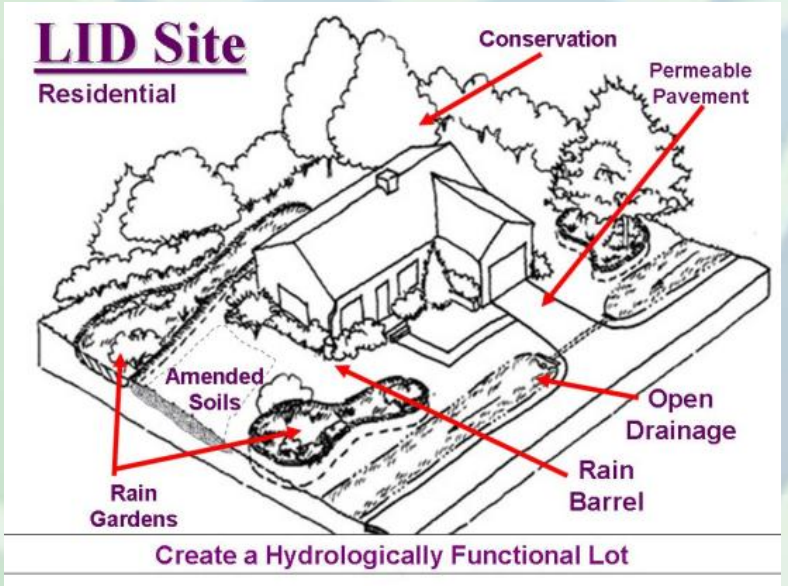
Rhode Island Stormwater Design and Installation Standards Manual



Public Workshop
QPA Requirements/Credits
March 22, 2011

Horsley Witten Group, Inc.

Low Impact Development (LID)

Community Planning

LID Site Design

LID BMPs

Larger Conventional BMPs

Receiving Waters

Horsley Witten Group, Inc.

