

Module 4 of 4

# Stormwater

# Management

# Design Review

NJ DEP Division of Water Quality

September 3, 2020



<b>Module 4 (3:06)</b>	
<b>No., Subject, Presenter</b>	<b>(duration)</b>
<b>1. Design Example 1, Brian</b>	<b>(45 minutes)</b>
	<b>(3 minute break)</b>
<b>2. Design Example 2, Changi</b>	<b>(30 minutes)</b>
<b>3. Design Example 3, Brian</b>	<b>(30 minutes)</b>
	<b>(3 minute break)</b>
<b>4. Design Example 4, Changi</b>	<b>(30 minutes)</b>
<b>5. Design Example 5, Minesh</b>	<b>(30 minutes)</b>
<b>6. Program Updates &amp; Closing Comments, Jim</b>	<b>(15 minutes)</b>

# PLAN REVIEW

## EXAMPLE 1

Brian Salvo  
NJDEP Division of Water Quality  
SWMDR Training Module 4  
September 3, 2020

# Presentation Goals

## Goals

- Review site plans and stormwater management report
- Identify any errors with the design

# Determining Applicable Design & Performance Standards

## Does the Development

- Trigger the municipality's SCO?
- Disturb one acre or more?
- Increase impervious coverage by  $\frac{1}{4}$  acre or more?

# Determining Applicable Design & Performance Standards

## Municipal Stormwater Control Ordinance:

- Major Development:

*Any development that provides for ultimately disturbing one or more acres of land or more than 10,000 square feet of new impervious surface.*

# Familiarize Yourself with the Site

Where are the pre-construction conditions?

- Important in determining the requirements
- Existing land cover
- Has the existing land cover existed for the past 5 years?

# Pre-Development Site



# Stormwater Management Report

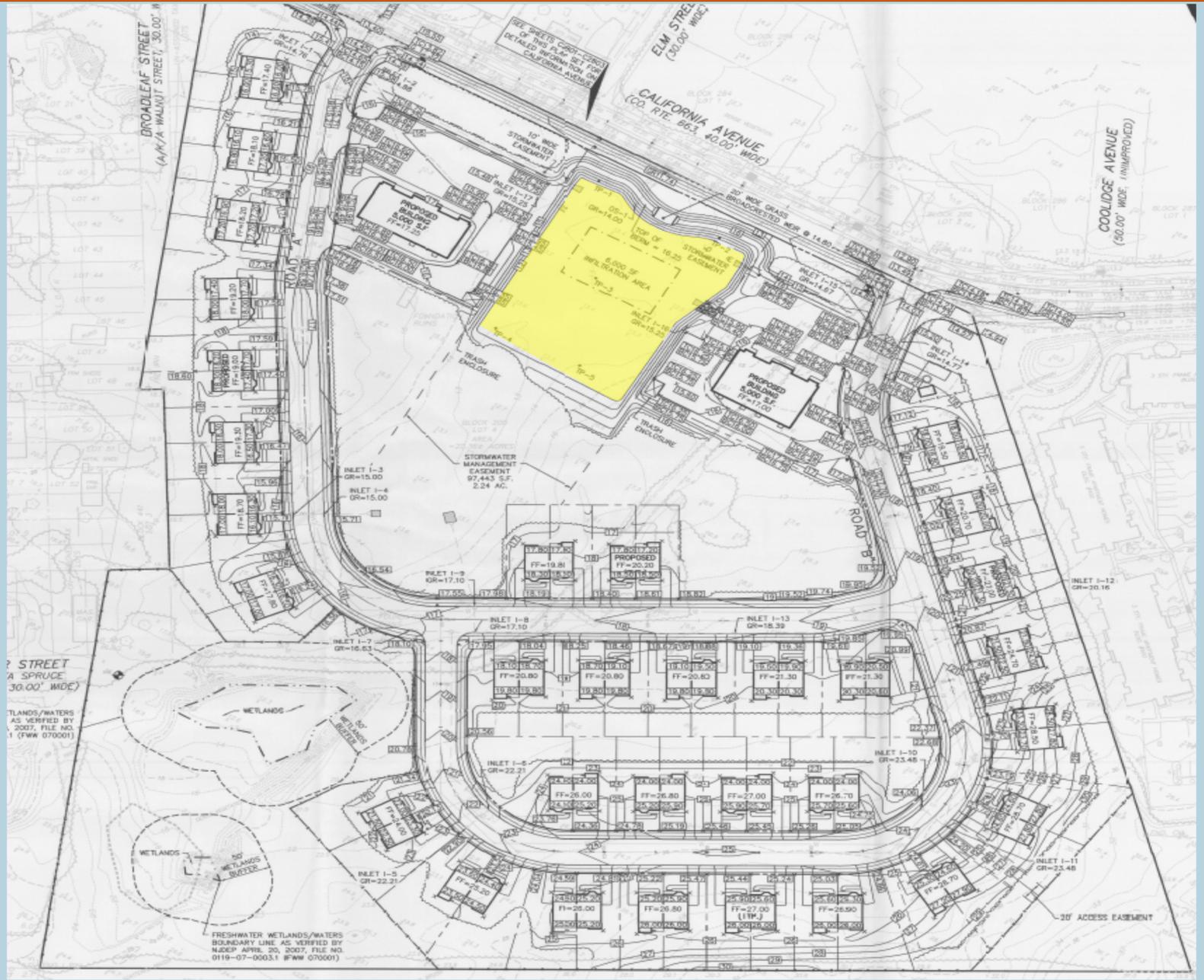
## Existing Coverage

Coverage Type	Area
Woods	19.71 acres
Open space	0.95 acres

## Proposed Coverage

Coverage Type	Area
Road, Roof, Driveway	5.50 acres
Open space	8.25 acres
Woods	6.91 acres

# Post-Development Site



# Determining Applicable Design & Performance Standards

## Disturbance & Increase in Impervious Area

- Total Disturbance:
  - 13.5 acres
- Increase in impervious area:
  - 5.5 acres
- Is the site a major development?
  - Yes

# Determining Applicable Design & Performance Standards

## Which standards are required?

- Water Quantity
  - Required
- Water Quality
  - Increase in impervious coverage > 0.25 acre
  - Required
- Groundwater Recharge
  - Planning Area 1 – Not “previously developed”
  - Required
- Nonstructural
  - Required for all major developments

# Nonstructural Strategies Used

What nonstructural measures were provided?

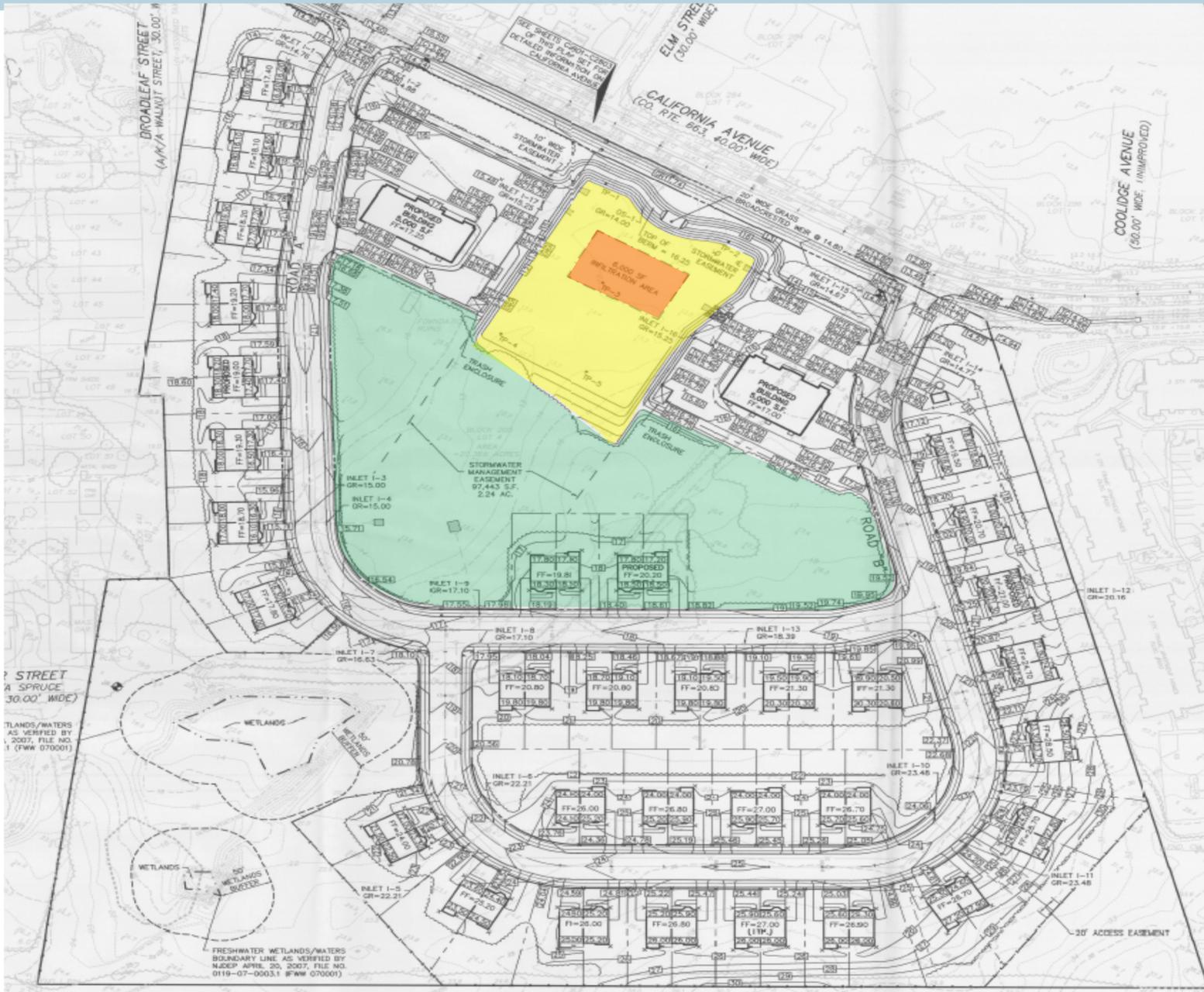
- Maximize the protection of natural drainage features and vegetation (#3)
- Minimize land disturbance including clearing and grading (#5)
- Minimize soil compaction (#6)

# Nonstructural Strategies Used

What nonstructural measures were provided?

- Minimize impervious surface or disconnect the flow of runoff over impervious surfaces (#2)
- Provide low maintenance landscaping that encourages retention and planting of native vegetation that minimizes the use of lawns, fertilizers, and pesticides (#7)

# Nonstructural Strategies



# Proposed Structural BMPs

## Infiltration Basin

- Lower area of BMP is infiltration area
  - 6,000 square feet
- Upper area of BMP to remain as woods

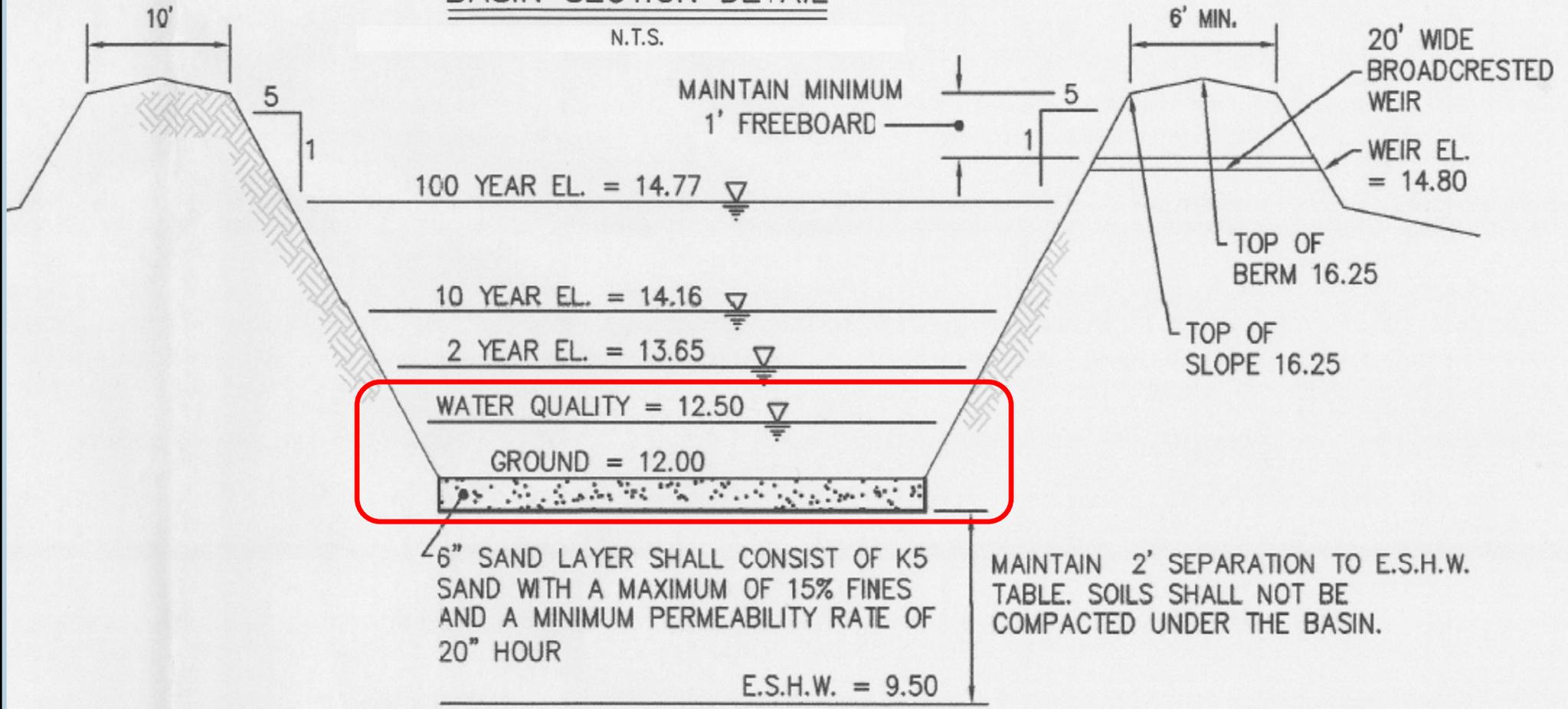
# Soil Testing

## Infiltration basin

- 6,000 square foot infiltration area
  - Required – 2 soil profile pits in infiltration area
  - Provided – 1 soil profile pit in infiltration area  
4 soil profile pits nearby
  - Also need determination of permeability
    - Used undisturbed tube permeameter tests - Acceptable

# Basin Detail

## BASIN SECTION DETAIL



# Test Pit #1

<b>Date:</b>	05/13/11	
<b>Performed by:</b>	[REDACTED]	
<b>Method:</b>	Test pit	
<b>Surroundings:</b>	Woodland	
<b>Depth (in) below existing grade</b>		<b>Sample Depth (in)</b>
+2		
0	Organic layer	
8	Gray (10YR 5/1) sand; single grain; loose	
39	Brownish-yellow (10YR 6/6) loamy sand; weak subangular blocky to granular structure; friable	24 (UD)
60	Light gray (2.5Y 7/1) loamy sand; common, coarse, prominent, yellowish-brown (10YR 5/6) mottles; subangular blocky structure; friable; saturated at 50 inches	
84+	White (10YR 8/1) sand; single grain; loose; saturated	
Surface Elevation=12.7± SHW Elevation=9.5± GW Elevation=8.5±		<b>Depth (in) below existing grade</b>
	<b>Seasonal High Water Table:</b>	39
	<b>Ground Water:</b>	50
Note: Test pit abandoned at 84 inches due to collapse from soil saturation		

# Test Pit #2

**Date:** 05/13/11  
**Performed by:** [REDACTED]  
**Method:** Test pit  
**Surroundings:** Woodland

**Depth (in) below existing grade**

**Sample Depth (in)**

Depth (in) below existing grade	Soil Description	Sample Depth (in)
+2		
0	Organic layer	
6	Gray (10YR 5/1) sand; single grain; loose	
16	Light yellowish-brown (2.5Y 6/4) loamy sand; weak subangular blocky to granular structure; friable	
36	Brownish-yellow (10YR 6/6) loamy sand to sandy loam; weak subangular blocky to granular structure; friable	24 (UD)
56	Light gray (2.5Y 7/1) loamy sand; few, coarse, prominent, yellowish-brown (10YR 5/6) mottles; subangular blocky structure; friable; saturated at 44 inches	
78+	White (10YR 8/1) sand; single grain; loose; saturated	

Surface Elevation=12.0±	
SHW Elevation=9.0±	<b>Depth (in) below existing grade</b>
GW Elevation=8.3±	
	<b>Seasonal High Water Table: 36</b>
	<b>Ground Water: 44</b>

Note: Test pit abandoned at 78 inches due to collapse from soil saturation

# Test Pit #3

**Date:** 05/13/11  
**Performed by:** [REDACTED]  
**Method:** Test pit  
**Surroundings:** Woodland

Depth (in) below existing grade		Sample Depth (in)
+2		
0	Organic layer	
6	Gray (10YR 6/1) sand; single grain; loose	
24	Olive yellow (2.5Y 6/6) loamy sand; weak subangular blocky to granular structure; friable	18 (UD)
40	Yellow (10YR 7/6) loamy sand; subangular blocky structure; friable	
60	Light gray (2.5Y 7/1) loamy sand; few, coarse, prominent, yellowish-brown (10YR 5/6) mottles; subangular blocky structure; friable; saturated at 54 inches	
78+	White (10YR 8/1) sand; single grain; loose; saturated	
Surface Elevation=12.8± SHW Elevation=9.5± GW Elevation=8.3±		<b>Depth (in) below existing grade</b>
<b>Seasonal High Water Table:</b>		40
<b>Ground Water:</b>		54
Note: Test pit abandoned at 78 inches due to collapse from soil saturation		

# Test Pit #4

**Date:** 05/13/11  
**Performed by:** [REDACTED]  
**Method:** Test pit  
**Surroundings:** Woodland

Depth (in) below existing grade		Sample Depth (in)
+2		
0	Organic layer	
4	Gray (10YR 5/1) sand; single grain; loose	
32	Dark yellowish-brown (2.5Y 4/6) loamy sand; weak subangular blocky to granular structure; friable	24 (UD)
48	Yellow (10YR 7/6) sand; single grain; loose	
56	Light gray (2.5Y 7/2) loamy sand; common, coarse, prominent, yellowish-brown (10YR 5/6) mottles; subangular blocky structure; friable	
84+	White (10YR 8/1) sand; single grain; loose; saturated	
Surface Elevation=13.4± SHW Elevation=9.4± GW Elevation=7.9±		<b>Depth (in) below existing grade</b>
<b>Seasonal High Water Table:</b>		48
<b>Ground Water:</b>		66
Note: Test pit abandoned at 84 inches due to collapse from soil saturation		

# Test Pit #5

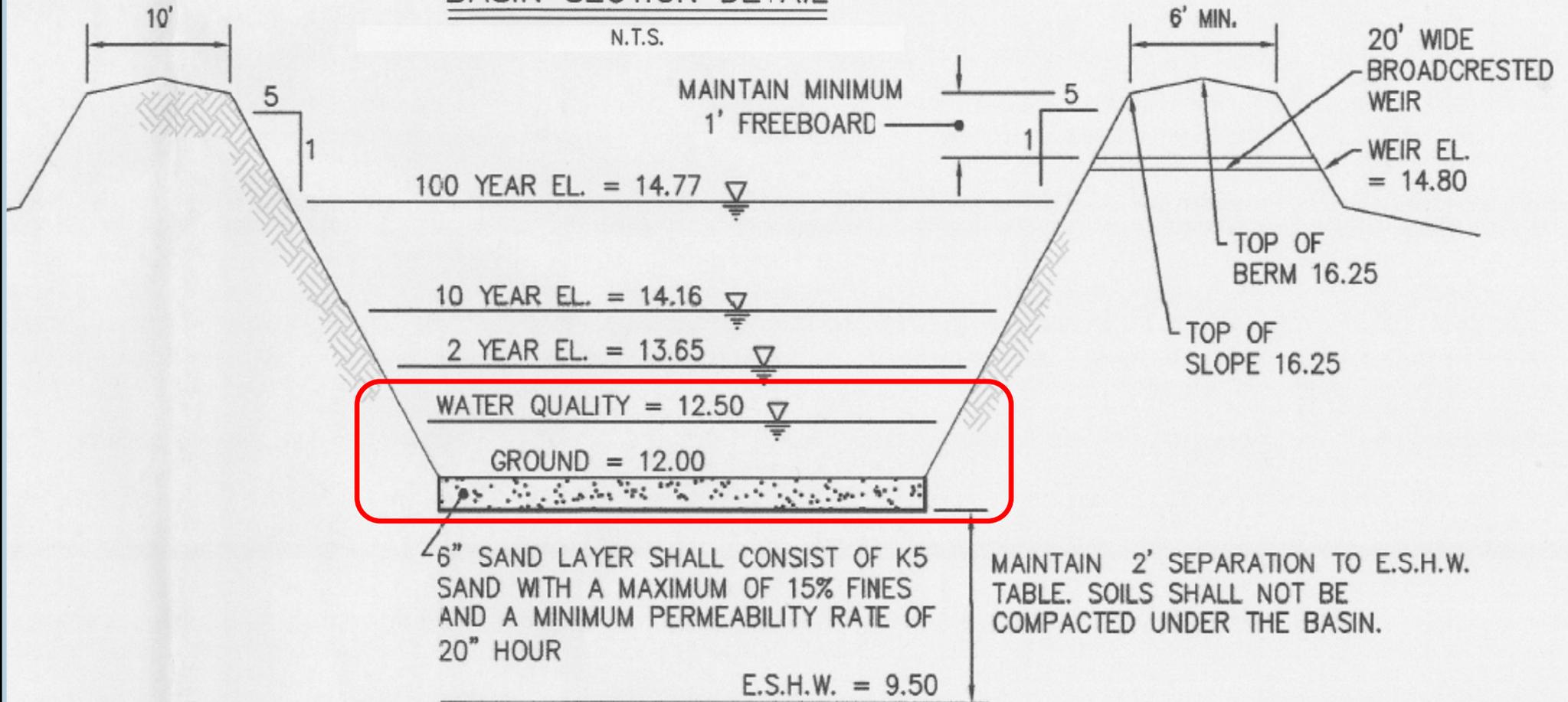
<b>Date:</b>	05/13/11	
<b>Performed by:</b>	[REDACTED]	
<b>Method:</b>	Test pit	
<b>Surroundings:</b>	Woodland	
<b>Depth (in) below existing grade</b>		<b>Sample Depth (in)</b>
+2		
0	Organic layer	
6	Very dark grayish-brown (10YR 3/2) sand; single grain; loose	
16	Olive yellow (2.5Y 7/4) loamy sand; subangular blocky structure; friable	
50	Yellow (10YR 6/6) loamy sand; weak subangular blocky to granular structure; friable	24 (UD)
66	Light gray (2.5Y 7/2) loamy sand; common, coarse, prominent, yellowish-brown (10YR 5/6) mottles; subangular blocky structure; friable; saturated at 62 inches	
80+	White (10YR 8/1) sand; single grain; loose; saturated	
Surface		
Elevation=13.7±		
SHW		<b>Depth (in) below existing grade</b>
Elevation=9.5±		
GW		
Elevation=8.5±		
	<b>Seasonal High Water Table:</b>	50
	<b>Ground Water:</b>	62
Note: Test pit abandoned at 80 inches due to collapse from soil saturation		
Sample code: UD = undisturbed sample		

# Test Pit Summary

Test Pit	SHWT Elevation
TP #1	9.5 ft
TP #2	9.0 ft
TP #3	9.5 ft
TP #4	9.4 ft
TP #5	9.5 ft

# Basin Detail

## BASIN SECTION DETAIL



# Permeability Test

## SAMPLE AND EQUIPMENT DATA

Radius of Permeameter Tube = 0.40 cm  
 Radius of Thin Walled Sample Tube = 2.40 cm  
 Height of Tube Before Sample is Added = 15.2 cm or 6.00 in  
 Height of Tube After Sample is Added = 3.8 cm or 1.4961 in  
 Length of Sample = 11.4 cm = 4.5039 in

## TUBE PERMEAMETER TEST DATA

1. TEST # TP-3 REPLICATE (letter) A DATE COLLECTED 5/13/2011

2. MATERIAL TESTED  
 FILL  NATIVE SOIL - (indicate depth)  18 in

3. TYPE OF SAMPLE:           UNDISTURBED  DISTURBED

4. BULK DENSITY DETERMINATION (Disturbed Samples Only):

Sample Density Used:            No            Yes

5. HEIGHT OF WATER LEVEL ABOVE RIM OF BASIN IN INCHES:

At the beginning of each test interval,            $H_1 =$  20.50 cm  
 At the end of each test interval,                    $H_2 =$  10.80 cm

6. RATE OF WATER LEVEL DROP:

TIME $T_1$ (start of test interval)	TIME $T_2$ (end of test interval)	TIME $T_3$ (Interval in minutes)	AVERAGE T (minutes)
<u>0.00</u>	<u>42.67</u>	<u>0.711</u>	
<u>0.00</u>	<u>43.76</u>	<u>0.729</u>	
<u>0.00</u>	<u>43.47</u>	<u>0.725</u>	
<u>0.00</u>	<u>44.25</u>	<u>0.738</u>	
<u>0.00</u>	<u>46.67</u>	<u>0.778</u>	<u>0.74</u>

7. CALCULATION OF PERMEABILITY:

$$\begin{aligned}
 K, (\text{in/hr}) &= 60 \text{ min/hr} \times r^2 / R^2 \times L (\text{in}) / T (\text{min}) \times \ln (H_1/H_2) \\
 &= 60 \text{ min/hr} \times 0.16 / 5.76 \times 4.5 / 0.74 \times \ln (20.5 / 10.8)
 \end{aligned}$$

**K = 6.54 in/hr**

**Soil Permeability Class = K4**

# Infiltration Rate Summary

Test Pit	Permeability Results (in/hr)
TP #1	2.67 (A)   3.84 (B)
TP #2	0.28 (A)   0.31 (B)
TP #3	6.54 (A)   2.21 (B)
TP #4	2.45 (A)   3.52 (B)
TP #5	12.73 (A)   11.91 (B)

# Test Pit #2

**Date:** 05/13/11  
**Performed by:** [REDACTED]  
**Method:** Test pit  
**Surroundings:** Woodland

Depth (in) below existing grade		Sample Depth (in)
+2		
0	Organic layer	
6	Gray (10YR 5/1) sand; single grain; loose	
16	Light yellowish-brown (2.5Y 6/4) loamy sand; weak subangular blocky to granular structure; friable	
36	Brownish-yellow (10YR 6/6) loamy sand to sandy loam; weak subangular blocky to granular structure; friable	24 (UD)
56	Light gray (2.5Y 7/1) loamy sand; few, coarse, prominent, yellowish-brown (10YR 5/6) mottles; subangular blocky structure; friable; saturated at 44 inches	
78+	White (10YR 8/1) sand; single grain; loose; saturated	

