

BMP Selection & Planning

**Leif Hauge, PE, P. Hydrologist
Land Resources Division
Waukesha County Dept. of Parks and Land Use**

Where Does the Discharge Go?

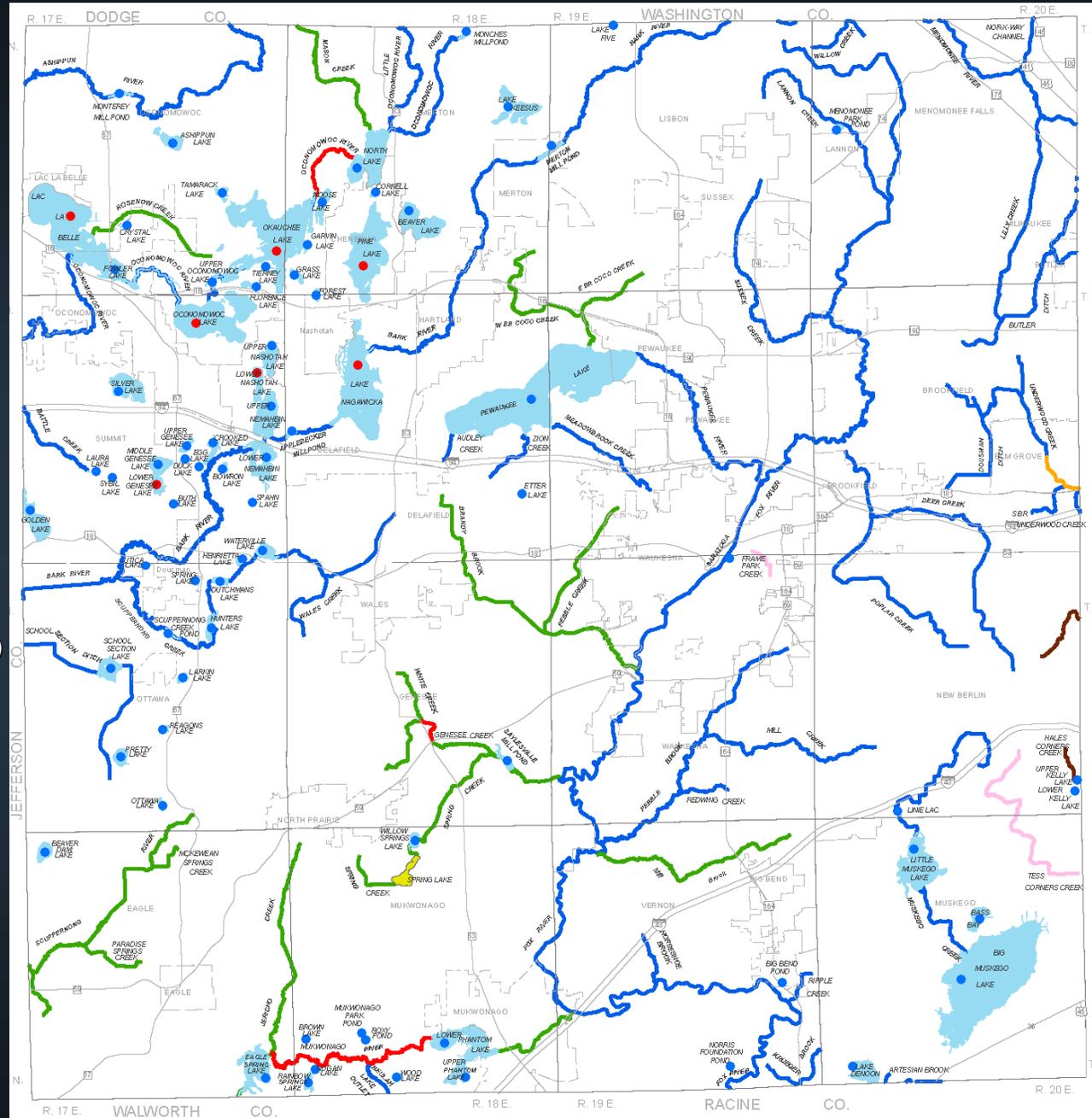
- Check downstream from each existing / proposed discharge point
- Receiving water bodies
- Impacts to neighboring properties
- Chronic wetness
- Possible exemptions
 - Regional detention
 - Internally drained area
- Use to establish management goals

