium =	6.3 feet
Gross Volume =	4,022 ft^3
Medium Void Ratio =	40%
Net Volume =	1,609 ft^3
RR_V Elevation =	1126.8
Volume provided =	1609 cf
RR_V provided =	711 cf
WQ_V provided =	854 cf

Critical Storm Duration Calculations

Storm Frequency (yrs)	CA	I (in/hr)	Q (cfs)	$Q_{ALLOWABLE}$ (cfs)	a	b	T_d	V_P (cft)	P_{180} (in)	P_{Td} (in)	V_{MAX} (cft)	$V_{Req'd}$ (cft)
1	0.19	4.87	0.90	**0.73**	97.05	12.88	12.38	150	1.79	0.73	371	1,082
2	0.19	5.62	1.04	**0.84**	123.19	15.91	13.54	164	2.03	0.83	399	1,110
5	0.19	6.85	1.27	**1.02**	157.99	18.44	14.08	176	2.44	1.02	421	1,132
10	0.19	7.91	1.47	**1.18**	184.23	19.96	14.04	172	2.82	1.18	412	1,123
25	0.19	9.42	1.75	**1.40**	219.21	21.13	13.83	171	3.38	1.40	413	1,124
50	0.19	10.60	1.96	**1.58**	249.86	22.28	13.85	171	3.84	1.58	417	1,128
100	0.19	11.90	2.21	**1.77**	278.71	23.01	13.59	161	4.34	1.77	396	1,107
										Minimum Pond Volume =		**1,132**
										RRV Req'd =		**711**
										Total Volume Req'd =		**1,844**

$T_d = ((2*C*A*a*b)/Qa)^{0.5}$-

$V_{Preliminary} = 60[CAa - (2CabAQ_A)^{0.5} + (Q_A/2)(b-T_C)]$

$V_{MAX} = V_P * (P_{180}/P_{Td})$

$VR_{eq'd} = RR_V + V_{MAX}$

POND VOLUME CALCULATIONS

Top of soil Elev. =	1131.0
Minimum Cover =	8 inches
Pond Area. =	630.0 sf
Pond Bottom =	1123.0
Depth of Medium =	7.3 feet
Gross Volume =	4,620 ft^3
Medium Void Ratio =	40%
Net Volume =	1,848 ft^3
RR_V Elevation =	1125.8
Volume provided =	**1848** ft^3
RR_V provided =	711 ft^3
WQ_V provided =	854 ft^3
Outlet IE Elev =	1127.7
Vol at IE =	1184 ft^3

OUTLET SIZE CALCULATIONS:

$Q = CA(2gH)^{1.5}$

Q =	1.77 cfs	Use 25-year storm
C =	0.6	
g =	32.2 fps	
IE Elev =	1127.7	
Top Pond =	1129.0	
H =	1.5 ft	

$A = Q/C(2gH)^{1.5}$

A = 0.0108 ft^2

$A = \pi(D^2/4)$

$D = (4A/\pi)^{0.5}$

D = 0.1172702 ft

D = 1.41 inches

NOTE: USE 4" MINIMUM DISCHARGE PIPE OR PROVIDE ACCESS TO OUTLET

POND DRAW DOWN TIME

T = V / (K*SA)

V =	1184 ft^3	Volume to Drain
K =	0.5 in/hr	Measured Infiltration Rate
K =	1.0 ft/day	Hydraulic Condoctivity
SA =	630.0 ft^2	Surface Area for Infiltration
T =	1.88 days	
T =	**45.12 hours**	**DRAIN TIME MUST BE < 72 HOURS**

STORMWATER MANAGEMENT CALCS

Runoff Reduction Calculations

Runoff Reduction Requirements

Site Area		0.47 ac	=	20,392 ft^2	
Impervious Area (I) =		0.16 ac	=	6,772 ft^2	33.2%
R_V =	0.35				
P =	1.20 in				
RR_V =	**711 ft^3**				
WQ_V =	**854 ft^3**				

Alernate RRv Calc for SFR = 6,772 x 0.1
RRv = 677 ft^2 would be acceptable!!

