



CLIMATE SMART LANDSCAPES AT HOME AND WORK

POROUS PAVING

MAY 5, 2024

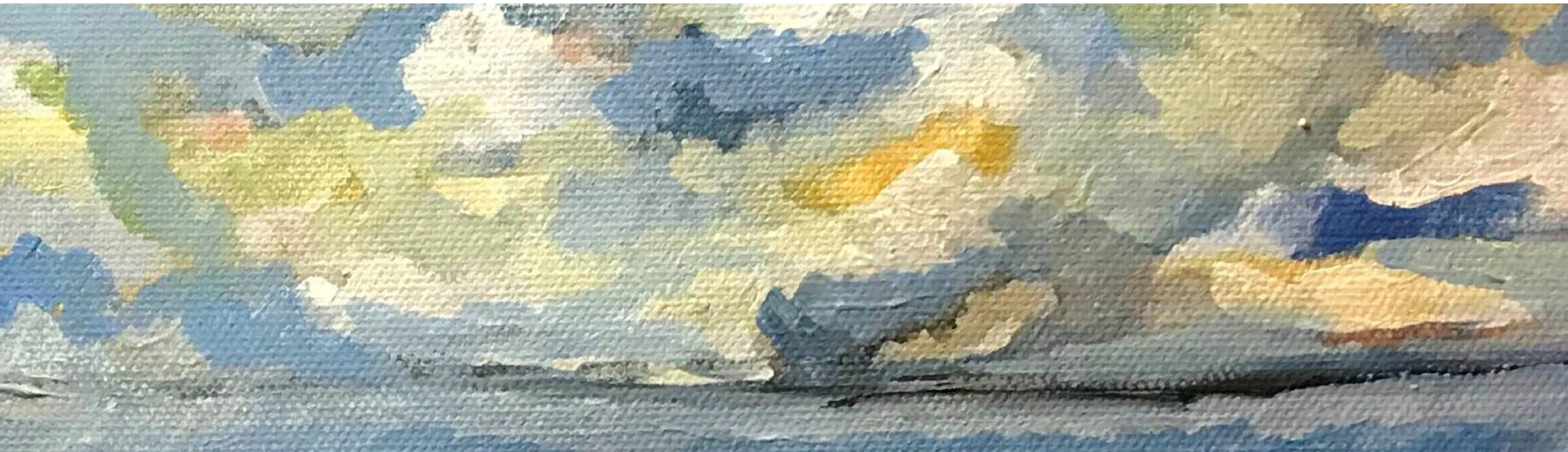
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PRINCIPAL, BERKSHIRE DESIGN GROUP

+ WHY POROUS PAVING?

**+WHAT TO CONSIDER BEFORE CHOOSING POROUS PAVING
AS A SOLUTION**

**+ POROUS PAVING MATERIALS COMMONLY USED WHICH
QUALIFY FOR INFILTRATION WITH MASS STORMWATER
GUIDELINES**

+ MAINTENANCE CONSIDERATIONS



An aerial photograph of a commercial district. The image shows a complex network of roads, numerous parking lots filled with cars, and several large commercial buildings. The landscape is dominated by paved surfaces, illustrating a high percentage of impervious area.

“
Research indicates that when
impervious area in a watershed
reaches 10 percent, stream
ecosystems begin to show
evidence of degradation,
and coverage more than 30
percent is associated with
severe, practically irreversible
degradation.
”

Metro Portland, Green Streets
Innovative Solutions for Stormwater and Stream Crossings



heat island mitigation

climate regulation

curb extension

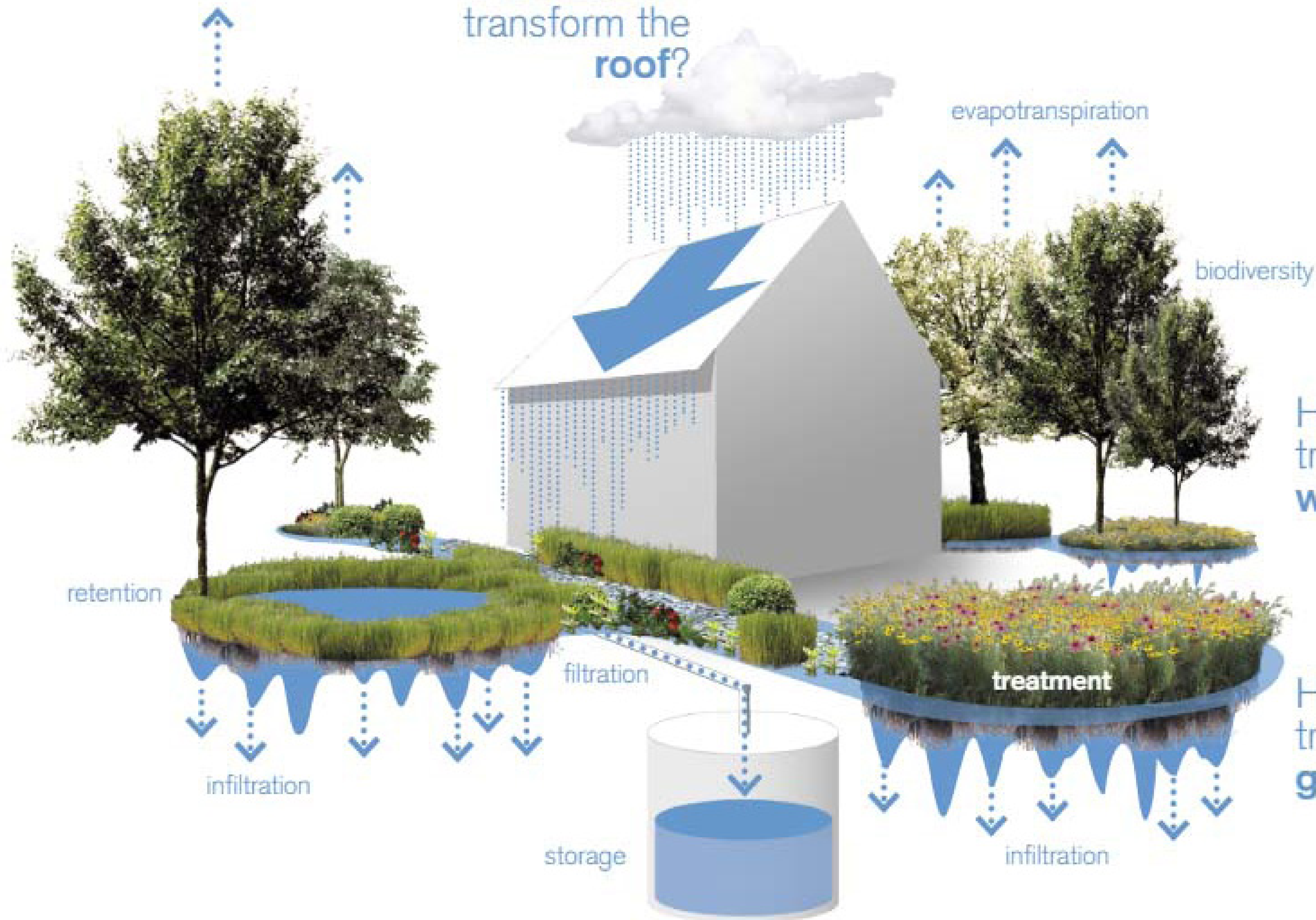
infiltration

non-invasive facultative landscapes

erosion control and
sediment retention

Siskiyou Street
Portland, Oregon

How can we
transform the
roof?



evapotranspiration

biodiversity

How can we
transform the
walls?