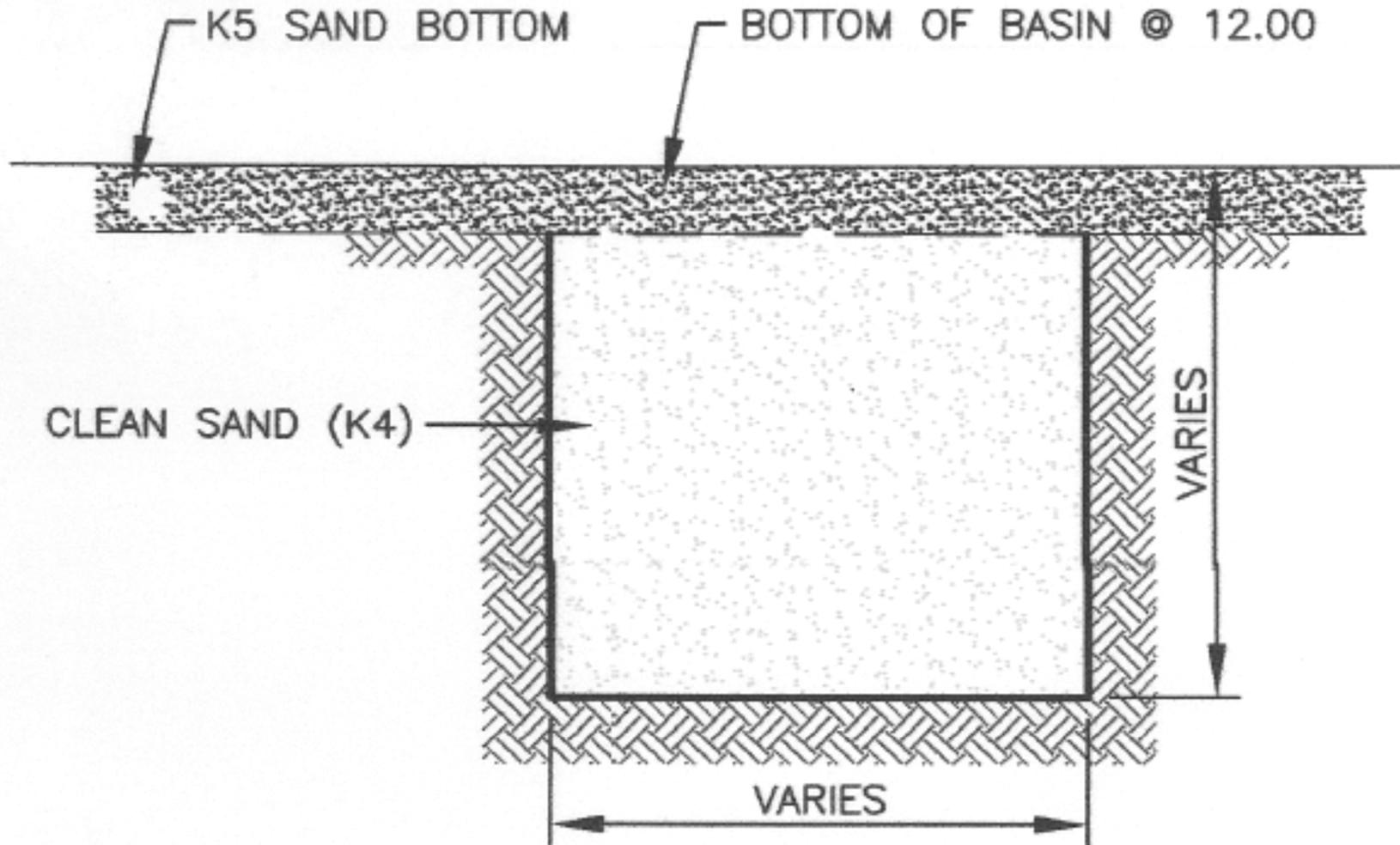
**Surface**  
 Elevation=12.0±  
 SHW  
 Elevation=9.0±  
 GW  
 Elevation=8.3±

**Depth (in) below existing grade**

**Seasonal High Water Table:** 36  
**Ground Water:** 44

Note: Test pit abandoned at 78 inches due to collapse from soil saturation

# Soil Replacement



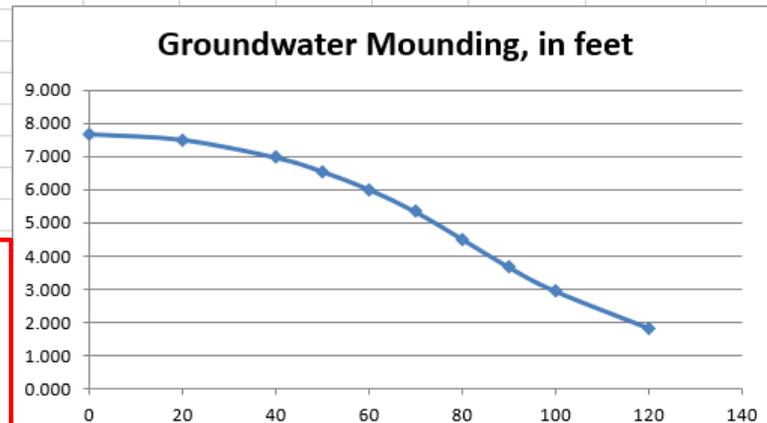
# Drain Time

- 6 inch orifice @ 13.2 ft
- Bottom of basin @ 12.0 ft
- Ponding depth 1.2 ft
- Infiltration rate = 1in/hr
- Drain Time = 14.4 hr

# Groundwater Mounding Analysis

Input Values			
2.2000	R		Recharge (infiltration) rate (feet/day)
0.260	Sy		Specific yield, Sy (dimensionless, between
22.00	K		Horizontal hydraulic conductivity, Kh (feet
80.000	x		1/2 length of basin (x direction, in feet)
95.000	y		1/2 width of basin (y direction, in feet)
1.200	t		duration of infiltration period (days)
30.000	hi(0)		initial thickness of saturated zone (feet)
37.676	h(max)		maximum thickness of saturated zone (be
7.676	$\Delta h(\max)$		maximum groundwater mounding (beneath center of basin at end of infiltration period)
Ground-water Mounding, in feet	Distance from center of basin, in x direction, in feet		
7.676	0		
7.504	20		
6.970	40		
6.548	50		
6.009	60		
5.336	70		
4.512	80		
3.669	90		
2.949	100		
1.840	120		

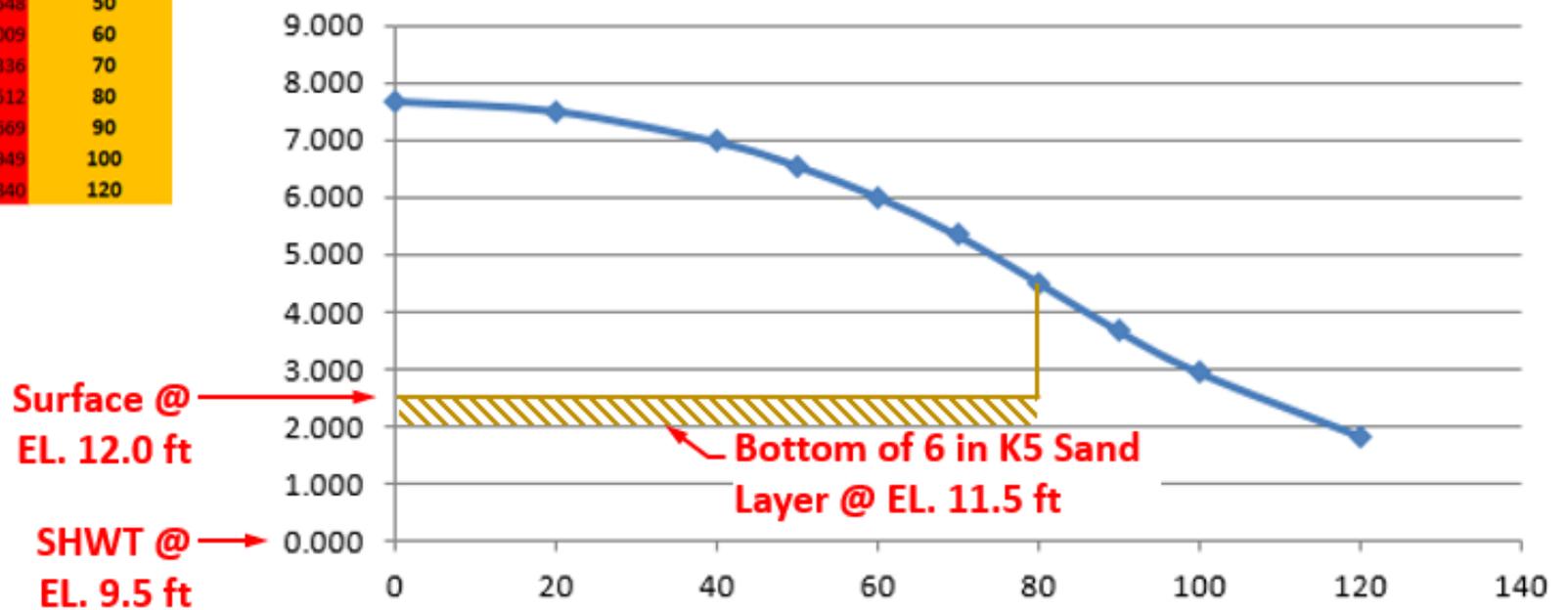
**For example purposes only;  
use published default values  
from the guidance  
document**



# Groundwater Mounding Analysis

37.676	h(max)
7.676	$\Delta h(\max)$
Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
7.676	0
7.504	20
6.970	40
6.548	50
6.009	60
5.336	70
4.512	80
3.669	90
2.949	100
1.840	120

Groundwater Mounding, in feet



# Groundwater Mounding Analysis

Duration of infiltration period,  $t$  (hours)

$$= \frac{\text{volume of runoff to be infiltrated (cf)} \times 12 \text{ in/ft}}{\text{Infiltration area (sf)} \times \text{Recharge rate (in/hr)}}$$

Input Values			
0.4000	$R$		Recharge (infiltration) rate (feet/day)
0.260	$S_y$		Specific yield, $S_y$ (dimensionless, between 0 and 1)
22.00	$K$		Horizontal hydraulic conductivity, $K_h$ (feet/day)*
80.000	$x$		1/2 length of basin (x direction, in feet)
95.000	$y$		1/2 width of basin (y direction, in feet)
3.000	$t$		duration of infiltration period (days)
30.000	$h_i(0)$		initial thickness of saturated zone (feet)
32.440	$h(\text{max})$		maximum thickness of saturated zone (beneath cen
2.440	$\Delta h(\text{max})$		maximum groundwater mounding (beneath center

For example purposes only; use published default values from the guidance document

# Infiltration Basin Requirements

- Distance from SHWT  $> 2$  ft
  - Distance = 2 ft
- Infiltration rate  $> 1$  in/hr
  - Soil Replacement
- Max. standing water depth  $< 2$  ft
  - 6 in orifice @ 13.2 ft, basin bottom 12.0 ft
- Infiltrate water quality storm
  - WQDS elevation = 12.5 ft
  - Recharge design storm elevation = 13.2 ft
- Drain Time (with mounding analysis)  $< 72$  hr

**BMP merits 80% TSS removal rate**

# Water Quantity

<b>Design Storm</b>	<b>Pre-developed Onsite Peak Runoff (cfs)</b>	<b>Pre-developed Offsite Peak Runoff (cfs)</b>	<b>Allowable Onsite Peak Runoff (cfs)</b>	<b>Allowable Total Peak Runoff (cfs)</b>	<b>Proposed Total Peak Runoff (cfs)</b>
2-year	2.3	1.5	1.15	2.65	2.5
10-year	12.9	3.7	9.675	13.375	5.1
100-year	48.5	9.6	38.8	48.4	34.7

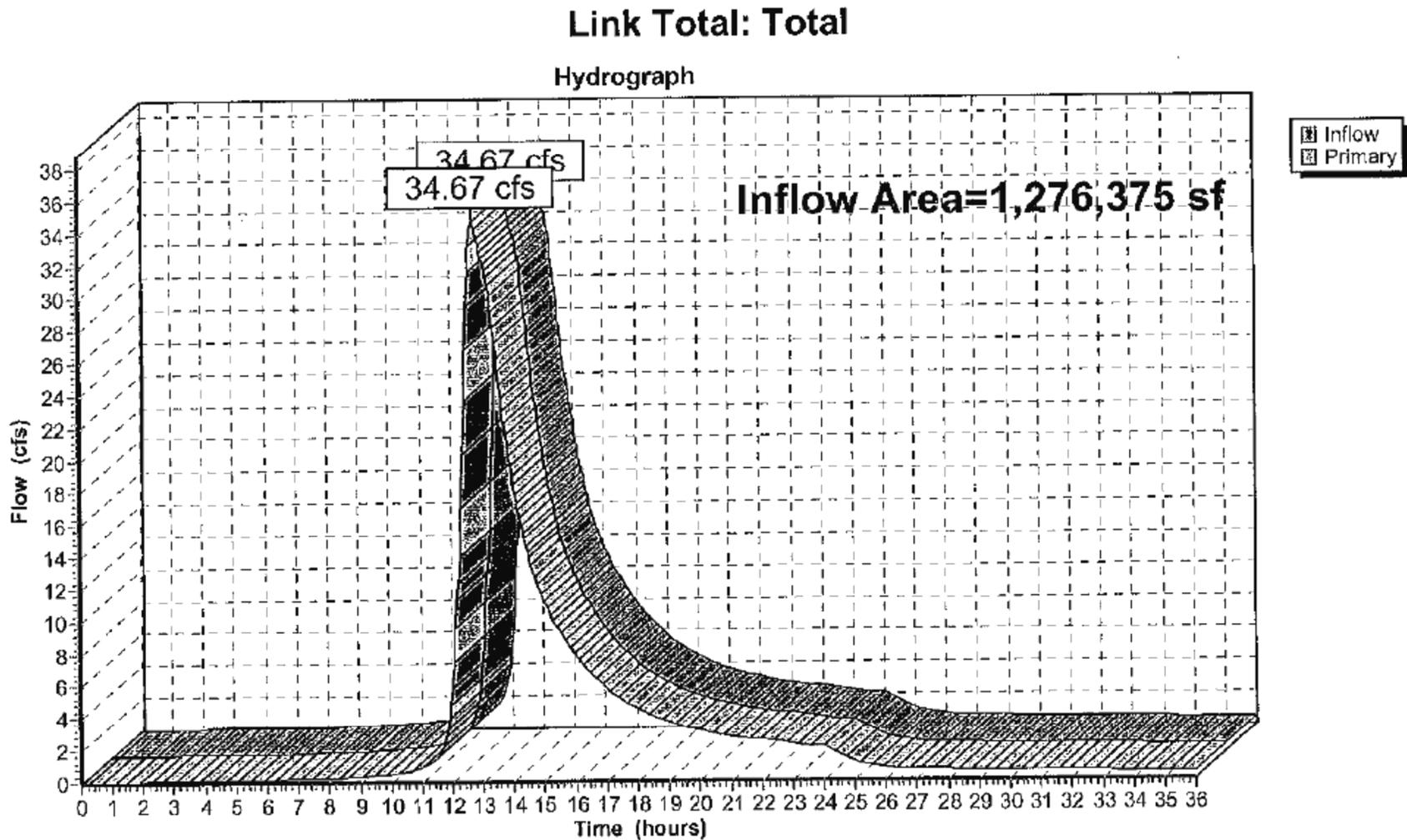
# Water Quantity

## What to check? (NRCS Method Used)

- Do the numbers in the table match calculation results?
- Were pervious and impervious calculated separately?
- Is the rainfall depth/distribution correct?
- Are the Times of Concentration correct?
- Do the land covers/HSGs match the field?
- Was the appropriate unit hydrograph used?
- Does the basin model match the plans (volume, outlets, etc.)?
- Was infiltration included in routings?

# Water Quantity

Do the numbers in the table match results?



# Water Quantity

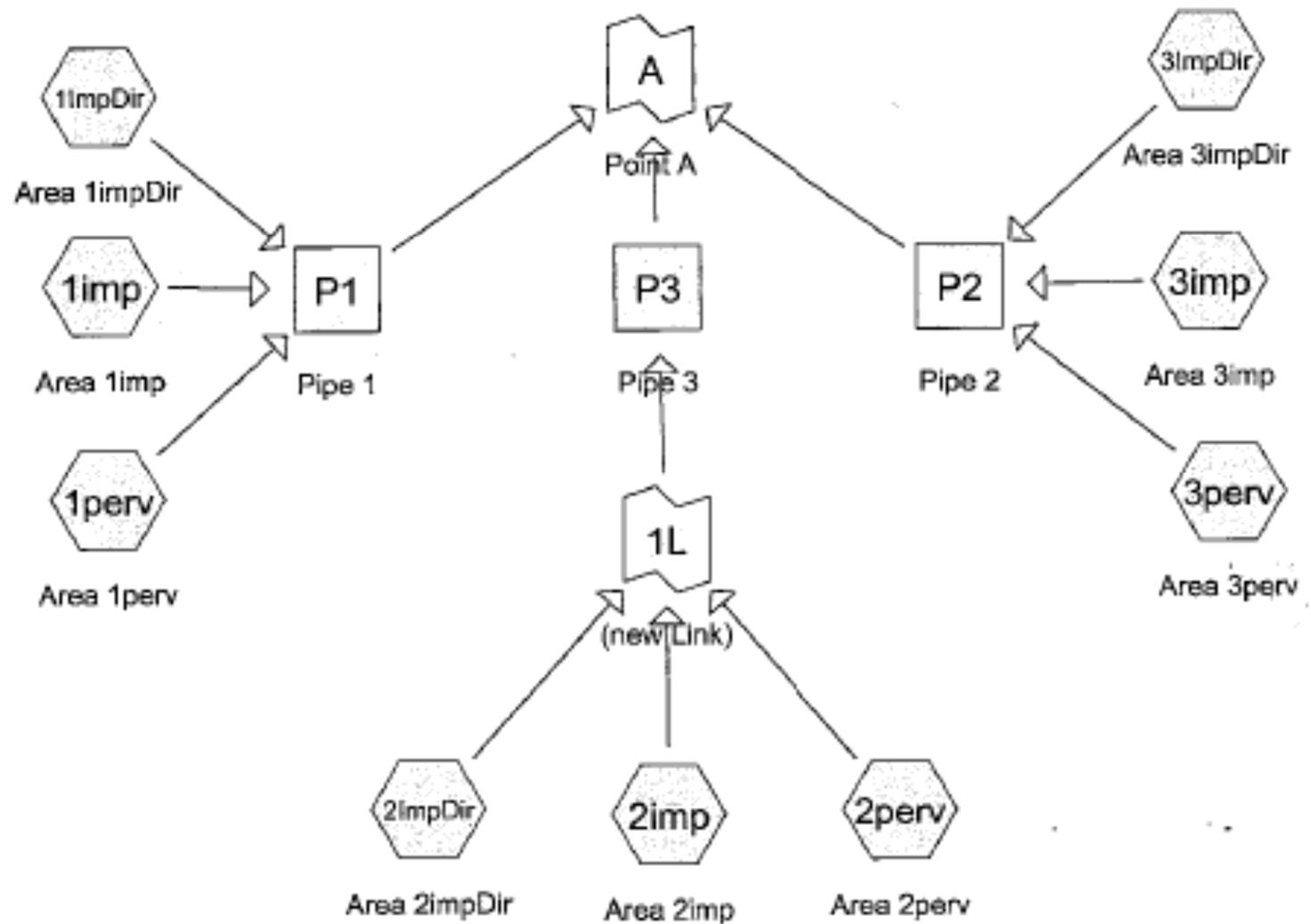
Design Storm	Pre-developed Onsite Peak Runoff (cfs)	Pre-developed Offsite Peak Runoff (cfs)	Allowable Onsite Peak Runoff (cfs)	Allowable Total Peak Runoff (cfs)	Proposed Total Peak Runoff (cfs)
2-year	2.3	1.5	1.15	2.65	2.5
10-year	12.9	3.7	9.675	13.375	5.1
100-year	48.5	9.6	38.8	48.4	34.7

# Water Quantity

Were pervious and impervious surfaces calculated separately?

- Easiest way to see this is usually the subcatchment diagram (ask for this if they haven't provided it)
- Note that some programs may allow pervious and impervious on the same subcatchment but still calculate separately

# Water Quantity



# Water Quantity

Were the correct rainfall depths/distribution used?

Calculations used:

Type III

2-year = 3.3 in

10-year = 5.2 in

100-year = 8.9 in

# Water Quantity

County	1 year	2 year	5 year	10 year	25 year	50 year	100 year
Atlantic	2.72	3.31	4.30	5.16	6.46	7.61	8.90
Bergen	2.75	3.34	4.27	5.07	6.28	7.32	8.47
Burlington	2.77	3.36	4.34	5.18	6.45	7.56	8.81
Camden	2.73	3.31	4.25	5.06	6.28	7.34	8.52
Cape May	2.67	3.25	4.22	5.07	6.34	7.47	8.73
Cumberland	2.69	3.27	4.25	5.09	6.37	7.49	8.76
Essex	2.85	3.44	4.40	5.22	6.44	7.49	8.66
Gloucester	2.71	3.29	4.24	5.05	6.29	7.36	8.55
Hudson	2.73	3.31	4.23	5.02	6.19	7.20	8.31
Hunterdon	2.80	3.38	4.26	5.00	6.09	7.02	8.03
Mercer	2.74	3.31	4.23	5.01	6.19	7.20	8.33
Middlesex	2.76	3.35	4.30	5.12	6.36	7.43	8.63
Monmouth	2.79	3.38	4.38	5.23	6.53	7.66	8.94
Morris	2.94	3.54	4.47	5.24	6.37	7.32	8.35
Ocean	2.81	3.42	4.45	5.33	6.68	7.87	9.20
Passaic	2.87	3.47	4.42	5.23	6.43	7.47	8.62
Salem	2.69	3.26	4.20	5.00	6.22	7.28	8.45
Somerset	2.76	3.34	4.25	5.01	6.15	7.13	8.21
Sussex	2.68	3.22	4.02	4.70	5.72	6.60	7.58
Union	2.80	3.39	4.35	5.17	6.42	7.49	8.69
Warren	2.78	3.34	4.18	4.89	5.93	6.83	7.82

# Water Quantity

Are the Tc calculations correct?

- Existing – 23.5 minutes

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	100	0.0300	0.09		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
5.2	875	0.0300	2.79		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
23.5	975	Total			

- Proposed – 6 minutes for all impervious surfaces

# Water Quantity

Do the land covers/HSGs match the field?

- What is the HSG?
  - They should have provided soil map
  - If not, visit the web soil survey
- Remember if web soil survey shows no HSG or defines the material on-site as fill, testing is required in accordance with appendix E to determine HSG

# Water Quantity



Pink = HSG B

Green = HSG A/D

Gray = unknown HSG

# Water Quantity

Existing Coverage		
Coverage Type	Area	Curve Number
Woods	19.71 acres	30/55
Open space	0.95 acres	39/61

Proposed Coverage		
Coverage Type	Area	Curve Number
Road, Roof, Driveway	5.5 acres	98/98
Open space	8.25 acres	39/61
Woods	6.91 acres	30/55

# Water Quantity

Was the appropriate unit hydrograph used?

- Application used DelMarVa unit hydrograph
  - Site is in coastal plain
  - Site is largely undisturbed
  - No steep slopes
- Can DelMarVa be used in proposed conditions too?
  - Yes, just not when sizing MTDs

# Water Quantity

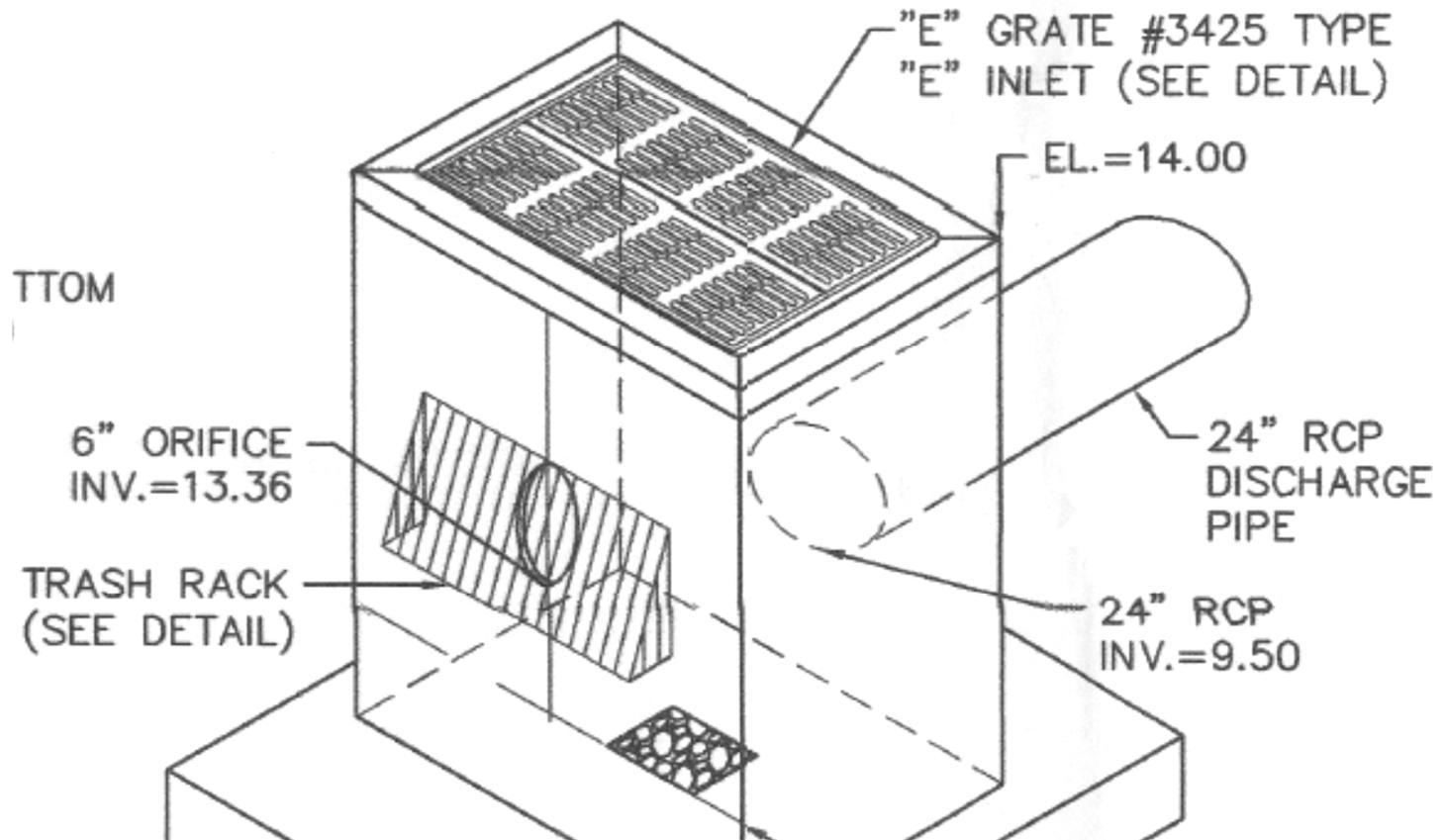
Does the basin model match the plans?

