Stormwater Report Interpretation for Conservation Commissioners

How to properly review stormwater reports for environmental protection and regulatory compliance

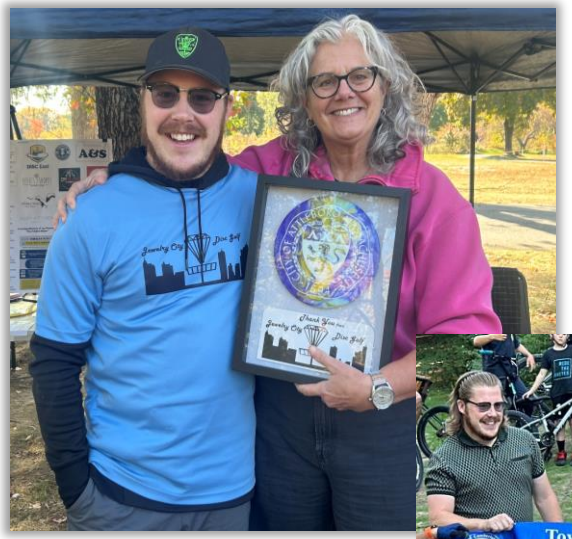
Presented today by:

PARE CORPORATION

ENGINEERS SCIENTISTS PLANNERS

Today's Presenter

Spencer Lynds



Project Engineer

B.S. Civil & Environmental Engineering

Title V Soil Evaluator

Attleboro Conservation Commissioner

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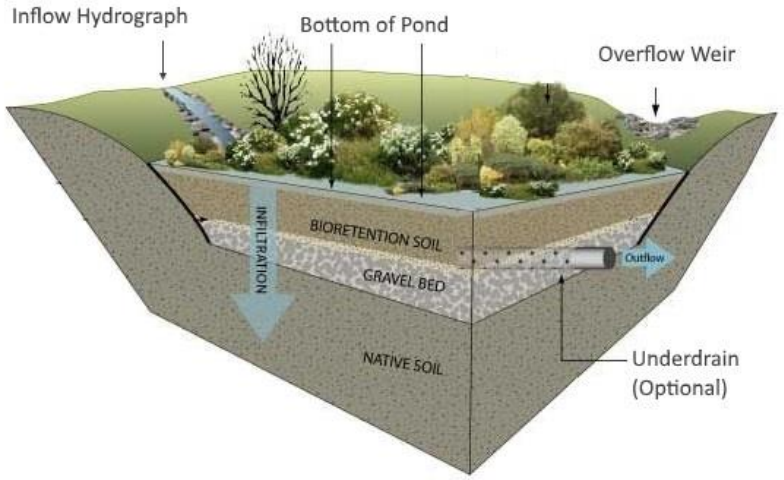
Avid Disc Golfer and Community Organizer

Today's Agenda



- Polls
- Slowing Down
- Mute Reminder

Stormwater Reports

- Information typically provided
- MassDEP Stormwater Handbook
- Local Bylaws (and future changes)

Soils and Groundwater Data

- Information typically provided
- What additional information can I ask for?

Guidance Document

- A tool to use for stormwater review (aligning with Volume 3 Chapter 1 of the Massachusetts Stormwater Handbook)

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Stormwater Reports

Information Typically Provided

A Typical Stormwater Report

- General Info
  - Existing and Proposed Project Descriptions
  - Soil and Groundwater Data
  - Methodology for calculating hydrologic conditions
  - Subcatchments: Existing and Proposed
  - Descriptions of Proposed Stormwater Infrastructure
  - Stormwater Standards and how they're being met

What changes are being considered for the Stormwater Handbook?

Greater treatment/Phosphorus, NOAA+, Green Infrastructure, hydraulic conductivity testing, and much more!

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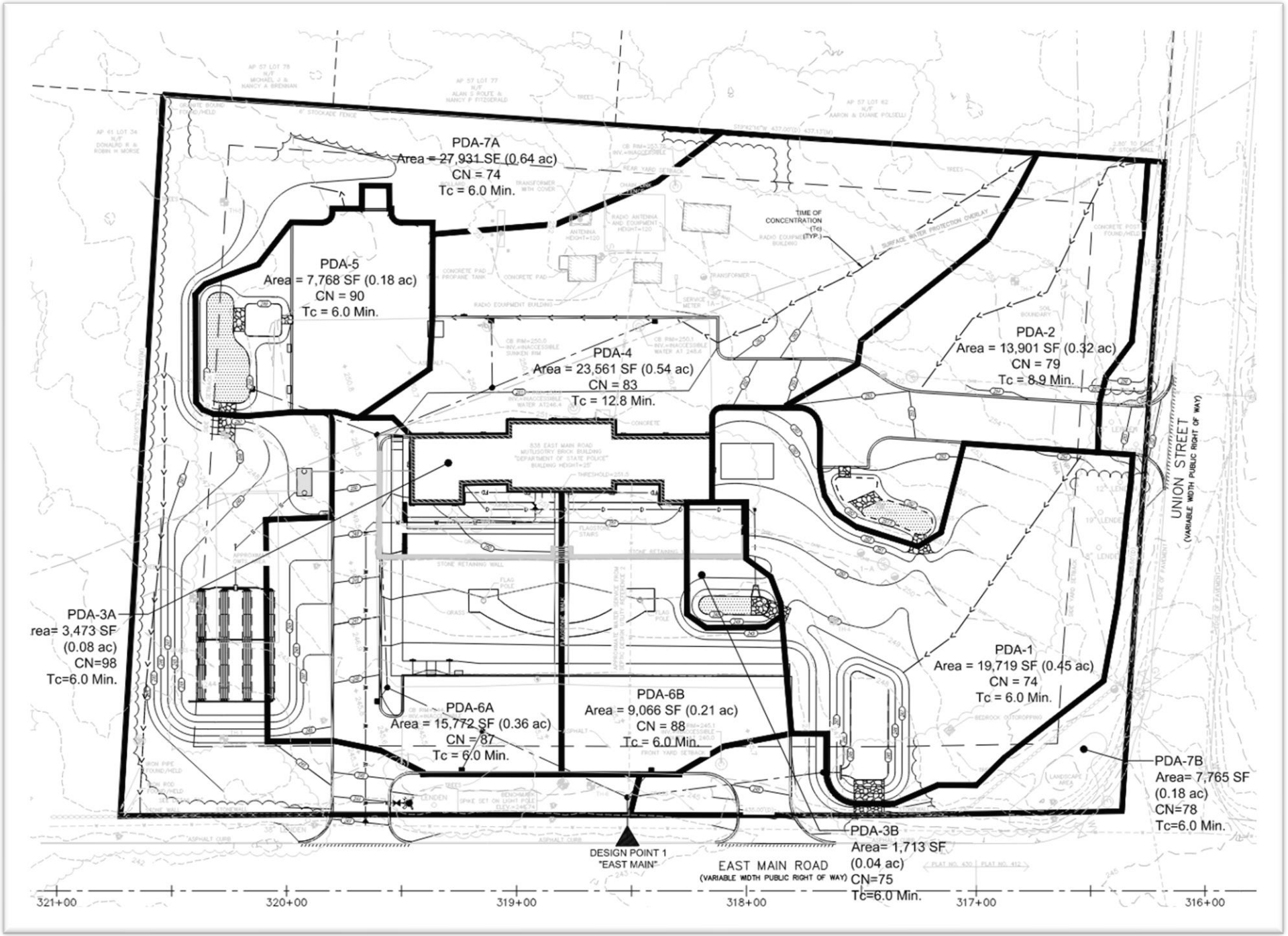
Typical Watershed Model

One is generated for existing conditions. Another is generated for proposed conditions (for comparison).