Critical Storm Duration Calculations

Storm Frequency (yrs)	CA	I (in/hr)	Q (cfs)	$Q_{ALLOWABLE}$ (cfs)	a	b	T_d	V_P (cft)	P_{180} (in)	P_{Td} (in)	V_{MAX} (cft)	$V_{Req'd}$ (cft)
1	0.19	4.87	0.90	**0.73**	97.05	12.88	12.38	150	1.79	0.73	371	1,082
2	0.19	5.62	1.04	**0.84**	123.19	15.91	13.54	164	2.03	0.83	399	1,110
5	0.19	6.85	1.27	**1.02**	157.99	18.44	14.08	176	2.44	1.02	421	1,132
10	0.19	7.91	1.47	**1.18**	184.23	19.96	14.04	172	2.82	1.18	412	1,123
25	0.19	9.42	1.75	**1.40**	219.21	21.13	13.83	171	3.38	1.40	413	1,124
50	0.19	10.60	1.96	**1.58**	249.86	22.28	13.85	171	3.84	1.58	417	1,128
100	0.19	11.90	2.21	**1.77**	278.71	23.01	13.59	161	4.34	1.77	396	1,107
										Minimum Pond Volume =		**1,132**
											RRV Req'd =	**711**
											Total Volume Req'd =	**1,844**

$T_d = ((2*C*A*a*b)/Qa)^{0.5}$-

$V_{Preliminary} = 60[CAa - (2CabAQ_A)^{0.5} + (Q_A/2)(b-T_C)]$

$V_{MAX} = V_P * (P_{180}/P_{Td})$

$VR_{eq'd} = RR_V + V_{MAX}$

SEE GSMM SECTION 3.3.6.2

POND VOLUME CALCULATIONS		
Top of soil Elev. =	1131.0	
Minimum Cover =	8	inches
Pond Area. =	630.0	sf
Pond Bottom =	1123.0	
Depth of Medium =	7.3	feet
Gross Volume =	4,620	ft^3
Medium Void Ratio =	40%	
Net Volume =	1,848	ft^3
RR_V Elevation =	1125.8	
Volume provided =	**1848**	ft^3
RR_V provided =	711	ft^3
WQ_V provided =	854	ft^3
Outlet IE Elev =	1127.7	
Vol at IE =	1184	ft^3

CALCULATE POND AREA

GRAVEL VOIDS ARE ASSUMED TO BE 40%

OUTLET SIZE CALCULATIONS:			
$Q = CA(2gH)^{1.5}$			
Q =	1.77	cfs	Use 25-year storm
C =	0.6		
g =	32.2	fps	
IE Elev =	1127.7		
Top Pond =	1129.0		
H =	1.5	ft	
$A = Q/C(2gH)^{1.5}$			
A =	0.0108	ft^2	
$A = \pi(D^2/4)$			
$D = (4A/\pi)^{0.5}$			
D =	0.11727	ft	
D =	**1.41**	**inches**	
NOTE: USE 4" MINIMUM DISCHARGE PIPE OR PROVIDE ACCESS TO OUTLET			

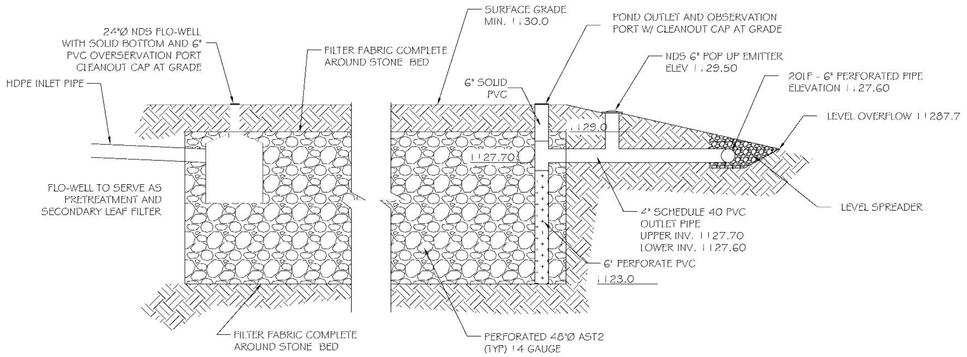
DETERMINE ORIFICE SIZE

USE OF 4” MINIMUM OUTLET PIPE MAY BE ALLOWED IF ACCESS TO OCS IS UNABLE TO BE PROVIDED BASED ON DISCHARGE ANALYSIS.

POND DRAW DOWN TIME			
T = V / (K*SA)			
V =	1184	ft^3	Volume to Drain
K =	0.5	in/hr	Measured Infiltration Rate
K =	1.0	ft/day	Hydraulic Condoctivity
SA =	630.0	ft^2	Surface Area for Infiltration
T =	1.88	days	
T =	**45.12**	**hours**	**DRAIN TIME MUST BE < 72 HOURS**