How can we
transform the
ground?

retention

filtration

treatment

infiltration

storage

infiltration



**SOILS CHANGE OVER TIME, BUT STRUCTURE
AND TEXTURE ARE DOMINANT**

**WEATHERING OF ROCK + BREAKDOWN OF
ORGANIC MATERIAL ABOVE**





Sandy

Loamy

Clay

STRUCTURE IS AN ARMATURE FOR HOLDING AIR AND WATER

<https://www.nesdis.noaa.gov/learn-about-soil-types>

**DENSE SOILS= LESS AIR, LESS INFILTRATION
LOOSE SOILS= MORE AIR, MORE WATER INFILTRATION**



hydrologic soil groups

D High runoff potential with slow rate of infiltration. Characteristics include clay, soils with a high water table, soils with claypan or a clay layer near surface, and shallow soils over impervious surface types.

C Slow infiltration and rate of water transmission potential. Characteristics include silty loam with a layer resisting water transmission or soils with moderately fine to fine texture types.

B Moderate infiltration and rate of water transmission potential. Characteristics include well-drained sandy loam and moderately fine texture to coarse gravel types.

A Low runoff potential and high infiltration rates that offer a high rate of water transmission. Characteristics include deep, well-drained sand and gravel types.

— increasing permeability —
↓

**IS POROUS PAVING
RIGHT FOR ME**

?