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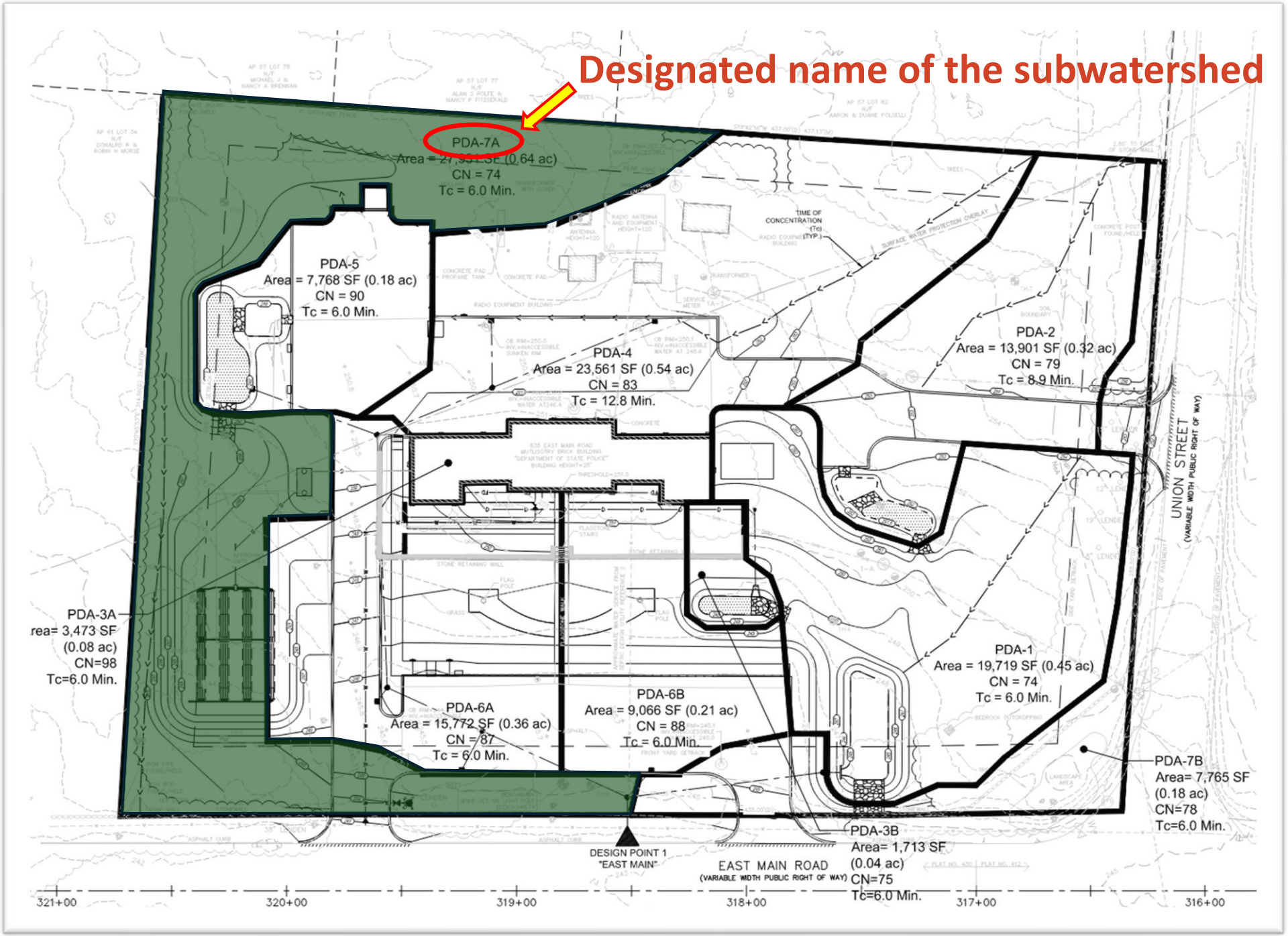
Subwatershed

Smaller portion of the overall drainage area



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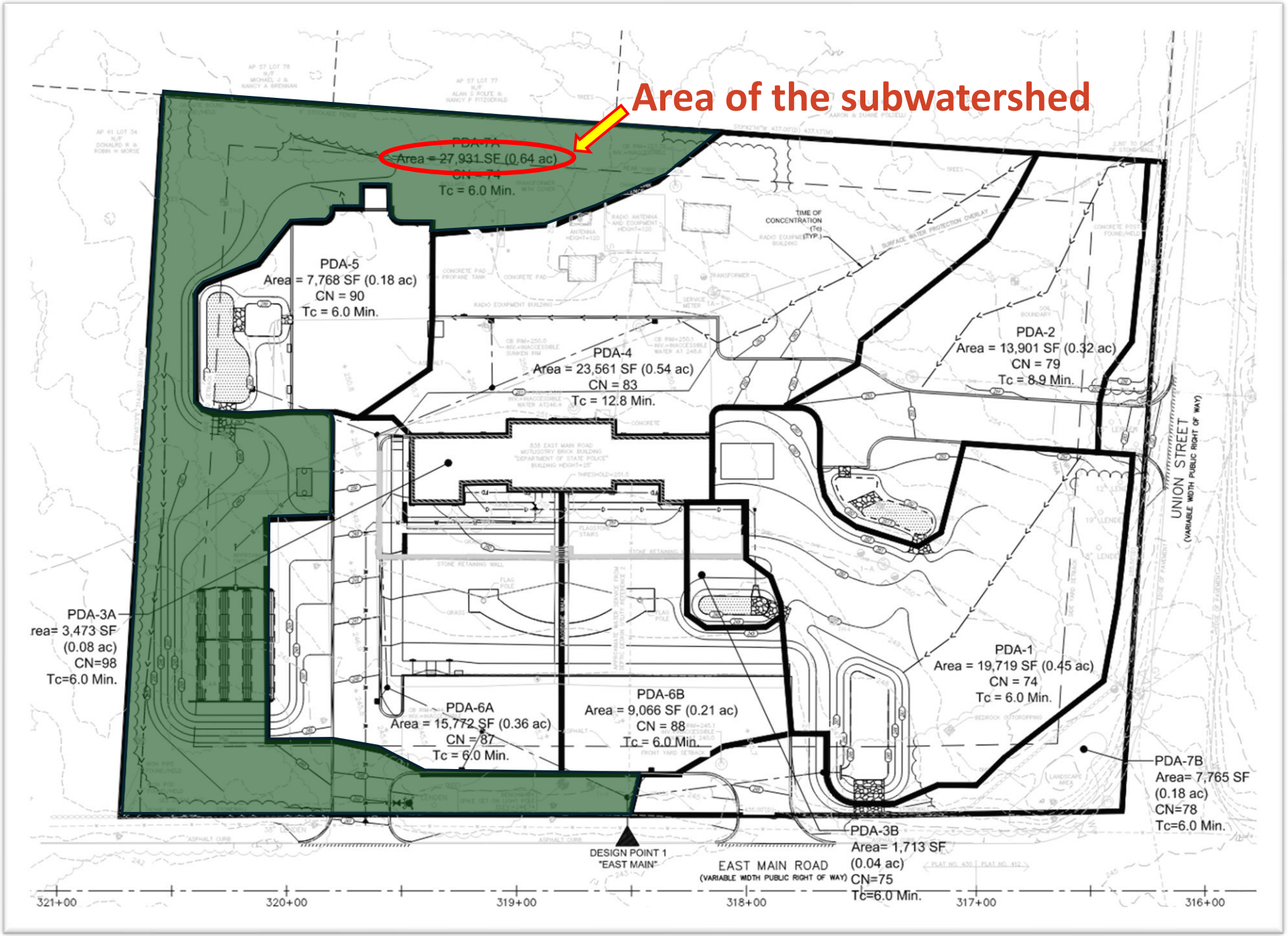
Subwatershed