- Outlet structure

Device	Routing	Invert	Outlet Devices
#1	Primary	9.50'	<b>24.0" x 51.0' long 24" Culvert</b> CPP, square edge headwall, $K_e = 0.500$ Outlet Invert = 8.86' $S = 0.0125'$ $C_c = 0.900$ $n = 0.013$ Corrugated PE, smooth interior
#2	Device 1	13.20'	<b>6.0" Vert. 6" Orifice</b> $C = 0.600$
#3	Device 1	14.00'	<b>4.00' x 4.00' Horiz. Type E Grate X 0.80</b> Limited to weir flow $C = 0.600$
#4	Primary	14.80'	<b>20' Broadcrested Weir, <math>C = 3.10</math></b> Head (feet) 0.00 0.20 1.20 Width (feet) 20.00 21.20 27.20

# Water Quantity

- Outlet structure



# Water Quantity

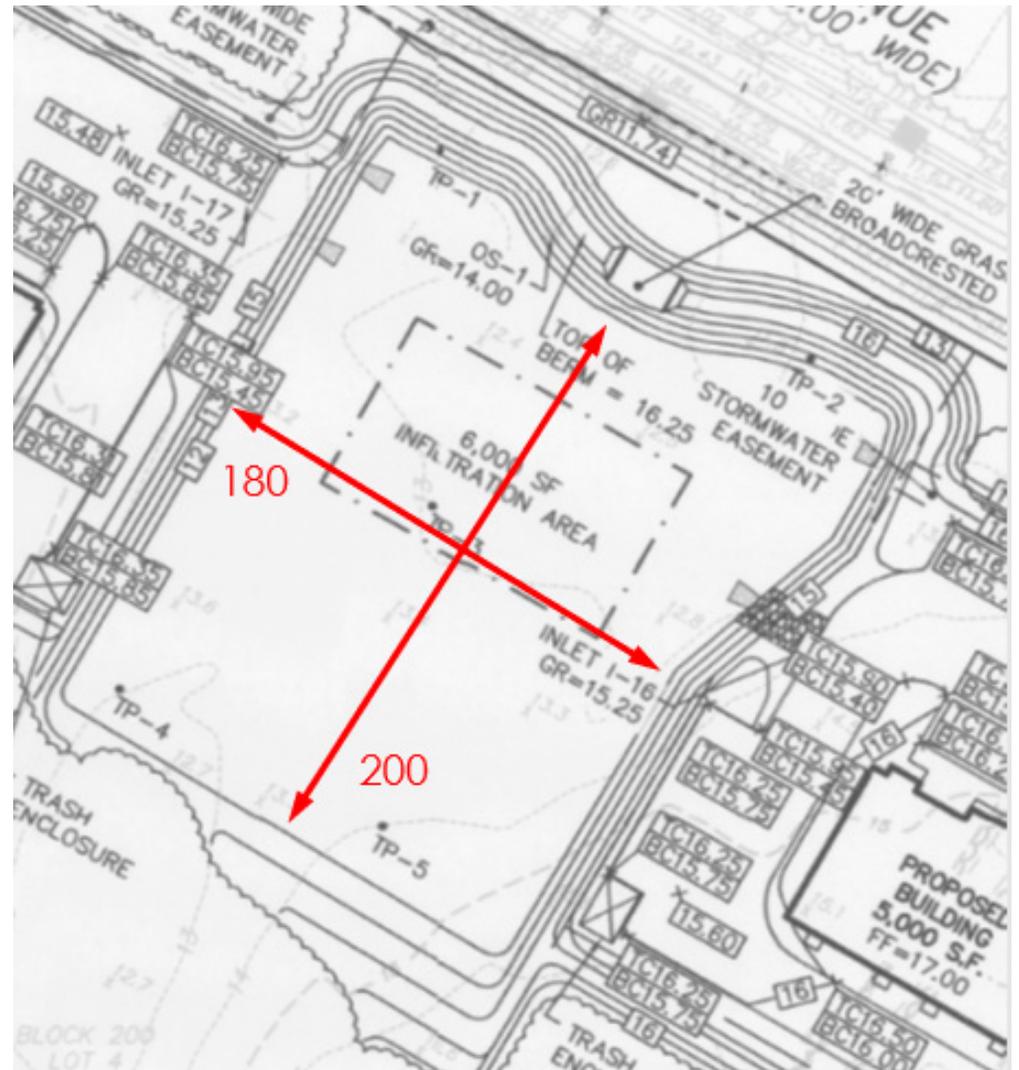
Does the basin model match the plans?

- Volume

Volume	Invert	Avail. Storage	Storage Description
#1	12.00'	270,293 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)
12.00	36,430	0	0
13.00	46,355	41,393	41,393
14.00	72,630	59,493	100,885
15.00	84,340	78,485	179,370
16.00	97,505	90,923	270,293

# Water Quantity

$$180 \times 200 = 36,000 \text{ sq ft}$$



# Water Quantity

Does the basin model match the plans?

- Volume

Volume	Invert	Avail. Storage	Storage Description
#1	12.00'	270,293 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)
12.00	36,430	0	0
13.00	46,355	41,393	41,393
14.00	72,630	59,493	100,885
15.00	84,340	78,485	179,370
16.00	97,505	90,923	270,293



# Water Quantity

Does the basin model match the plans?

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14.00	72,630	59,493	100,885
15.00	84,340	78,485	179,370
16.00	97,505	90,923	270,293

# Water Quantity

## Was infiltration used in the routings?

- Check outlet structure for infiltration, exfiltration, custom outlets, or discarded flow

Device	Routing	Invert	Outlet Devices
#1	Primary	9.50'	<b>24.0" x 51.0' long 24" Culvert</b> CPP, square edge headwall, $K_e = 0.500$ Outlet Invert = 8.86' $S = 0.0125'/$ $C_c = 0.900$ $n = 0.013$ Corrugated PE, smooth interior
#2	Device 1	13.20'	<b>6.0" Vert. 6" Orifice</b> $C = 0.600$
#3	Device 1	14.00'	<b>4.00' x 4.00' Horiz. Type E Grate X 0.80</b> Limited to weir flow $C = 0.600$
#4	Primary	14.80'	<b>20' Broadcrested Weir, <math>C = 3.10</math></b> Head (feet) 0.00 0.20 1.20 Width (feet) 20.00 21.20 27.20

# Water Quantity

## Summary

- Need to fix detail of outlet structure on plan
- Otherwise everything looks OK

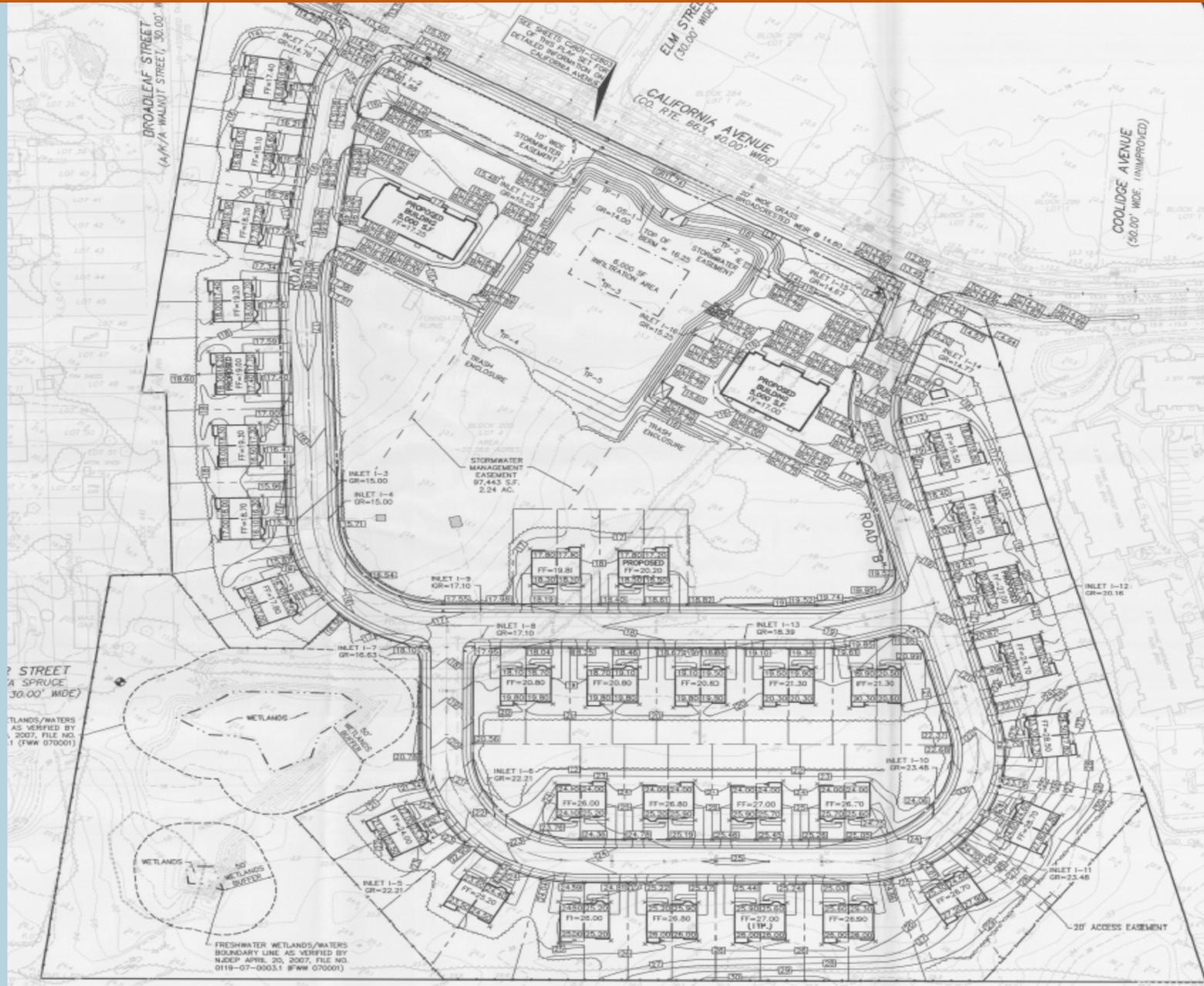
**The water quantity requirement is met**

# Water Quality

- 5.5 acres of new impervious coverage
  - Only roadways, parking areas, etc. require treatment

**Simplest thing to do is look back at the plans and determine if the entire roadway/parking network is directed to the basin**

# Post-Development Site



# Water Quality

## Summary

- Since BMP is granted 80% TSS removal rate  
**AND**
- All of the new roadway/parking/driveways drain to the BMP

**The water quality requirement is met**

# Groundwater Recharge

Engineer has opted to infiltrate the difference in the 2-year storm

- Existing 2-year runoff volume = 40,825 cf
- Proposed 2-year runoff volume = 100,218 cf
- Difference = 59,393 cf
- Volume below lowest outlet = 59,400 cf

# Maintenance Plan

- Responsible party – Developer
  - Will probably need updating after construction
- Preventative maintenance tasks and schedules - OK
- Cost estimates – OK
- Blank maintenance logs - OK
- Needs to be recorded on deed

# Stormwater Management Report

## Total Summary

- Nonstructural – OK, need to require restriction
- BMP Design - OK
- Water Quantity – OK, with change to outlet detail
- Water Quality - OK
- Groundwater Recharge - OK
- Maintenance Manual - OK

**Meets the stormwater control ordinance and can be approved**

# Contact Information

**Bureau of Nonpoint Pollution Control  
Division of Water Quality  
401 East State Street  
PO Box 420, Mail Code 401-2B  
Trenton, NJ 08625-420  
Tel: 609-633-7021  
[www.njstormwater.org](http://www.njstormwater.org)**

**Brian Salvo**

**[Brian.Salvo@dep.nj.gov](mailto:Brian.Salvo@dep.nj.gov)**



**New Jersey  
DEPARTMENT of  
ENVIRONMENTAL  
PROTECTION**

# PLAN REVIEW

## EXAMPLE 2

Changi Wu  
NJDEP Division of Water Quality  
SWMDR Training Module 4  
September 3, 2020

# Presentation Goals

## Goals

- Review site plans and stormwater management report
- Identify any errors with the design
- Suggest potential solutions

# Determining Applicable Design & Performance Standards

## Does the Development

- Trigger the municipality's SCO?
- Disturb one acre or more?
- Increase impervious coverage by  $\frac{1}{4}$  acre or more?

# Determining Applicable Design & Performance Standards

## Municipal Stormwater Control Ordinance:

- Major Development:

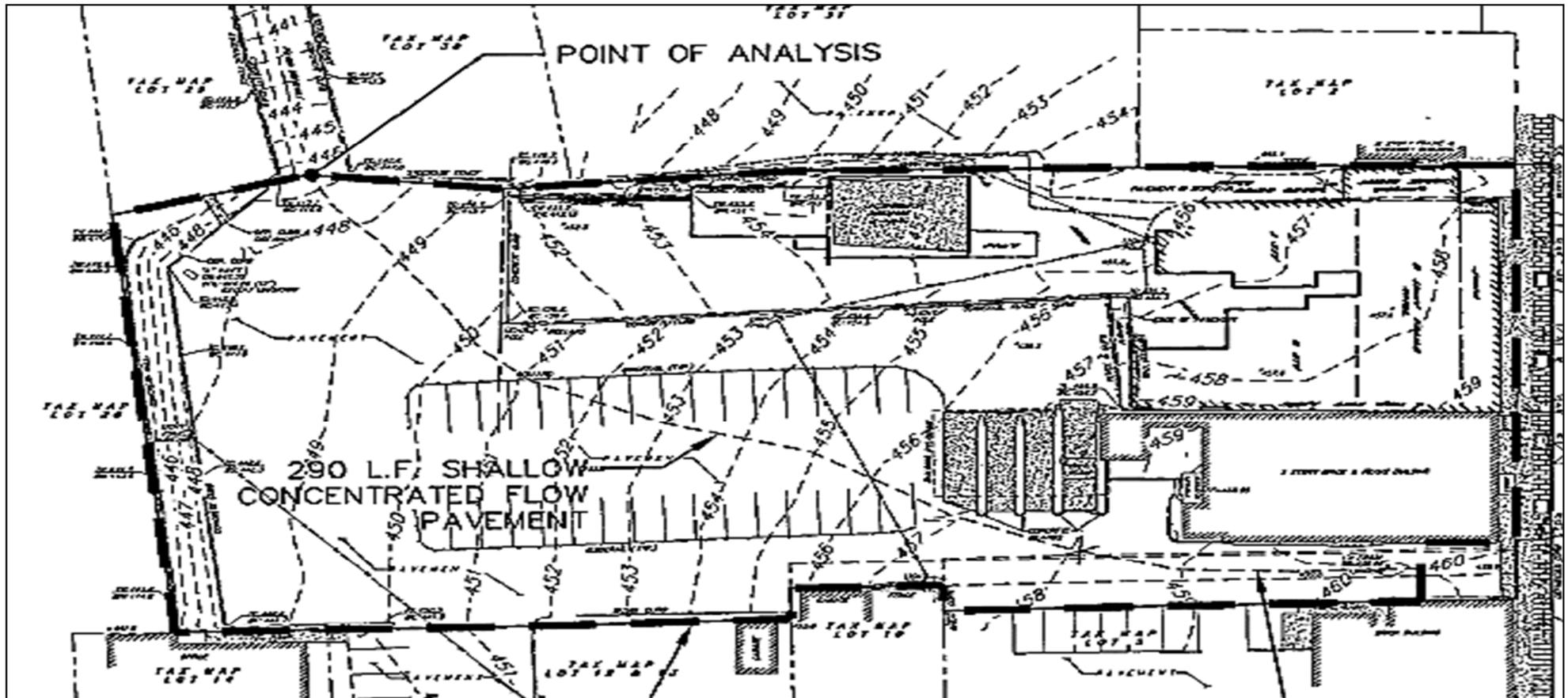
*“Any development that provides for ultimately disturbing one or more acres of land or would create 1/4 acre or more of impervious surface.”*

# Familiarize Yourself with the Site

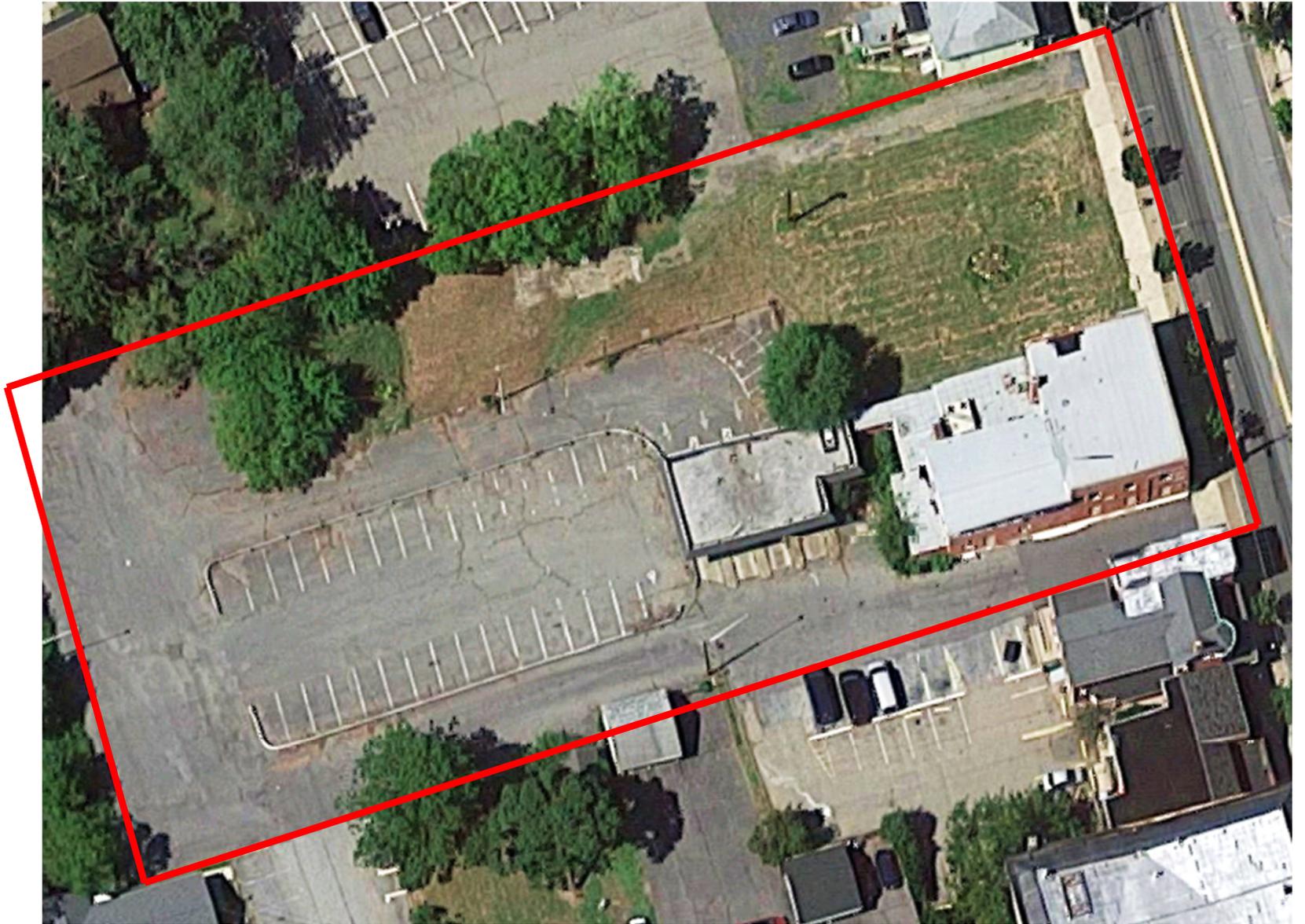
Where are the pre-construction conditions?

- Important in determining the requirements
- Existing land cover
- **Has the existing land cover existed for the past 5 years?**

# Pre-Development Site Condition



# Pre-Development Site Aerial Photo 2012



# Pre-Development Site Aerial Photo 2007



# Pre-Development Site

A runoff coefficient for existing conditions...

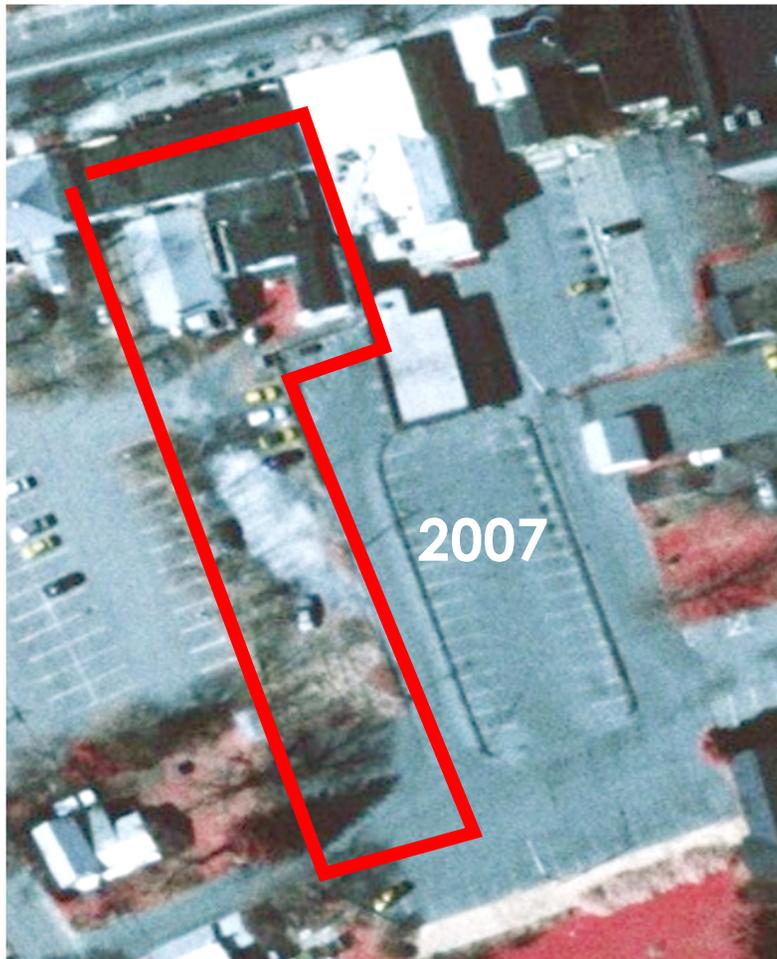
May be used if the design engineer verifies that the hydrologic condition *has existed on the site for at least **five years***

**If more than one land cover has existed...**

During the five years immediately prior to the time of applications, the land cover with the *lowest runoff potential* shall be used for the computations

# Pre-Development Site

Which has the lowest runoff potential?



# Pre-Development Conditions

*What does this mean for stormwater management of the site?*

# Stormwater Management Report

Based on 2007  
conditions...

## Existing Coverage

Coverage Item	Area
Roof & Paved Driveway	60,342 sf
Gravel	6,495 sf
Lawn	4,664 sf

Based on 2012  
conditions...

## Existing Coverage

Coverage Item	Area
Roof & Paved Driveway	<b>46,342 sf</b>
Gravel	6,495 sf
Lawn	<b>18,664 sf</b>

## Proposed Coverage

Coverage Item	Area
Roof & Paved Driveway	59,626 sf
Gravel	<b>0 sf</b>
Lawn	11,875 sf

# Stormwater Management Report

Based on 2007 conditions...

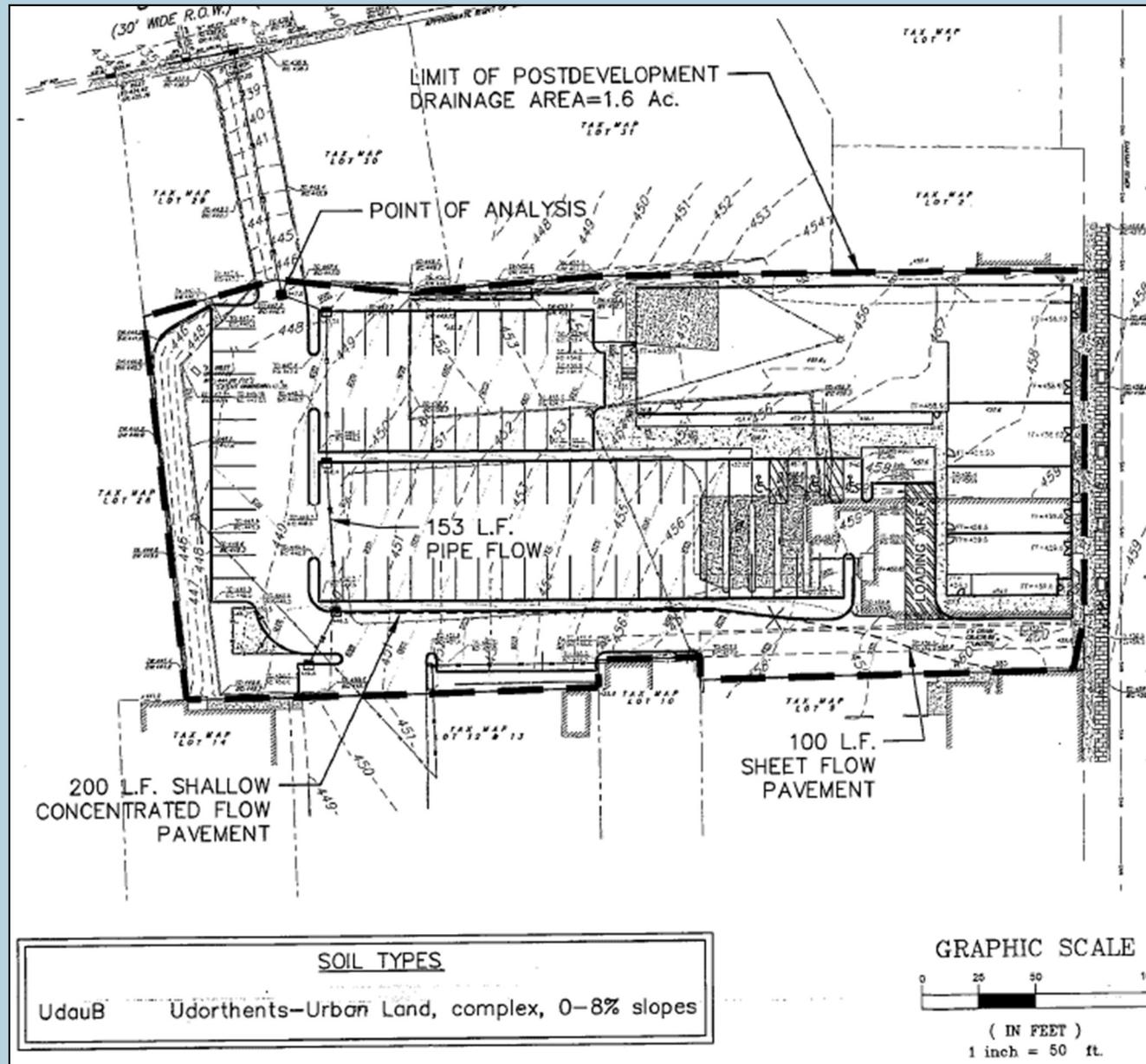
- Impervious coverage was reduced, the time of concentration was maintained
- The post-construction hydrographs did not exceed the pre-construction hydrographs
- Water quantity was met
- Water quality was not required
- No groundwater recharge was required

# Stormwater Management Report

Based on 2012 conditions...

- Impervious coverage was increased by greater than  $\frac{1}{4}$  acre, time of concentration was decreased
- Water quantity was not met
- Water quality was required
- Groundwater recharge was required

# Post-Development Site

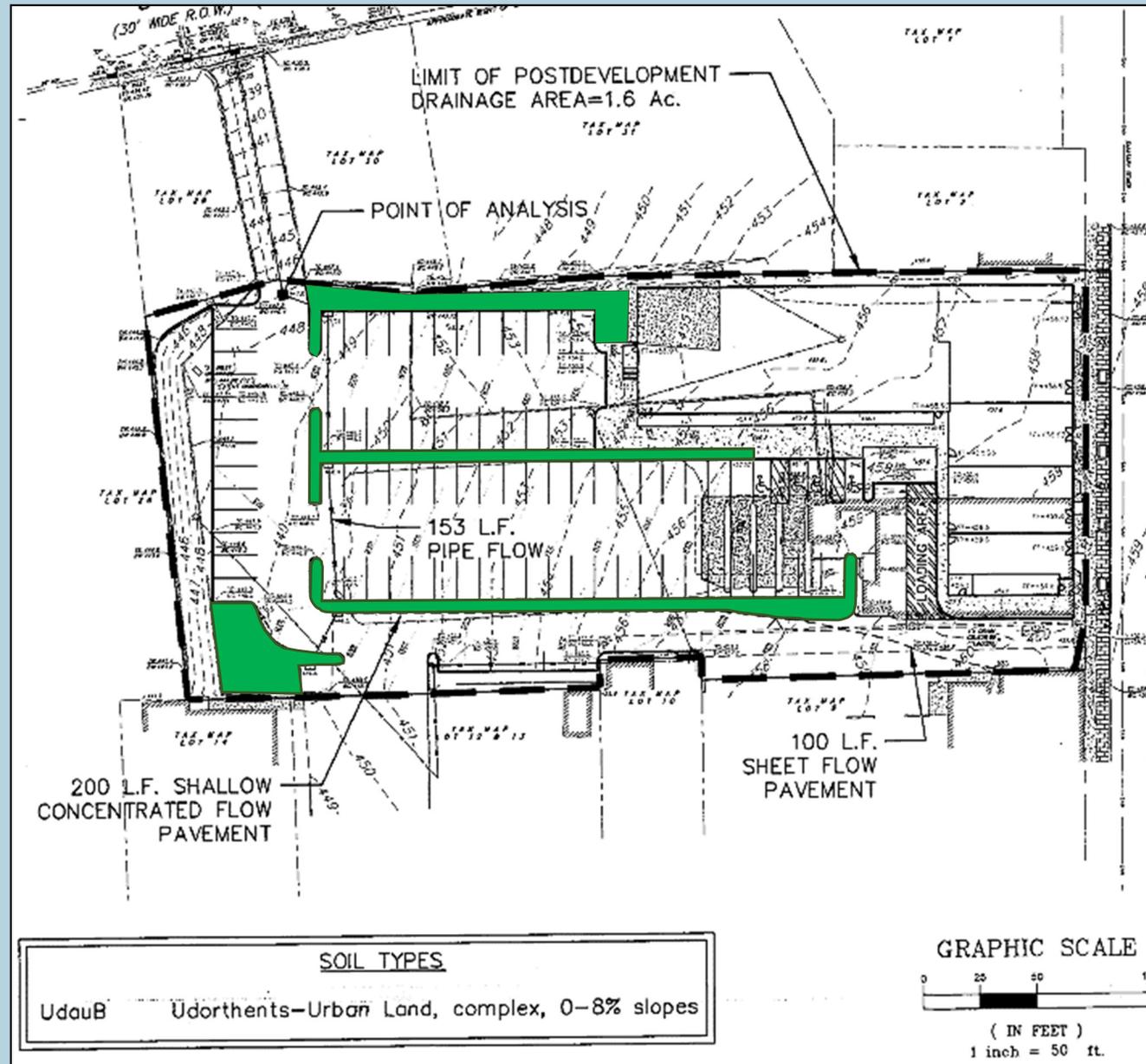


# Stormwater Management Report

What are some ways to meet the requirements?