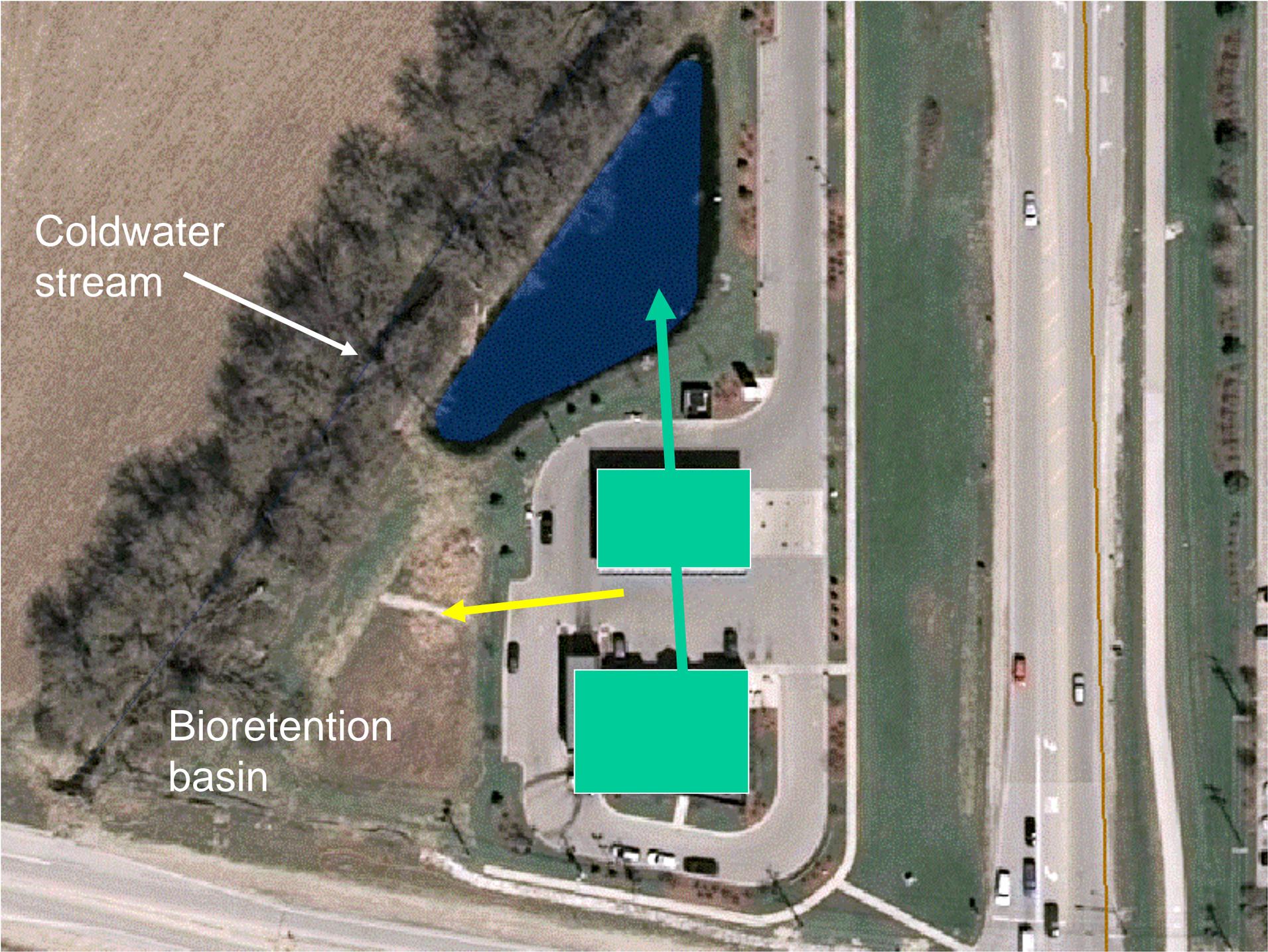
Water Resource Classifications

Waukesha County

Legend

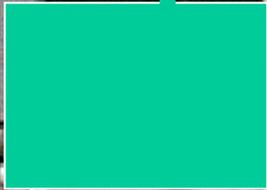
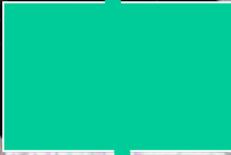
- Lake Supports Cold Water Species (7)
- Lake Supports Fish and Aquatic Life (73)
- Outstanding Resource Water (1-Spring Lake)
- Warm Water Streams (40)
- Cold Water Streams (10)
- Exceptional Resource Waters (3)
- Limited Forage Fish (1)
- Limited Aquatic Life (2)
- Special Variance Waters (1)