SOMETIMES

IMPORTANT QUESTIONS

+ TYPE OF SUBSOIL

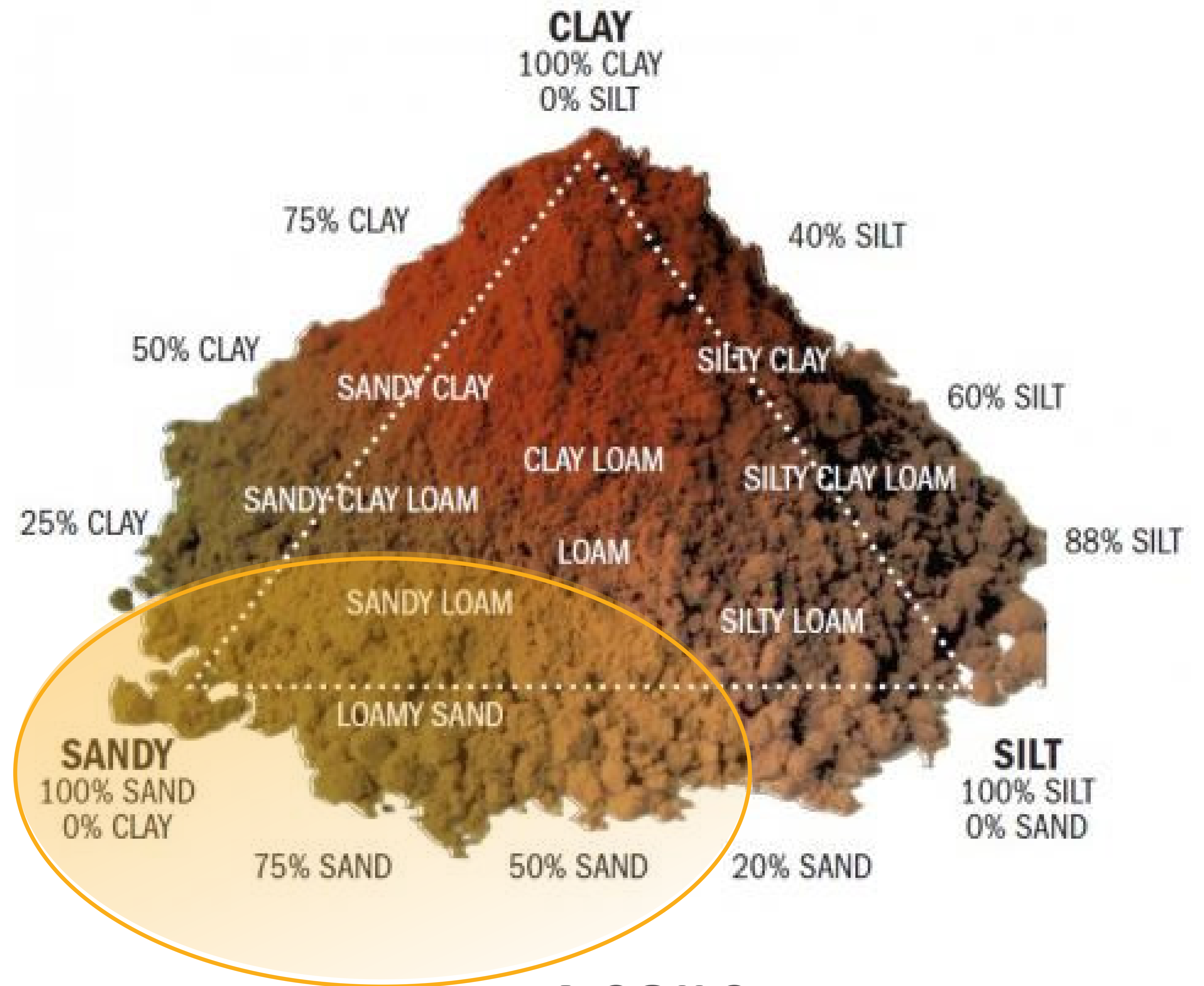
+ DEPTH TO GROUNDWATER

**+DO YOU HAVE A BASEMENT OR A SLAB ON
GRADE**

+ DISTANCE OF SURFACE FROM HOME

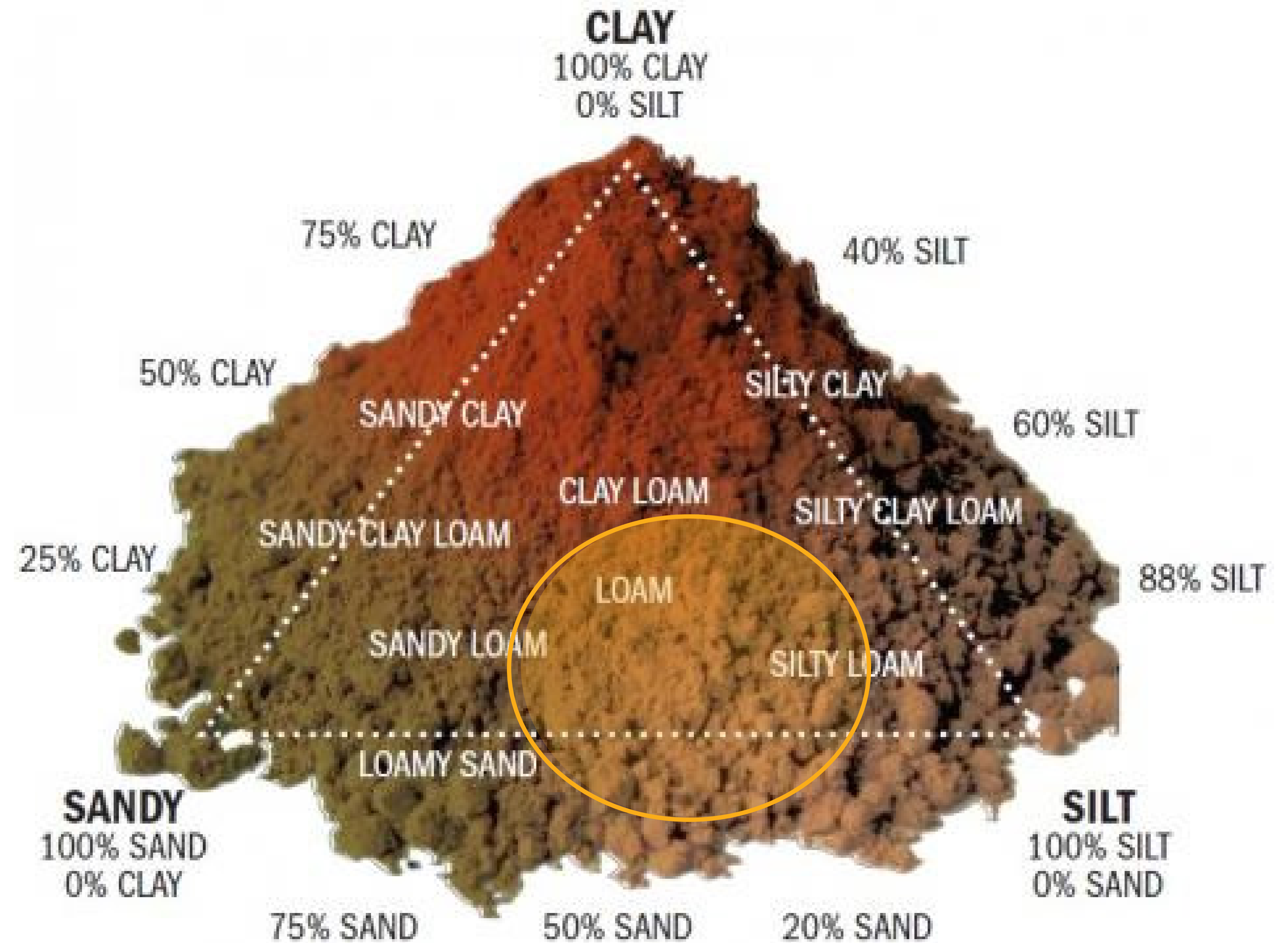
+CONTEXTUAL TOPOGRAPHY

WHAT HYDROLOGIC
CLASSIFICATION OF
SOILS DO YOU HAVE?
(DEFINED BY
THE NRCS
AND VERIFIED
IN THE FIELD)



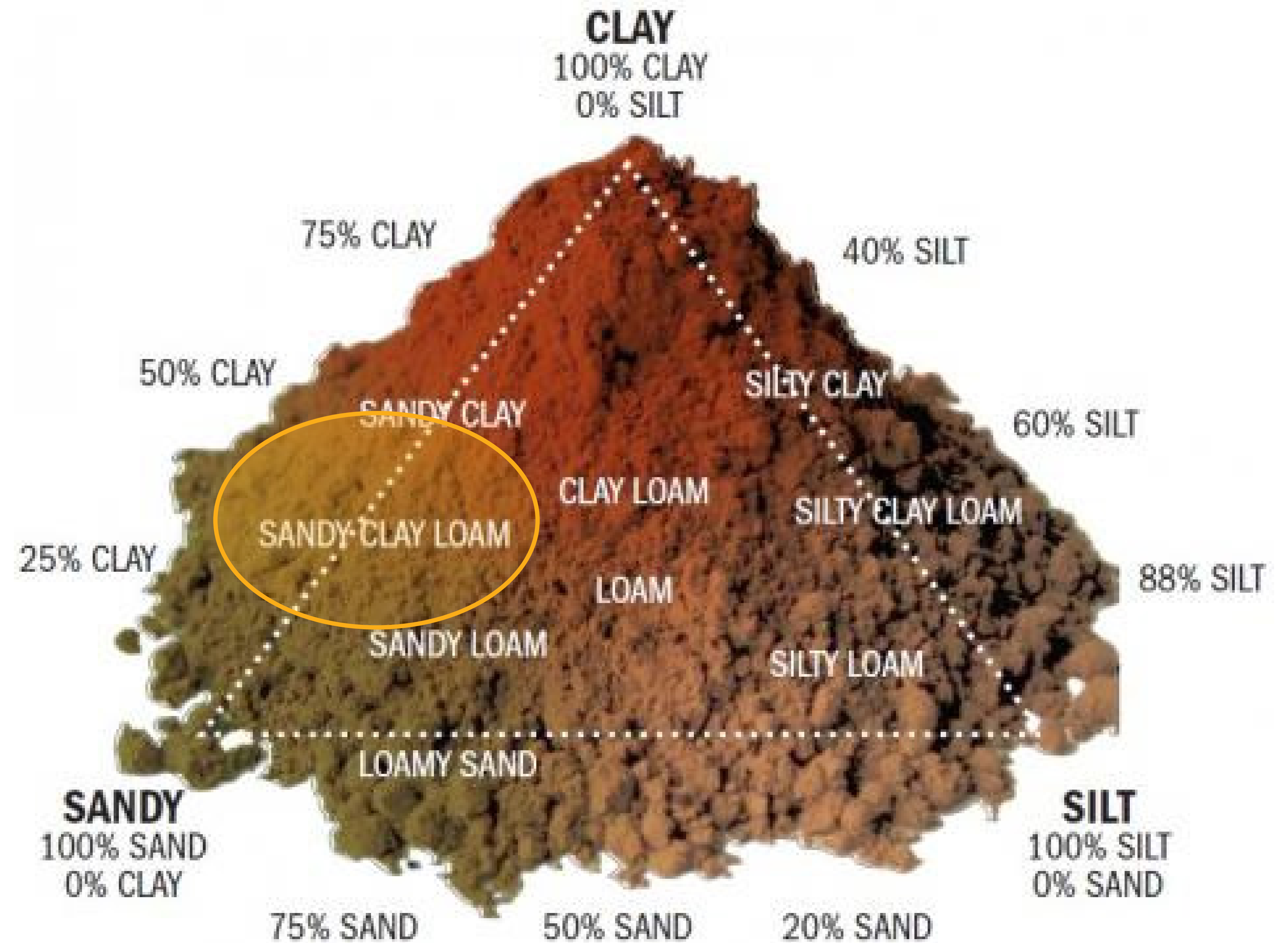
A SOILS
SAND, LOAMY SAND: HIGH INFILTRATION RATES
EVEN WHEN THOROUGHLY WET
(SAND AND GRAVELS)