- Water quantity:
  - Underground detention system
- Water quality?
  - Green infrastructure

# Post-Development Site



# Contact Information

**Bureau of Nonpoint Pollution Control  
Division of Water Quality  
401 East State Street  
PO Box 420, Mail Code 401-2B  
Trenton, NJ 08625-420  
Tel: 609-633-7021  
[www.njstormwater.org](http://www.njstormwater.org)**

**Changi Wu**  
[Chang.i.wu@dep.nj.gov](mailto:Chang.i.wu@dep.nj.gov)



**New Jersey**  
**DEPARTMENT of**  
**ENVIRONMENTAL**  
**PROTECTION**

# PLAN REVIEW

## EXAMPLE 3

Brian Salvo  
NJDEP Division of Water Quality  
SWMDR Training Module 4  
September 3, 2020

# Presentation Goals

## Goals

- Review site plans and stormwater management report
- Identify any errors with the design
- Suggest potential solutions

# Determining Applicable Design & Performance Standards

## Which standards are required?

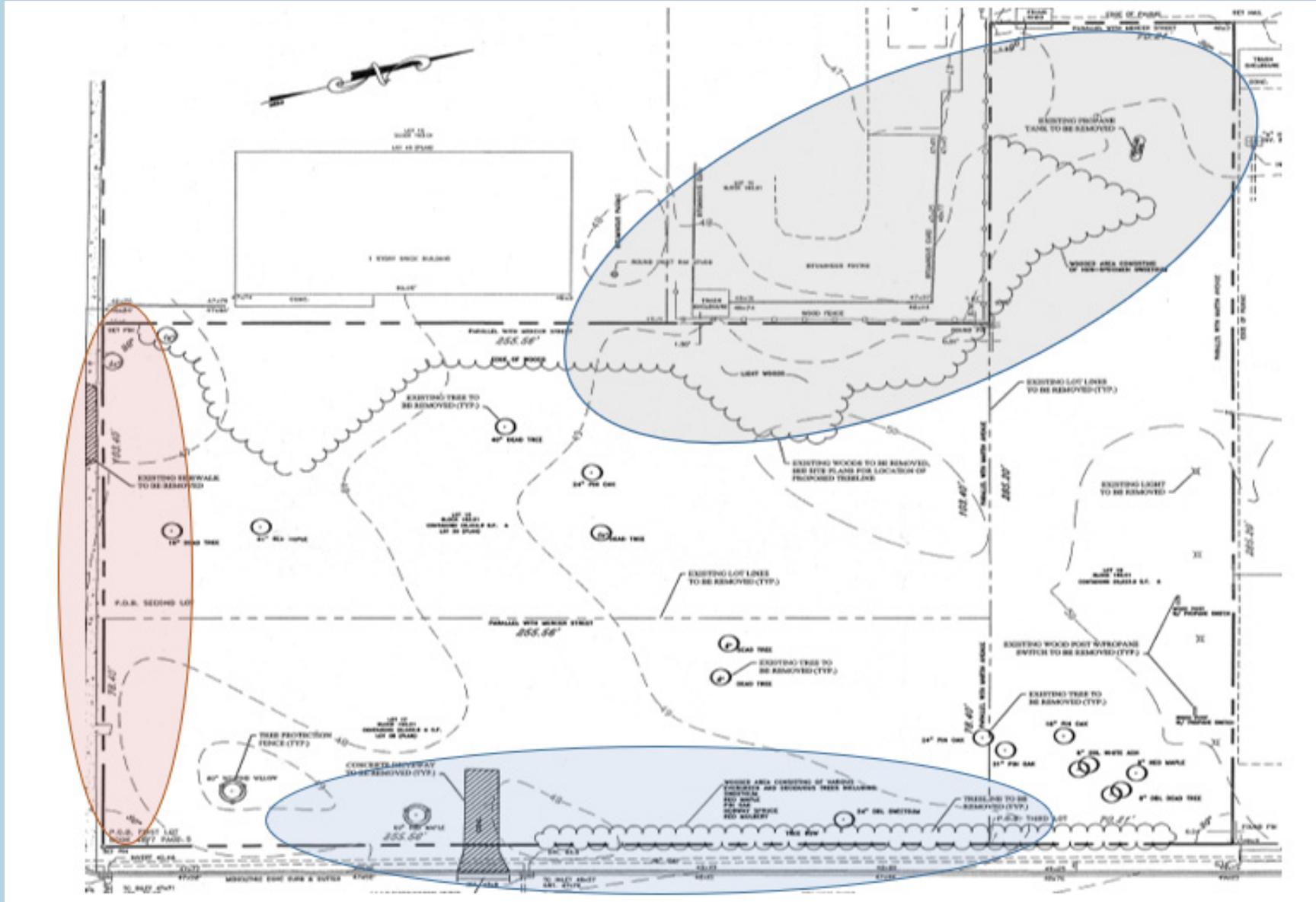
- Stormwater Control Ordinance for Municipality
- Amount of Disturbance
- Tidal Water Body Discharge
  - **Water Quantity is required?**
- Urban Redevelopment Area
  - **Ground Water Recharge is required?**
- Increase in Impervious Coverage
  - **Water Quality is required?**

# Familiarize Yourself with the Site

Where are the pre-construction conditions?

- Important in determining the requirements
- Existing land cover

# Pre-Development Site



# Stormwater Management Report

## Existing Coverage

Coverage Item	Area
Parking Lot, Roof, Driveway	258 sf
Lawn	66,224 sf

## Proposed Coverage

Coverage Item	Area
Parking Lot, Roof, Driveway	37,064 sf
Lawn	29,418 sf



# Determining Applicable Design & Performance Standards

## Which standards are required?

- Stormwater Control Ordinance for Municipality
- Amount of Disturbance
- Tidal Water Body Discharge
  - **Water Quantity is required?**
- Urban Redevelopment Area
  - **Ground Water Recharge is required?**
- Increase in Impervious Coverage
  - **Water Quality is required?**

# Soil Logs

**GROUDWATER DEPTH:** 3'3"      **BORING TYPE:** Geoprobe  
**SEASONAL HIGH GROUNDWATER:** 2'6"      **DATE:** 12-15-2011

Depth	Soil Description
0 – 3"	Grass/Organics
3" – 1'6"	10 YR 5/6 Yellowish Brown Fine Sand, Little Silt, Trace Clay
1'6" – 2'6"	10 YR 4/1 Dark Gray Silt, Little Fine Sand
2'6" – 5'	10 YR 5/2 Grayish Brown and 10 YR 7/8 Yellow Silt, Little Fine Sand, Little Clay (Redoximorphic Features)
5' – 7'	10 YR 4/1 Dark Gray and 10 YR 6/8 Brownish Yellow Silt, Some Clay, Trace Fine Sand (Redoximorphic Features)
7' – 12'	10 YR 4/2 Dark Grayish Brown and 10 YR 7/8 Yellow Silt, Some Clay, Trace Fine Sand
12' – 14'	2.5 YR 2.5/1 Black Clay, Some Silt
14' – 16'	10 YR 3/2 Very Dark Grayish Brown Clay, Some Silt, Trace Fine Sand

# **WATER QUANTITY**

# Engineer's Claim

The discharges of the proposed stormwater management systems will result in no increases, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the two, 10, and 100 year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site, therefore, the project meets the water quantity standard.

# Peak Flow Rates

## Existing Condition

Drainage Area	2-Year Storm	10-Year Storm	100-Year Storm
EAST	0.40 cfs	0.82 cfs	1.66 cfs
WEST	0.34 cfs	0.70 cfs	1.43 cfs
SOUTH	0.51 cfs	1.04 cfs	2.12 cfs

## Proposed Condition

Drainage Area	2-Year Storm	10-Year Storm	100-Year Storm
DA-1 (EAST)	0.37 cfs	0.65 cfs	1.31 cfs
DA-2 (SOUTH)	0.46cfs	0.79 cfs	1.42 cfs

# Difference in Peak Discharges

**1<sup>st</sup> Street Runoff Reduction Table – EAST vs. DA-1 (EAST)**

Storm	EAST	DA-1 (EAST)	Difference in Peak Discharges
2-year	0.40 cfs	0.37 cfs	-0.03 cfs (92.5%)
10-year	0.82 cfs	0.65 cfs	-0.17 cfs (79.3%)
100-year	1.66 cfs	1.31 cfs	-0.35 cfs (78.9%)

**Acorn Avenue Runoff Reduction Table – SOUTH vs. DA-2 (SOUTH)**

Storm	SOUTH	DA-2 (SOUTH)	Difference in Peak Discharges
2-year	0.51 cfs	0.46 cfs	-0.05 cfs (90.2%)
10-year	1.04 cfs	0.79 cfs	-0.25 cfs (76.0%)
100-year	2.12 cfs	1.42 cfs	-0.70 cfs (67.0%)

# Curve Numbers

## Summary for Subcatchment DA-2: To Acorn Avenue

Area (sf)	CN	Description
6,628	98	Paved parking, HSG D
5,337	80	>75% Grass cover, Good, HSG D
<b>11,965</b>	<b>90</b>	<b>Weighted Average</b>
5,337	80	44.61% Pervious Area
6,628	98	55.39% Impervious Area

# Volume

**1<sup>st</sup> Street Volume Reduction Table – EAST vs. DA-1 (EAST)**

<b>Storm</b>	<b>EAST</b>	<b>DA-1 (EAST)</b>	<b>Difference in Volume</b>
2-year	2,581 cf	10,747 cf	+8,166 cf
10-year	5,199 cf	18,316 cf	+13,117 cf
100-year	10,634 cf	33,182 cf	+ 22,548 cf

**Acorn Avenue Volume Reduction Table – SOUTH vs. DA-2 (SOUTH)**

<b>Storm</b>	<b>SOUTH</b>	<b>DA-2 (SOUTH)</b>	<b>Difference in Volume</b>
2-year	3,310 cf	2,352 cf	-958 cf
10-year	6,669 cf	4,011 cf	-2,658 cf
100-year	13,640 cf	7,273 cf	-6,367 cf

# GROUNDWATER RECHARGE

# Engineer's Claim

Soil test pits were performed in the vicinity of each stormwater management basin. The soil logs show that the existing soil is primarily clay, with low permeability. The clayey soils restrict groundwater recharge. Therefore, groundwater recharge has not been provided for this project.

Map unit symbol	Map unit name	Rating
KkoC	Klinesville channery loam, 6 to 12 percent slopes	D

# Determining Applicable Design & Performance Standards

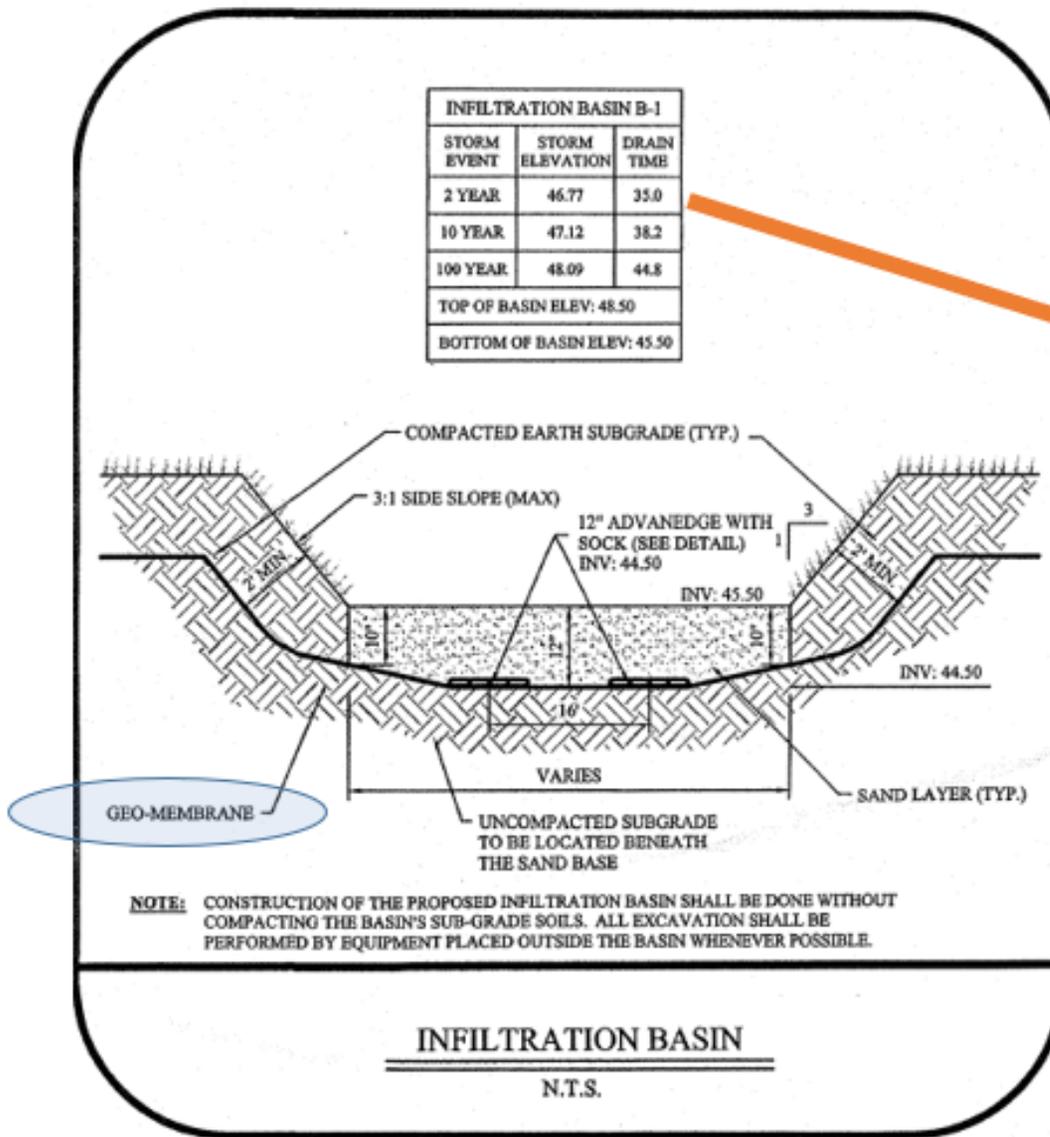
## Which standards are required?

- Stormwater Control Ordinance for Municipality
- Amount of Disturbance
- Tidal Water Body Discharge
  - **Water Quantity is required?**
- HSG D Soils
  - **Ground Water Recharge is required?**
- Increase in Impervious Coverage
  - **Water Quality is required?**

# **WATER QUALITY**

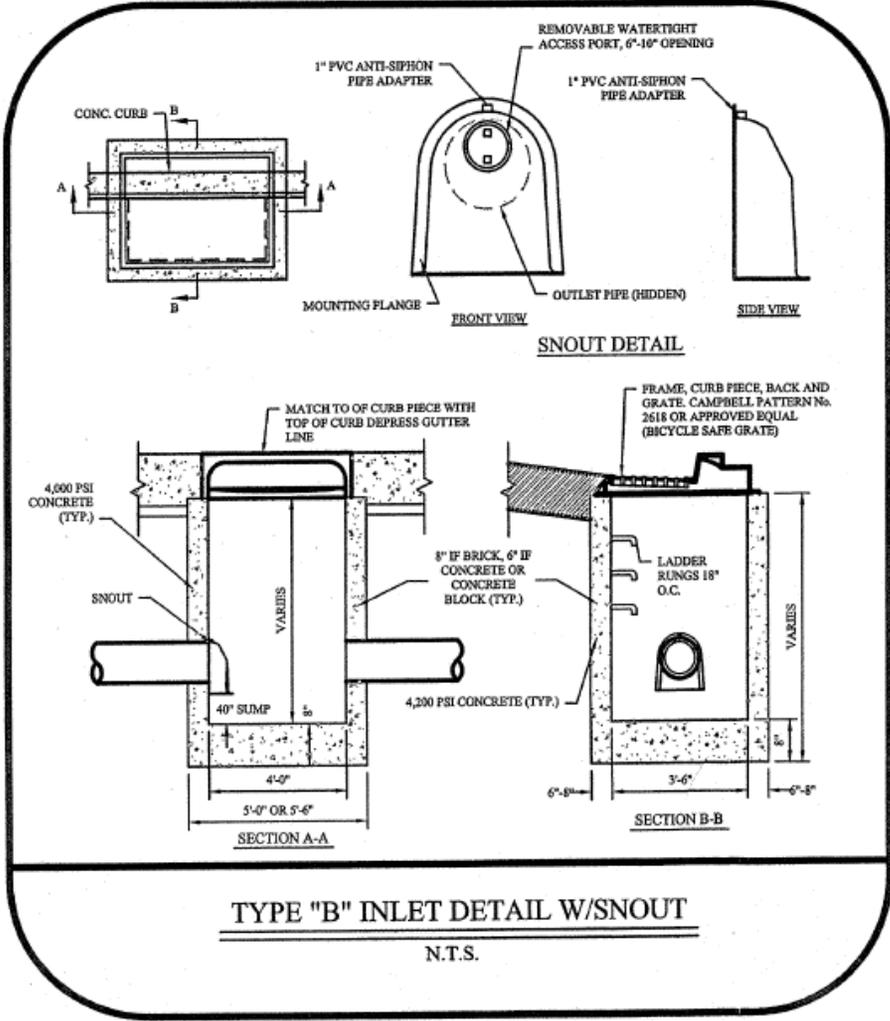


# Stormwater Management Basin Detail

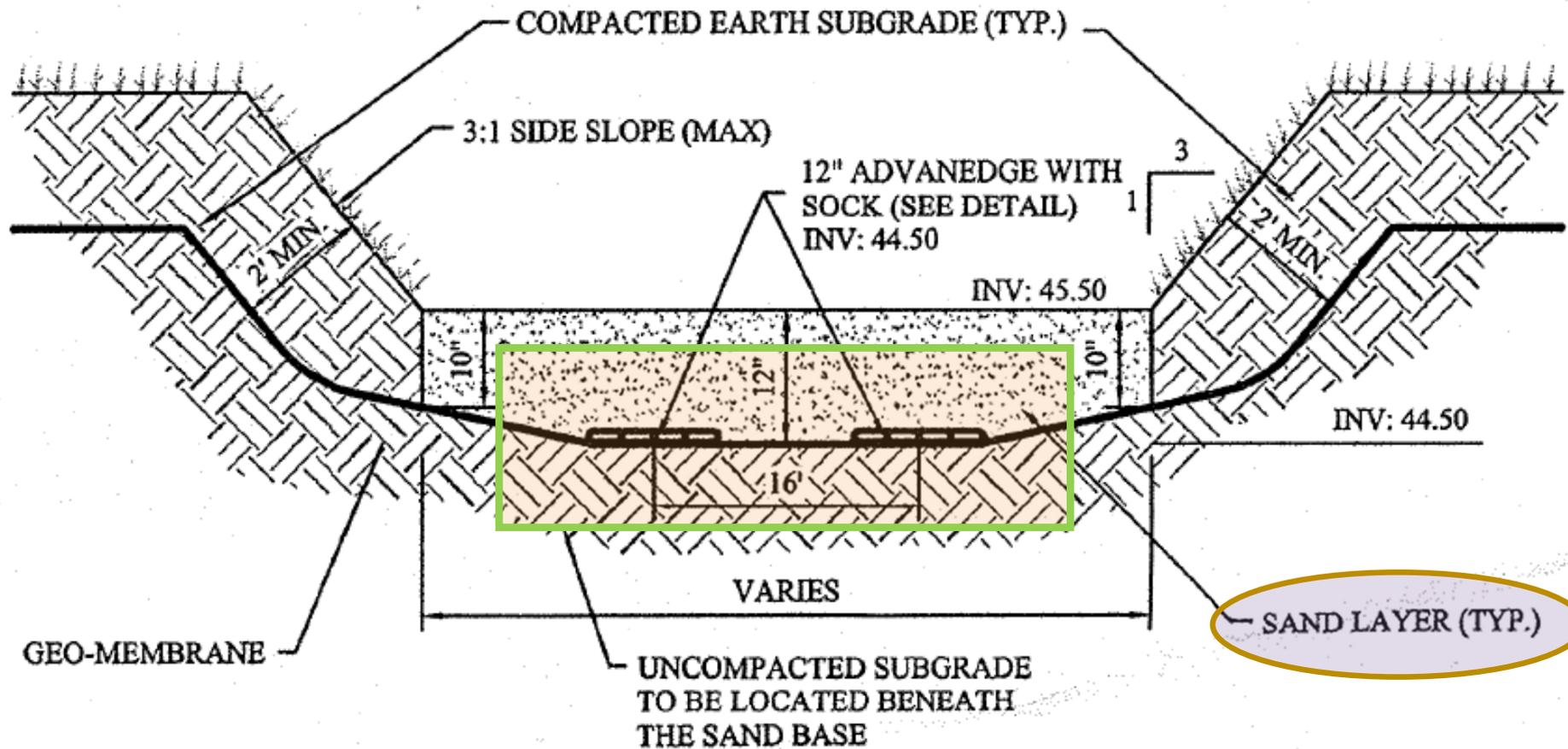


INFILTRATION BASIN B-1		
STORM EVENT	STORM ELEVATION	DRAIN TIME
2 YEAR	46.77	35.0
10 YEAR	47.12	38.2
100 YEAR	48.09	44.8
TOP OF BASIN ELEV: 48.50		
BOTTOM OF BASIN ELEV: 45.50		

# Forebay?



# Sand Filter Detail (In-Depth)



**NOTE:** CONSTRUCTION OF THE PROPOSED INFILTRATION BASIN SHALL BE DONE WITHOUT COMPACTING THE BASIN'S SUB-GRADE SOILS. ALL EXCAVATION SHALL BE PERFORMED BY EQUIPMENT PLACED OUTSIDE THE BASIN WHENEVER POSSIBLE.

# Hazards



# Contact Information

**Bureau of Nonpoint Pollution Control  
Division of Water Quality  
401 East State Street  
PO Box 420, Mail Code 401-2B  
Trenton, NJ 08625-420  
Tel: 609-633-7021  
[www.njstormwater.org](http://www.njstormwater.org)**

**Brian Salvo**

**[Brian.Salvo@dep.nj.gov](mailto:Brian.Salvo@dep.nj.gov)**



**New Jersey  
DEPARTMENT of  
ENVIRONMENTAL  
PROTECTION**

# PLAN REVIEW

EXAMPLES  
4a, 4b & 4c

Changi Wu  
NJDEP Division of Water Quality  
SWMDR Training Module 4  
September 3, 2020

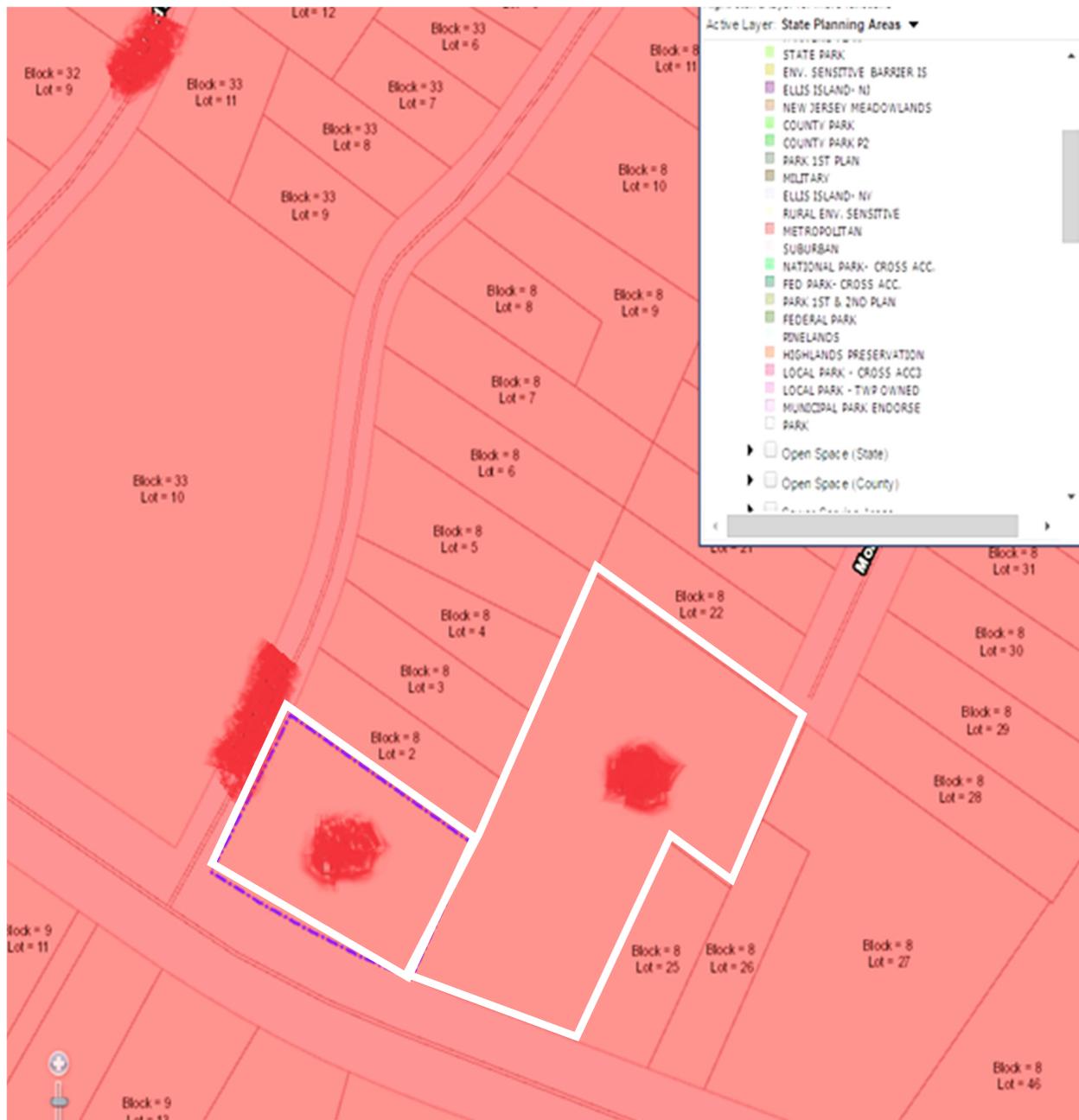
# EXAMPLE 4a

# Project Information

- Development  $\geq 1$  acre disturbance
- Major development
  - Water quantity is required
- Increase of impervious surface  $\geq 0.25$ 
  - Water quality is required
- Groundwater recharge is required unless exempt
  - PA1 area, but whether a part of the property is “previously developed” is questionable

# Recharge Exemption

- Groundwater recharge requirement does not apply to projects within the “urban redevelopment area.”
- "Urban Redevelopment Area" is defined as **previously developed portions** of areas:
  1. Delineated on the State Plan Policy Map (SPPM) as the **Metropolitan Planning Area (PA1)**, Designated Centers, Cores or Nodes;
  2. Designated as CAFRA Centers, Cores or Nodes;
  3. Designated as Urban Enterprise Zones; and
  4. Designated as Urban Coordinating Council Empowerment Neighborhoods.