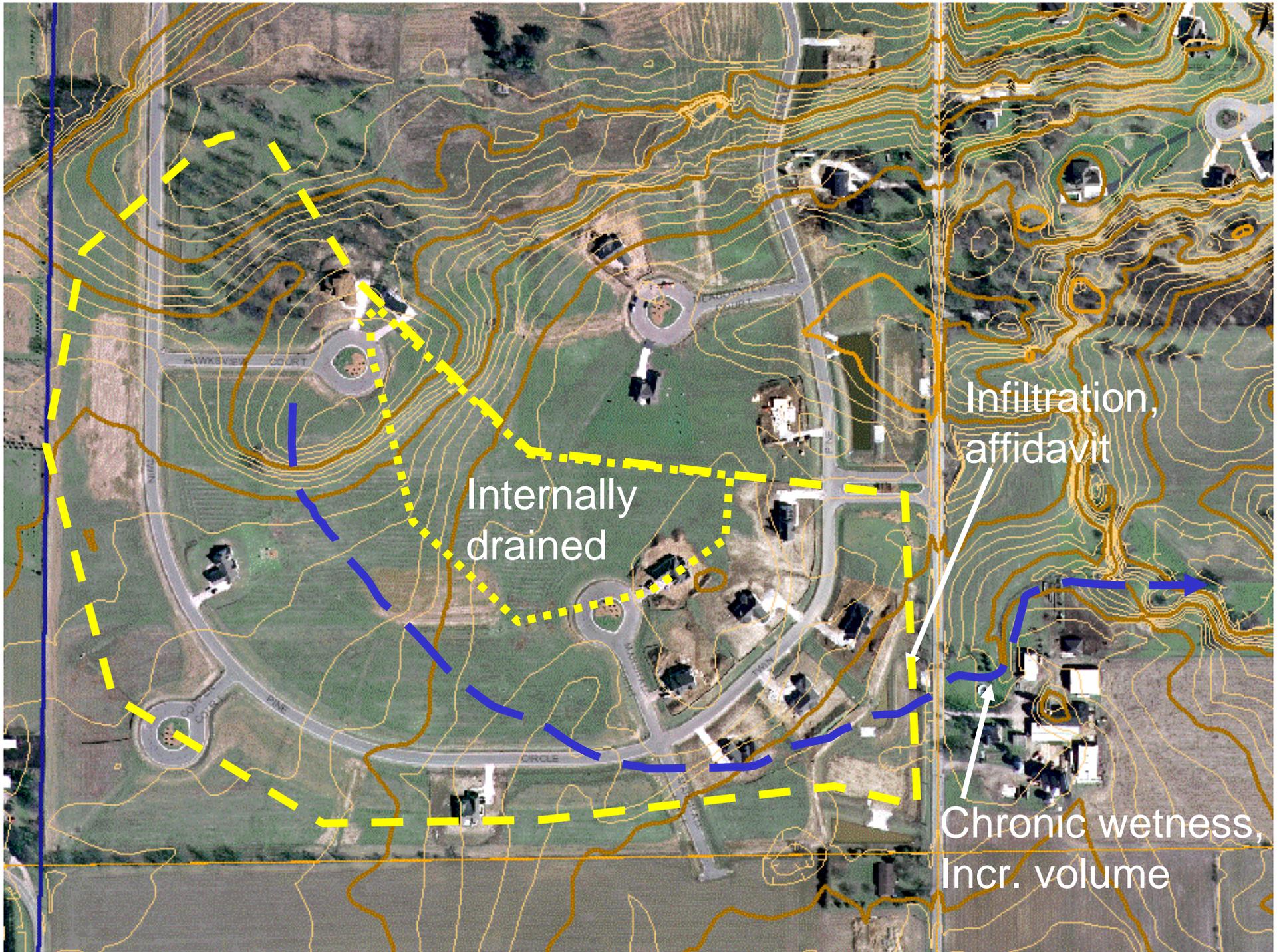




Coldwater stream

Bioretention basin

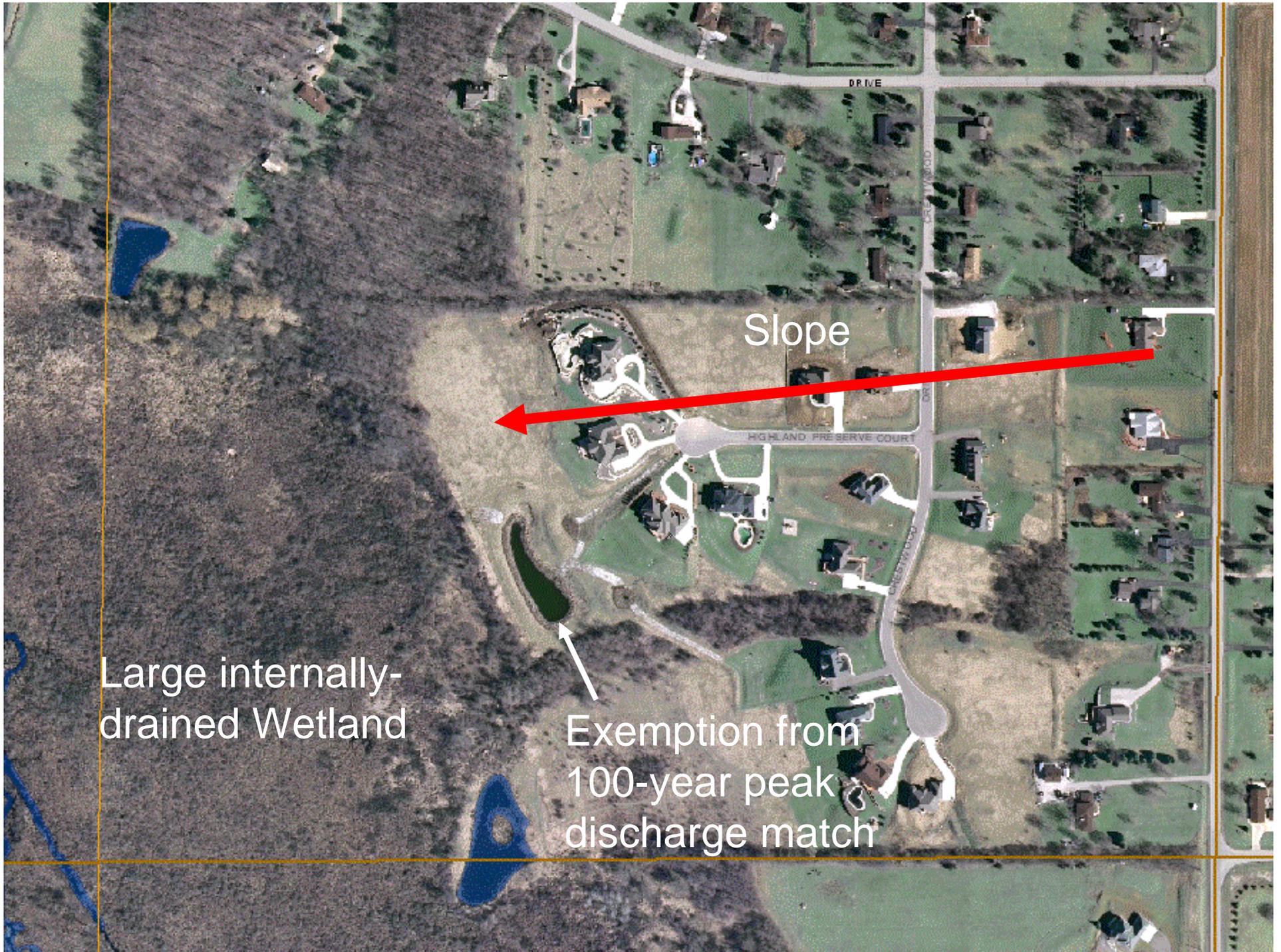




Internally
drained

Infiltration,
affidavit

Chronic wetness,
Incr. volume



Slope

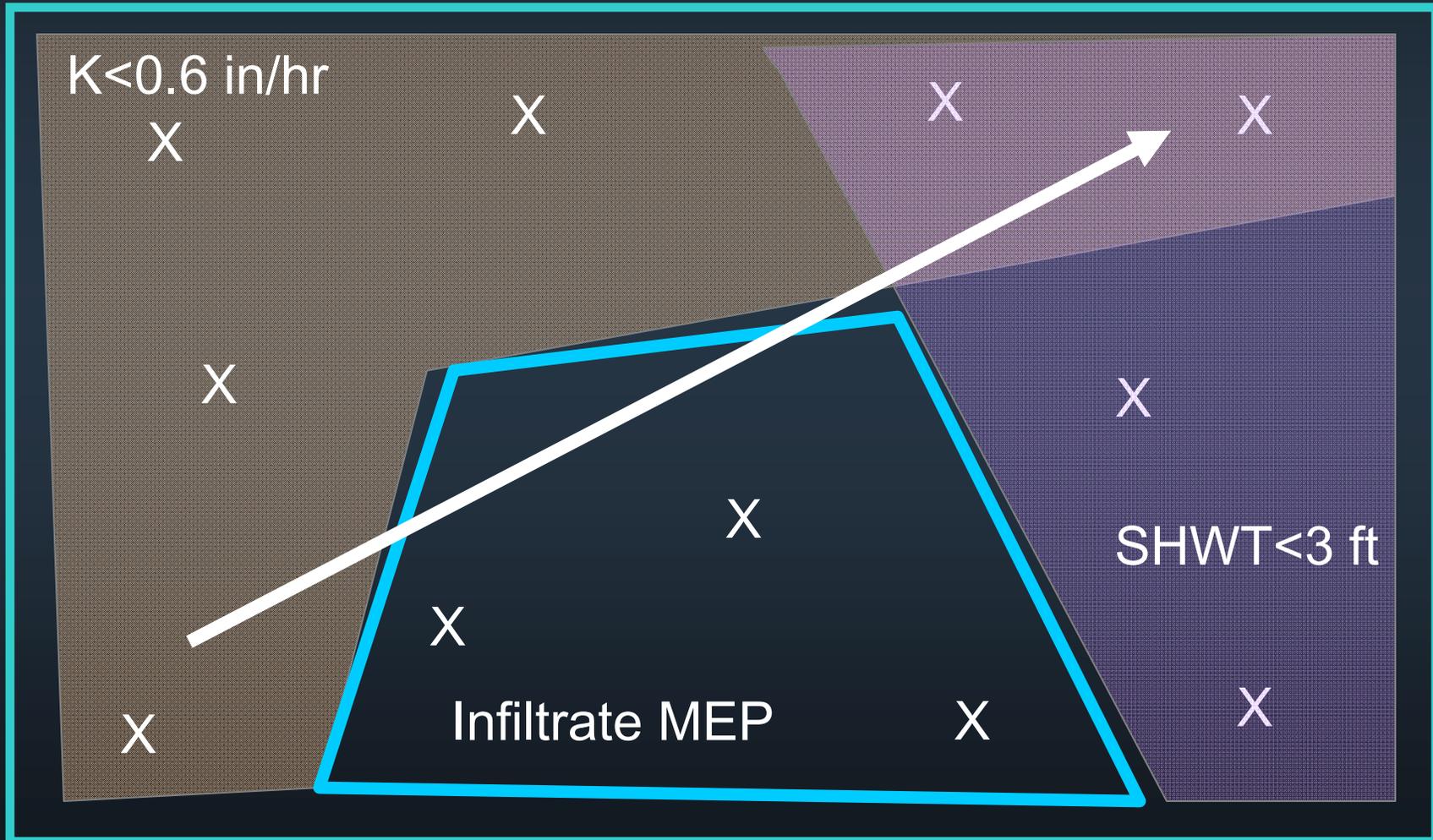
Large internally-drained Wetland