WHAT HYDROLOGIC
CLASSIFICATION OF
SOILS DO YOU HAVE?
(DEFINED BY
THE NRCS
AND VERIFIED
IN THE FIELD)



B SOILS
SILT LOAM OR LOAM, MODERATE
INFILTRATION

**WHAT HYDROLOGIC
CLASSIFICATION OF
SOILS DO YOU HAVE?
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THE NRCS
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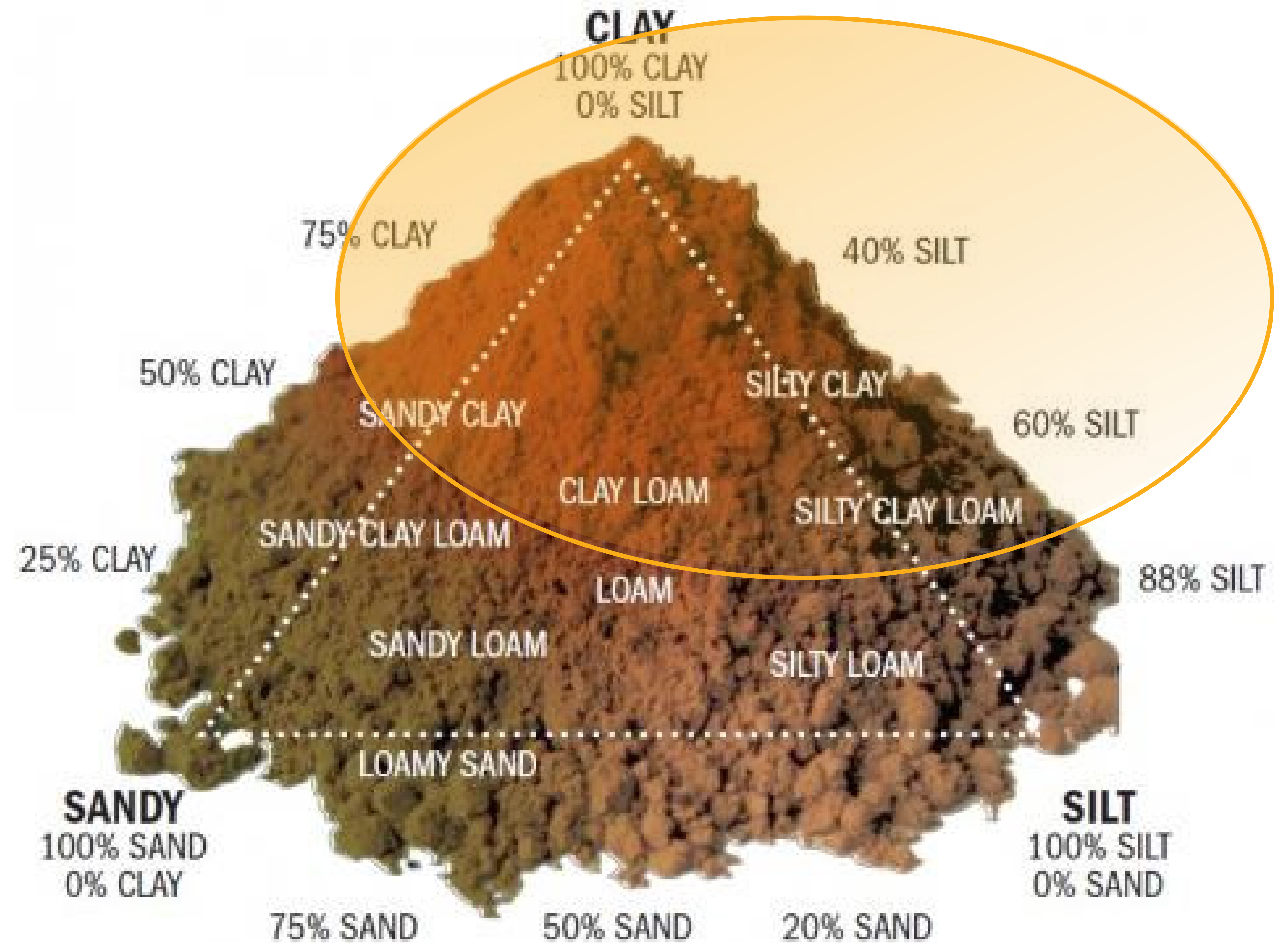


C SOILS

SANDY CLAY LOAM

**LOW INFILTRATION RATES WHEN WET. FINE STRUCTURE
IMPEDES DOWNWARD MOVEMENT OF WATER**

WHAT HYDROLOGIC
CLASSIFICATION OF
SOILS DO YOU HAVE?
(DEFINED BY
THE NRCS
AND VERIFIED
IN THE FIELD)



D SOILS

SANDY CLAY LOAM

LOW INFILTRATION RATES WHEN WET. TEND TO SWELL
WHEN WET, HIGH WATER TABLE

**POKE TEST-
SQUEEZE HANDFUL OF SOIL.**



+ GRITTY AND FALLS APART = SANDY

+ HOLDS TOGETHER BUT FALLS APART WHEN YOU POKE IT = LOAM

+ SLIPPERY AND OOZES BTWN FINGERS = CLAY

+SLIPPERY, HOLDS SHAPE, STAINS FINGERS, DRY IS POWDERY= SILT



DEPTH TO GROUNDWATER ?