DATE		COUNTY			DISTRICT	
00/00/00		ESSEX			0720 VERONA	
DEED REGISTRATION						R.T.F. EXEMPT
BOOK	PAGE	DEED DATE	DATE RECORDED	R.T. FEE	PRICE	
		06/05/12	06/14/12	500	125000	
G R A N T O R				G R A N T E E		
TAX MAP & LIST DESCRIPTIONS			PROPERTY CLASSIFICATION			
BLOCK			CLASS	1		
LOT			CL. 4 TYPE			
QUAL			CONDO			
ASSESSED VALUE						
YEAR SAME AS DEED	LAND		BUILDINGS		TOTAL	
2012	485700		0		485700	
PROPERTY LOCATION					FLOOR AREA	YEAR BUILT
					0	0
REMARKS:					RATIO:	
					0	
ADDITIONAL BLOCKS/LOTS						
BLOCK	LOT	QUAL	LAND	BUILDINGS	TOTAL	
			0	0	0	
			0	0	0	
			0	0	0	
			0	0	0	
			0	0	0	
NONUSABLE CODE			SERIAL NO.			
24			3029747			

# EXAMPLE 4b

# Project Information

- Development  $\geq 1$  acre disturbance
- Major development
  - Water quantity is required
- Increase of impervious surface  $\geq 0.25$ 
  - Water quality is required
- Groundwater recharge is required unless exempt
  - PA1 area, but whether a part of the property is “previously developed” is questionable

Existing condition



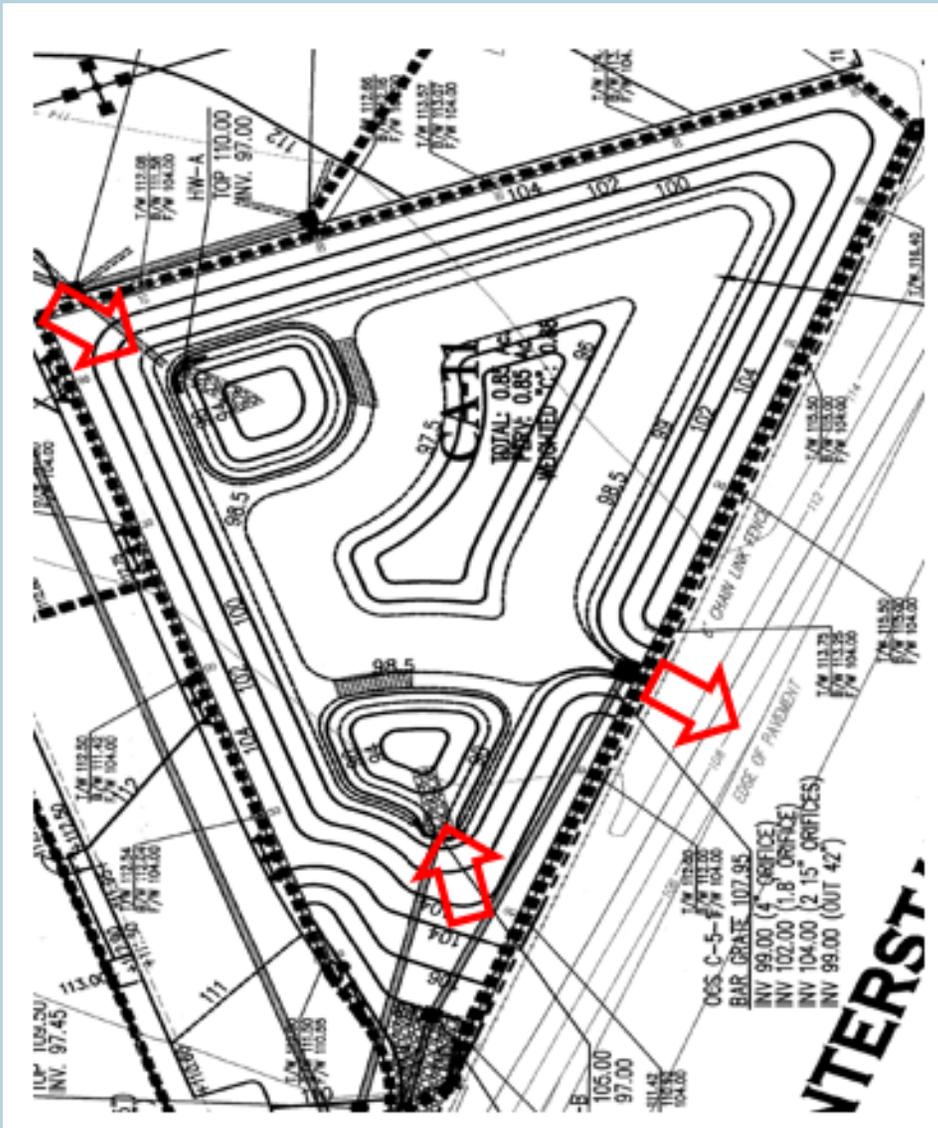
Post-construction condition



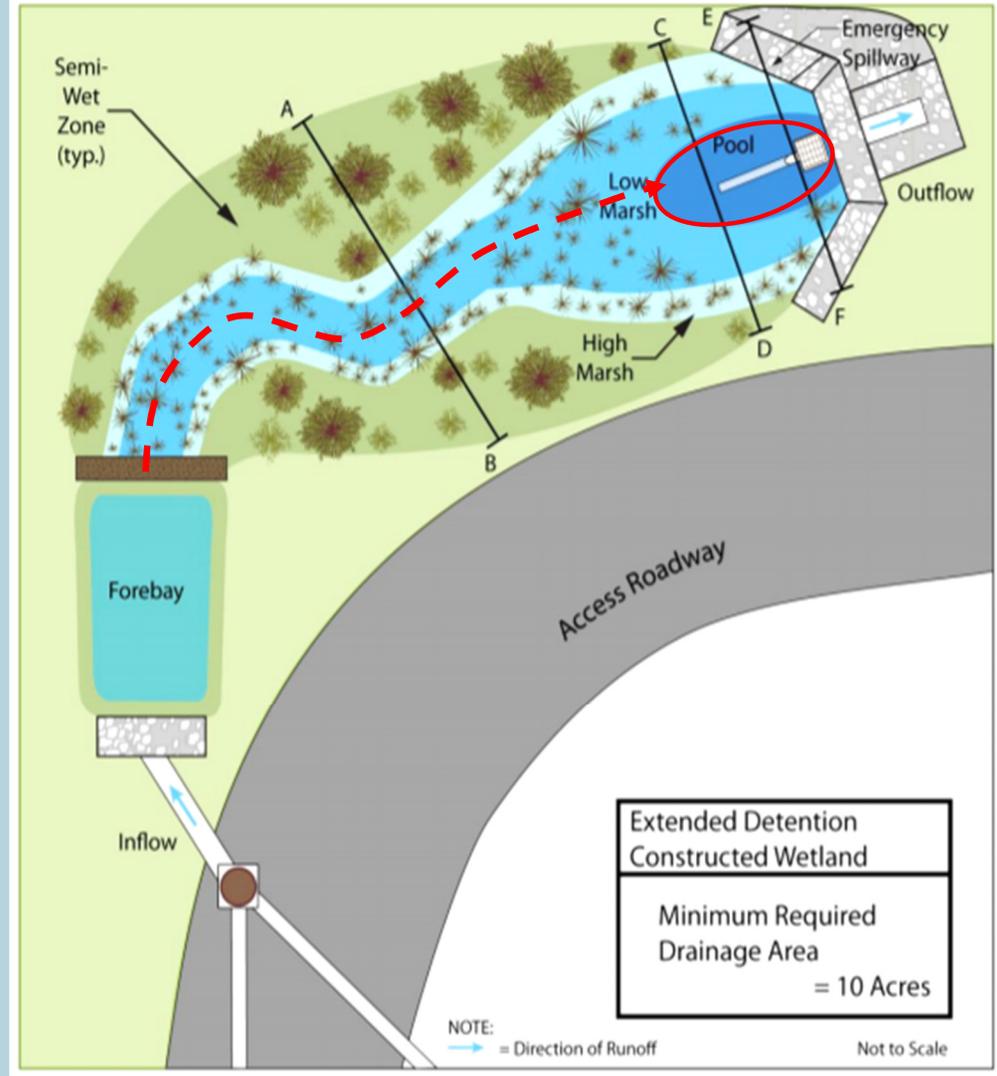


Extended  
standard  
constructed  
wetland

# Other Issues



## Extended Detention Constructed Wetlands - Plan View



Minimum Length to Width Ratio 1:1  
One inlet is too close to the outlet

# Other Issues

- Nonstructural strategies were incorporated
- Water Quantity Calculation was underestimated

## MASTER DESIGN STORM SUMMARY

Network Storm Collection: Union Count., NJ

Return Event	Total Depth in	Rainfall Type	RNF ID
100Y	7.5000	Synthetic Curve	TypeIII 24hr

NOAA  
Data

PDS-based precipitation frequency estimates with 90% confidence interval							
Duration	Average recurrence interval (years)						
	1	2	5	10	25	50	100
24-hr	2.81 (2.60-3.06)	3.40 (3.15-3.70)	4.37 (4.04-4.75)	5.19 (4.79-5.64)	6.44 (5.88-6.98)	7.52 (6.82-8.14)	8.72 (7.83-9.45)

NRCS  
County  
Ave.

County	1 year	2 year	5 year	10 year	25 year	50 year	100 year
Union	2.80	3.39	4.35	5.17	6.42	7.49	8.69

# Maintenance Plan

- No responsible party contact information
- No specific preventative tasks for constructed wetland
  - Wetland Vegetation
  - Depth/Settlement
  - Sinuous path pattern
  - Channelization
- No cost estimate
  - Regular maintenance
  - Dredge
  - Permit

**STORMWATER MANAGEMENT FACILITIES  
MAINTENANCE PROGRAM: POST  
CONSTRUCTION ACTIVITIES**

**PROPOSED RETAIL  
DEVELOPMENT**

*Prepared for:*

*Prepared by:*

<u>DESCRIPTION</u>	<u>PAGE NO.</u>
INTRODUCTION .....	1
POST CONSTRUCTION INSPECTION PHASE .....	5
MAINTENANCE EQUIPMENT & PROCEDURES .....	6
A. Objectives .....	6
B. Definitions .....	7
C. The Importance of SWMF Maintenance .....	8
D. Comprehensive SWMF Maintenance Review .....	11
E. SWMF Maintenance Procedure .....	15
1. Preventive Maintenance Procedures .....	17
a. Grass Cutting .....	17
b. Grounds Maintenance .....	18
c. Vegetative Cover .....	19
d. Removal and Disposal of Trash & Debris .....	19
e. Sediment Removal & Disposal .....	20
f. Mechanical Components .....	20
g. Elimination of Potential Mosquito Breeding Habitats .....	20
h. Maintenance of Stormwater Detention Facility .....	21
i. Inspection .....	22
j. Reporting .....	22
2. Corrective Maintenance Procedures .....	23
a. Structural Repairs .....	23
b. Dam Embankment & Slope Repairs .....	24
c. Dewatering .....	24
d. Removal of Debris & Sediment .....	23
e. Maintenance of Stormwater Management Area .....	24
f. Extermination of Mosquitos .....	25
g. Erosion Repair .....	25
h. Fence Repair .....	27
i. Elimination of Trees, Brush, Roots & Annual Burrows .....	27
j. Snow & Ice Removal .....	27
3. Aesthetic Maintenance Procedures .....	28
a. Data Sheet for Maintenance Plan .....	28
b. Graffiti Removal .....	28
c. Grass Trimming .....	28
d. Control of Weeds .....	28
e. Details .....	29

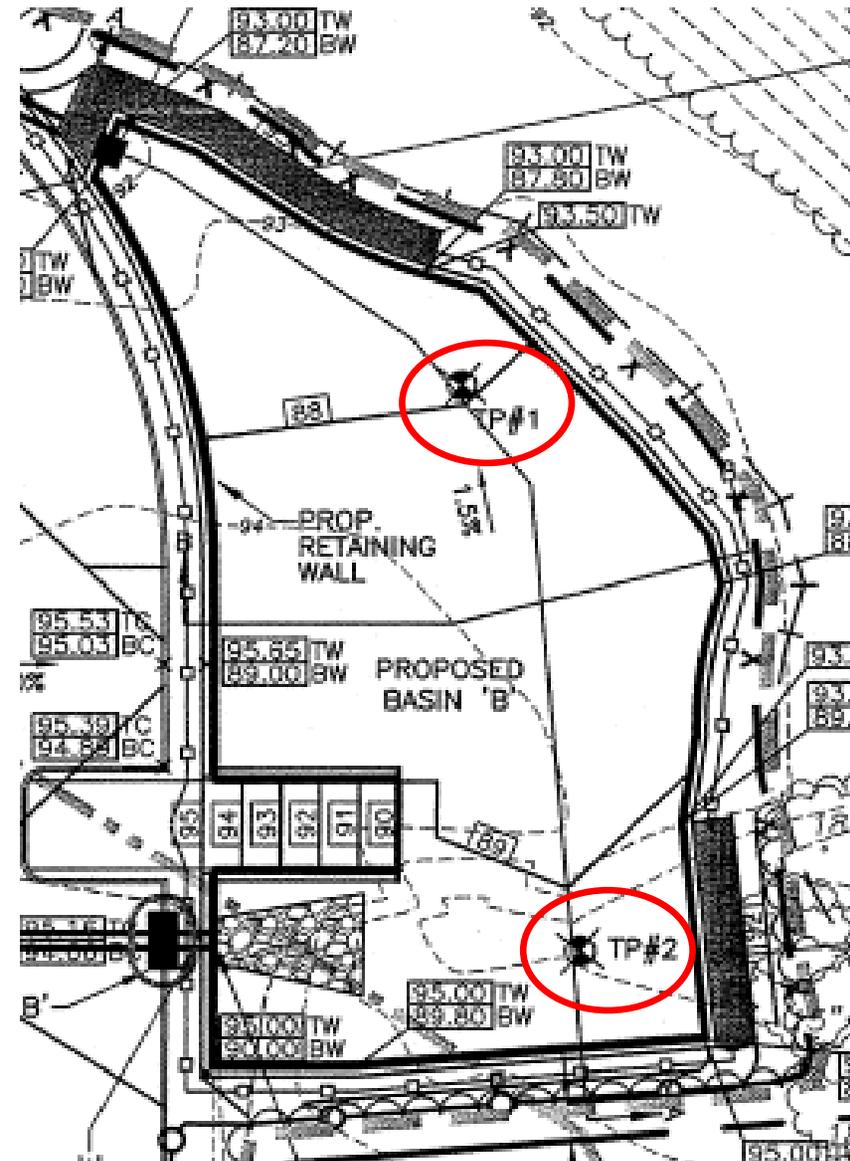
# EXAMPLE 4c



# Soil Testing

## Infiltration Basin

- Bottom from EL. 89 to EL. 88 &
  - Sand bed 0.5 ft
  - Lowest point = EL. 87.5
  - Basin area = 6,540 sf
  - Max. water quality storm depth EL. 89.1
  - Soil Test Pits, TP#1 & TP #2
- 
- **No. of soil test pits**
    - 6,540 sf
  - **Location**
    - In the infiltration area



# Soil Testing

- Soil profit pit depth from basin's sand bottom
  - Greater of 8 ft or 2x max water depth (1.1 ft)
- Sand bottom is at EL. 87.5 ft
- Required depth = 8 ft below EL. 87.5 ft

## TP#1 Depth

- GL is EL. 93.8 ft,
- The required depth =  $93.8 - 87.5 + 8 = 14.3$  ft (176 in from GL)

## SHWT separation

- SHWT at 96 in from GL;
- Sand bottom at EL. 87.5 ft (75.9 in from GL)  
Separation = 20.1 in (1.68 ft)  
Separation is not enough

CLIENT: [REDACTED] PROJECT: [REDACTED]  
 BLOCK: [REDACTED] LOT(s): [REDACTED] TOWNSHIP: [REDACTED] COUNTY: [REDACTED]  
 CREW: [REDACTED] INSPECTOR: [REDACTED] DATE: 4/26/11 No Witness

TEST PIT -1 Elev. 93.8			
DEPTH INCHES	SOIL	COLOR	SOIL TEXTURE
0"-37"	10YR 6/4		Sandy Clay Loam subangular blocky, friable
37"-52"		Debris, Silt Fence Material Tree Stumps, Construction Trash	Sandy Loam angular blocky, friable
52"-96"	1 Gley 5/10GY	Greenish Gray trace of construction debris	Sandy Clay Loam Subangular Blocky, Friable
96"-108"	5Y 5/2	Reddish Gray	Sand Single Grain Loose
108"-139"	10YR 7/2	Light Gray	Sandy Clay (moist) massive, firm
139"-178"	10YR 7/2	Light Gray	Fine Sand (moist) Single Grain Loose

SHWT: 96" Seepage at 134"  
 No permeability test taken

# Permeability Test

## TP#2 Depth

- GL is EL. 91.8,
- Required depth  
 $= 91.8 - 87.5 + 8 \text{ ft}$   
 $= 12.3 \text{ ft (147.6 in)}$  from GL

## SHWT separation

- SHWT at 56 in (EL. 87.13 ft)
- sand bottom at EL. 88.5 ft (39.6" from GL)
- separation =  $88.5 - 87.13 = 1.37 \text{ ft}$
- Permeability rate test depth
- below sand bottom of the basin but above SHWT
  - Most restrictive horizon is Sandy Loam
  - Tested at sandy soil layer

TEST PIT -2 Elev. 91.8			
DEPTH INCHES	SOIL	COLOR	SOIL TEXTURE
0"-21"	2.5Y 6/4	Light Yellowish Brown	Loamy Sand subangular blocky, friable
21"-30"	10YR 3/2	Very Dark Grayish Brown	Sandy Loam angular blocky, friable
<u>30"-42"</u>	10YR 5/4	Yellowish Brown	<u>Sandy Loam subangular blocky, friable</u>
42"-56"	2.5Y 7/4	Pale Yellow	Sand single grain loose
56"-168"	2.5Y 6/6	Olive Yellow	Silty Sand

Permeability tests in accordance with the NJDEP BMP Manual-Appendix E were performed at Test Pit #2 within the sand stratum encountered. Results of the permeability test, testing method and other data are provided in Appendix D of this report. In summary, the sandy soils found above the estimated seasonal high water table, at approximately 42"-56" below existing ground surface found to have a permeability rate of 4.84 in/hr.

Permeability Test Taken at 52"

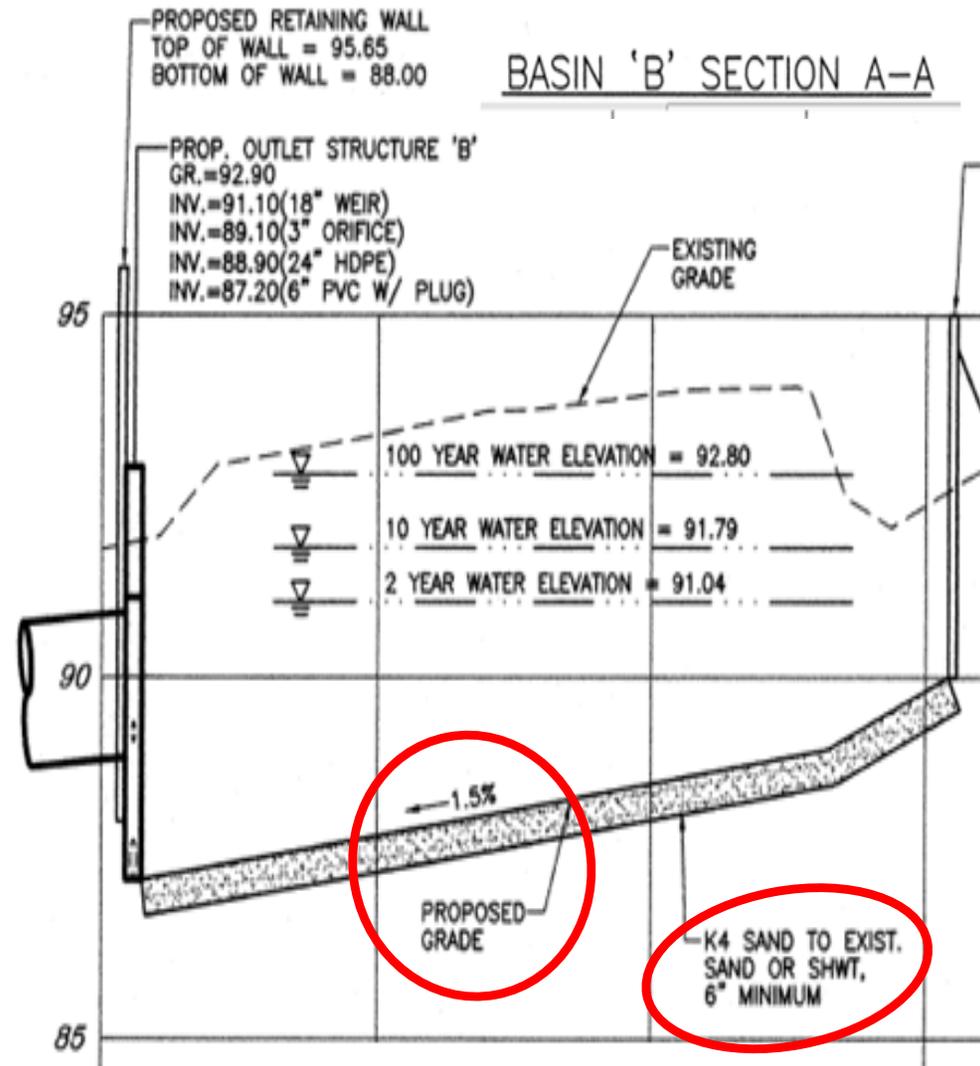
SHWT: 56" Seepage at 61"

# Consequences



# Other Issues

- Infiltration basin has a sloped bottom
  - Infiltration basin needs to have a level basin bottom in order to even distribute runoff over entire basin bottom for even infiltration
- K4 sand was used for the sand layer of infiltration basin
  - Sand layer must meet the specification of K5 sand



# Maintenance Plan

## STORMWATER MANAGEMENT FACILITIES MAINTENANCE, REPAIR AND SAFETY PLAN

The on-site stormwater management facilities were designed to operate under conditions that require regular active maintenance to ensure their integrity and proper operation. In order to assure the aforementioned, the following maintenance plan must be implemented and adhered to by the owner as a minimum. Should specific conditions warrant additional maintenance measures shall also be implemented as required. When establishing or restoring vegetation, bi-weekly inspections of vegetation health should be performed during the first growing season. Once established, the inspection of vegetation health, density and diversity shall be performed at least twice annually. The vegetated cover should be maintained at 85%.

### 1. Inspection

Routine inspection of the Infiltration/retention basin shall be performed on a monthly basis and following all storms exceeding one inch of rainfall. In addition to the monthly inspections, the basin should be inspected annually by a licensed professional engineer to ensure its proper operation and to provide recommended changes to the maintenance thereof. Among the specific items that must be looked for and reported on are erosion of the side slopes, breaching of embankments, damage to fences and gates, and deterioration of the headwalls and outlet works. Any erosion on the basin side slopes must be repaired and then reseeded in accordance with the State Soil Erosion Control Standards. Breaching of embankments may be caused by animals, settlement or other factors. Deterioration of the outlet structure may cause a basin failure to occur and result in property damage downstream. Due to all of the concerns above, any observed deficiencies must be reported and corrected immediately upon discovery. Other minor items such as displacement of rip-rap, etc., should also be noted and repaired in a timely fashion.

### 2. Maintenance Activities

#### A. Turf Management

All turf shall be actively maintained throughout the year by the proper application of fertilizers, pesticides, weed control, lime, supplemental seeding, and any other measures necessary to maintain a healthy stand of grass. All treatments are to be applied in accordance with the manufacturer's recommendations and safety precautions. Grassed areas are to be mowed twice a month as a minimum during the growing session, with mowing scheduled weekly or as needed during periods of heavy growth. All grass clippings shall be removed from the basin area and disposed of properly.

IMINARY AND FINAL  
EROSION CONTROL NOTES AND  
FOR

# Contact Information

**Bureau of Nonpoint Pollution Control  
Division of Water Quality  
401 East State Street  
PO Box 420, Mail Code 401-2B  
Trenton, NJ 08625-420  
Tel: 609-633-7021  
[www.njstormwater.org](http://www.njstormwater.org)**

**Changi Wu  
[Chang.i.wu@dep.nj.gov](mailto:Chang.i.wu@dep.nj.gov)**



**New Jersey  
DEPARTMENT of  
ENVIRONMENTAL  
PROTECTION**

# PLAN REVIEW

## EXAMPLE 5

Minesh Patel  
NJDEP Division of Water Quality  
SWMDR Training Module 4  
September 3, 2020

# Presentation Goals

## Goals

- Review site plans and stormwater management report
- Identify any errors with the design
- Suggest potential solutions

# Determining Applicable Design & Performance Standards

## Does the Development

- Trigger the municipality's SCO?
- Disturb one acre or more?
- Increase impervious coverage by  $\frac{1}{4}$  acre or more?

# Determining Applicable Design & Performance Standards

## Municipal Stormwater Control Ordinance:

- Major Development:

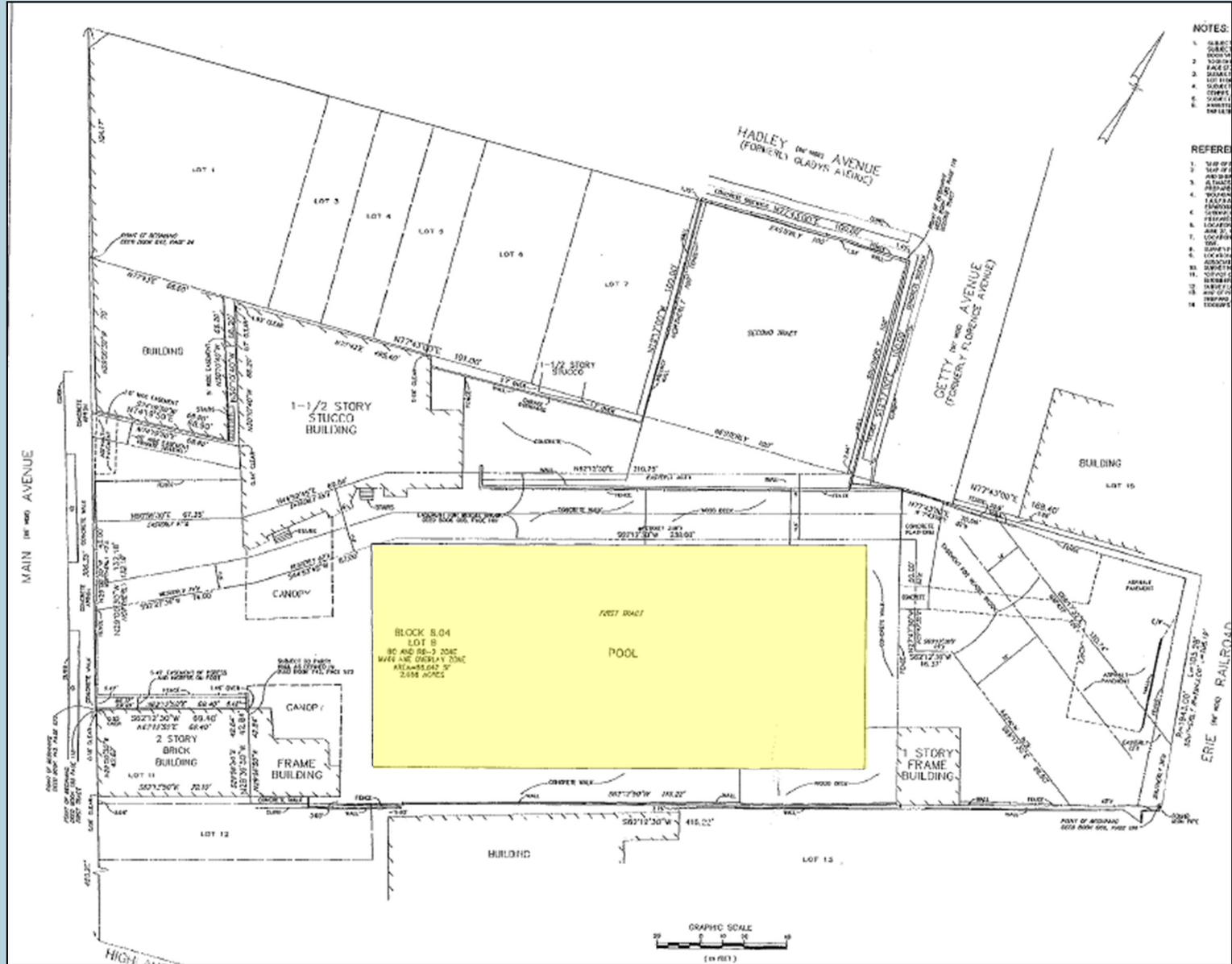
*“Any development that provides for ultimately disturbing one or more acres of land or would create ¼ acre or more of impervious surface.”*

# Familiarize Yourself with the Site

What are the pre-construction conditions?