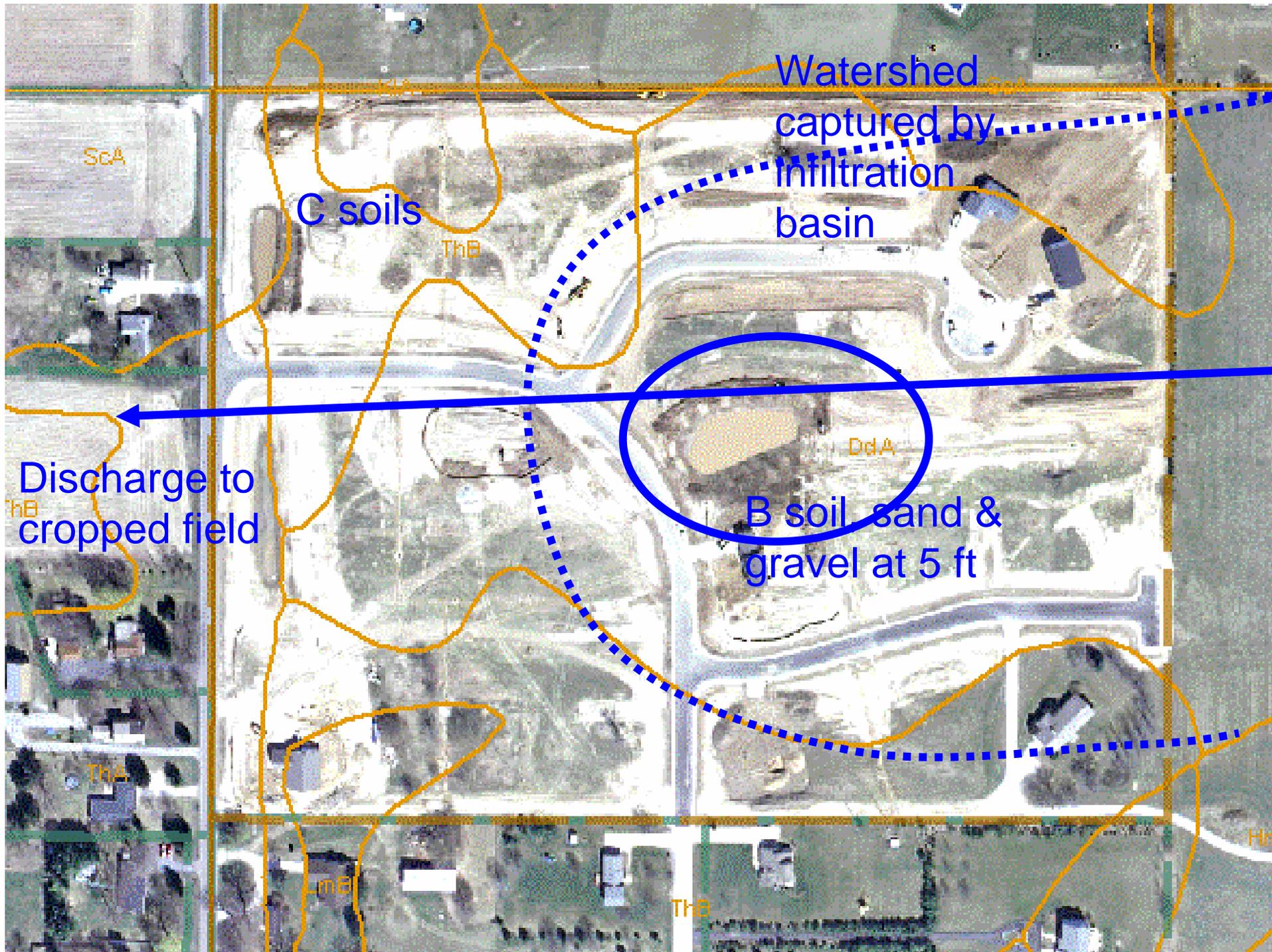
Exemption from 100-year peak discharge match

Is Infiltration Feasible?

- Preferred BMP
- Meets ordinance requirements
 - peak discharge
 - water quality
 - volume reduction
- Mitigates most downstream impacts
 - Thermal impacts
 - Chronic wetness