Area is typically registered in square feet and acres



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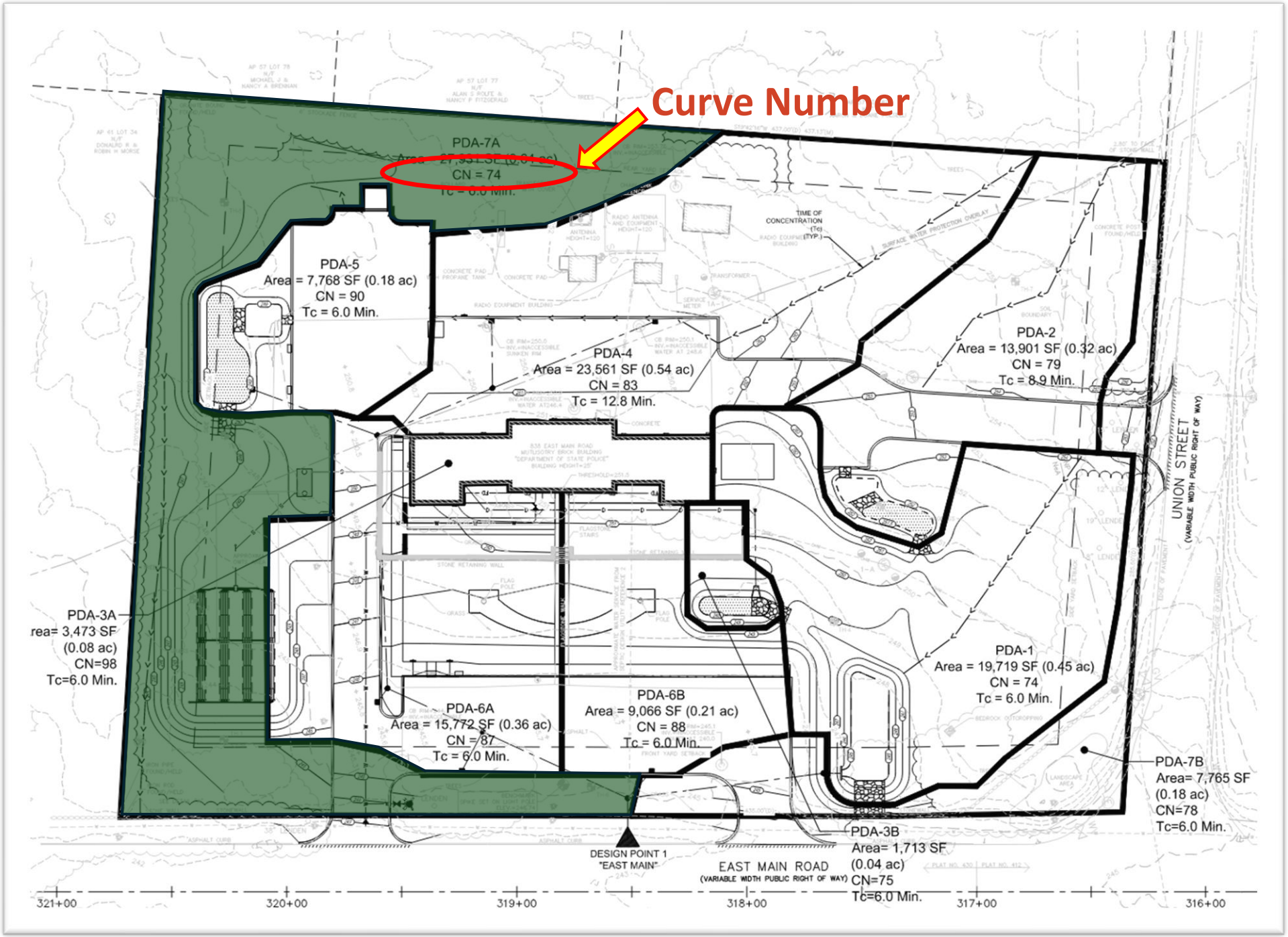
Subwatershed

Curve number (CN) is the measure of how impervious the area is (on average)



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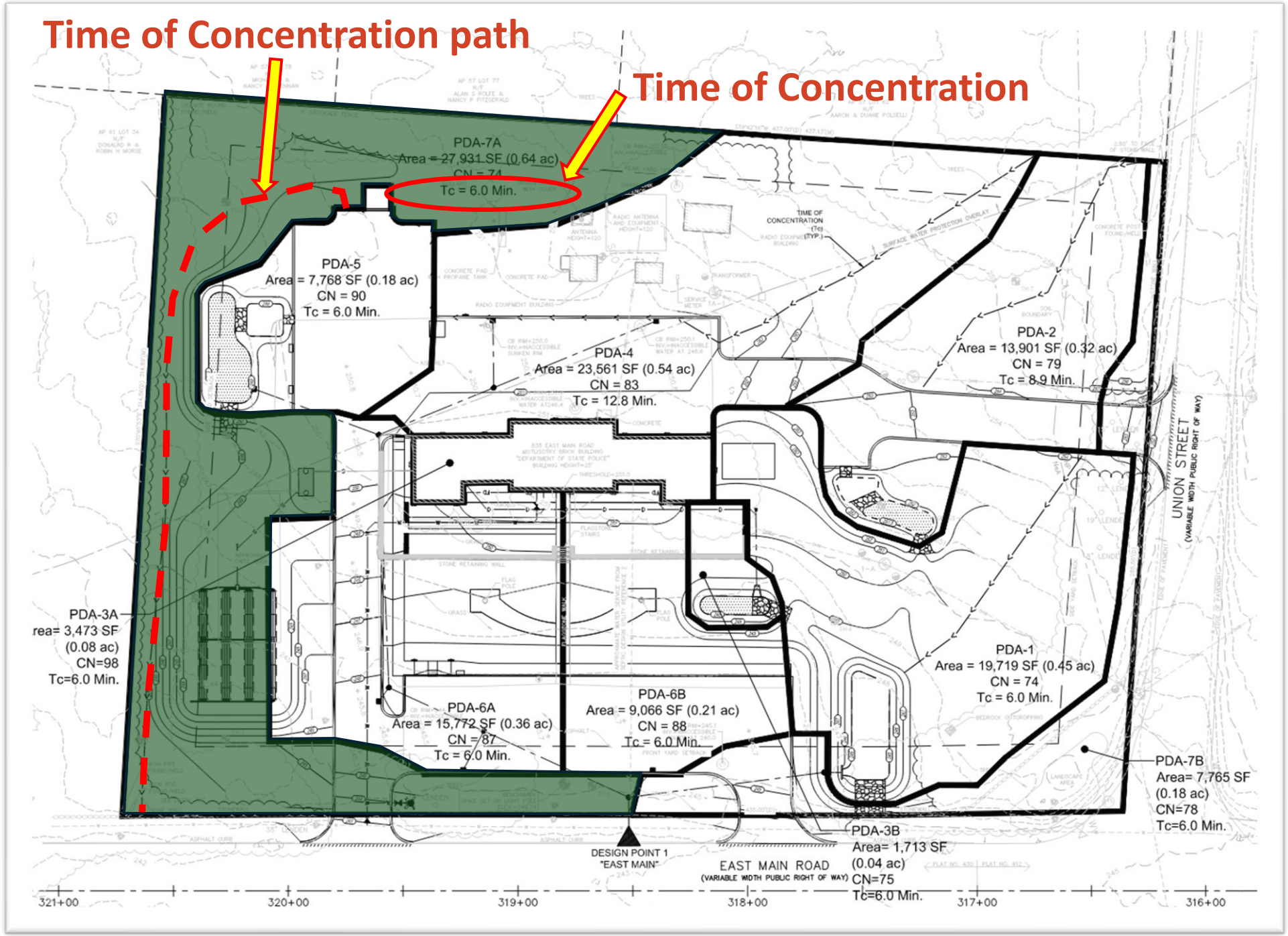
Subwatershed