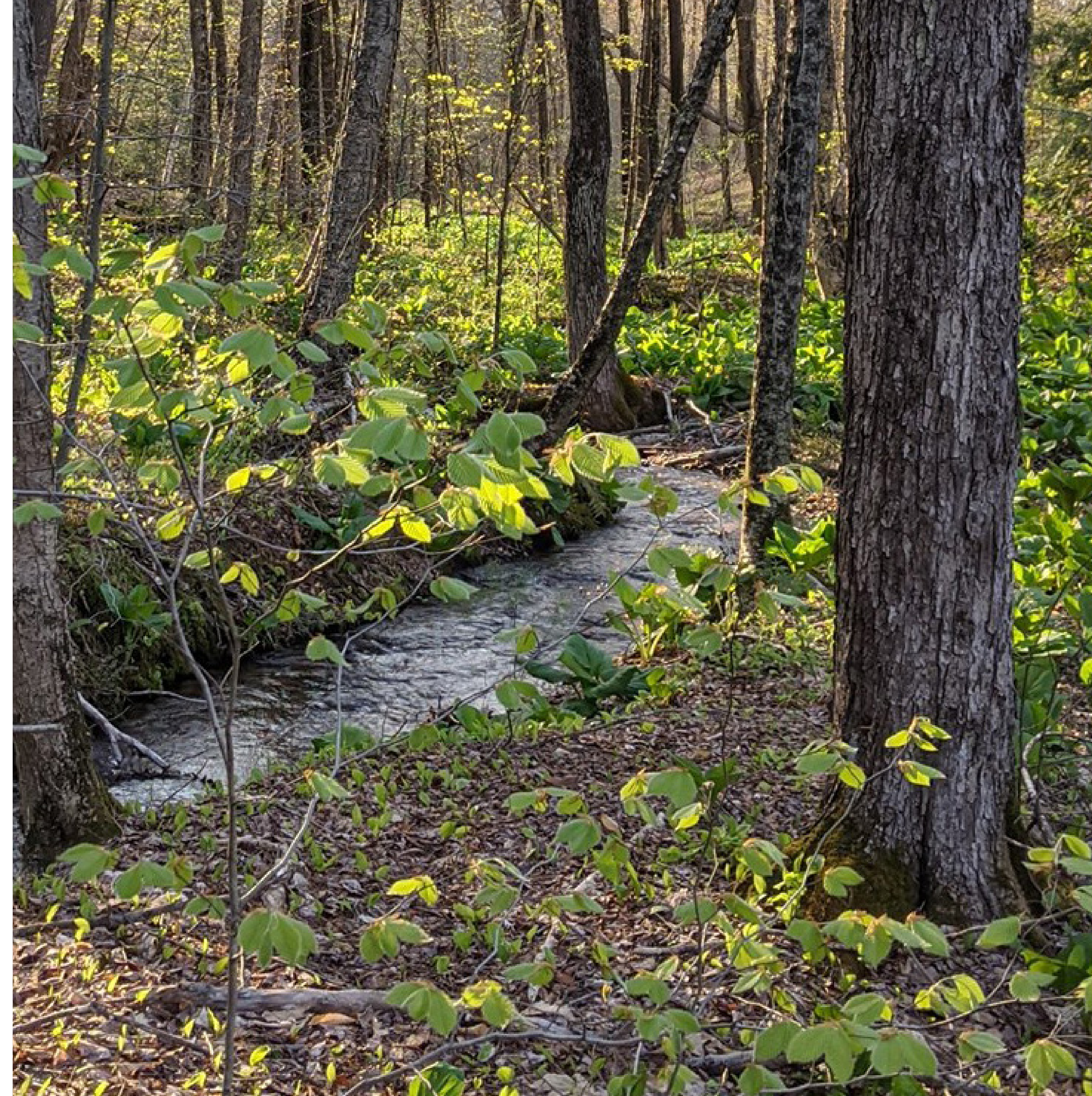
**IS GROUNDWATER AT LEAST 51" DEEP OR 4.25' BELOW THE SURFACE? POROUS
PAVING NEEDS 2' SEPARATION FROM GROUNDWATER**



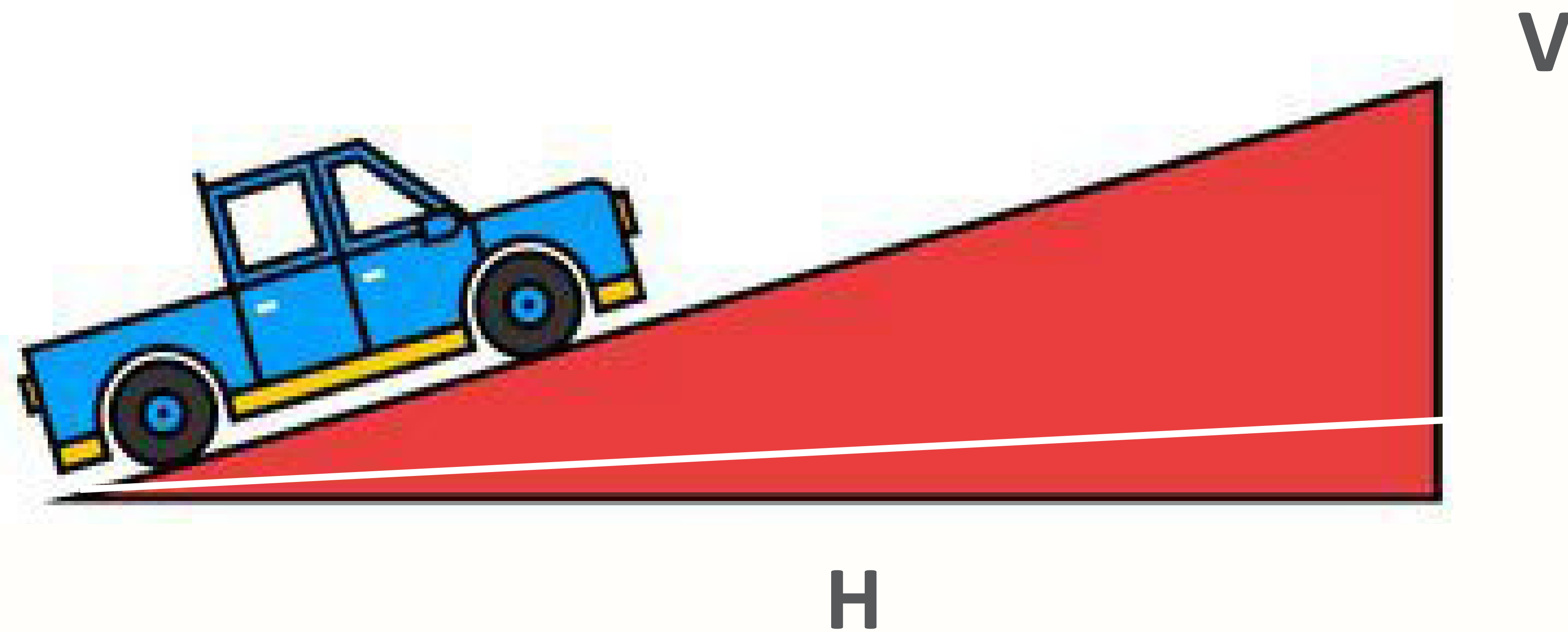
DO YOU HAVE A BASEMENT ?
POROUS PAVING MUST BE AT LEAST 10' AWAY FROM SLAB ON
GRADE FOUNDATIONS AND 20' AWAY FROM BASEMENTS



**WHAT IS THE SHAPE OF THE LAND?
ARE YOU IN A LOW POINT? OR A HIGH POINT?
WHERE WILL WATER GO?**



ARE THERE WETLANDS WITHIN 100'?
IS THERE A STREAM WITHIN 200'?