- Important in determining the requirements
- Existing land cover
- Has the existing land cover existed for the past 5 years?

# Pre-Development Site



# Pre-Development Site



# Stormwater Management Report

## Existing Coverage

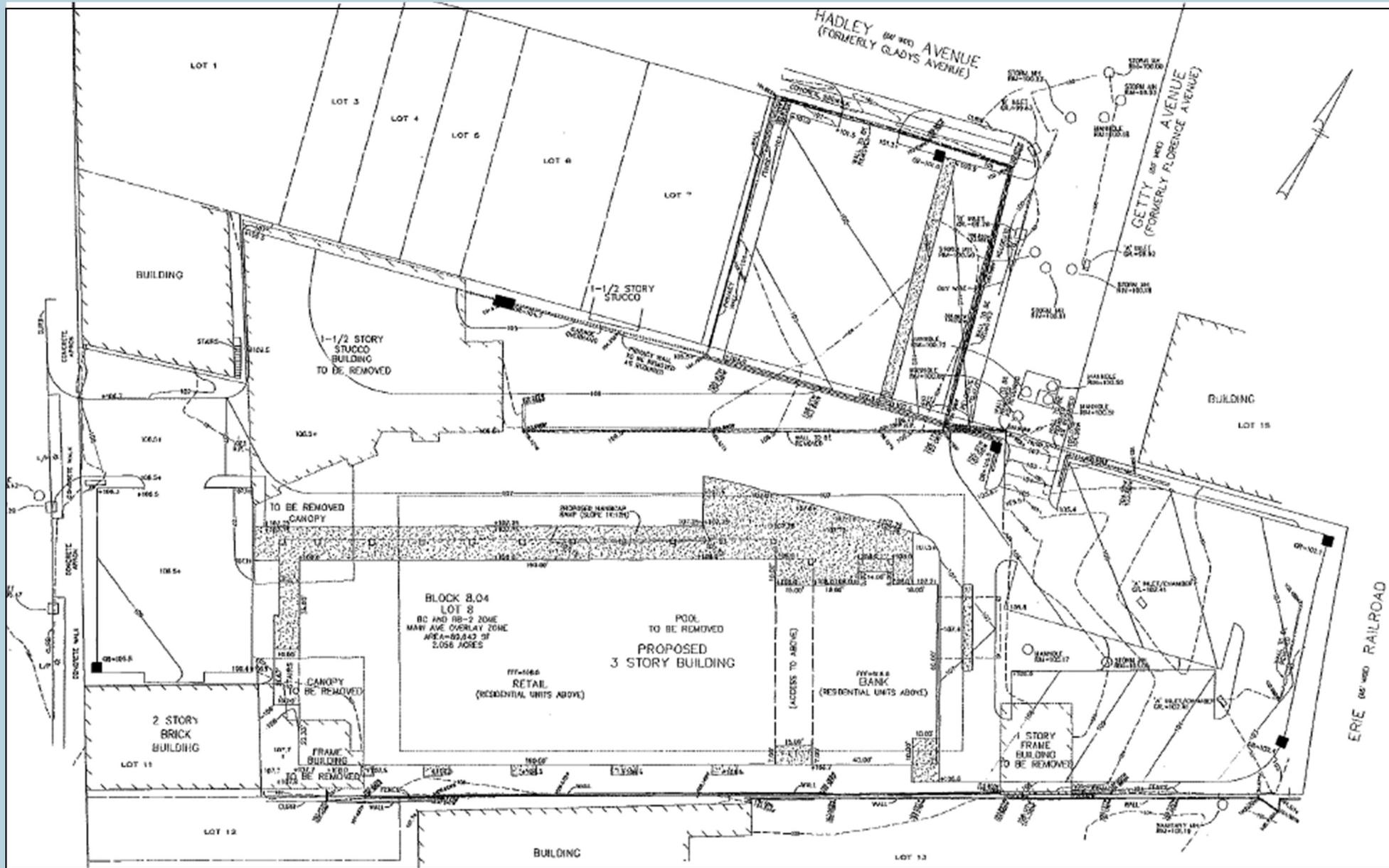
Coverage Item	Area
Parking Lot, Roof, Driveway	1.61 acres
Lawn	0.52 acres

## Proposed Coverage

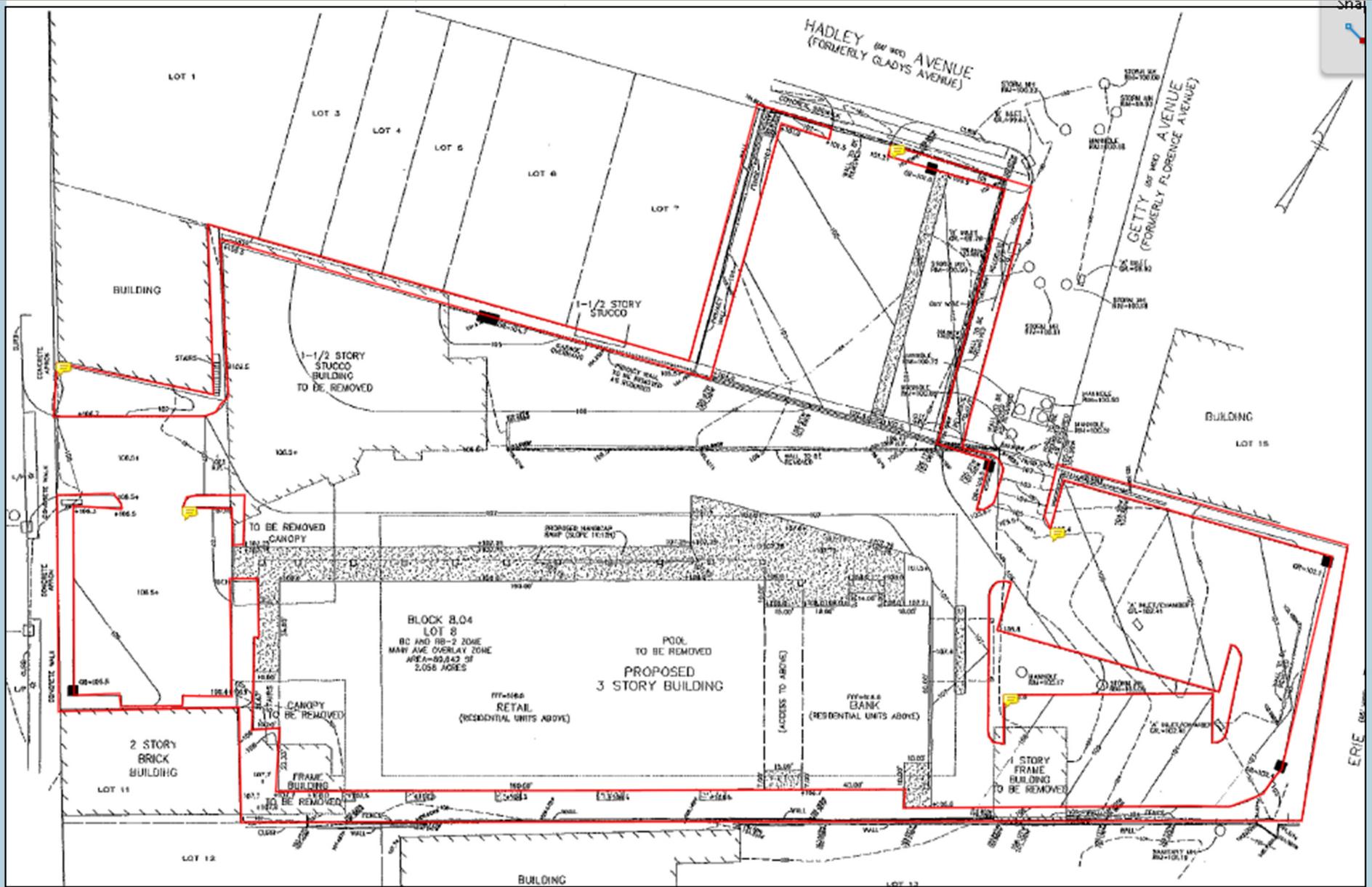
Coverage Item	Area
Parking Lot, Roof, Driveway	1.836 acres
Lawn	0.294 acres



# Post-Development Site



# Post-Development Site



# Determining Applicable Design & Performance Standards

## Disturbance & Increase in Impervious Area

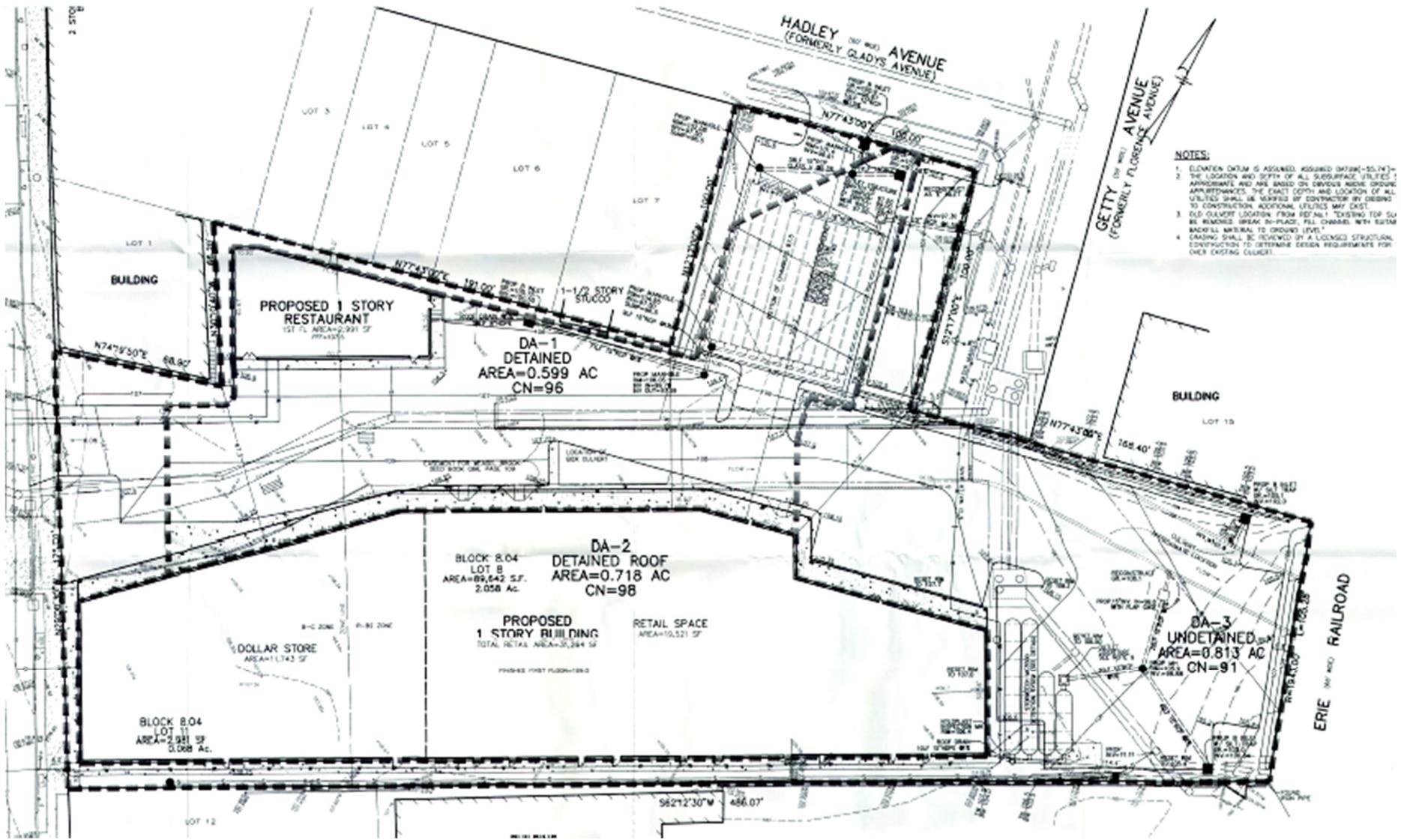
- Total Disturbance:
  - 2.13 acres
- Increase in impervious area:
  - 0.226 acres
- Is the site a major development?
  - Yes

# Determining Applicable Design & Performance Standards

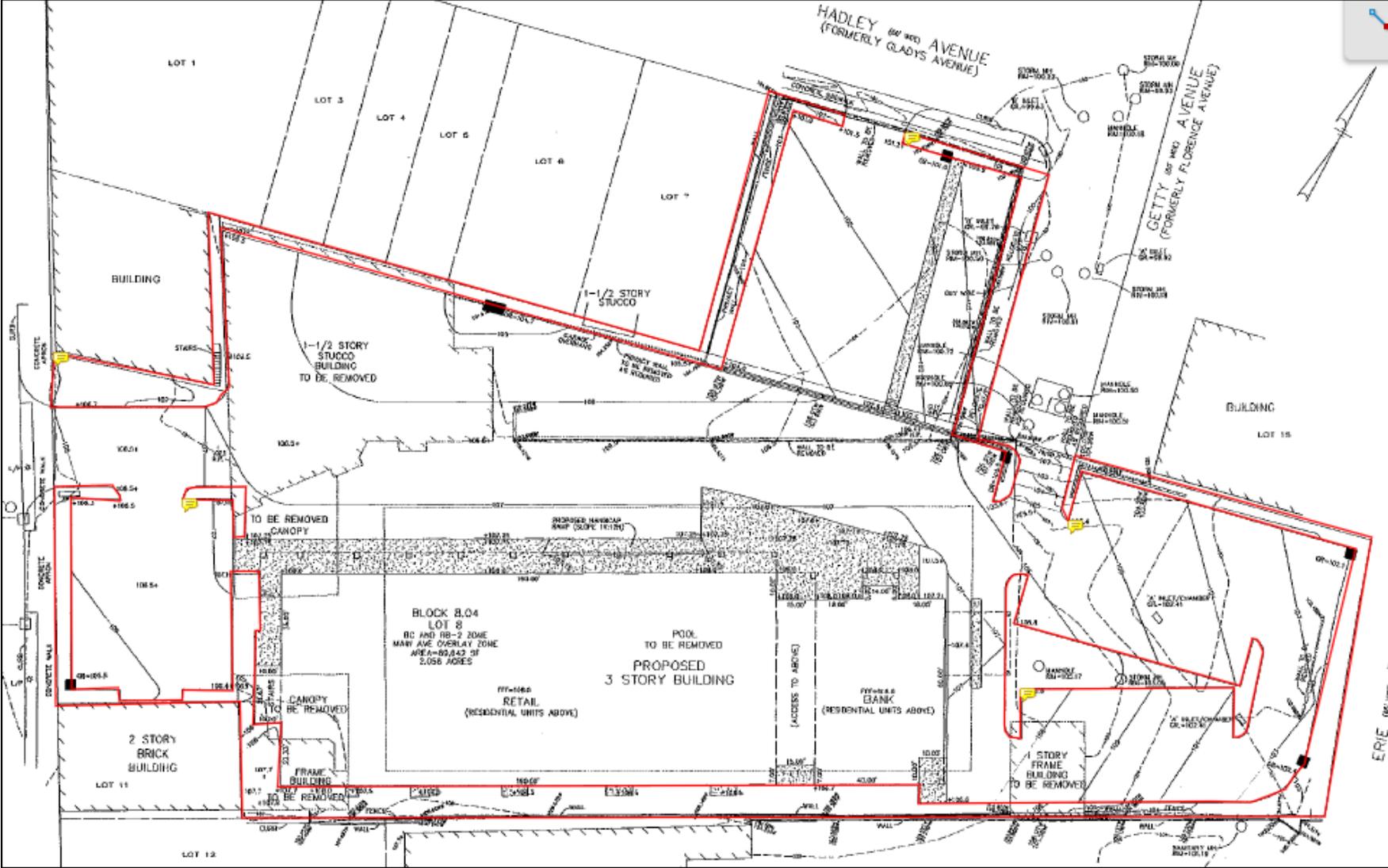
## Which standards are required?

- Water Quantity
  - Required
- Water Quality
  - Increase in impervious coverage <0.25 acre
  - Not required
- Groundwater Recharge
  - Urban redevelopment area
  - Not required, provided anyway

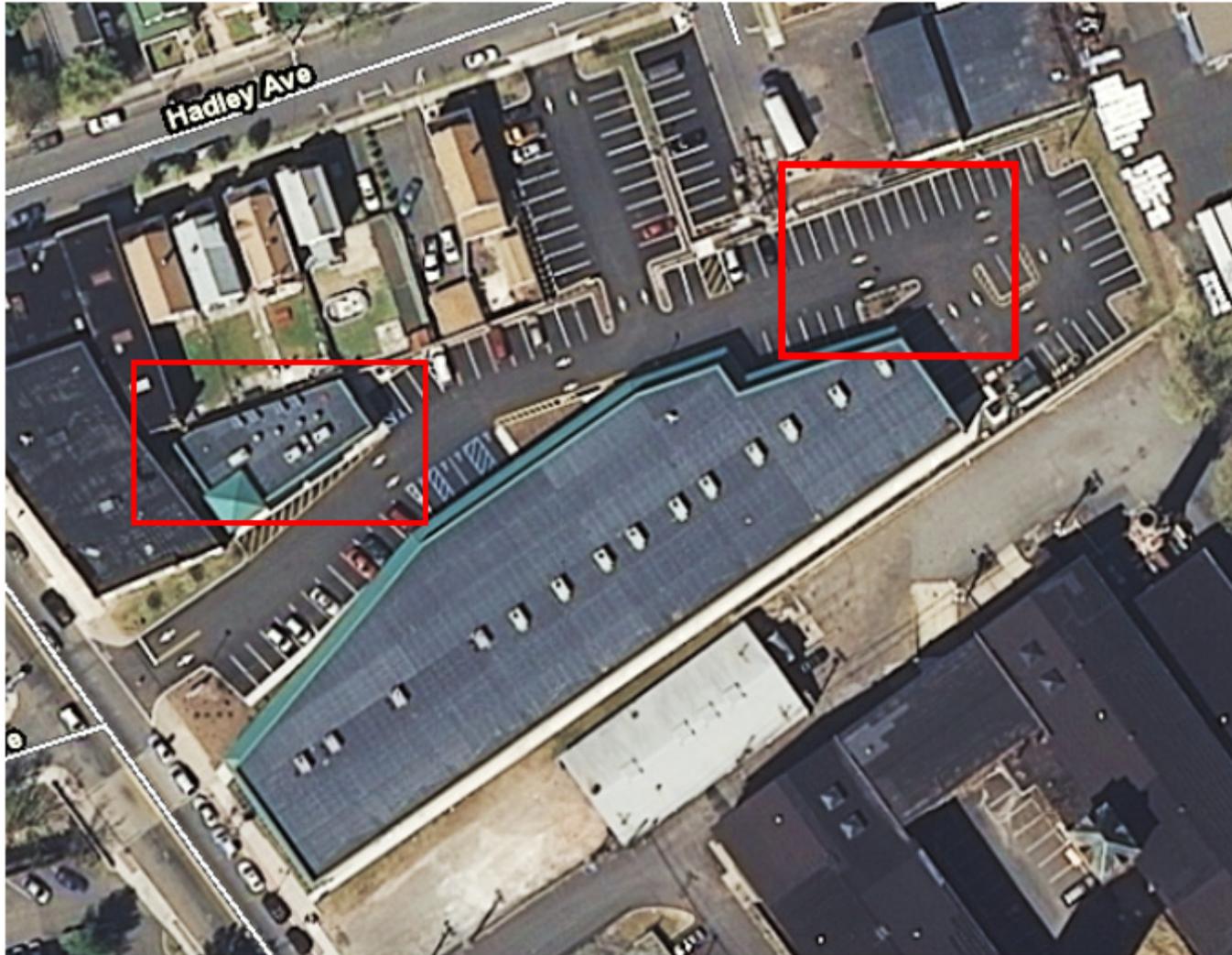
# Proposed Site Plan



# Proposed Site Plan



# Post-Development Site



# Pre-Development Conditions

*What does this mean for this site?*

# Determining Applicable Design & Performance Standards

## Which standards are required?

- Water Quantity
  - Required
- Water Quality
  - Increase in impervious coverage > 0.25 acre
  - Required
- Groundwater Recharge
  - Urban redevelopment area
  - Not required, provided anyway

# GROUNDWATER RECHARGE

# Groundwater Recharge

## What is required?

- Site was exempt from groundwater recharge, designer provided it anyway
- Submitted groundwater recharge spreadsheet
- Soil testing required for any proposed infiltration BMP

# Groundwater Recharge

## Soil Testing

- No soil testing data submitted
- Stormwater management report:

*“...the only soil present on site is Urban land-Boonton complex (UbB). Boonton soils are classified as a type C soil and are not well suited for infiltration due to their slow permeability.”*

**- This is not true! UL-Boonton soils are not HSG C**

# Groundwater Recharge

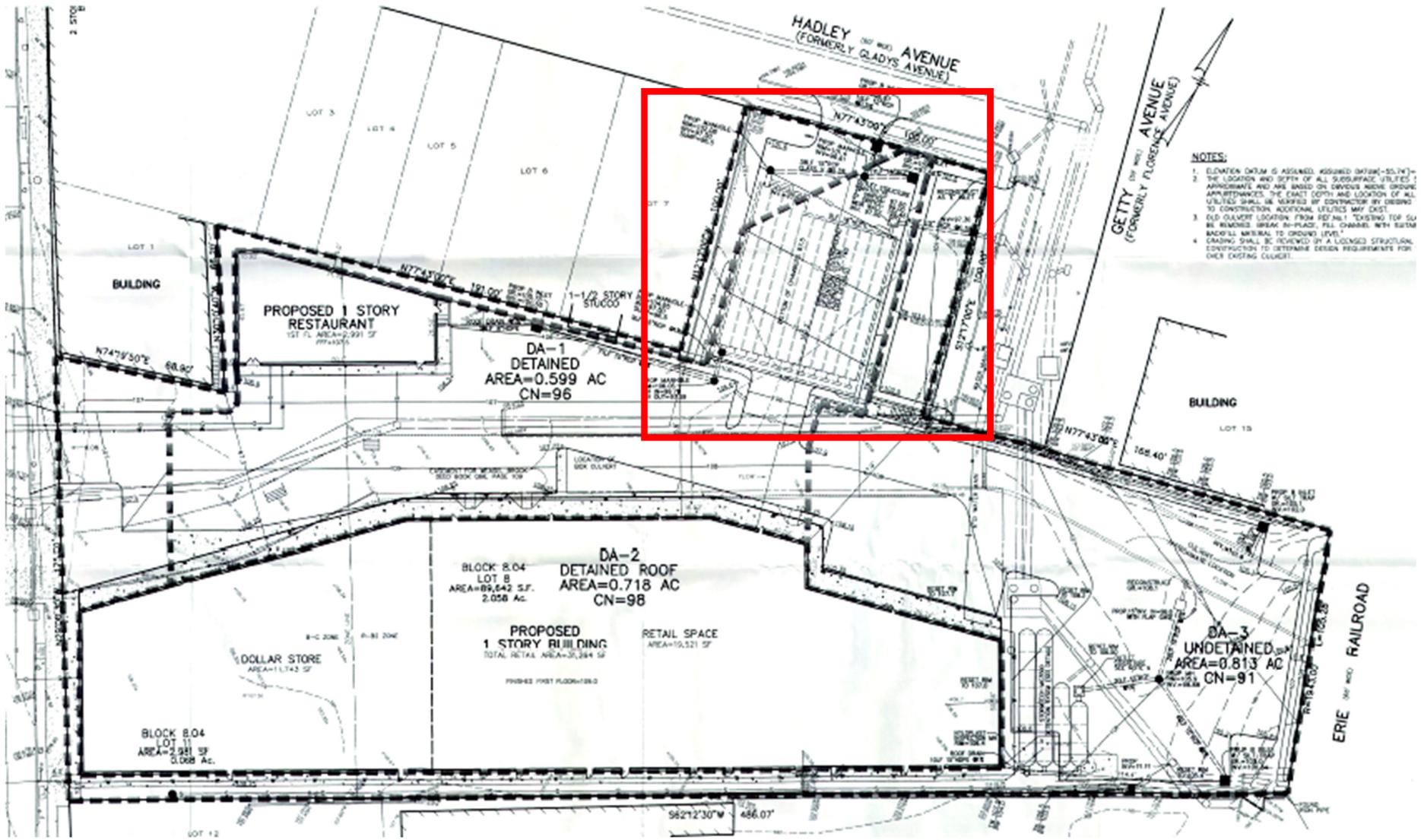
## Soil Testing

- Soil testing required to determine the permeability and separation from SHWT
- Small stream traverses the site via a culvert
- Basin will likely not drain fast enough

# Groundwater Recharge

Pre-Development Conditions						Post-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)	Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.52	Open space	Boonton	13.9	26,188	1	0.294	Open space	boonton	13.9	14,806
2	1.61	impervious areas	Boonton	0.0	-	2	1.836	impervious areas	boonton	0.0	-
3						3					
4						4					
5						5	0				
6						6	0				
7	0					7	0				
8	0					8	0				
9	0					9	0				
10	0					10	0				
11	0					11	0				
12	0					12	0				
13	0					13	0				
14	0					14	0				
15	0					15	0				
Total =	2.1			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)	Total =	2.1			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				3.4	26,188					1.9	14,806
<b>Procedure to fill the Pre-Development and Post-Development Conditions Tables</b>						<b>Annual Recharge Requirements Calculation ↓</b>					
For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table						% of Pre-Developed Annual Recharge to Preserve = 100%					
						Total Impervious Area (sq.ft) 79,976					
						<b>Post-Development Annual Recharge Deficit= 11,382 (cubic feet)</b>					

# Proposed Site Plan



# Groundwater Recharge

Project Name		Description		Analysis Date		BMP or LID Type					
Sample Project		This is a test application		09/01/03							
Recharge BMP Input Parameters				Root Zone Water capacity Calculated Parameters				Recharge Design Parameters			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
BMP Area	ABMP	3916.0	sq. ft	Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.68	in	Inches of Runoff to capture	Qdesign	0.36	in
BMP Effective Depth, this is the design variable	dBMP	2.4	in	ERWC Modified to consider dEXC	EDRWC	0.00	in	Inches of Rainfall to capture	Pdesign	0.46	in
Upper level of the BMP surface (negative if above ground)	dBMPu	54.0	in	Empty Portion of RWC under Infil. BMP	RERWC	0.00	in	Recharge Provided Avg. over Imp. Area		19.8	in
Depth of lower surface of BMP, must be >= dBMPu	dEXC	60.0	in					Runoff Captured Avg. over imp. Area		19.8	in
Post-development Land Segment Location of BMP, Input Zero if Location is distributed or undetermined	SegBMP	2	unitless								
<input type="checkbox"/> Solve for ABMP to provide Vdef	<input type="checkbox"/> Solve for dBMP to provide Vdef	<input type="checkbox"/> Default Vdef & Aimp		BMP Calculated Size Parameters				CALCULATION CHECK MESSAGES			
				ABMP/Aimp	Aratio	0.15	unitless	Volume Balance-->	Solve Problem to satisfy Annual Recharge		
				BMP Volume	VBMP	783	cu. ft	dBMP Check-->	OK		
								dEXC Check-->	OK		
								BMP Location-->	OK		
Parameters from Annual Recharge Worksheet				System Performance Calculated Parameters				OTHER NOTES			
Post-D Deficit Recharge (or desired recharge volume)	Vdef	11,382	cu. ft	Annual BMP Recharge Volume		44,284	cu. ft	Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Res sensitive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as deter the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and oth			
Post-D Impervious Area (or target Impervious Area)	Aimp	26,789	sq. ft	Avg BMP Recharge Efficiency		100.0%	Represents % Infiltration Recharged				
Root Zone Water Capacity	RWC	3.33	in	%Rainfall became Runoff		78.5%	%				
RWC Modified to consider dEXC	DRWC	0.00	in	%Runoff Infiltrated		51.3%	%				
Climatic Factor	C-factor	1.59	no units	%Runoff Recharged		17.2%	%				
Average Annual P	Pavg	49.2	in	%Rainfall Recharged		13.5%	%				
Recharge Requirement over Imp. Area	dr	1.7	in								
<b>How to solve for different recharge volumes:</b> By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP. To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration, click the "Default Vdef & Aimp" button.											