Time of Concentration (Tc) is the longest path stormwater would flow in the watershed, measured in minutes



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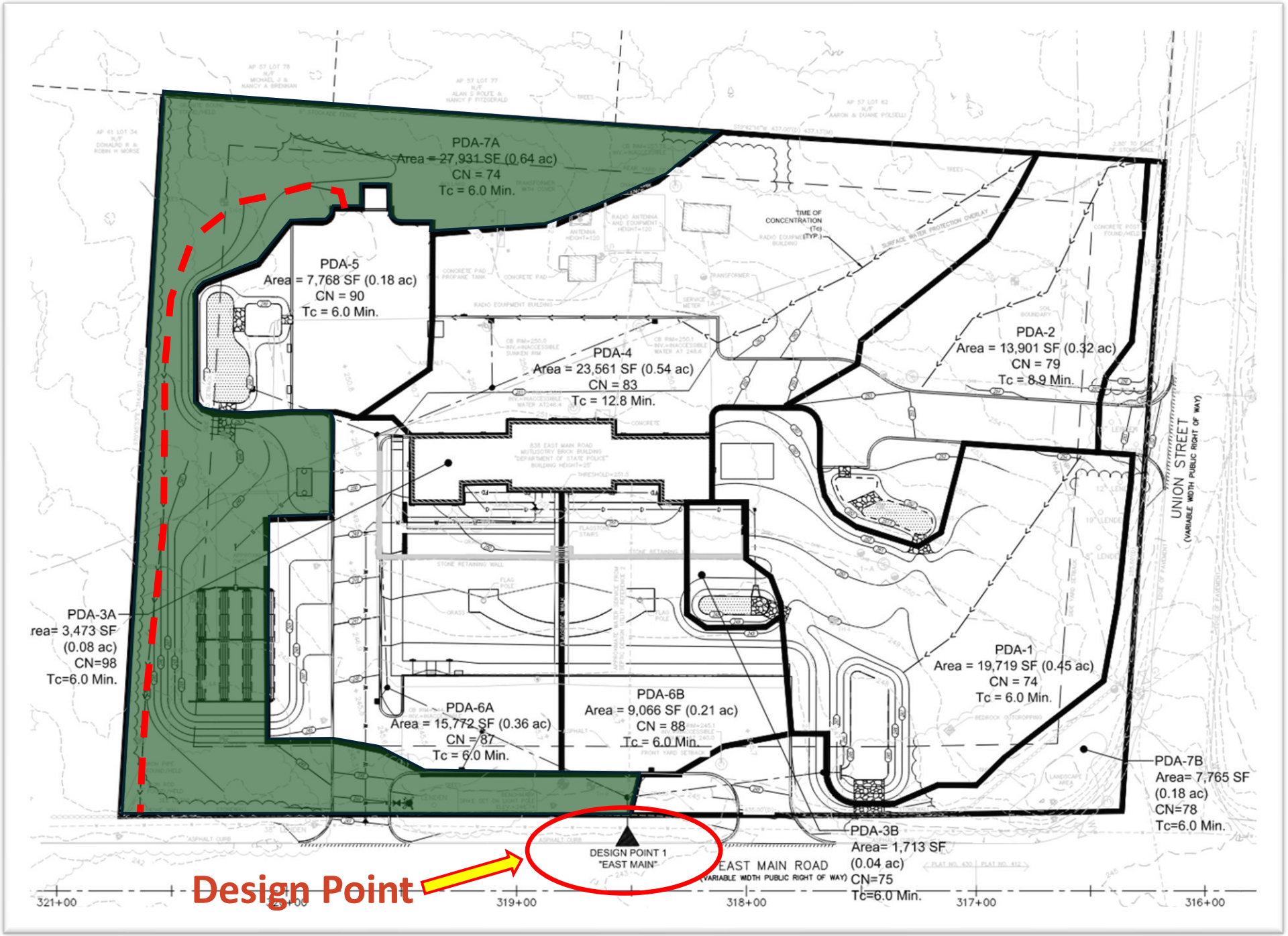
Subwatershed