HOW STEEP WILL THE SLOPE BE?

5% OR LESS OR

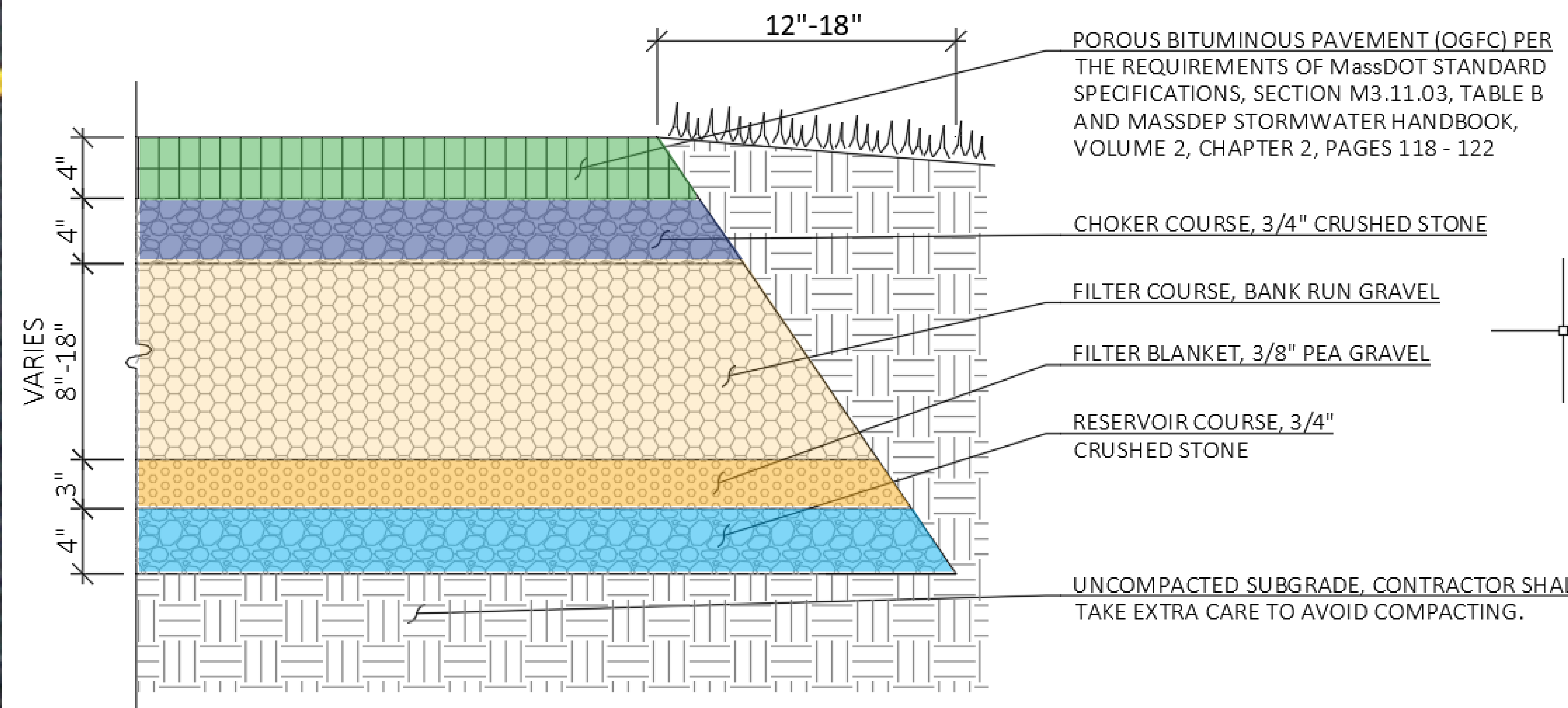
1' V IN 20' H OR MORE



VEHICLE OR PEDESTRIAN USE?

**WHAT KIND OF
POROUS PAVING
?**

POROUS ASPHALT





POROUS GRASS PAVERS

- + IS THE AREA SHADY OR IN FULL SUN? PICK SEEDS ACCORDINGLY**
- + CONSIDER WEED MANAGEMENT IF NOT GOOD TOPSOIL**
- + FILL THE VOIDS UP TO THE TOP AND USE PLATE COMPACTOR TO SHAKE EVERYTHING IN**
- + ANTICIPATE 35% SHRINKAGE**
- + COURSE SAND + PEAT MOSS WORKS BETTER THAN TOPSOIL, IF THE TOPSOIL IS NOT FREE OF WEEDS**
- + SEED AT 2.5LBS PER 1000 SF, SWEEP ANY SEED FALLING ON THE CONCRETE INTO THE VOIDS.**
- + PENN MULCH (MULCH SEED ACCELERATOR)**
- + BIOTONE (MYCORRHIZAE TREATMENT)**
- + 1/4" BELOW THE SURFACE OF CONCRETE SO AS TO NOT BREAK**
- + UNDERDRAINAGE?**
- + EDGES- CURB OR EDGE RESTRAINT**





POROUS UNIT PAVERS

PERMEABLE PAVERS



- + PAVER HAS SPACER BARS IN CAST TO ENSURE WIDER JOINTS
- + JOINTS $\frac{1}{4}$ " OR LARGER
- + JOINT FILL MATERIAL = CRUSHED ANGULAR CHIP STONE $\frac{1}{6}$ " TO $\frac{3}{8}$ "