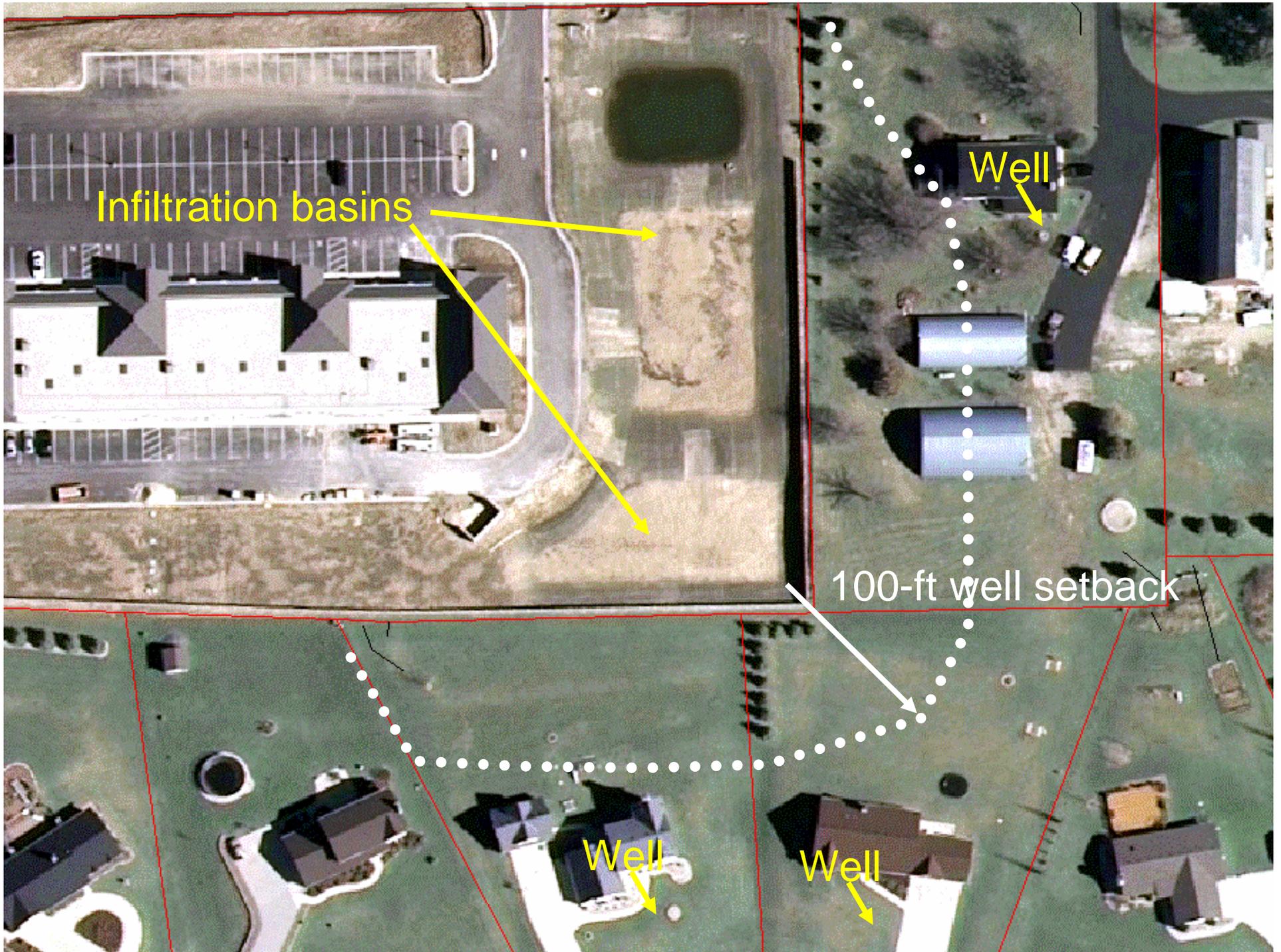
Infiltrate Where Feasible





Infiltration Constraints

- 100-foot private well setback
- Filtering layer requirement
 - 3 feet with 20% fines
 - 5 feet with 10% fines
- Exclusions: fueling areas, industrial material handling, shallow bedrock, shallow water table





4% fines



Fueling Area

No Pre-Treatment

Monitoring well for petroleum contamination?

Any Filtering Layer?

Infiltrate roof runoff where more-polluted runoff (eg. parking lots) is excluded

- Maximum extent practicable
- Not required to infiltrate runoff from entire site
- No separation requirement for roof runoff

H.G. RAMP
CONCRETE
1,153 SQ. FT.

TIMBER WALL
BRUSH
CONCRETE
B-2 GAS TANK

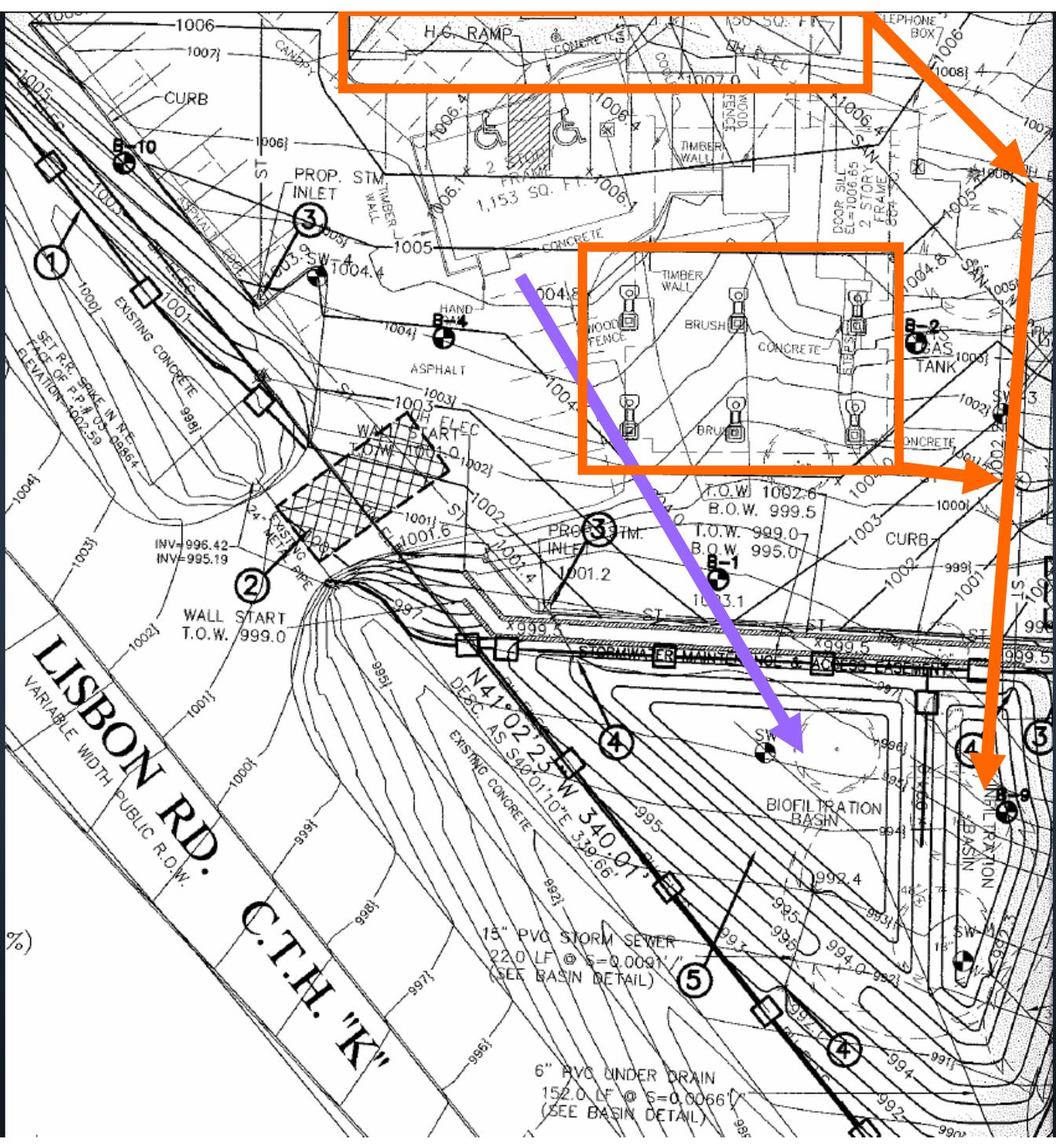
LISBON RD.
VARIABLE WIDTH PUBLIC R.O.W.
C.T.H. "K"

15" PVC STORM SEWER
220.0 LF @ S=0.0091'
(SEE BASIN DETAIL)

6" PVC UNDER DRAIN
152.0 LF @ S=0.0066'
(SEE BASIN DETAIL)