Design Point is where the existing flow is compared to the proposed flow



Design Point

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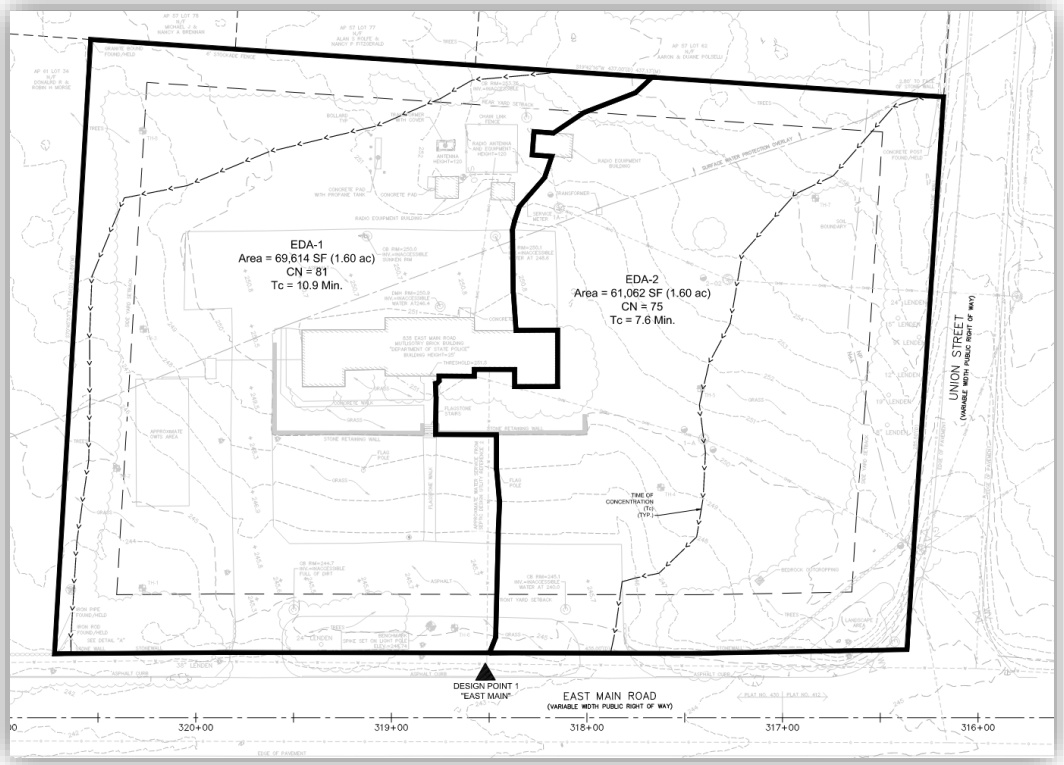
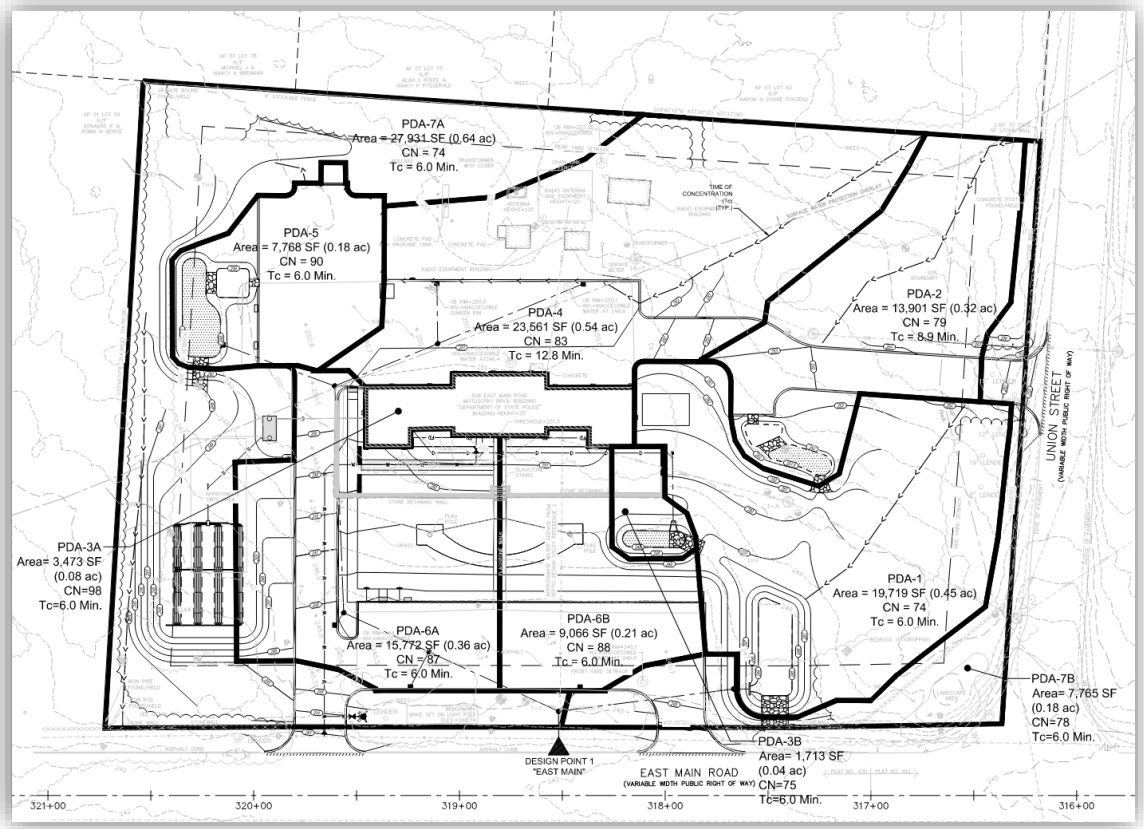


EXISTING



PROPOSED

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Stormwater Reports

Massachusetts Stormwater Handbook

The Stormwater Handbook

STANDARD 1

No new untreated discharges

No new untreated stormwater conveyance to areas or design points not already receiving stormwater from a given site. Proposed discharges are also prohibited from generating erosion in or near natural resources.

STANDARD 2

Post-Development Peak Discharge

Flow to a given design point under proposed conditions may not exceed flow to that design point in the existing conditions for storm events

What about volume?

Regulating and enforcing that which is not explicity stated

Exceptions and Alternatives

Land subject to Coastal Storm Flowage
Low permeability soils

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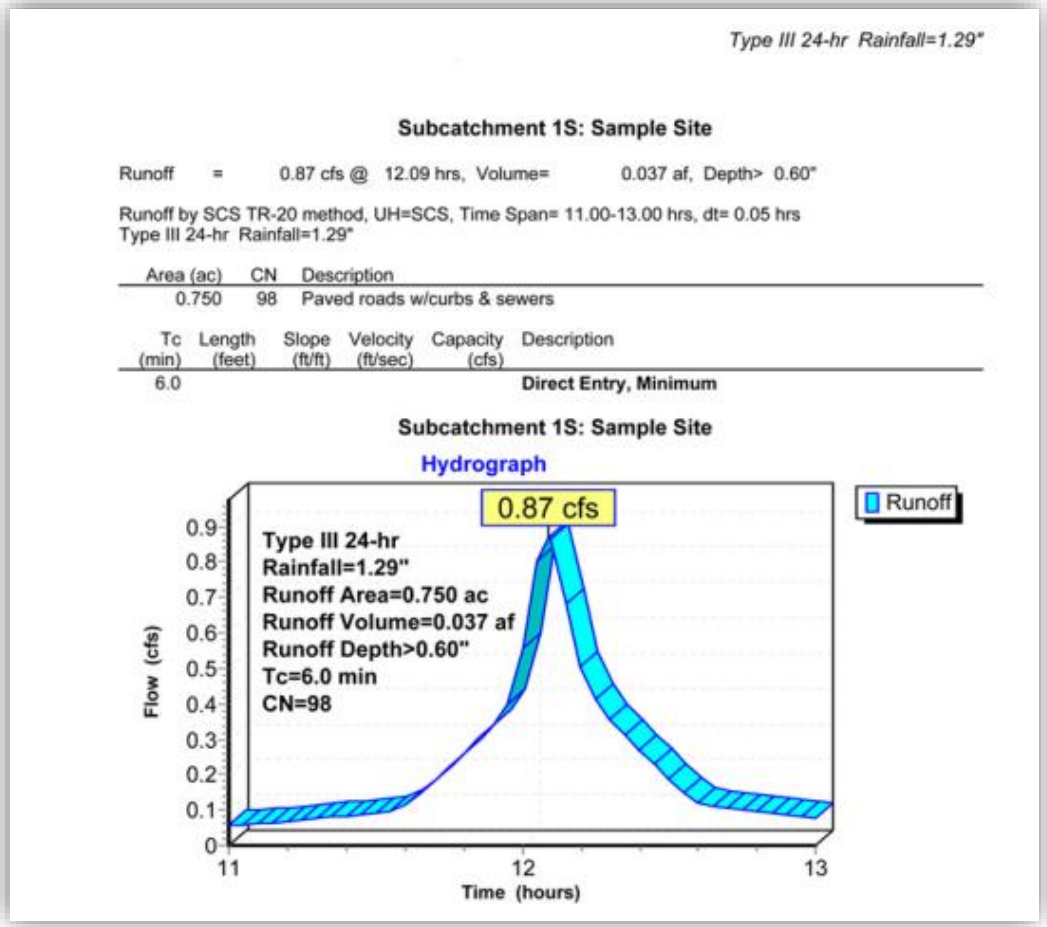