NON-PERMEABLE PAVERS



- + JOINT SIZE TYPICALLY $\frac{1}{16}$ " TO $\frac{3}{16}$ "
- + JOINT FILL MATERIAL POLYMERIC SAND

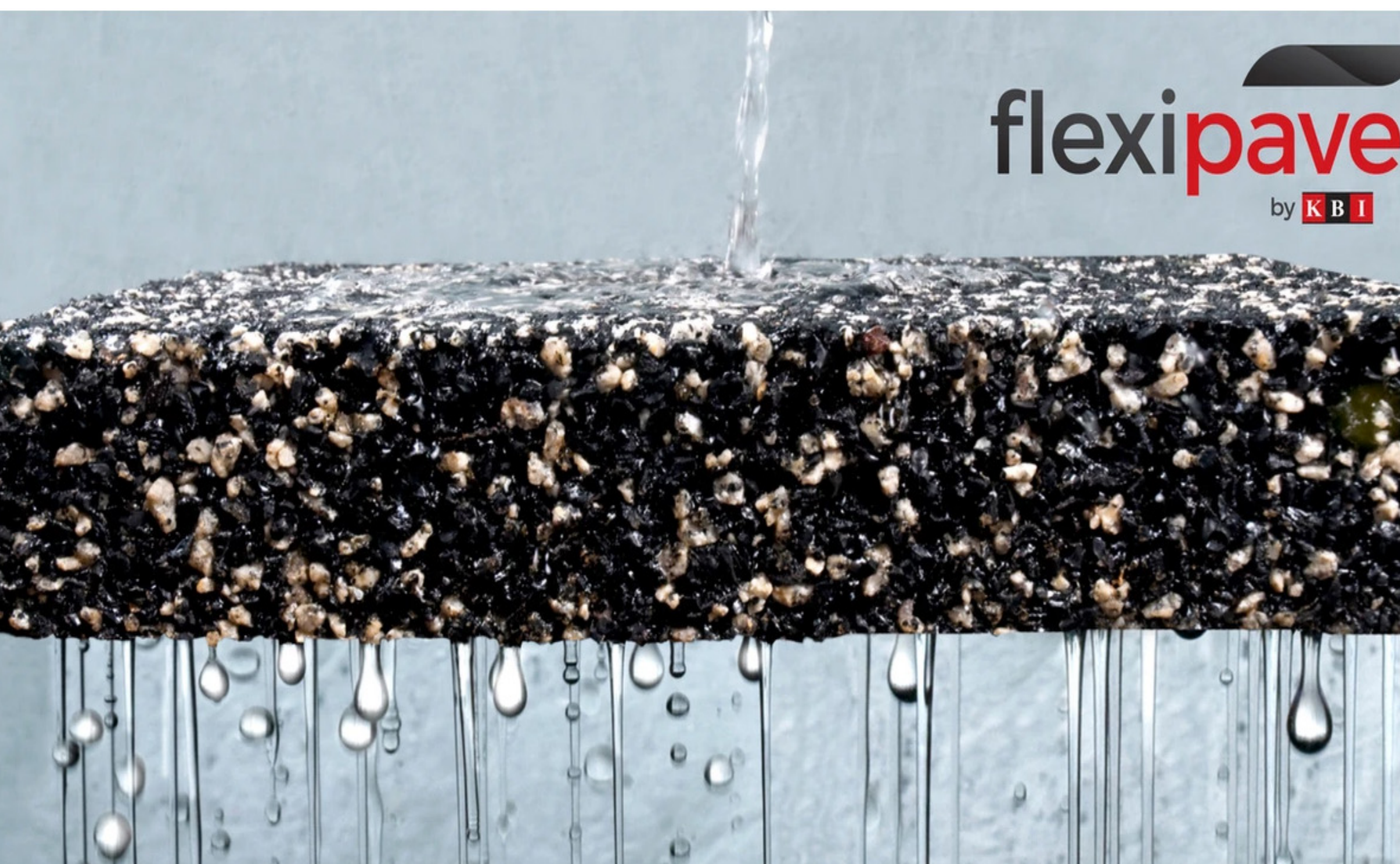


FLEXIPAVE



FLEXI PAVE IS A THREE PART MIX OF CLEAN RECYCLED CAR TIRES, GRANITE AND A PROPRIETARY BINDER. ONCE THE MIX IS CURED, IT BECOMES VERY DURABLE, EXTREMELY POROUS AND HAS MULTIPLE BENEFITS:

- **POROSITY RATE OF OVER 2,400 GALLONS PER HOUR PER SQUARE FEET.**
- **WILL NOT CRACK OR SPLIT**
- **RESISTANCE TO ALMOST ALL CHEMICALS**
- **SLIP RESISTANCE**
- **FLEXIBILITY TO POUR INTO MULTIPLE ENVIRONMENTS**
- **SOLUTION FOR STORM WATER MANAGEMENT.**
- **REDUCE MAINTENANCE AND LIABILITIES FOR TRIPPING AND FALLING**
- **MEETS ADA GUIDELINES**





UNDERDRAINS

- +NON WOVEN GEOTEXTILE FABRIC (NO FILTER FABRIC)
- + 3/4" CRUSHED STONE (WASHED)
- + 4 TO 6" PERFORATED PIPE
- + 1% SLOPE MIN
- + OUTFALL LOCATION