# Groundwater Recharge

## Post-D Impervious Area

- Set to the impervious area draining to recharge BMP
- Post-D:
  - From NJGRS: 26,789 sf
  - From stormwater management report: 23,784 sf
- DA to recharge basin (including pervious): 26,092 sf

# Groundwater Recharge

## BMP Area

- Measured from site plan
- Infiltration volume must be equal to BMP Area times effective depth
- Provided effective depth = 2.4 inches

# Groundwater Recharge

## BMP Effective Depth

### REQUESTED POND WS ELEVATIONS:

Min. Elev.= 97.00 ft  
Increment = .05 ft  
Max. Elev.= 100.50 ft

\*\*\*\*\*  
OUTLET CONNECTIVITY  
\*\*\*\*\*

---> Forward Flow Only (UpStream to DnStream)  
<--- Reverse Flow Only (DnStream to UpStream)  
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Circular	02	--->	TW	98.750	100.500
Orifice-Circular	01	--->	TW	97.500	100.500
TW SETUP, DS Channel					

# Groundwater Recharge

## BMP Effective Depth

- Infiltration depth = 6 inches
- Storage media porosity = ?
- Provided effective depth = 2.4 inches

# Groundwater Recharge

## dBMPu and dEXC

- dBMPu: depth to upper level of BMP surface
- dEXC: depth to lower level of BMP surface
- Found using elevations on the plan and/or detail sheets
  
- Bottom of chambers: El. 97 ft
- Maximum infiltration elevation: El. 97.5 ft
- Ground surface: El. 102-105 ft

# Groundwater Recharge

## dBMPu and dEXC

- dBMPu: 54 inches
- dEXC: 60 inches
- As a quick check, the difference should be the maximum infiltration depth (6 inches)

# Groundwater Recharge

## SegBMP

- Land segment on which BMP is located
- Located on segment 2 (impervious area)
- Important to properly assign soil data, even for impervious areas

# Groundwater Recharge

## Review Issues:

- No soil testing
- Post-development conditions do not match plans
- Overestimated amount of impervious area to recharge BMP
- Did not provide sufficient information to verify effective depth

# **WATER QUANTITY**

# Water Quantity

## What needs to be reviewed?

- Time of concentration
- Curve numbers
- Proper routing
- Basin design

# Water Quantity

## Time of Concentration

- Assumed to be 0.167 hours (10 minutes)
- Minimum time of concentration in NRCS method is 0.1 hours (6 minutes)
- No calculations to verify this under existing conditions



# Water Quantity

## Curve Numbers and Routing

Open space (lawns, parks, golf courses, cemeteries, etc.) <sup>3</sup> :				
Poor condition (grass cover < 50%) .....	68	79	86	89
Fair condition (grass cover 50% to 75%) .....	49	69	79	84
Good condition (grass cover > 75%) .....	39	61	74	80
Impervious areas:				
Paved parking lots, roofs, driveways, etc. (excluding right-of-way) .....	98	98	98	98

# Water Quantity

## Water Quantity Analysis:

- Stormwater management report:

*“Infiltration occurring within the basin has not been considered in the calculations to be conservative.”*

- This is not just conservative, it is required!

# Water Quantity

## Water Quantity Analysis:

- Proposed peak flows:
  - 2-year storm: 47% pre-development
  - 10-year storm: 63.3% pre-development
  - 100-year storm: 76.1% pre-development
- Water quantity not met – all of the inputs were wrong!

# Contact Information

**Bureau of Nonpoint Pollution Control  
Division of Water Quality  
401 East State Street  
PO Box 420, Mail Code 401-2B  
Trenton, NJ 08625-420  
Tel: 609-633-7021  
[www.njstormwater.org](http://www.njstormwater.org)**

**Minesh Patel**  
[minesh.patel@dep.nj.gov](mailto:minesh.patel@dep.nj.gov)



**New Jersey**  
**DEPARTMENT of**  
**ENVIRONMENTAL**  
**PROTECTION**

MS4

# Program Update

And Closing  
Comments

Jim Murphy  
NJDEP Division of Water Quality  
SWMDR Training Module 4  
September 3, 2020

# Introduction

## Topics

- Rule Amendments
- MS4 Permit Renewals
- Permit Overview
- NJDEP Assistance/Guidance
- MS4 Audit Program
- BMP Manual Updates

# Amendments to Stormwater Management Rules

- March 2, 2020: Adoption of Rules
  - One year delayed operative date, effective 3-2-2021
  - Current rules are in effect until 3-1-2021
  - Same timeframe municipalities have to update ordinances in accordance with MS4 permits

# MS4 Permit Universe – Tier A & B

## Permittees

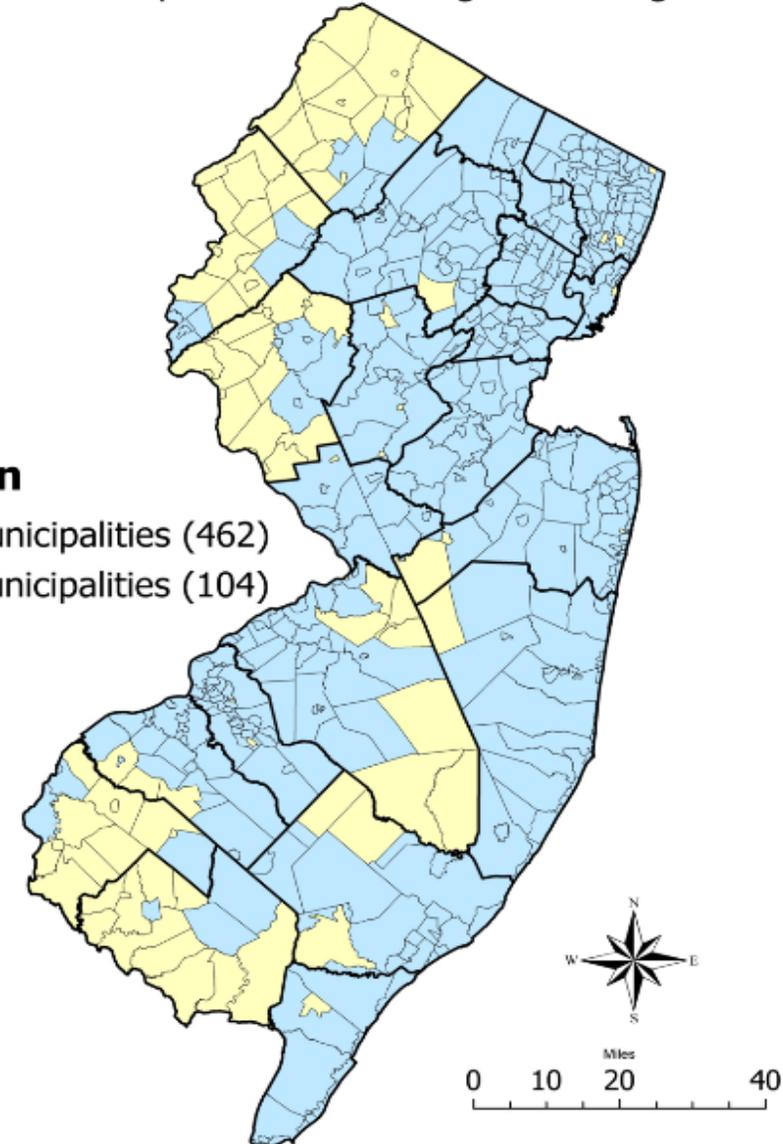
- Tier A Municipalities (462)
  - urbanized or along or near the coast
- Tier B Municipalities (104)
  - rural and non-coastal
- Permits Renewed 2018

## Municipal Tier Assignments 2009

Under the NJPDES Municipal Stormwater Regulation Program

### Explanation

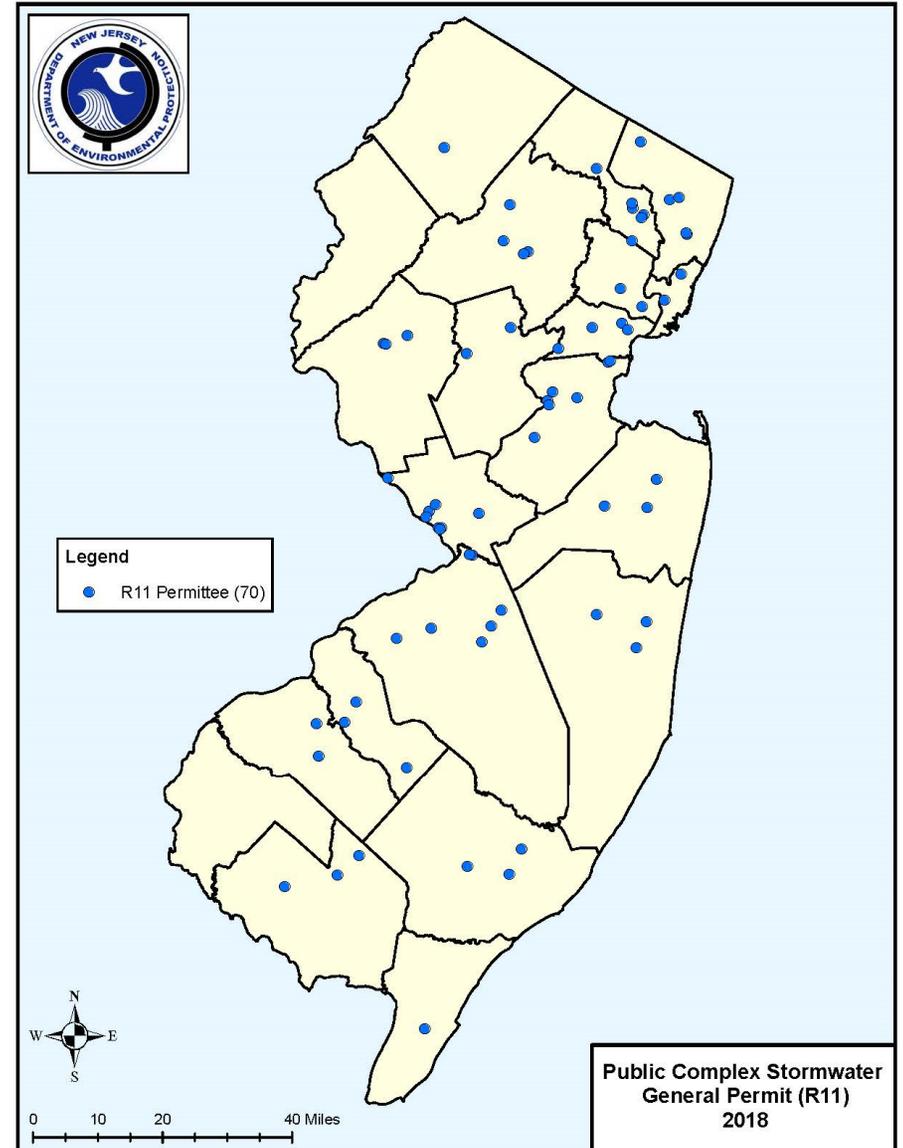
- Tier A - Municipalities (462)
- Tier B - Municipalities (104)



# MS4 Permit Universe – Public Complex

## Public Complex Permittees

- Sixty-Nine Permittees (69)
  - Colleges
  - Universities
  - Hospitals
  - Prisons
- Permit Renewed 2019



# MS4 Permit Universe – Highway Agencies

## Highway Agencies

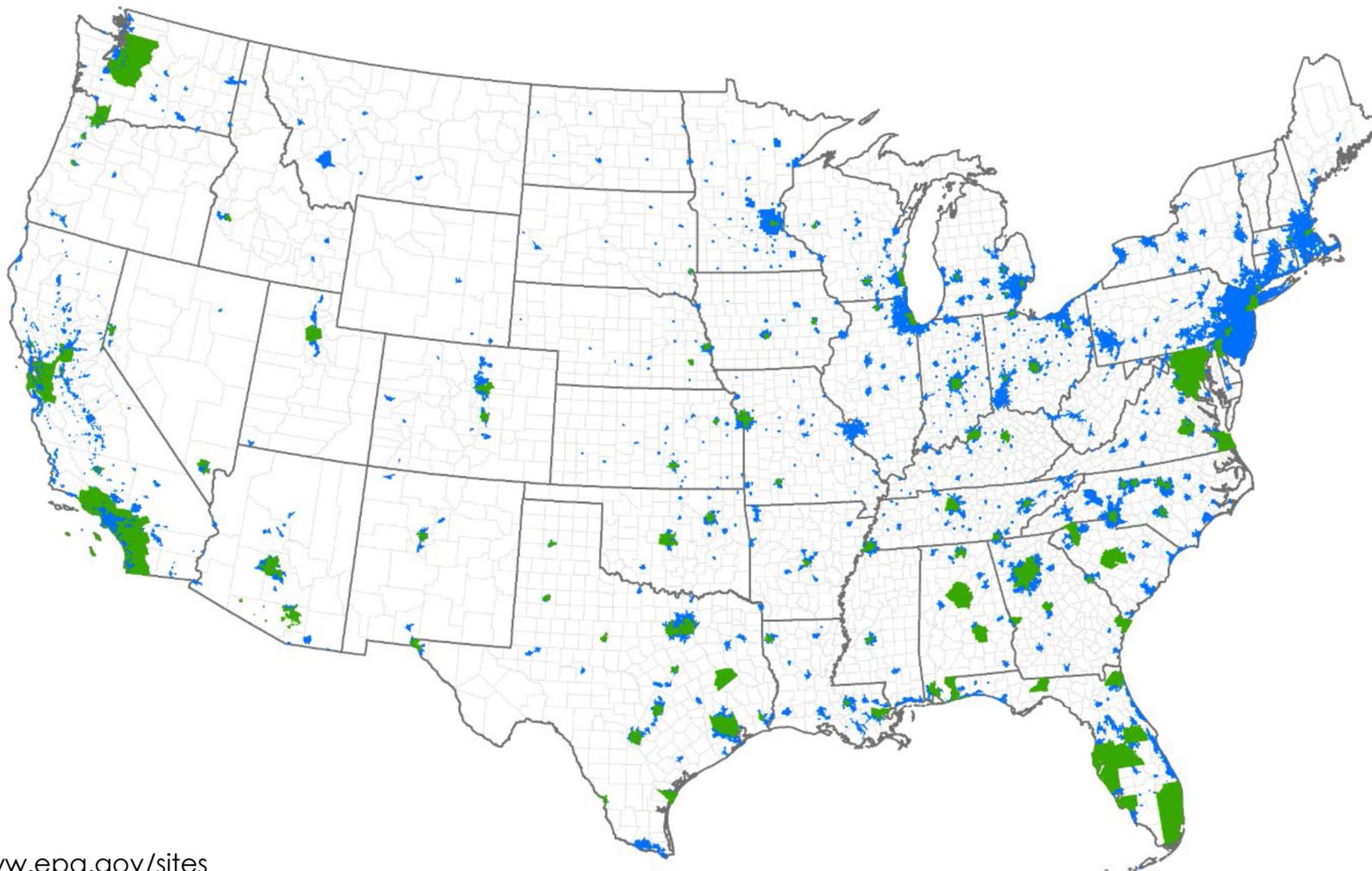
- Thirty-Three Permittees (33)
  - Counties
  - 3 NJDOT (North, Central, South)
  - Transportation Agencies
    - Turnpike
    - Parkway
    - Bridge Commissions
- Permit Renewed
  - 1/1/2020

MS4 Permits:

[https://www.nj.gov/dep/dwq/msrp\\_home.htm](https://www.nj.gov/dep/dwq/msrp_home.htm)



# National Map of Regulated MS4s



Source:  
[https://www.epa.gov/sites/production/files/2017-01/documents/final\\_compendium\\_intro\\_document\\_508.pdf](https://www.epa.gov/sites/production/files/2017-01/documents/final_compendium_intro_document_508.pdf)

# Public Education and Outreach

## Involve Public in Reducing Pollutants in Stormwater

- Implement Public Education Program
- Increased annual points from 10 to 12
- Maintain Documents
- Certify Annually

### Now Allows For:

- Updated activities (social media, web pages, etc.)
- More Opportunities Available to Align with Current Municipal Activities



# Post Construction Runoff Control

## Review of Stormwater Management Designs for Major Development

- Local Review to Ensure consistency with NJ Stormwater Rules
  - Quantity, Quality, GW Recharge
- Utilize Attachment D Checklist to ensure compliance with Design and Performance requirements under the Stormwater Rules
- Maintain Records and Certify Annually
- Updated BMP Manual for easier comprehension and understanding of design requirements
- Updated Training videos on Stormwater BMPs
- **FREE** DEP training for local review of stormwater designs (“Engineers training”)

Attachment D – Major Development Stormwater Summary

General Information			
1. Project Name:			
2. Municipality:	County:	Block(s):	Lot(s):
3. Site Location (State Plane Coordinates – NAD83):		E:	N:
4. Date of Final Approval for Construction by Municipality: Date of Certificate of Occupancy:			
5. Project Type (circle all that apply): Residential   Commercial   Industrial   Other (please specify) _____			
6. Soil Conservation District Project Number:			
7. Did project require NJDEP Land Use Permit?   Yes   No   Land Use Permit #:			
8. Did project require the use of any mitigation measures?   Yes   No If yes, which standard was mitigated?			

Project Information

Site Design Specifications	
1. Area of Disturbance (acres):	Area of Proposed Impervious (acres):
2. List all Hydrologic Soil Groups:	
3. Please Identify the Amount of Each Best Management Practices (BMPs) Utilized in Design Below: Bioretention Systems ___   Constructed Wetlands ___   Dry Wells ___   Extended Detention Basins ___ Infiltration Basins ___   Combination Infiltration/Detention Basins ___   Manufactured Treatment Devices ___ Pervious Paving Systems ___   Sand Filters ___   Vegetative Filter Strips ___   Wet Ponds ___ Grass Swales ___   Subsurface Gravel Wetlands ___   Other _____	

Site Information & Other BMPs Used

Storm Event Information			
Storm Event: Rainfall (inches and duration)	2 yr.: _____	10 yr.: _____	
	100 yr.: _____	WQ DS: _____	
Runoff Computation Method (circle one): NRCS: Dimensionless Unit Hydrograph   NRCS: Delmarva Unit Hydrograph   Rational   Modified Rational Other: _____			

Storm Event Info

Basin Specifications (answer all that apply) *If more than one basin, attach multiple sheets*			
1. Type of Basin:		Surface/Subsurface (circle one)	
2. Owner (circle one):		Private: If so, Name:   Phone number:	
3. Basin Construction Completion Date:			
4. Drain Down Time (hr.):			
5. Design Soil Permeability (in./hr.):			
6. Seasonal High Water Table Depth from Bottom of Basin (ft.):		Date Obtained:	
7. Groundwater Recharge Methodology (circle one):   2 Year Difference   NJGRS   Other   NA			
8. Groundwater Mounding Analysis (circle one):   Yes   No   If, Yes Methodology Used:			
9. Maintenance Plan Submitted:   Yes   No   Is the Basin Deed Restricted:   Yes   No			

Basin only Information

Comments: \_\_\_\_\_

# POLLUTION PREVENTION/GOOD HOUSEKEEPING

## Community Wide Ordinances and Measures

- Retains Six Existing Ordinance Requirements
- Catch Basin Inspection and Cleaning
  - At least every Five Years
  - Focus on Problematic Areas Certify Annually
- Street Sweeping
  - Miles swept & tons collected
- Maintain Records and Certify Annually
- Less Prescriptive
- Discretion to Municipality to Prioritize



# POLLUTION PREVENTION/GOOD HOUSEKEEPING

## Municipal Maintenance Yards and Ancillary Operations

- Expanded List to Cover Common Activities at MMY
  - Aggregate Materials and Construction Debris Storage
  - Street Sweepings, Catch Basin Clean Out Material
  - Yard Trimmings & Wood Waste Management
- Containment of Vehicle Wash water
  - Maintain Logs
    - Annual Engineers Inspection & Certification
    - Storage Tank Use & Pump Out Log
    - Integrity Testing every 3 Years
  - Attachment E of the Permit
- Maintain Records and Certify Annually



# PP/GH-Training Requirements

## Employee Training

- Specific to the Employee's Job Title and Duties
- Within Three (3) Months of Commencement of Duties
- Every Two (2) Years Thereafter
- Maintain Records and Certify Annually
- More Specific/Targeted
- DEP Training Materials Posted On-line



# PP/GH-Training Requirements

## Stormwater Management Design Review

- Required Training for Stormwater Management Design Reviewers
  - (e.g. Municipal Engineers)
- Training Required Every Five Years
- Register/DEP Maintains Records
- FREE NJDEP Training – Twice per Year



# PP/GH-Training Requirements

## Board & Council Member Training (Tier A & B)

- Required Training by All Board and Council Members
- Overview of Stormwater Permit Requirements
- “Asking the Right Questions”
- Maintain Records and Certify Annually
- FREE On-line Class (45 minutes)



# Mapping, Illicit Discharge and Scouring

## Localized Stream Scouring

- Develop, Update, Implement a Program
- Inspect Every Outfall Once Per 5 Years (Tier A & B)/Annually (R11)
- Mapping App
- Document Inspections
  - Location
  - IF Scouring
    - Repairs Prioritized
    - Repairs Scheduled



# Mapping, Illicit Discharge and Scouring

## Illicit Discharge Detection and Elimination

- Develop, Update, Implement, and Enforce Ongoing Program
- Inspect Every Outfall Once Per 5 Years (Annually for R11)
- Mapping App
- Document Inspections
  - Location
  - Illicit Connection Inspection Report Form



# Other Control Measures – Maintenance

## Maintenance of Stormwater BMPs (e.g. basins, MTDs, GI, etc.)

- Maintain all publicly owned stormwater BMPs
- Ensure maintenance of all privately owned BMPs built after 1984
  - Location
  - Illicit Connection Inspection Report Form
- Inspection and Maintain per maintenance Plan to Ensure proper function and operation
  - Maintain a Log
  - Location Information
  - Date
  - Findings
  - Maintenance Performed
- Prioritize Repairs



# Other Control Measures – Maintenance

## Maintenance of Stormwater BMPs (e.g. basins, MTDs, GI, etc.)

### Assistance:

- Mapping Application and License
- Extensive new O & M checklist and guidance posted on-line
- Town-wide Land Use GP for basin maintenance
- Letter from Department to support municipality gaining information about and access to private stormwater facilities



# TMDL

## Incorporation of TMDL information into SPPP

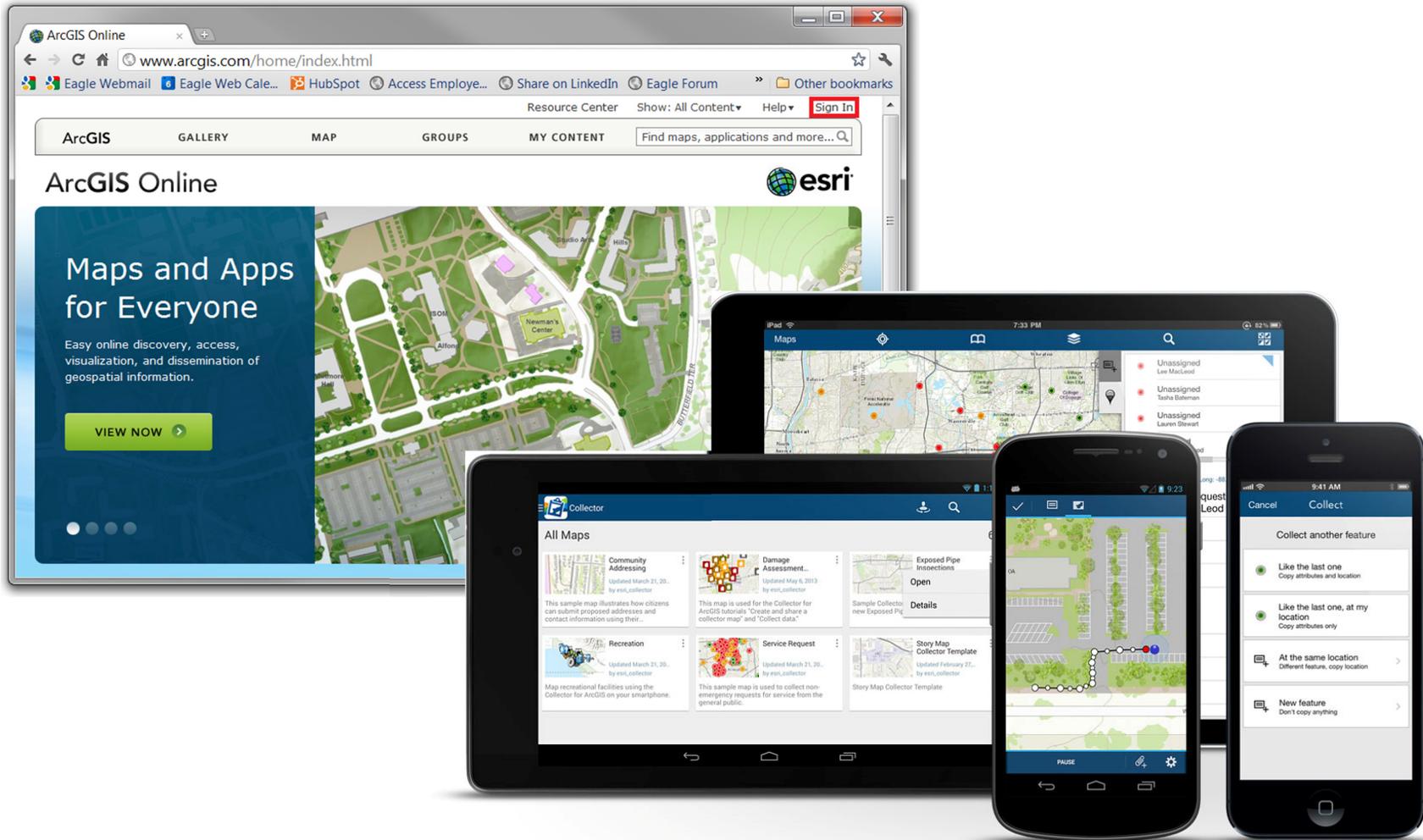
- Identify impaired waterways in municipality
- Identify and develop strategies to address sources of pollutants
- Update SPPP annually to include optional measures
- Prioritize stormwater facility maintenance & repairs
- TMDL Look-up Tool posted on-line
- Summarized strategies already posted



**Measurable Goals for Statewide Basic Requirements and Other Conditions of this Permit for Existing Permittees**

Summary of Minimum Standard (See Part IV for specific permit requirements)	Permit Cite	Measurable Goal (See Part IV for specific permit requirements)	Implementation Schedule	New Requirement?
<b>Public Involvement and Participation Including Public Notice</b>				
Provide for public notice under the Open Public Meetings Act, statutory procedures for enactment of ordinances, and Municipal Land Use Law when providing for public participation in the development and implementation of a stormwater program, and maintain records necessary to demonstrate compliance.	IV.B.1.a & d	Certify in each annual report that all public notice requirements have been met and relevant records kept. Reference in the SPPP the location of associated municipal records.	EDPA	No
Provide the current SPPP to the public upon request.	IV.B.1.b.i	Certify in each annual report that the SPPP was made available to the public.	EDPA	No
Post the current SPPP on the municipality's website.	IV.B.1.b.ii	Certify in each annual report that the SPPP has been posted on the municipality's website (to the extent required by Part IV.F.1.f) and that the posted SPPP is current.	EDPA + 90 days	Yes
Post the current Municipal Stormwater Management Plan (MSWMP) and related ordinances on the municipality's website.	IV.B.1.b.iii	Certify in each annual report that the MSWMP and related ordinances have been posted on the municipality's website and that the posted documents are current.	EDPA + 90 days	Yes
<b>Local Public Education and Outreach</b>				
Implementation of a Public Education and Outreach Program by conducting activities that total a minimum of 12 points on an annual basis.	IV.B.2.a	Certify in each annual report that the minimum point value has been met and report point totals in the Annual Report. Maintain records of materials and activities from Attachment B, including dates of activities and any other relevant documentation (e.g. brochures, pictures, sign-in sheets, press clippings).	EDPA	Modified
Label storm drain inlets, maintain the legibility of those labels, and replace labels that are missing or not legible along sidewalks that are adjacent to municipal streets; and within plazas, parking areas or maintenance yards operated by the municipality.	IV.B.2.b	Certify in each annual report that storm drains have been properly labeled and/or maintained. Records tracking storm drain inlet label status shall be kept with the SPPP.	EDPA	No

# NJDEP Mapping and Inventory Assistance



# NJDEP Mapping and Inventory Assistance

## Mapping App

- All Drop Down Menus
- Smart Phone/Tablet/GIS
- Multiple Collection Methodologies
- Guidance Pending
- In Person Training and Assistance

## Mapping App – Feature Classes

- Outfall Pipe
- Stormwater Management Basin
- Subsurface Infiltration/Detention System
- MTDs
- Green Infrastructure
- Storm Drain Inlet



# TMDL Look-Up Tool

TMDL  
Look-Up  
Tool

## Bureau of Nonpoint Pollution Control

[Find Forms](#) | [Contact Us](#)

### Total Maximum Daily Load (TMDL) Look-Up Tool

The tool was developed to assist New Jersey's municipal stormwater coordinators with the development of plans and strategies to reduce stormwater discharges from Municipal Separate Storm Sewer Systems. It should also prove useful to others with an interest in water quality issues that affect our state.