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Table 1: Peak Flow Table (CFS)

Design Storm:	2	10	25	50	100
DP-1					
Pre	1.34	2.08	2.59	2.93	3.39
Post	0.11	0.17	0.36	0.74	1.42
Difference	-1.23	-1.81	-2.23	-2.19	-1.97
DP-2					
Pre	0.05	0.22	0.39	0.51	0.69
Post	0.03	0.18	0.33	0.44	0.66
Difference	-0.02	-0.04	-0.06	-0.07	-0.03
DP-3					
Pre	0.03	0.10	0.16	0.21	0.27
Post	0.03	0.10	0.16	0.21	0.27
Difference	0.00	0.00	0.00	0.00	0.00

Table 2: Peak Volume Table (CF)

Design Storm:	2	10	25	50	100
DP-1					
Pre	4,149	6,524	8,217	9,359	10,895
Post	337	524	911	1,366	2,006
Percent Reduction	91.9%	92.0%	88.9%	85.4%	81.6%
DP-2					
Pre	374	999	1,548	1,955	2,541
Post	279	771	1,209	1,617	2,427
Percent Reduction	25.4%	22.8%	21.9%	17.3%	4.4%
DP-3					
Pre	155	376	565	703	899
Post	155	376	565	703	899
Percent Reduction	0%	0%	0%	0%	0%
Net					
Pre	4,678	7,899	10,330	12,017	14,335
Post	779	1,671	2,685	3,686	5,332
Percent Reduction	83%	78%	74%	69%	62%

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Existing Conditions at Design Point

Proposed Conditions at Design Point

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The Stormwater Handbook

STANDARD 3

No loss in annual recharge

Loss of annual recharge to groundwater shall be eliminated or minimized.

Table 2.3.3. 1982 Rawls Rates[18]

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

Calculations must be provided or it must be proven that cover changes will not incur losses to recharge.

?

Poorly drained soils?
Reduction in impervious surfaces?
Proposing pervious surfaces?

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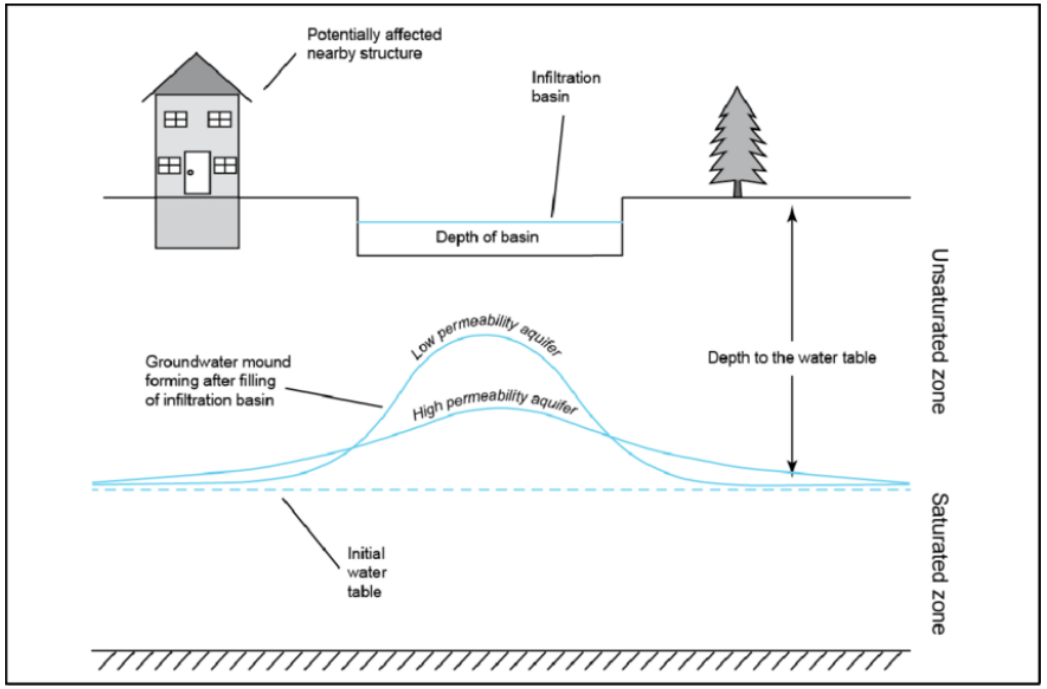
STANDARD 3

No loss in annual recharge

Loss of annual recharge to groundwater shall be eliminated or minimized.

Groundwater "mounding" is concern if nearby structures may be affected.



Calculations must be provided for mounding analysis if the separation from the bottom of a system is less than four feet and the recharge system handles a 10-year storm.

?

What method of mounding analysis was performed? "Hantush" method is acceptable. Will the basin drain within 72 hours?

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STANDARD 4

Total suspended solids

Stormwater systems shall be designed to remove 80% of the post-development load of Total Suspended Solids.

BMP	Removal Rate	TSS Load	Removed	Load
PDA-1				
Street Sweeping*	10%	1.00	0.10	0.90
Grassed Channel*	50%	0.90	0.45	0.45
Hydrodynamic Separator**	60%	0.45	0.27	0.18
	total TSS removal:		**82%**	
PDA-2				
Street Sweeping*	10%	1.00	0.10	0.90
Bioretention area*	80%	0.90	0.72	0.18
Hydrodynamic Separator**	60%	0.18	0.11	0.07
	total TSS removal:		**93%**	

Drainage Area	Vehicular Area (SF)	% of Total Vehicular Area	TSS Removed	Weighted % TSS Removal
PDA-1	111,913	0.71	82.0%	58.3%
PDA-2	45,434	0.29	92.8%	26.8%
Total	157,347	1.00		**85.1%**

Total Annual TSS Removal Rate = **85.1%**

Notes:

* Based on Table 5-3 of EPA Storm Water Runoff Management Measure

** Based on TARP Reports of Hydrodynamic Separators

Calculations must be provided to support removal of suspended solids.

What stormwater treatment units can be added to increase TSS removal?

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STANDARD 5

LUHPPL

Facilities with greater pollutant implications need greater preventative and treatment measures in place. Stormwater discharges require the use of specific stormwater management BMPs. The use of infiltration practices without pretreatment is prohibited.

Examples: Above ground storage tanks, livestock management, cemeteries, Zones A/B/C developments, herbicide applications, certain material storage, high intensity parking areas.

Full list of LUHPPL developments provided in Volume 1, Chapter 1 of the Massachusetts Stormwater Handbook

Does the site contain any LUHPPL?