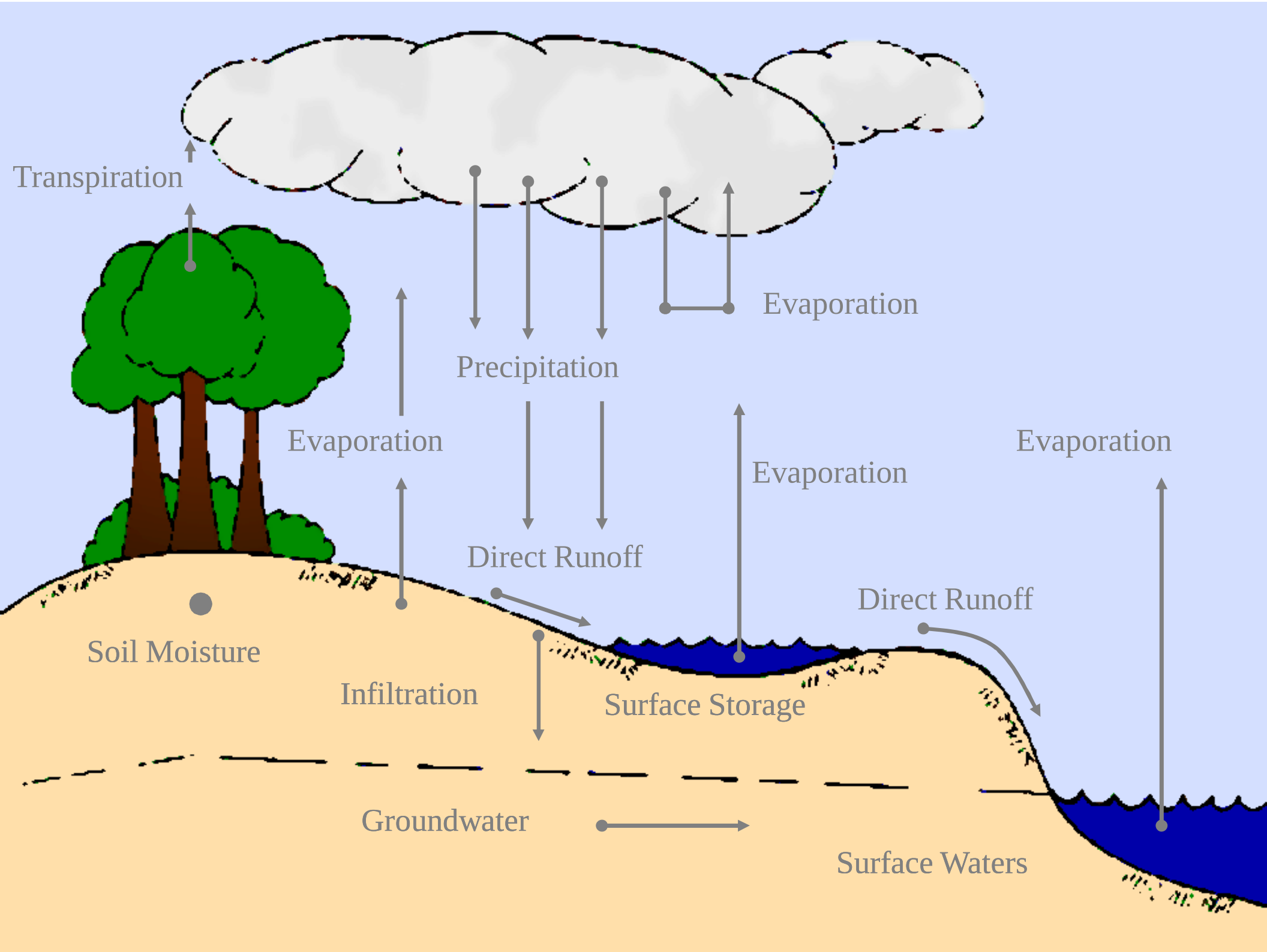
LID Stormwater Credits