BIOFILTRATION BASIN

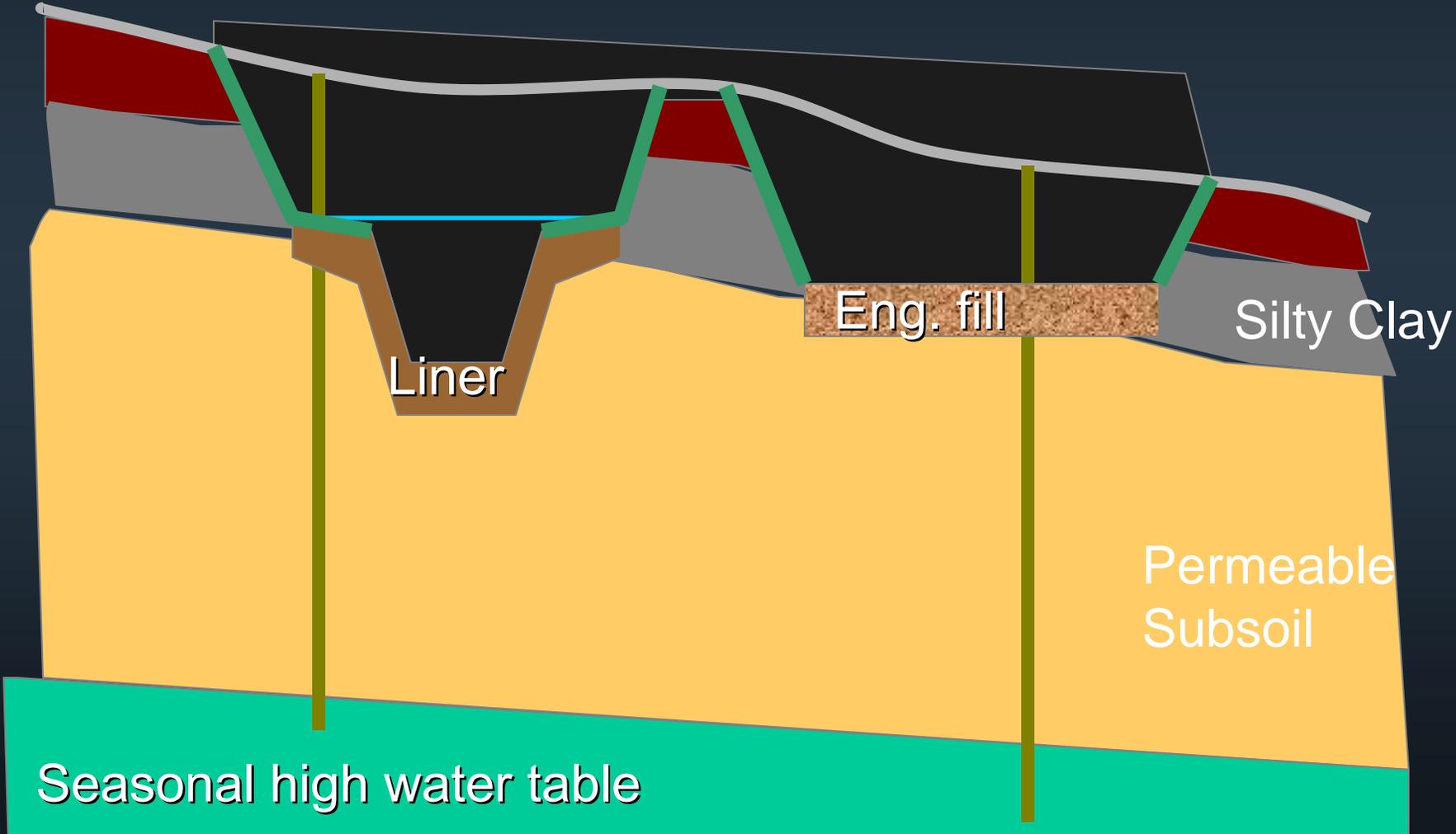
NATL. TR. BASIN



Can Soils Be Amended?

- If upper soil layers are not infiltrative, are there deeper soils that are?
- What is depth to permeable material?
- Depth to limiting factors
- Filtering layer
- Infiltration testing
- Stone trenches