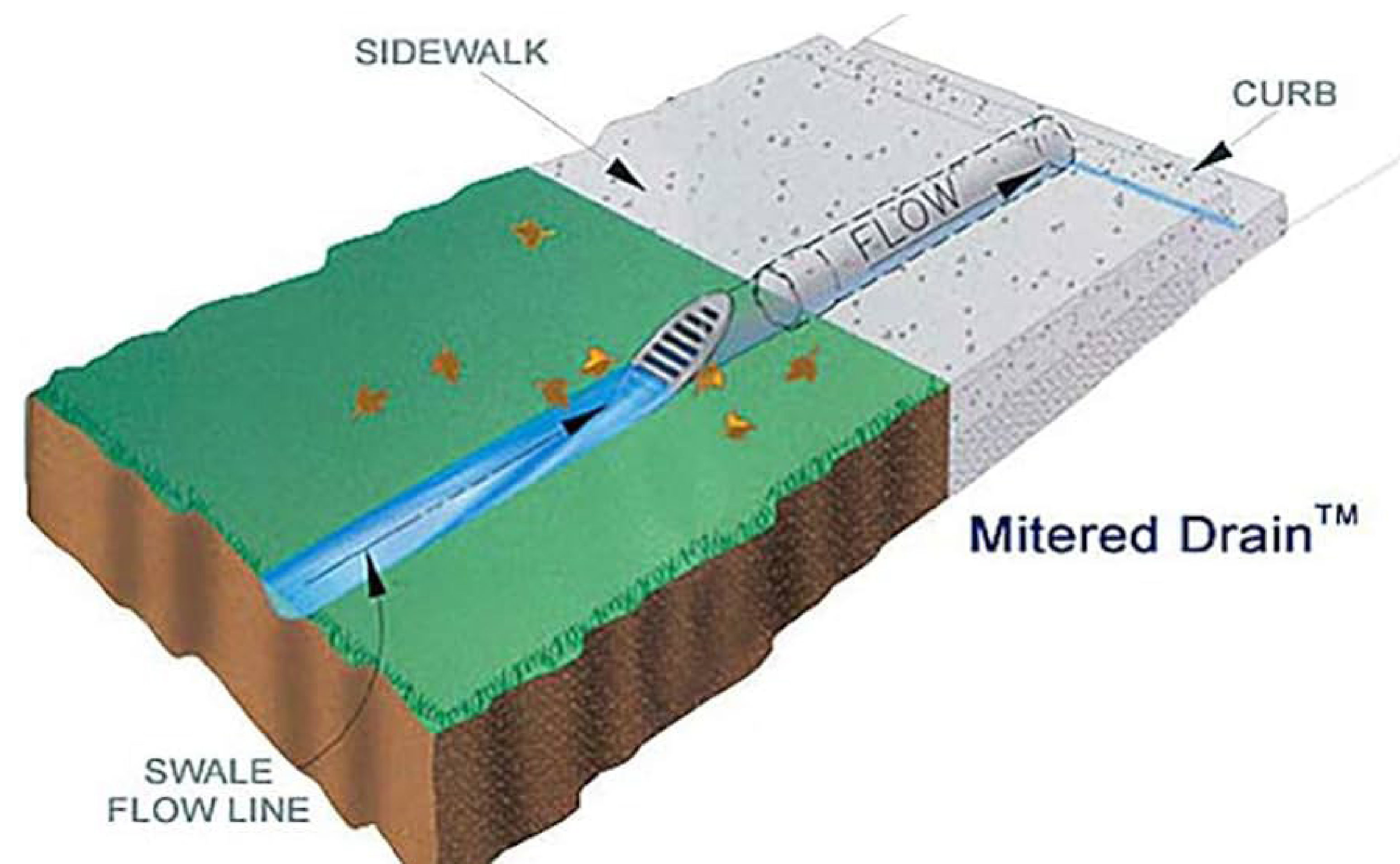
CLEANOUT

- + PVC PIPE AND WHYE OR BEND
- + CAP



PIPE OUTLET

- + MESH OR GRATE TO PREVENT CLOGGING FROM SMALL CREATURES
- + ANGLED OUTLET END
- + 2' SEPARATION FROM RECEIVING AREA



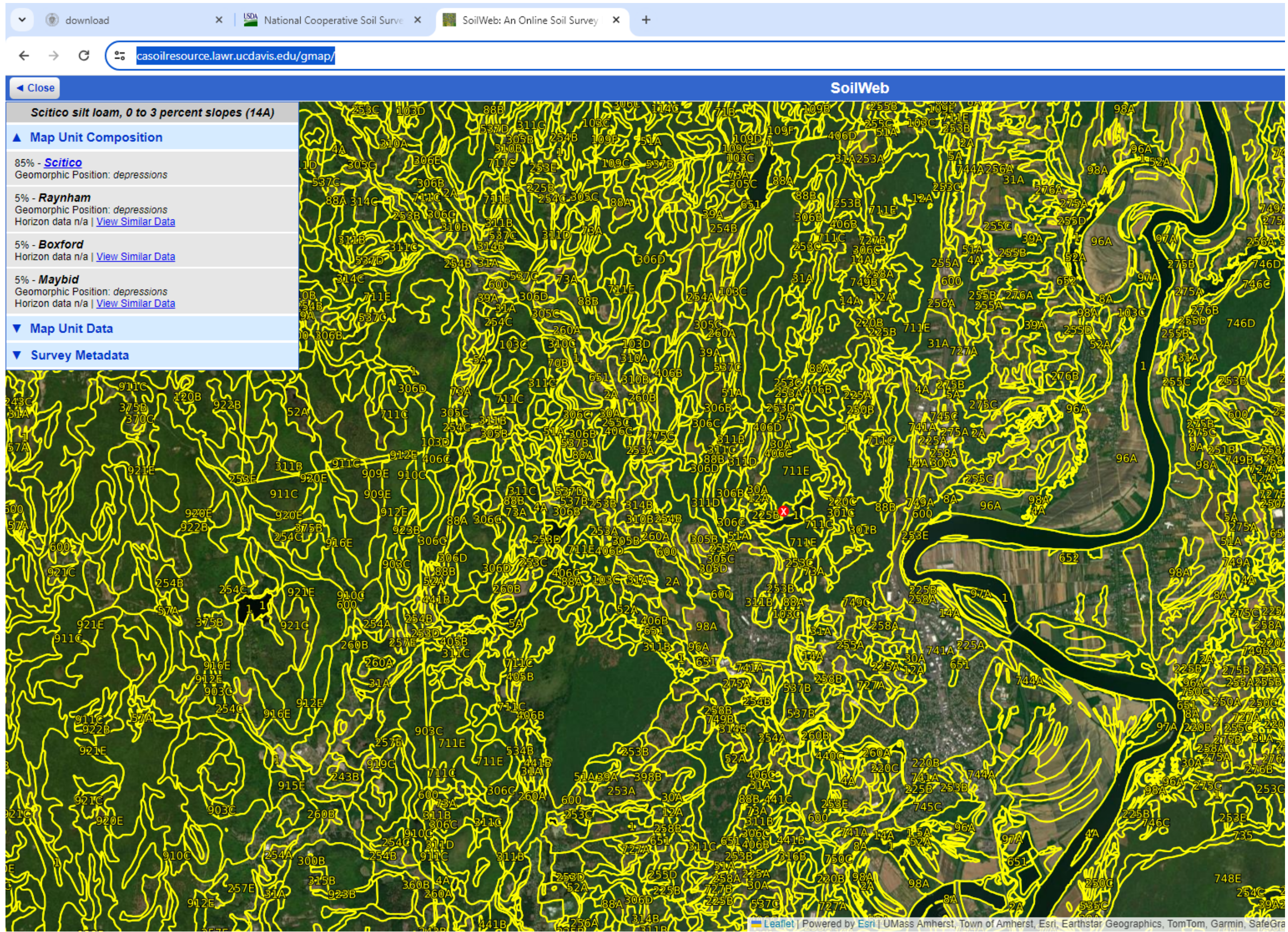


MAINTENANCE

- + AVOID USING SAND TO MANAGE ICE**
- + POROUS PAVEMENTS TEND TO REQUIRE LESS DEICING MATERIALS DUE TO THE LACK OF MOISTURE ON THE SURFACE**
- + USE A RUBBER TIP PLOW BLADE OR SNOW BLOWER BLADE**
- + SET PLOW AND BLOWER BLADE HIGHER**
- + DO SCHEDULE REGULAR VACUUMING AND INSPECTIONS OF UNDERDRAINS.**

RESOURCES

Volume 2
Chapter 2:
Structural BMP
Specifications for
the Massachusetts
Stormwater
Handbook



UC DAVIS NRCS WEB DATA BASE

SUB SOIL/GROUNDWATER
ANALYSIS:
CERTIFIED SOIL EVALUATOR
GEOTECHNICAL ENGINEER
CIVIL ENGINEER

INSTALLATION ADVICE:
PRODUCT REPS
CERTIFIED INSTALLERS



THANK YOU