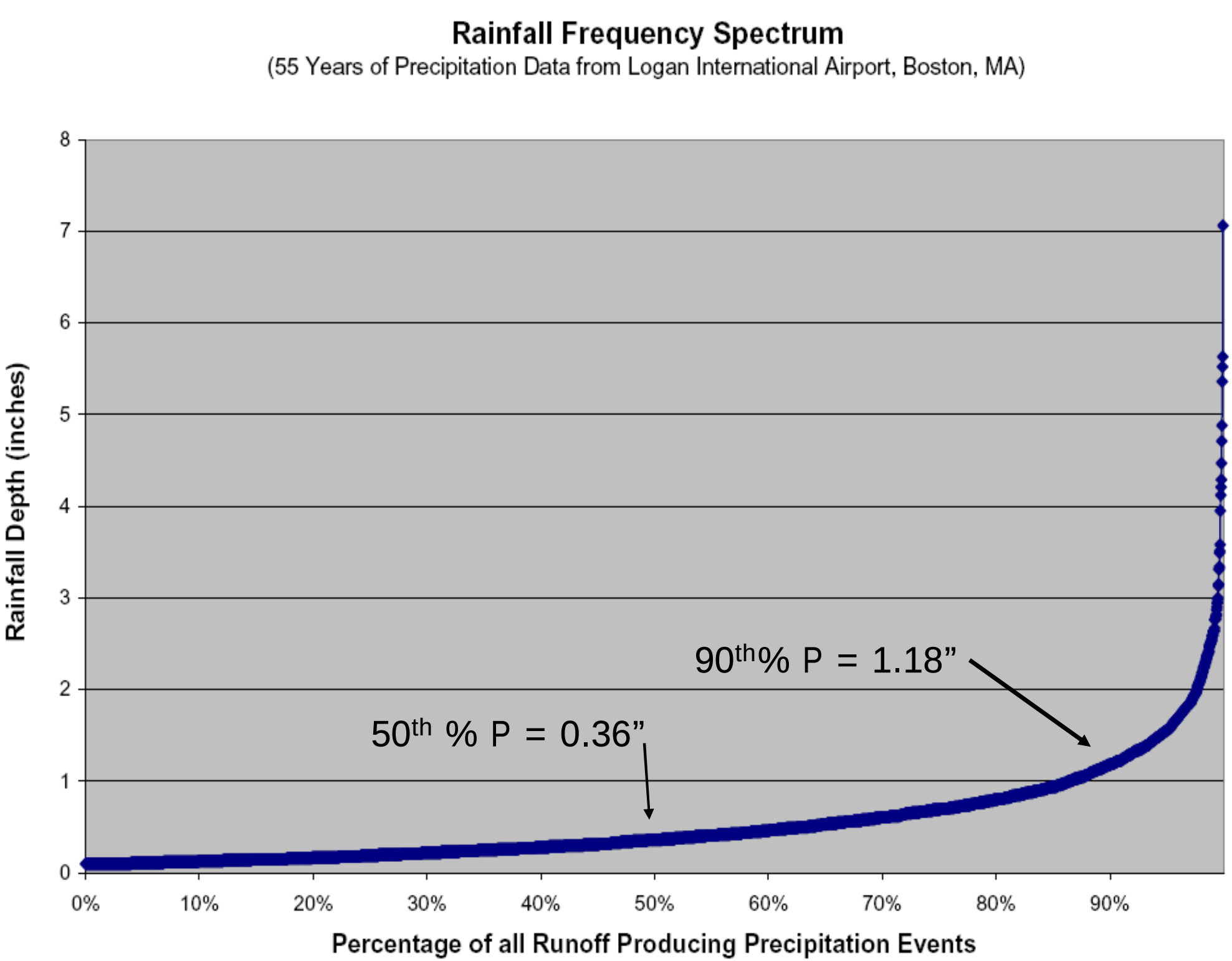
LID Site Design Credit:

Disconnected Rooftop Runoff

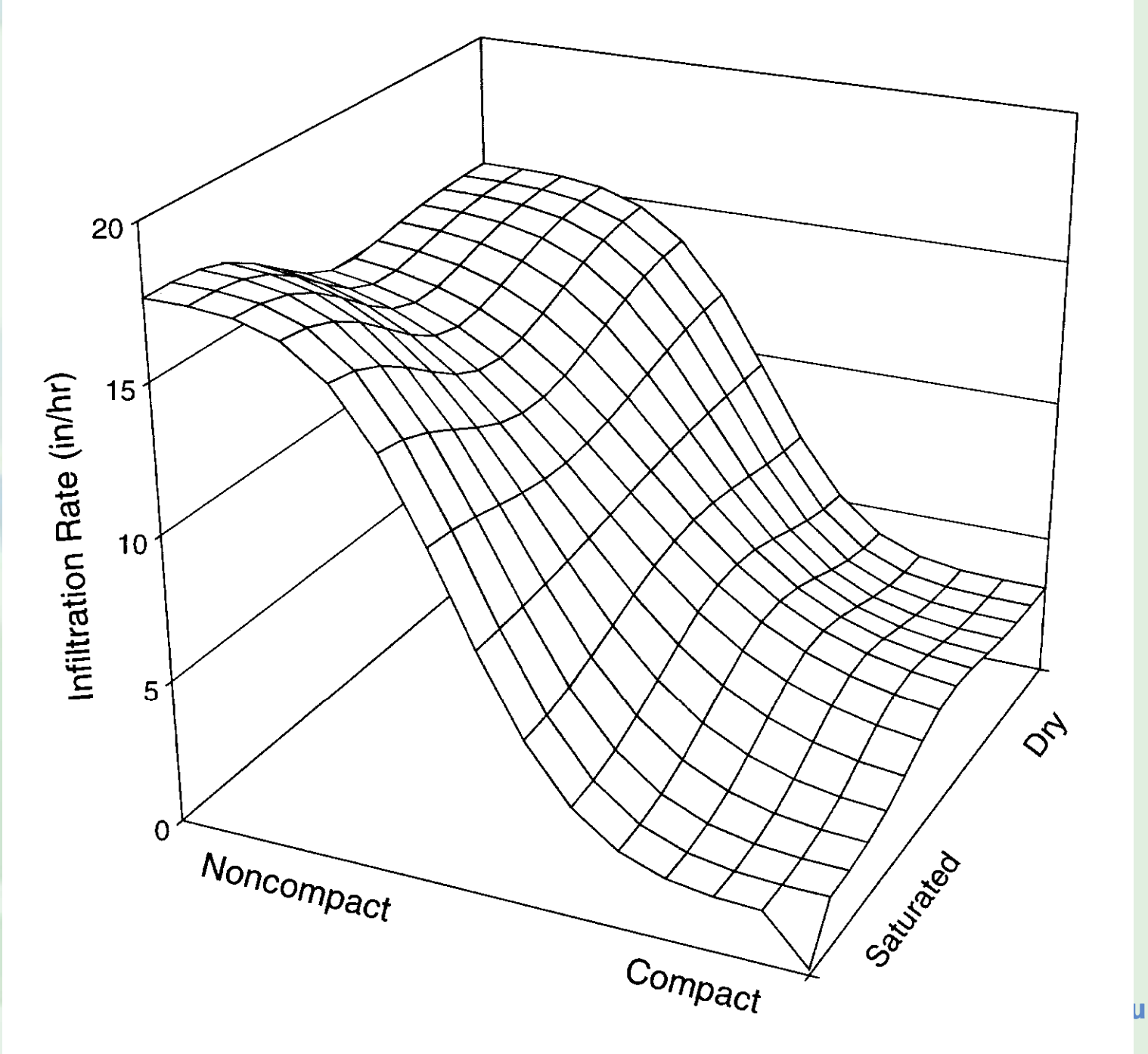
Disconnected Non-Rooftop Runoff

Credit can be used to reduce or eliminate Re_v and WQ_v storage requirements.