Soil Amendment







Point Discharge Mitigation

- Level spreaders
- Discharge to prairie area
- Increase absorption



Prairie

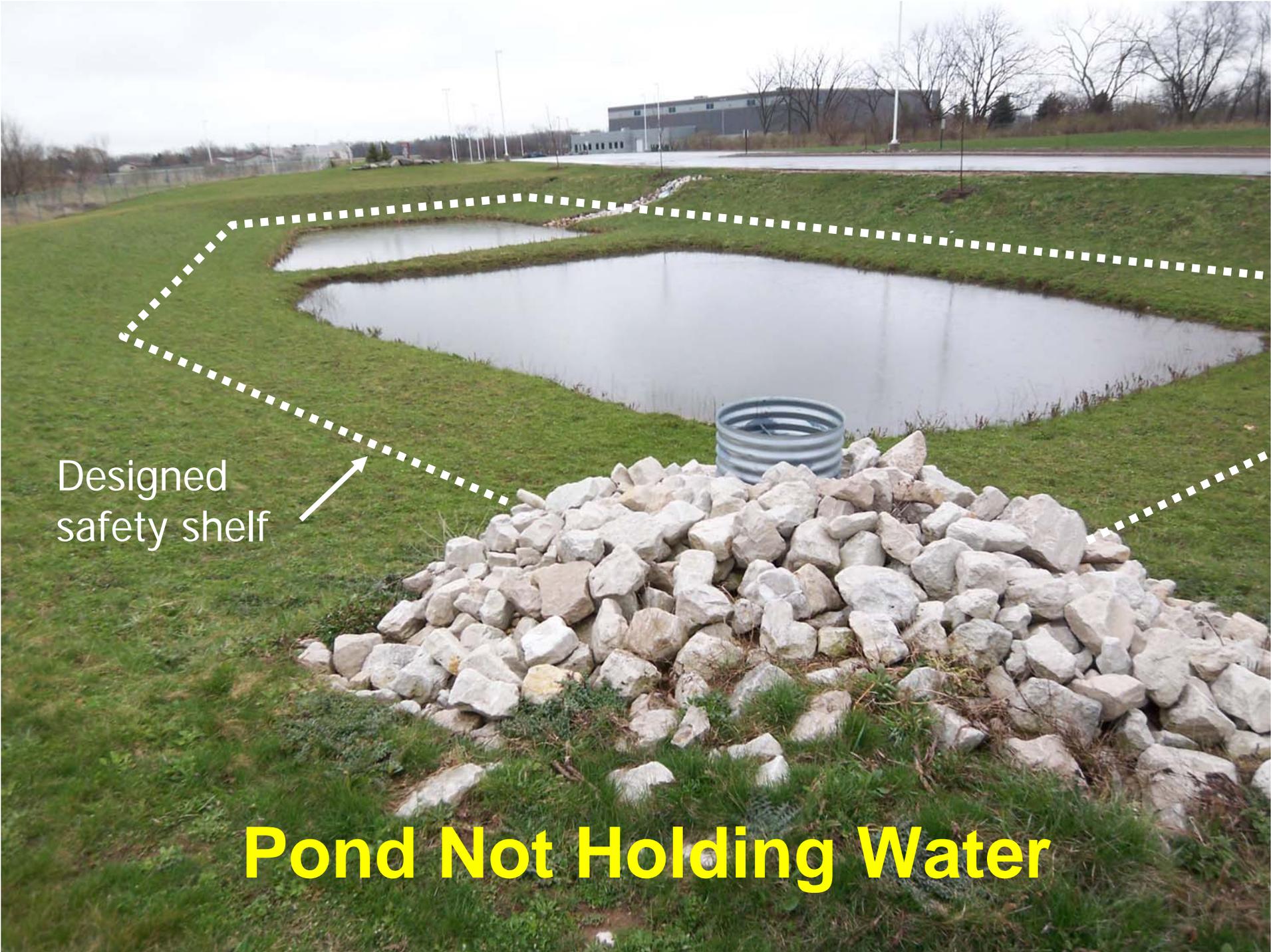


Neighbor's
Field



Suitability for Wet Detention

- If thermal impacts are not an issue
- If volume increase is not a problem
- Will watershed support permanent pool?
- Will soil support permanent pool?