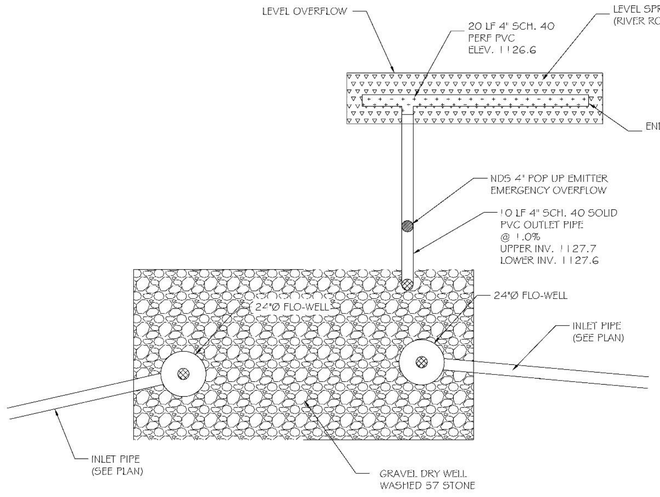
FOR ANY DETENTION VOLUME BELOW OUTLET, CALCULATE DRAWDOWN TIME THROUGH INFILTRAITON

MUST NOT EXCEED 72 HOURS



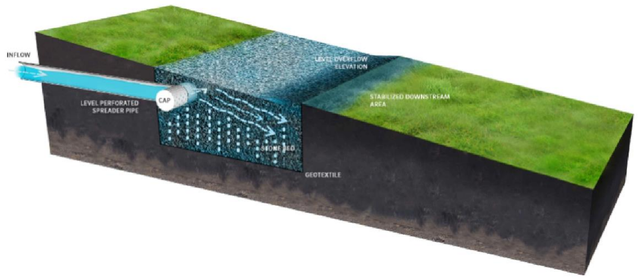
DRY WELL – ELEVATION

NO SCALE



DRY WELL – PLAN

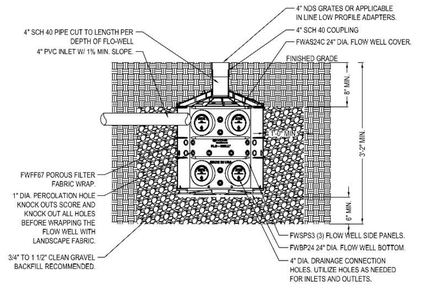
NO SCALE



LEVEL SPREADER SCHEMATIC

NO SCALE

NDS, INC.
851 NORTH HARVARD AVE.
LINDSAY, CA 93247
TOLL FREE: 1-800-726-1994
PHONE: (559) 562-9888
FAX: (559) 562-4488
www.ndspro.com



NOTES:
1. MUST BE INSTALLED 10' AWAY FROM STRUCTUREOR FOUNDATION.
2. FWAS24 KIT DOES NOT COME WITH FWPB24 BTM.
3. REFERENCE FLO-WELL CALCULATOR ON NDSPRO.COM
4. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
5. DO NOT SCALE DRAWING.
6. THIS DRAWING IS INTENDED FOR USE BY ARCHITECTS, ENGINEERS, CONTRACTORS, CONSULTANTS AND DESIGN PROFESSIONALS FOR PLANNING PURPOSES ONLY.
7. ALL INFORMATION CONTAINED HEREIN WAS CURRENT AT THE TIME OF DEVELOPMENT BUT MUST BE REVIEWED AND APPROVED BY THE PRODUCT MANUFACTURER TO BE CONSIDERED ACCURATE.

FLO-WELL DRY WELL SYSTEM

FLO-WELL INSTALLATION DETAIL - LOAD CLASS "A" & "B" - GRAVEL INSTALLATION DETAIL

REVISION DATE 3-5-2015

As-Built Requirements

As-Built Review Process

As-Builts are submitted through the CSS Portal.

- Drawings shall be uploaded into the permit file and assigned for review
- Reviews are scheduled for completion within 3 business days of submittal
- Comments/deficiencies will be sent via email to all contacts within the permit
- As-built approval is required prior to issuance of Certificate of Occupancy/Completion.

Hydrology As-built Requirements:

- Design Engineer shall be engaged to inspect and certify the as-built stormwater management system.
- As-built Stormwater Management System shall be shown and detailed on the As-built drawings.

STORM WATER MANAGEMENT FACILITY CERTIFICATION

_____, a (Registered Professional Engineer or a Professional Land Surveyor or a Registered Landscape Architect) in the State of Georgia, hereby certify with my signature and seal, that the STORM WATER MANAGEMENT facility (facilities) for the Project known as _____ Permit Number _____ lying in Land Lot _____ of Fulton County, Georgia's _____ Land District, has (have) been constructed in conformance with the approved plans and specifications and in accordance with the City of Sandy Springs' requirements. I further certify that I or my designated individual was present during its installation. This is the _____ day of _____, 20_____.

_____ _____

Signature & Seal Printed Name

AS-BUILT STORMWATER DATA - BASIN X

Storm Frequency (yrs)	$Q_{ALLOWABLE}$ (cfs)	$Q_{AS\text{-}BUILT}$ (cfs)	Required Storage Volume (cft)	As-built Storage Volume (cft)
2				
5				
10				
25				
50				
100				

Questions?

Thank You!

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weleton@sandyspringsga.gov

End of Presentation