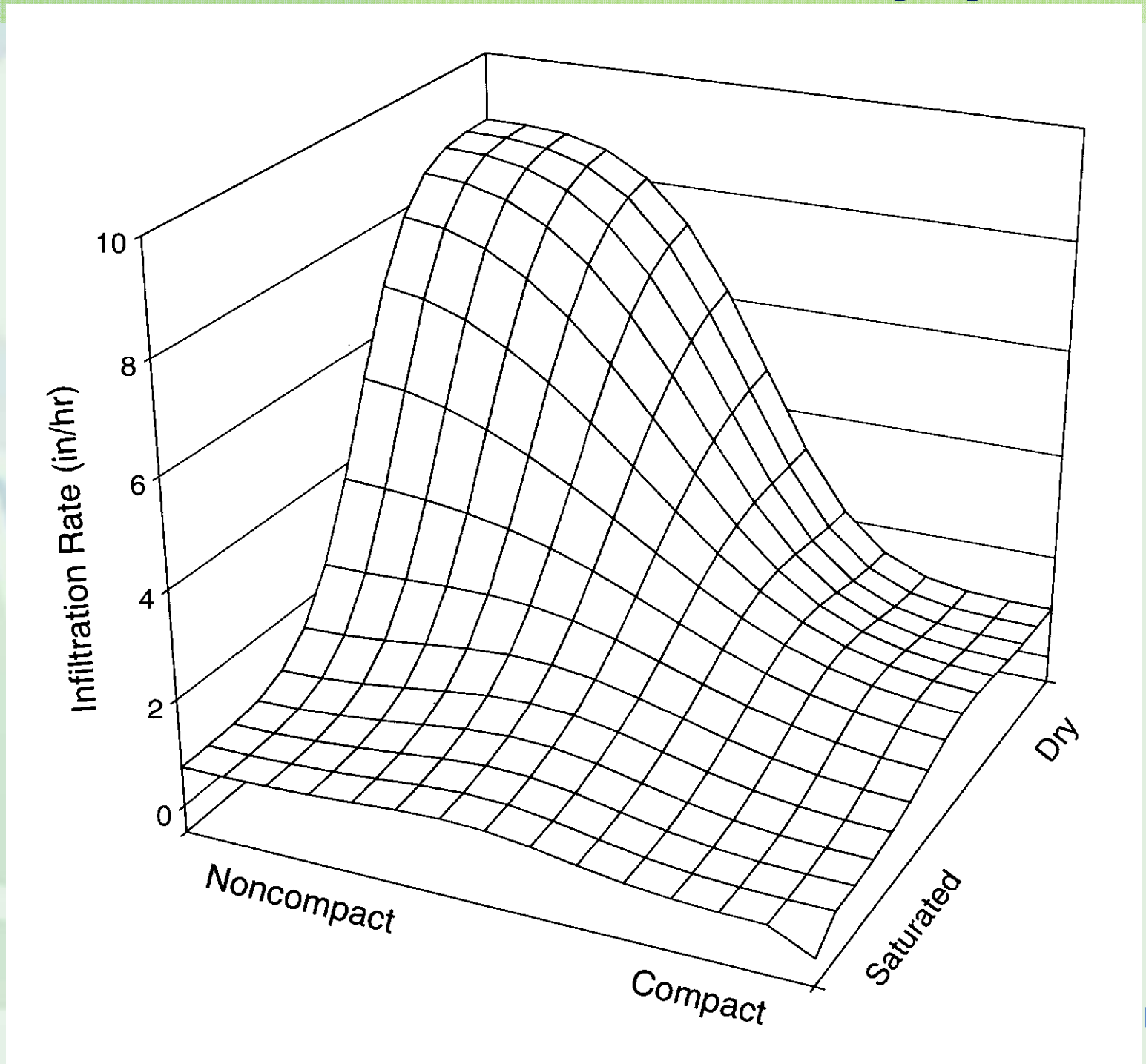

Transpiration
Evaporation
Precipitation
Evaporation
Evaporation
Evaporation
Direct Runoff
Direct Runoff
Soil Moisture
Infiltration
Surface Storage
Groundwater
Surface Waters


Rainfall Frequency Spectrum
(55 Years of Precipitation Data from Logan International Airport, Boston, MA)
Rainfall Depth (inches)
0
1
2
3
4
5
6
7
8
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
Percentage of all Runoff Producing Precipitation Events
90th% P = 1.18”
50th % P = 0.36”

Infiltration Rates in Disturbed Sandy Urban Soils



Infiltration Rates in Disturbed Clayey Urban Soils



Qualified Pervious Areas?

Clarification: QPAs can be over a flow length (concentrated flow) or across an area (sheet flow).

- For concentrated flow: Calculate the required minimum length.
- For sheet flow: Calculate the required minimum length and width.

QPA Definition

- Fully stabilized natural or landscaped vegetated area;
- Correlated with NRCS Curve Numbers for "good hydrologic condition"
- Minimum of 4 inches of top soil or organic material;
- Located outside of regulated wetland areas and buffer areas (i.e, not permitted with the 50 ft perimeter wetland);
- Lawn areas seeded with low-maintenance grassed adapted to New England.

LID Stormwater Credits

- Still need to meet other Standards;
- Must maintain engineering “standard of care” and “good drainage design;”
- Direct runoff over qualifying pervious areas (QPAs); and
- LUHPPL runoff not eligible for credit.

Which lot looks like it might qualify for a QPA?

Credit Restrictions

- Qualifying Pervious Area (QPA) located 10 ft from bldg foundation;
- Every 1,000 sq ft of impervious area must have at least 75 linear feet pervious flow and be longer than the contributing flow length (min length = 1,000 sf/75' = 13.3'/sq ft); and
- Can be no overlap for QPA (i.e., can't direct 2 different areas to the same QPA);