"LUHPPL" = Land Uses with Higher Potential Pollutant Loads

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STANDARD 6

Critical Area Discharges

Applies to discharges within critical areas within Zone II, Interim Wellhead Protection Areas, or near other critical areas: Shellfish Growing Areas, Bathing Beaches, Outstanding Resource Waters, Special Resource Waters, and Cold-Water Fisheries.

Tables CA1/2/3 define special performance standards based on resource in question (Volume 1, Chapter 1)

Does the site contain any Critical Area Discharges?

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STANDARD 7

Redevelopment

Projects that classify as redevelopment operate to meet most Standards only to the “maximum extent practicable”

Redevelopment Projects

Maintenance and improvement of existing roadways (adding lanes, shoulders, existing drainage systems, repaving)

Projects with no net increase in impervious area on existing developed sites

Remedial projects related to stormwater management improvements and storm/sewer separation projects

Redevelopment Checklist (Volume 2, Chapter 3)

How does this project qualify as a redevelopment project?

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STANDARD 7

Redevelopment

Projects that classify as redevelopment operate to meet most Standards only to the “maximum extent practicable”

What is “Maximum Extent Practicable”?

As set forth in Standard 7, the phrase “to the maximum extent practicable” means that:

(1) Proponents of redevelopment projects have made all reasonable efforts to meet the requirements of Standards 2 and 3 and the pretreatment and structural stormwater best management practices requirements of Standards 4, 5, and 6 and to bring existing outfalls into compliance with Standard 1.

(2) They have made a complete evaluation of possible stormwater management measures, including environmentally sensitive site design that minimizes land disturbance and impervious surfaces, low impact development techniques and structural stormwater BMPs; and

(3) If not in full compliance with Standard 1 for existing outfalls, Standards 2 and 3 and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6, they are implementing the highest practicable level of stormwater management.

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STANDARD 8

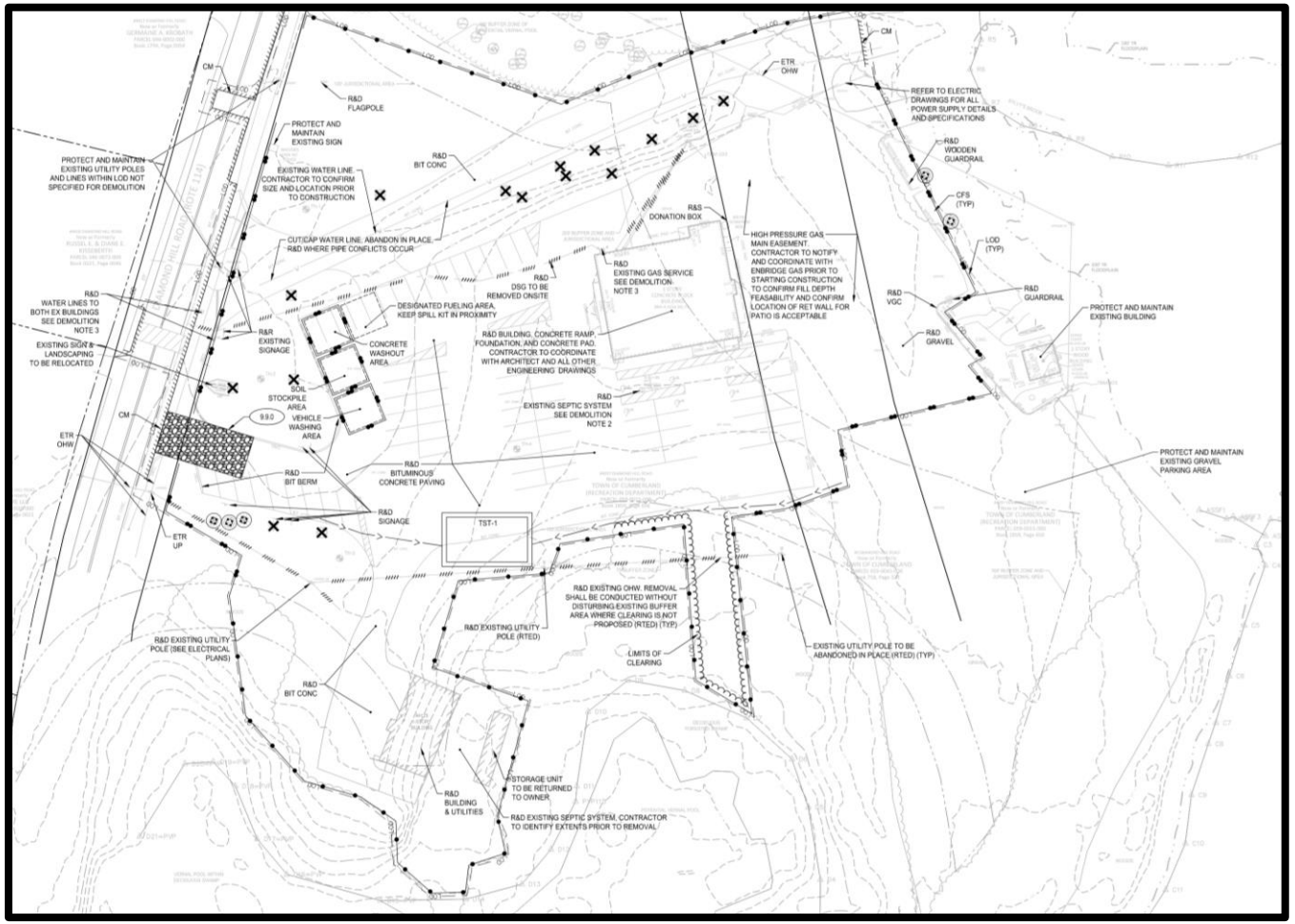
Sediment and Erosion Control

A plan for erosion controls must be in place prior to construction.

- Identify responsible parties
- Full stabilization must be in place upon project completion with temporary controls fully removed

“SWPPP” = Stormwater Pollution Prevention Plan

Projects over 1 acre require a SWPPP (very commonly overlooked or provided by contractor).



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STANDARD 9

Long Term Operation and Maintenance (O&M) Plan

Include at a minimum:

- Identify System Owner(s)
- Party Responsible for O&M & Communication to Owner
- Routine Tasks post-construction
- Plan identifying stormwater BMPs and features
- Description and delineation of safety features
- O&M Budget

Does this project have municipal O&M implications?

Who is responsible for remedial actions?

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STANDARD 10

Illicit Discharges Prohibition

Discharges that are not entirely comprised of stormwater.

Examples:

Floor Drains

Septic/Sewer not heading to a combined system

Industrial Waste

An illicit discharge statement is required with projects under wetlands jurisdiction.