To use the TMDL Look-Up Tool, go to the dropdown feature below and locate your municipality. The tool will display a list of watersheds and established, approved or adopted TMDL information associated with the selected municipality. To view the TMDL document and find Implementation strategies, click on the associated link: [View the TMDL Document](#). Once you have opened the TMDL document you can locate the Implementation section using the table of contents.



County:  Municipality:

Please click Reset for a new search.

**A Guide to Abbreviations used in the TMDL**  
Hg = Mercury  
TP = Total Phosphorus  
DO = Dissolved Oxygen  
TSS = Total Suspended Solids

Go

- East Windsor Township
- Ewing Township
- Hamilton Township
- Hightstown Borough
- Hopewell Borough
- Hopewell Township
- Lawrence Township
- Pennington Borough
- Trenton City
- Robbinsville Township
- West Windsor Township
- Princeton

Posted at:  
[www.nj.gov/dep/dwq/msrp\\_home.htm](http://www.nj.gov/dep/dwq/msrp_home.htm)

TMDL  
Look-Up  
Tool

**Total Maximum Daily Load(TMDL) Information for Selected Municipality:**

**Applicable Stream TMDL(s)**

- Total Maximum Daily Loads for Fecal Coliform to Address 28 Streams in the Northwest Water Region  
Fecal Coliform - 2003 : Assunpink Creek, Shabakunk Creek, Little Shabakunk : [View the TMDL Document](#)
- Total Maximum Daily Loads for Fecal Coliform to Address 48 Streams in the Raritan Water Region  
Fecal Coliform - 2003 : Duck Pond Run : [View the TMDL Document](#)
- Total Maximum Daily Loads for Fecal Coliform to Address 48 Streams in the Raritan Water Region  
Fecal Coliform - 2003 : Stony Brook : [View the TMDL Document](#)
- Total Maximum Daily Load for Mercury Impairments Based on Concentration in Fish Tissue Caused Mainly by Air Deposition to Address 122 HUC 14s Statewid  
Mercury - 2010 : Stony Bk(Province Line Rd to 74d46m dam) : [View the TMDL Document](#)

**Applicable Lake TMDL(s)**

None

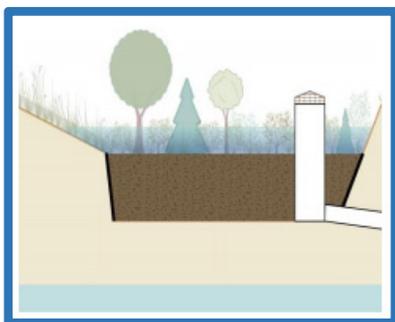
**Applicable Shellfish TMDL(s)**

None

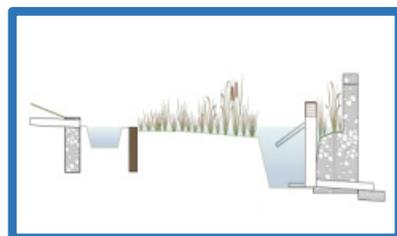
**Amendment to the Atlantic, Cape May,  
Lower Delaware, Lower Raritan-Middlesex,  
Mercer, Monmouth, Northeast, Ocean,  
Sussex, Tri-County, Upper Delaware and  
Upper Raritan Water Quality Management  
Plans**

**Total Maximum Daily Load for  
Mercury Impairments Based on  
Concentration in Fish Tissue Caused Mainly  
by Air Deposition  
to Address 122 HUC 14s Statewide**

# New/Updated BMP Chapters



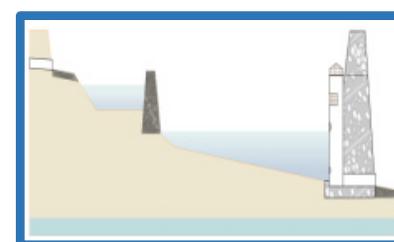
Bioretention  
Systems



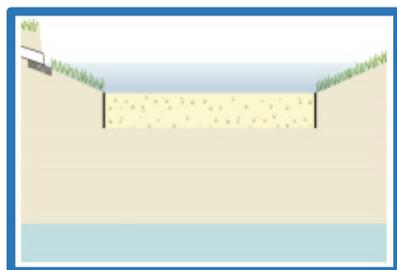
Standard  
Constructed  
Wetlands



Dry Wells



Extended  
Detention  
Basins

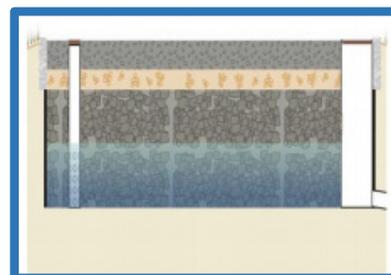


Infiltration Basins

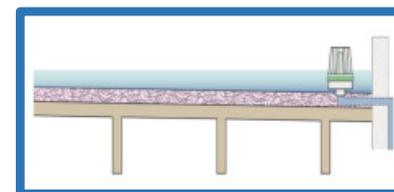
## 9.6 MANUFACTURED TREATMENT DEVICES

Manufactured treatment devices (MTD) are proprietary stormwater treatment systems used to address the stormwater quality impacts of land development. MTDs rely upon a variety of mechanisms to remove pollutants from stormwater runoff. When selecting an MTD for a particular site, the peak flow rate of the Water Quality Design Storm, the contributory drainage area, and the physical size limits of the MTD installation area must be known in advance. An MTD must have a Department-issued certification letter in order to be accepted for use and be sized in accordance with its published verification report. Currently, the total suspended solids (TSS) removal rate is either 50 or 80%, depending upon the individual certification of the device, which may be found at: <http://www.njstormwater.org/treatment.html>.

MTDs



Pervious  
Paving Systems



Blue Roofs

## **Comment Period Closed 5/1/20**

- Chapter 5 – Stormwater Mgmt Quantity and Quality Standards and Computations
- Chapter 12 – Soil Testing Criteria

## **Recently Posted Final Updates**

- Chapter 13 – Groundwater Table Hydraulic Impact Assessments for Infiltration BMPs
- Appendix D – Model Municipal SCO



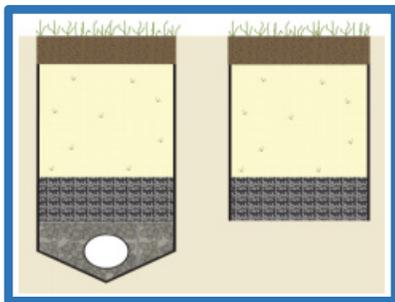
## Edits in Progress

- Chapter 3 – Munic. and Regional SW Mgmt Planning
- Chapter 4 – Stormwater Pollutant Removal Criteria
- Chapter 9 – GI BMPs
- Chapter 10 – GI BMPs with Waiver
- Chapter 11 – Non-GI BMPs

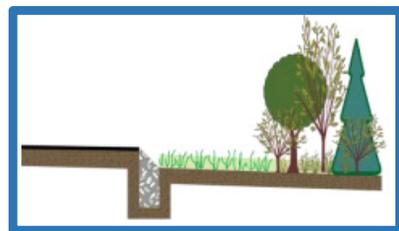
BMP Manual: [https://www.njstormwater.org/bmp\\_manual2.htm](https://www.njstormwater.org/bmp_manual2.htm)



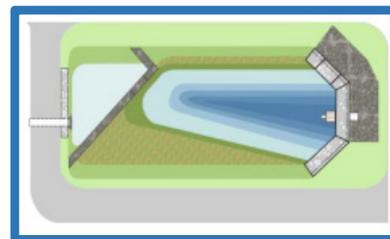
# New/Updated BMP Chapters (cont'd.)



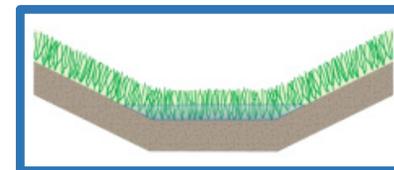
Sand Filters



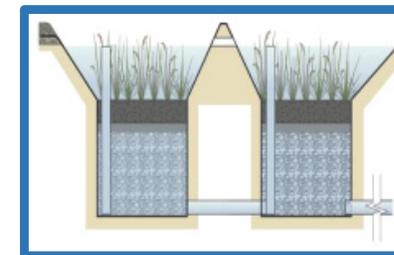
Vegetative  
Filter Strips



Wet Ponds



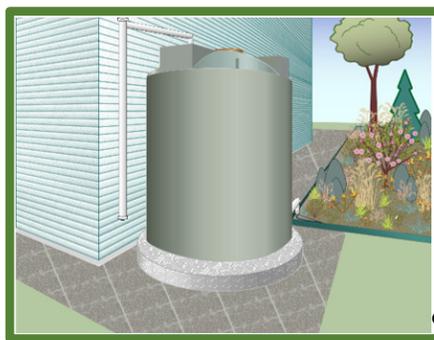
Grass Swales



Subsurface  
Gravel  
Wetlands



Rain Garden



Cistern



Green Roofs

**Newest...**

## 9.4 EXTENDED DETENTION BASINS



An extended detention basin is a stormwater management facility that temporarily stores and attenuates stormwater runoff. In addition, extended detention basins provide pollutant treatment for runoff from the Water Quality Design Storm through settling. When designed in accordance with this chapter, the total suspended solids (TSS) removal rate is 40 - 60%, depending on the duration of runoff detention.

### N.J.A.C. 7:8 Stormwater Management Rules - Design and Performance Standards

	Nonstructural Strategies	Not Allowed
	Water Quantity	Yes, when designed for the 2-, 10- and 100-year design storms
	Groundwater Recharge	Not Allowed
	Water Quality	40 - 60% TSS Removal, depending on duration of detention

### Water Quality Mechanisms and Corresponding Criteria

#### Settling

Minimum Detention Time for Calculation of TSS Removal Rate	12 hours
Maximum Detention Time for Calculation of TSS Removal Rate	24 hours

# Stormwater Maintenance Guidance and Website

Stormwater  
Maintenance  
Guidance

## Templates and Field Manuals



One Template  
of  
Maintenance Plan

Fourteen Templates of Field Manuals  
for Fourteen Types of  
Stormwater Management Measures

One Template  
of  
Maintenance Log

## Maintenance Website - Resources and Information

STATE OF NEW JERSEY  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
NJ STORMWATER.ORG  
*Stormwater in New Jersey*

### Maintenance Guidance

The guidance on this page is intended to assist design engineers and responsible parties with complying with the maintenance requirements for stormwater management measures. The Maintenance Guidance can be customized to allow for specific considerations in design, site conditions, and responsible party needs.

### State Permits Potentially Required During Maintenance

[Click here](#) for State Permits

### Rainfall Information

The National Climatic Data Center provides current and historical precipitation information, which can assist maintenance crews with assessments.

[Click here](#) for Rainfall Information

### Stormwater Training for Maintenance of Stormwater Management Measures

[Click here](#) for Stormwater Training

# Stormwater Training

Stormwater Training

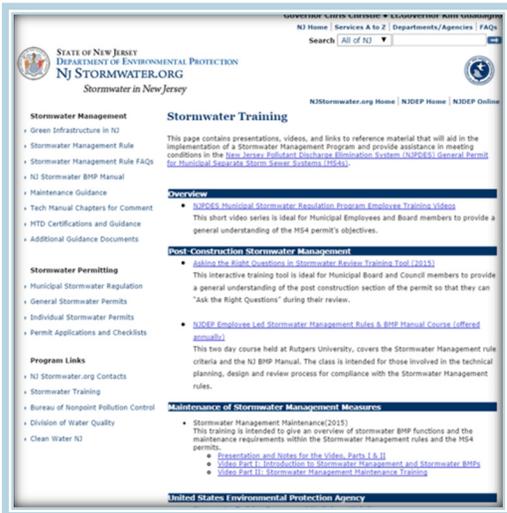
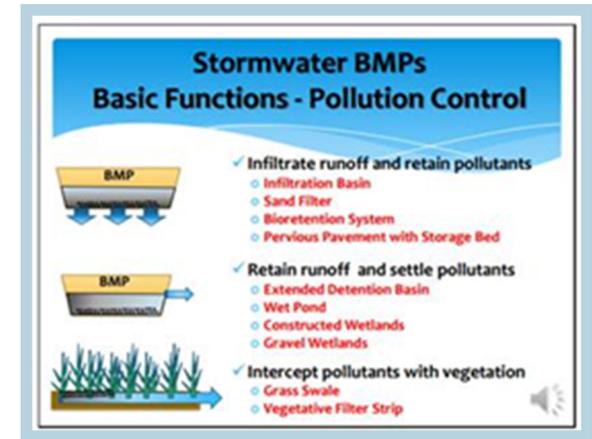


Live Training Courses

New Training Page at DEP Website

Videos & Interactive Tools

Training for NJDOT



# Manufactured Treatment Devices (MTD) Certification Process

**MTD Certification Process**

STATE OF NEW JERSEY  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
NJ STORMWATER.ORG

## Stormwater Manufactured Treatment Devices

An MTD is required to be NJCAT verified and NJDEP certified when the MTD is used to satisfy the requirements of the [Stormwater Management rule \(N.J.A.C. 7:8\)](#), as a result of triggering the requirements for major development.

For projects receiving New Jersey Environmental Infrastructure Financing Program ([NJEIFP](#)) funding, an MTD must be either: 1) NJCAT verified and NJDEP certified or 2) installed using the [NJEIFP MTD Funding Policy](#).

An MTD which is not NJCAT verified or NJDEP certified may be used as long as the MTD is not intended to satisfy the requirements of the [Stormwater Management rule](#) and is not subject to [NJEIFP MTD Funding Policy](#).

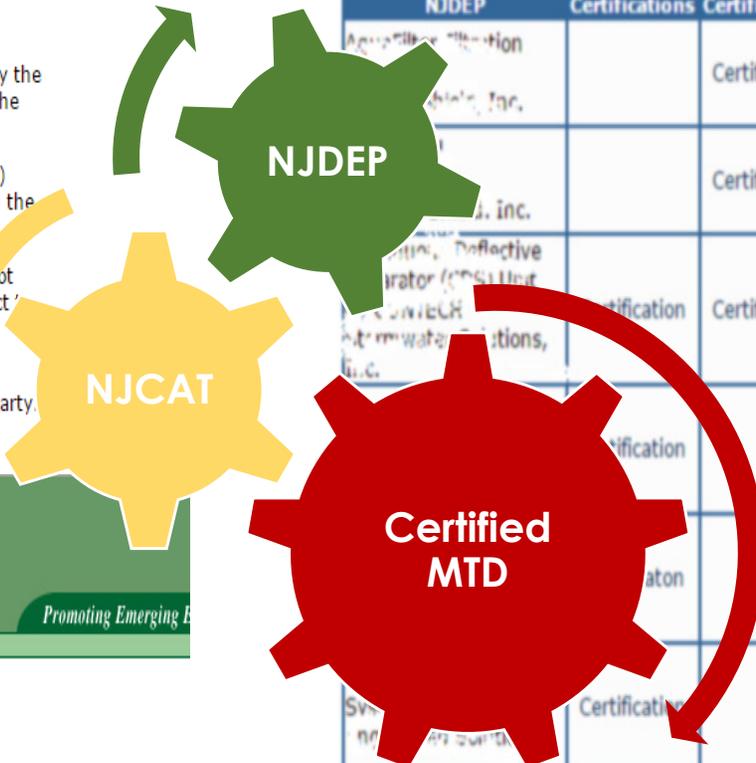
Please note that any MTD installed should be listed on the MS4 permittee's inventory of stormwater management measures and must be properly maintained by the responsible party. Other state, federal and local requirements may apply.



- About Us
- Verification Process

### Verification Process

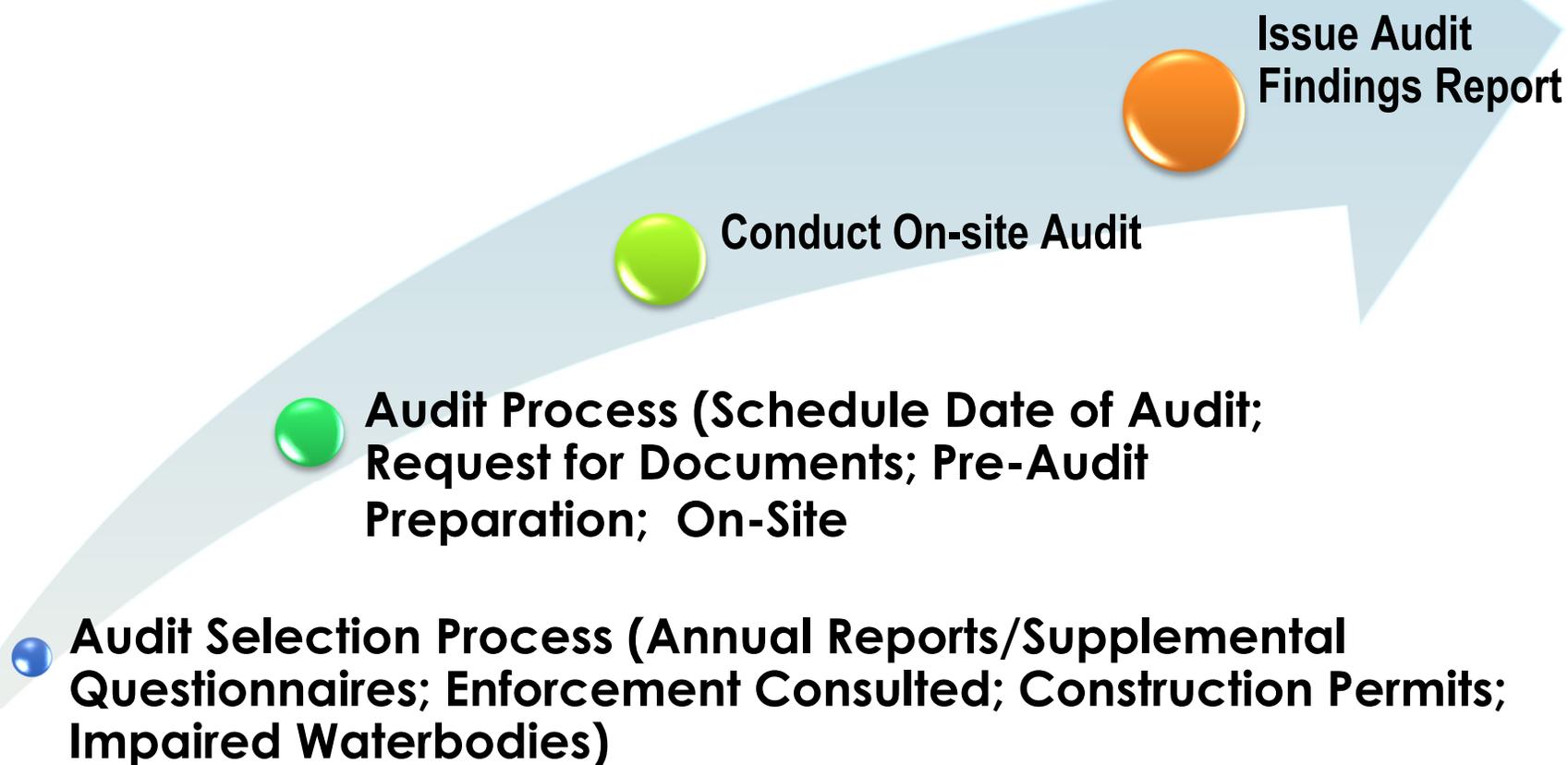
The Technology Verification Program specifically encourages collaboration between vendors and users of technology. Through this program, teams of academic and business professionals form to implement a comprehensive evaluation of vendor specific performance claims. The result of successfully completing this program is documentation of independent third party confirmation of claims that provides valuable information to business and governmental decision-makers.



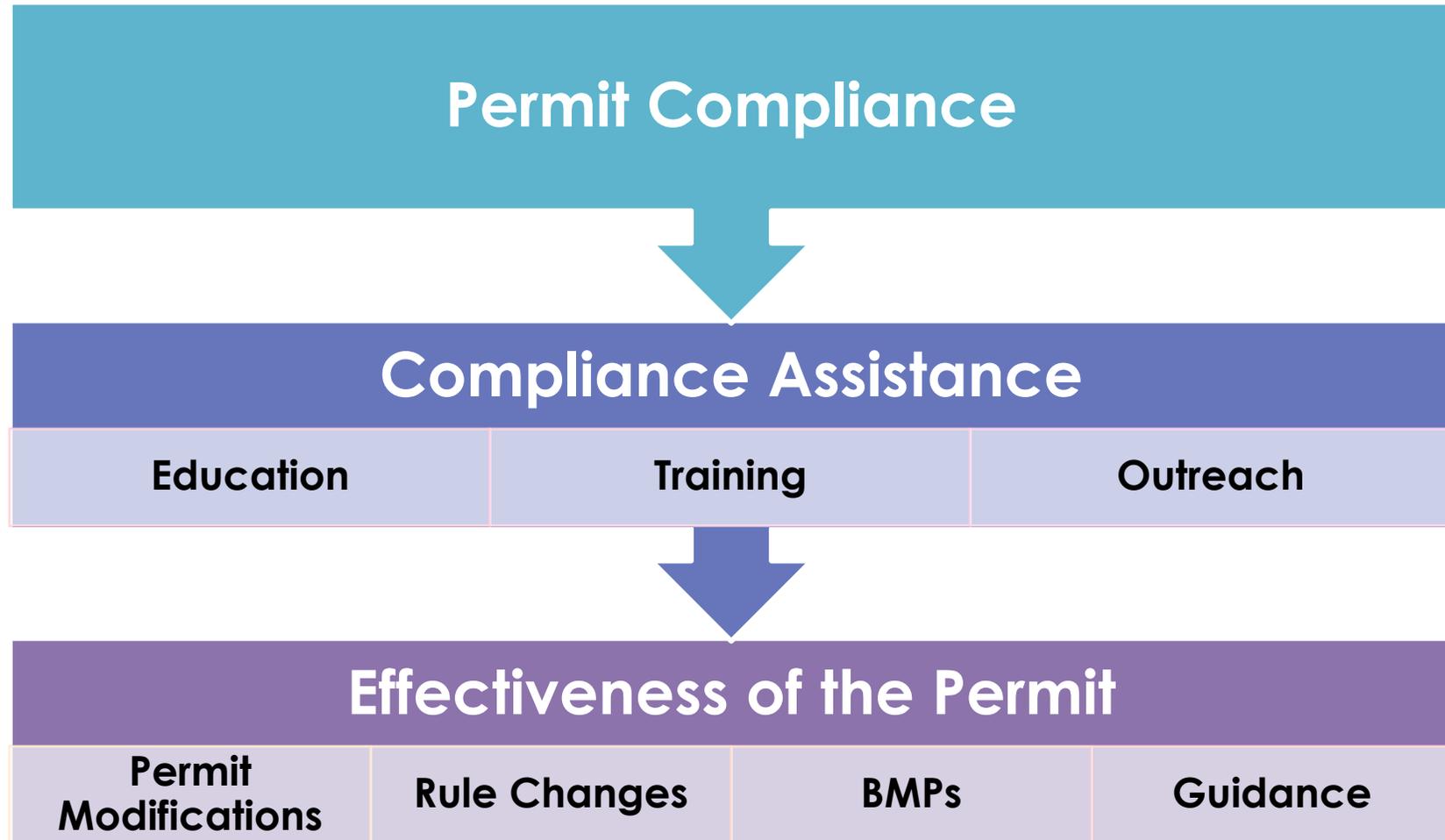
Stormwater Management Manufactured Treatment Devices Certified by NJDEP	MTD Laboratory Test Certifications	Field Test Certifications	Superseded Certifications	Certified TSS Removal Rate	Maintenance Plan
Apprentice Filtration		Certification	Superseded	80%	Plan
...		Certification	Superseded	50%	Plan
...		Certification	Superseded	50%	Plan
...		Certification	Superseded	50%	Plan
...		Certification	Superseded	50%	Plan
...		Certification	Superseded	80%	Plan
...		Certification	Superseded	80%	Plan
...		Certification	Superseded	80%	Appendix A

# MS4 Permit Audit Program

MS4  
Permit  
Audit



# Goals of the MS4 Audit Program



# MS4 Audit Selection

- Advance Notice and Coordination
  - Minimum 30 days notice
  - [www.nj.gov/dep/dwq/tier\\_a\\_guidance\\_other.htm](http://www.nj.gov/dep/dwq/tier_a_guidance_other.htm)
- Solicitation of Project Plans
- On-site Discussion and Review
  - 1 or 2 Days
  - Stormwater Coordinator/Twp. Engineer, etc.
- Areas of Focus
  - MS4 Permit Conditions - SBRs, Ordinances, etc.
  - Post Construction Requirements under NJAC 7:8

# Moving Forward

- Ongoing MS4 Stormwater Audits
- Outreach Activities
  - Mapping App
  - Engineers Training
- Appendix A = Permit Summary Table
- Tools Are the Key
  - Training
  - Updated BMPs
  - GI Guidance Document
  - Inspection/Field Manual Templates
  - Mapping



# Important Links

## NJDEP Stormwater Web Page

- <http://www.nj.gov/dep/dwq/fd.htm>
  - BMP Manual
  - Stormwater Training
  - TMDL Look-up Tool
  - Maintenance Guidance
  - MS4 Permit Documents
  - Mapping and Inventory
  - Educational Resources
- MTDs
  - <https://www.njstormwater.org/treatment.html>
- Tools Are the Key
  - [http://www.nj.gov/dep/dwq/msrp\\_home.htm](http://www.nj.gov/dep/dwq/msrp_home.htm)

# Important Reminders

## Course Survey

- Will be emailed within the next two weeks
  - Complete and Send Back
- Survey Required for Course Certificate of Completion
  - No Survey = No Certificate
- Provide Copy of Certificate to Stormwater Program Coordinator
- Complete this Course Every Five Years
- Handouts Available on the NJDEP Webpage
  - <https://www.njstormwater.org/training.htm>

# Questions?

**Bureau of Nonpoint Pollution Control  
Division of Water Quality  
401 East State Street  
PO Box 420, Mail Code 401-2B  
Trenton, NJ 08625-420  
Tel: 609-633-7021  
[www.njstormwater.org](http://www.njstormwater.org)**

**Jim Murphy**  
[james.murphy@dep.nj.gov](mailto:james.murphy@dep.nj.gov)



**New Jersey**  
**DEPARTMENT of**  
**ENVIRONMENTAL**  
**PROTECTION**