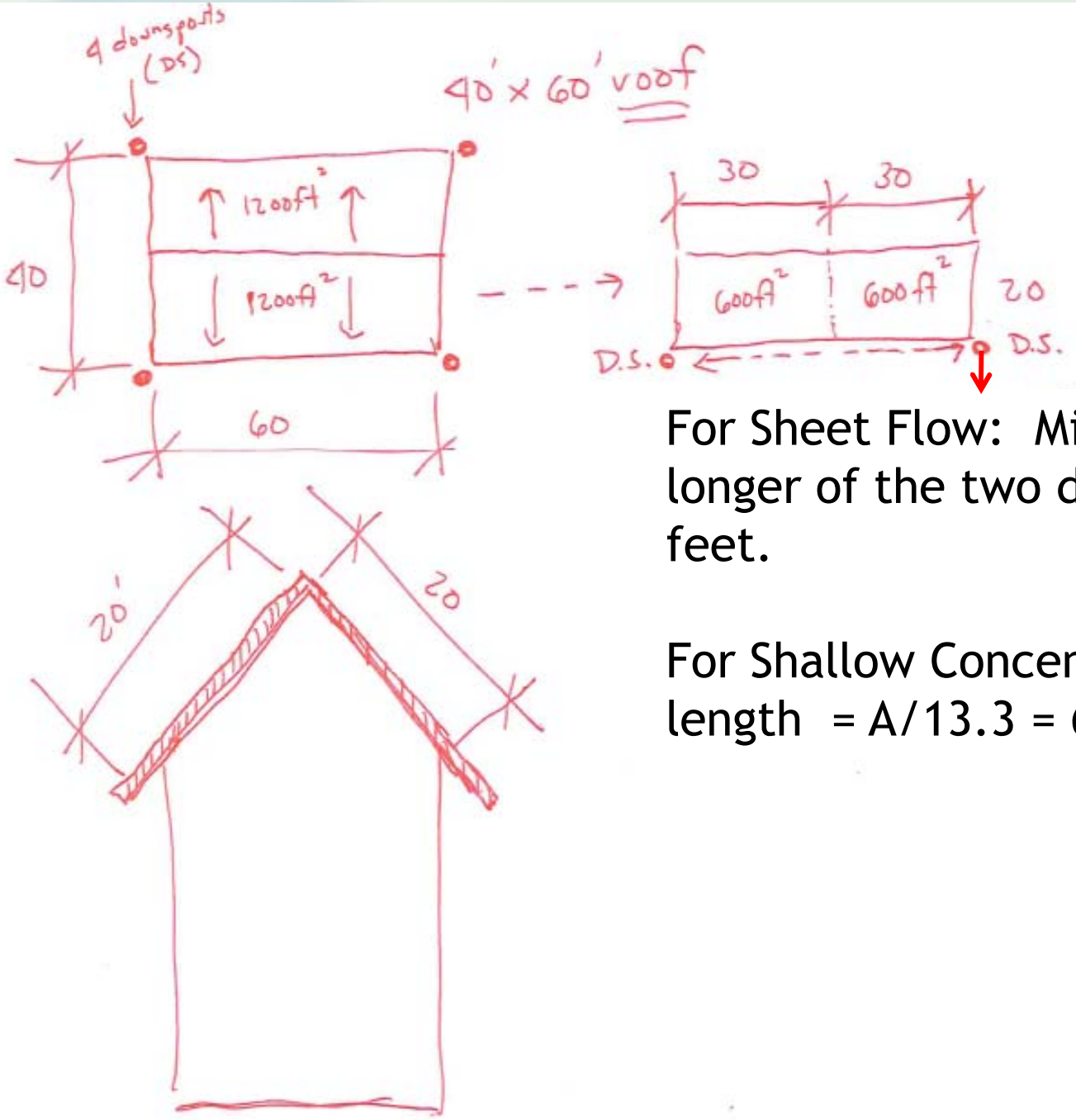
Credit Restrictions
(Continued)

- Res Lots > 6,000 ft^2;
- Slope of QPA < 5.0%;
- QPAs located over A or B soils;
- No construction traffic over QPA;
- O&M Plan required;
- QPA cannot be a wetland resource; and
- QPA must be controlled by the owner/applicant

Example Calculation

Given: a 40' x 60' gable single family rooftop, with 4 downspouts at each corner:

- What is the minimum QPA as Sheet flow?
- What is the minimum QPA length through a vegetated Swale?



For Sheet Flow: Minimum width is the longer of the two dimensions: i.e., 30 feet.

For Shallow Concentrated Flow: Minimum length = A/13.3 = 600 ft^2/13.3 = 45 feet.

Stormwater Credit (Recharge; Re_v)

- Two Methods:
  - Percent Volume – storage provided based on volume required for Re_v and/or WQ_v
  - Percent Area (Re_a) – required impervious area to drain to a QPA based on:

$Re_a = (F)(I)$, where

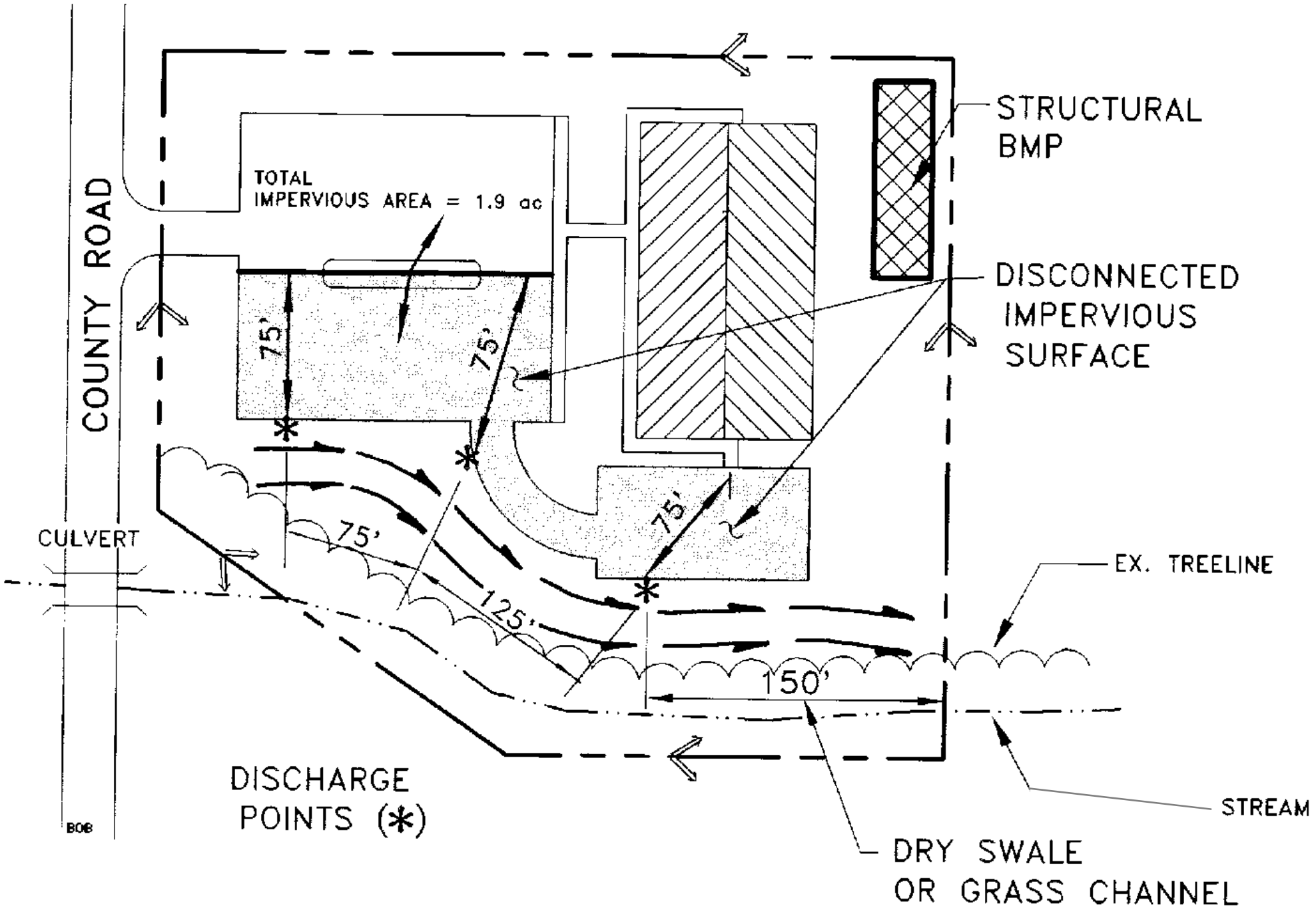
F = Recharge Factor based on soils (dimensionless)

I = Impervious area (in acres or ft^2)

Recharge Methods

% Volume versus % Area Methods

1. Calculate volume based on HSG (Re_v)
2. Calculate area method: Re_a = (F)(I); where F = recharge factor and I site impervious area.
3. Site area draining to a QPA is subtracted from Re_a
4. Divide new Re_a by Re_v: (Re_a / Re_v)
5. Multiply fraction by original Re_v to obtain volume that must be treated by conventional structural practice.


COUNTY ROAD
TOTAL
IMPERVIOUS AREA = 1.9 ac
STRUCTURAL
BMP
DISCONNECTED
IMPERVIOUS
SURFACE
75'
75'
75'
75'
CULVERT
125'
EX. TREELINE
150'
DISCHARGE
POINTS (*)
STREAM
DRY SWALE
OR GRASS CHANNEL
BOB

Example Calculation

Given: non-rooftop impervious area = 1.9 ac lying over HSG A soils, 0.9 ac are disconnected to discharge to QPAs :

- What is the required Re_v to be managed by a structural practice?
  - Re_v = 1" (F)(I)/12 = 1" (0.60)(1.9 ac)/12 = 0.095 ac-ft (4,138 ft^3)
  - Re_a = (F)(I) = (0.60)(1.9 ac) = 1.14 ac

Answer: 1.14 ac - 0.9 ac = 0.24 ac

New Re_v = 0.24 ac/1.14 ac (4,138 ft^3) = 871 ft^3