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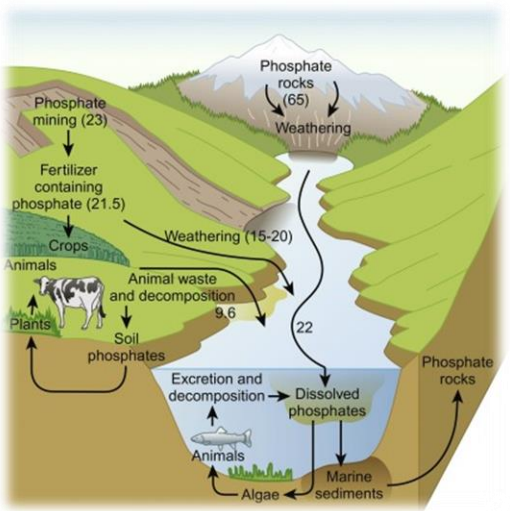
Potential Changes

- Round 1 of review comments completed, Round 2 coming soon
- Current Changes Being Considered
  - Better treatment of TSS and TP (Total Phosphorus)
  - NOAA+ Rainfall Data
  - Green Infrastructure
  - Hydraulic Conductivity Testing Mandate
  - … and much more!



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Soils and Groundwater Data

Soils

Desktop Review

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Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

UC Davis Soil Web (https://casoilresource.lawr.ucdavis.edu/gmap/)

- Safe vs. Unsafe Assumptions

Board of Health septic information

MASSDEP Well Information (https://eeaonline.eea.state.ma.us/portal#!/search/welldrilling)

Soils

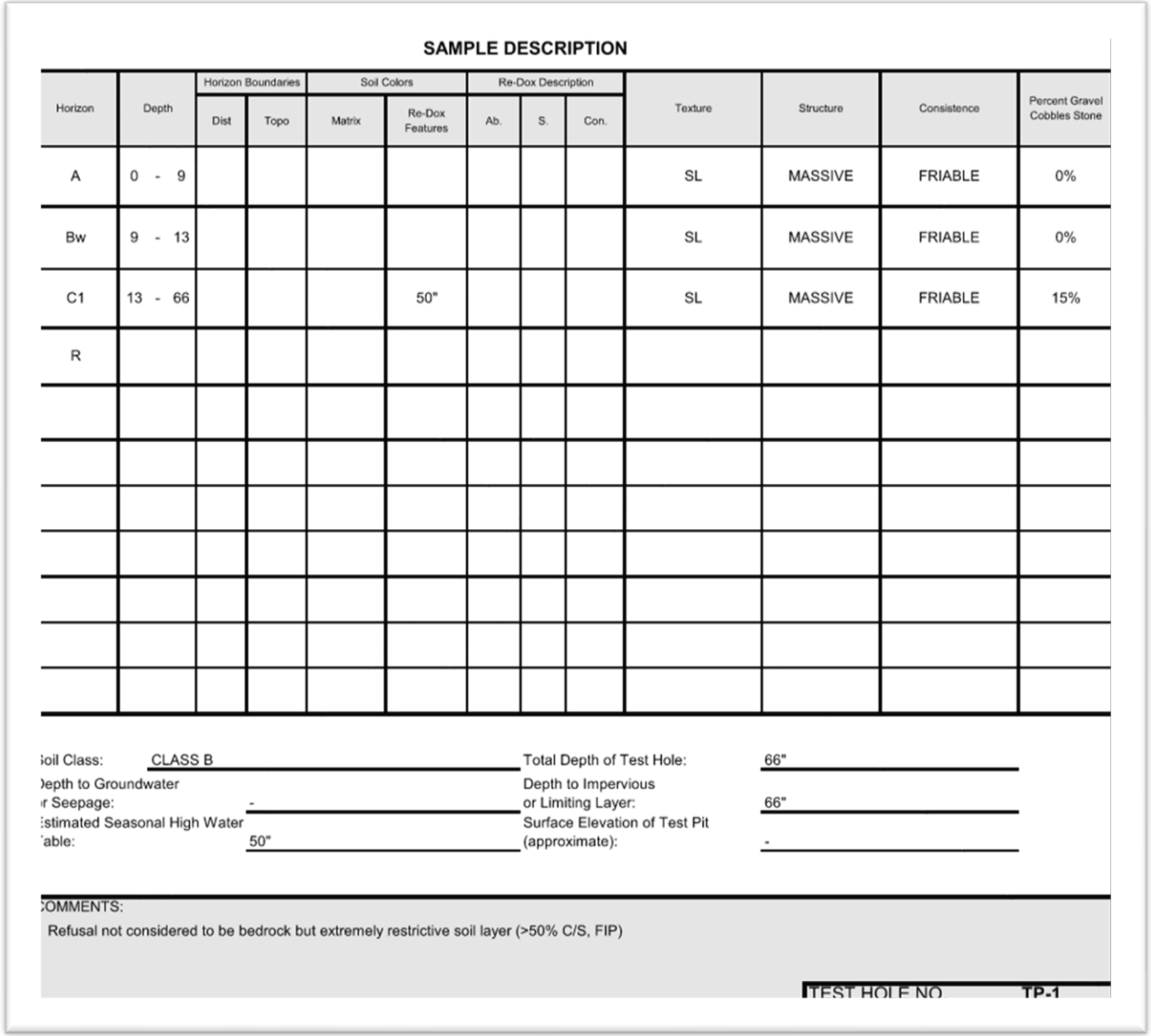
Field Review

Test Pit Logs

- Matches Soil Web? Qualified Individual? Rawls Rate used? Sieve?

Field Tests: falling head, double ring penetrometer, etc.

- NOT PERC TESTS



SAMPLE DESCRIPTION

Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Percent Gravel Cobbles Stone
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
A	0 - 9								SL	MASSIVE	FRIABLE	0%
Bw	9 - 13								SL	MASSIVE	FRIABLE	0%
C1	13 - 66				50"				SL	MASSIVE	FRIABLE	15%
R												

oil Class: CLASS B

Total Depth of Test Hole: 66"

epth to Groundwater r Seepage: -

Depth to Impervious or Limiting Layer: 66"

stimated Seasonal High Water able: 50"

Surface Elevation of Test Pit (approximate): -

OMMENTS:

Refusal not considered to be bedrock but extremely restrictive soil layer (>50% C/S, FIP)

TEST HOLE NO. TP-1

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Groundwater

Ideal Groundwater Indicators

- Redoximorphic features
- Weeping w/ Frimpter adjustment

Weeping: Groundwater penetrating through the side walls of a test pit

Other Groundwater Indicators

- Weeping outside of wet season (November to April)
  - In my opinion: weeping in general
- Frimpter method (relative to weeping/bottom of pit)

Commissioner Tools

- Board of Health proximal test pits
- DEP well data
- Vertical well installation (perforated pipe)
- Photo Evidence

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Guidance Document

A tool for Commissioners

Stormwater Review Tool for Commissioners

See provided review tool specifically developed for commissioners to aid in the review of applications. This tool keeps in mind the scope of review limited to a Conservation Commissioner.

- What additional information/clarification can I request of an applicant within my review scope as a commissioner?
- What additional calculations can I request of an applicant within my review scope as a commissioner?
- What additional field tests can I request of an applicant within my review scope as a commissioner?
- Peer Reviews are always one of the best options for review

View this document as a supplement and partial summary of Volume 3, Chapter 1 which lays out in detail the performance metrics and calculations for each Standard.

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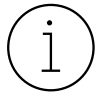
Today's Takeaways

What I hope you learned from this presentation…



An awareness of what information is commonly missed or left out of Stormwater Reports

Minimum expectations from applicants for information being provided about a stormwater design

A deeper knowledge of stormwater topics so you can get the most out of developments in your town or city

An understanding of what questions to ask if you need more clarity or information about a project

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Thank you!

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Questions?

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