Designed
safety shelf



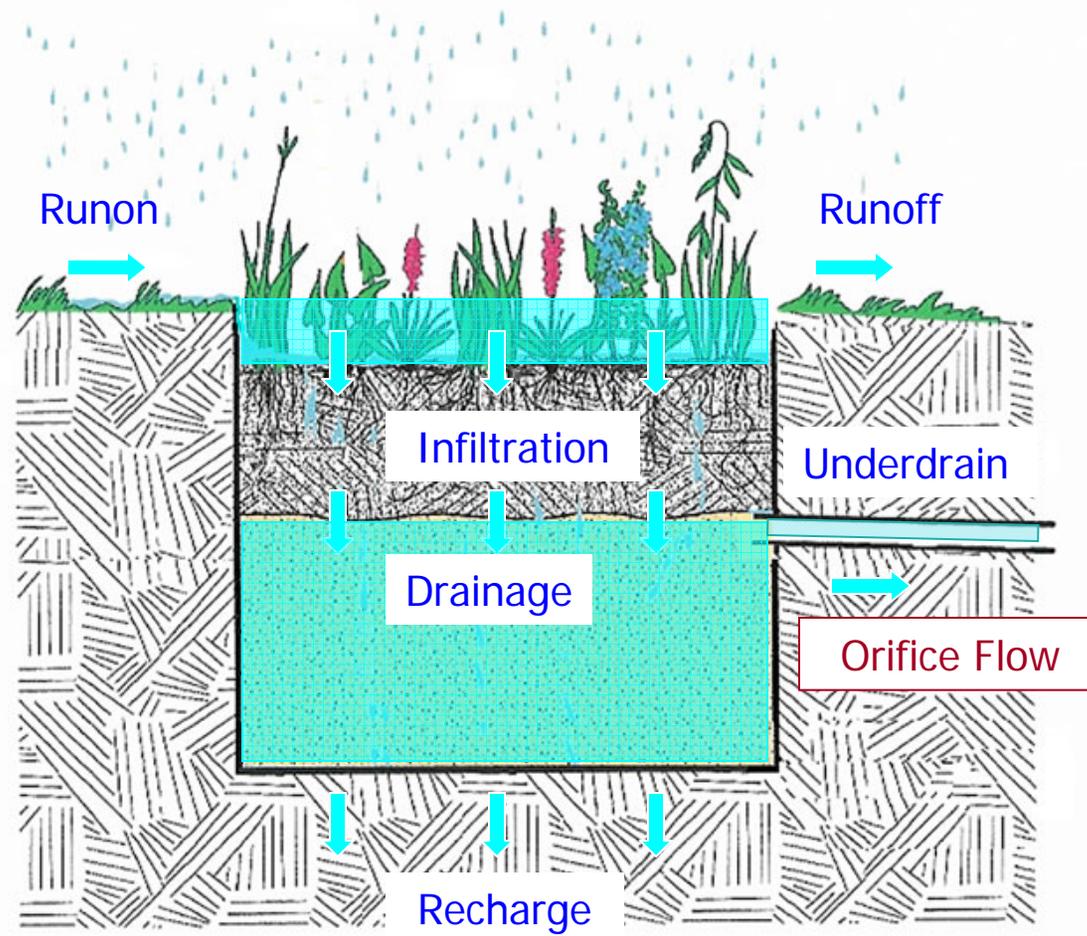
Pond Not Holding Water

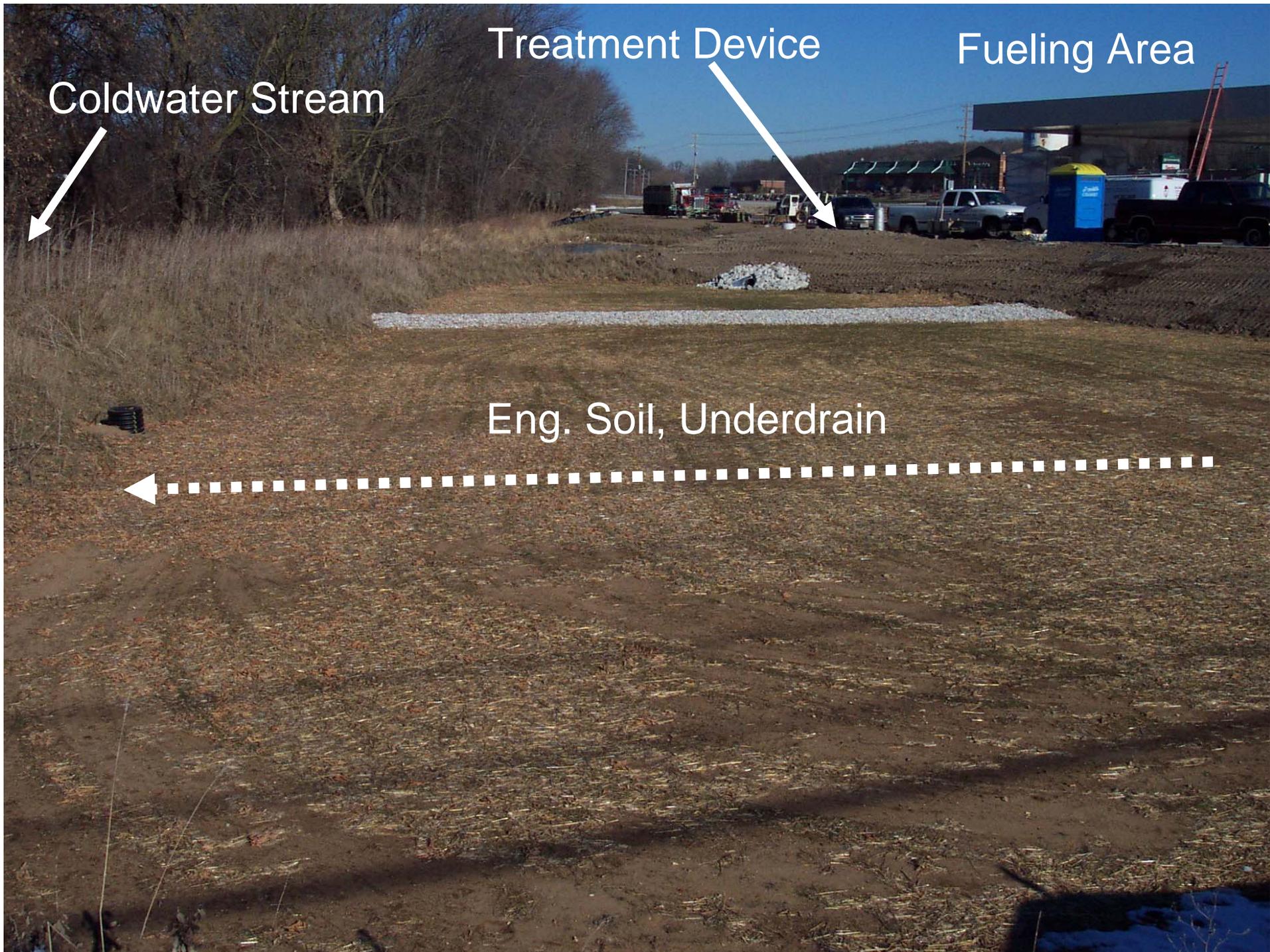


Suitability for Bioretention

- Provides thermal mitigation
- Limited to smaller drainage areas
- Filtering layer built-in
- Effective in poorly-drained soils
- Volume reduction – plant uptake, evaporation, infiltration
- Potential small footprint

How Does it Work?



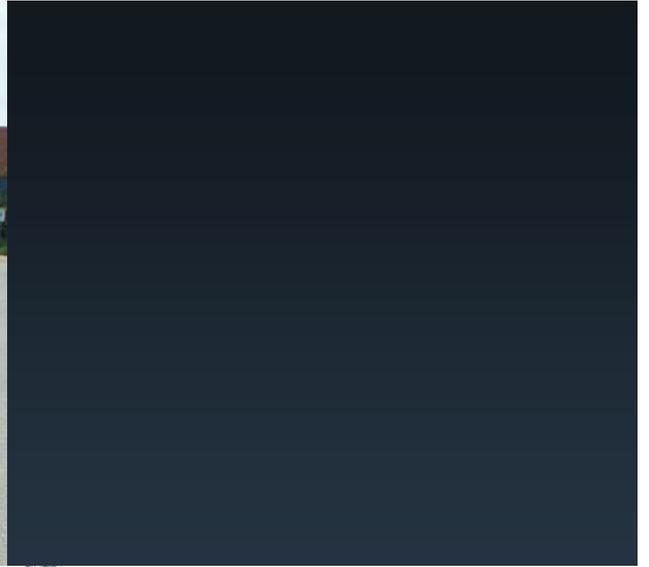


Coldwater Stream

Treatment Device

Fueling Area

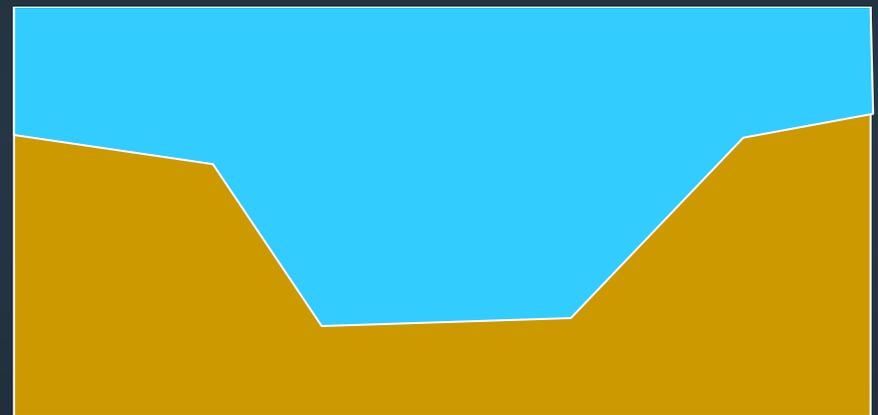
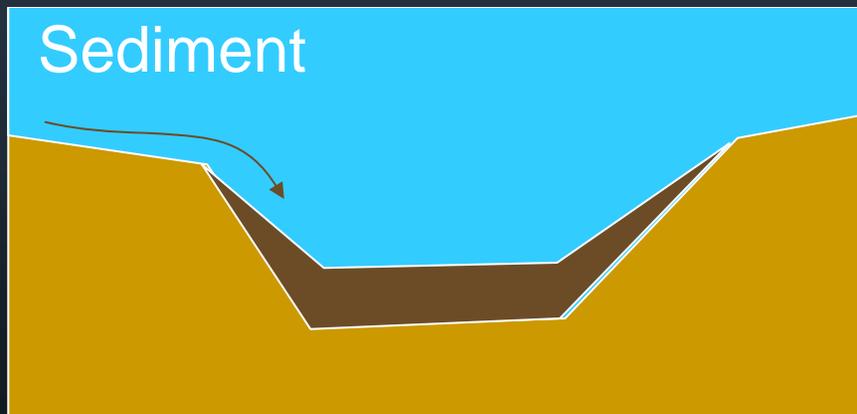
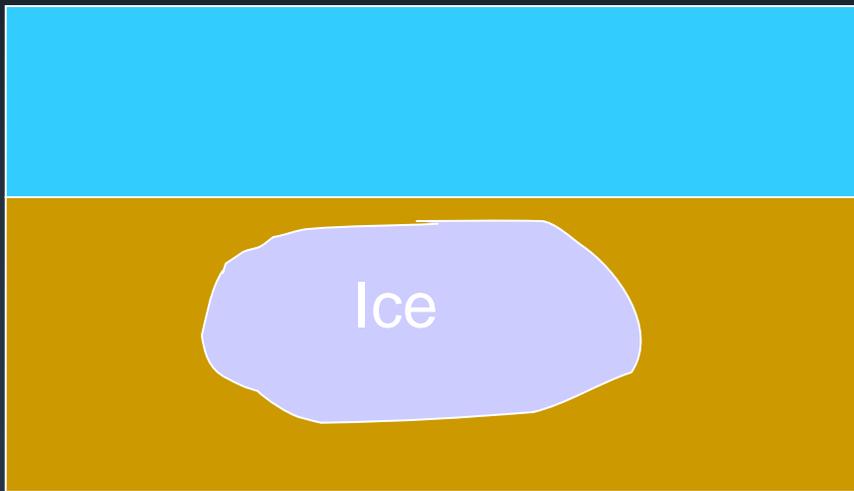
Eng. Soil, Underdrain



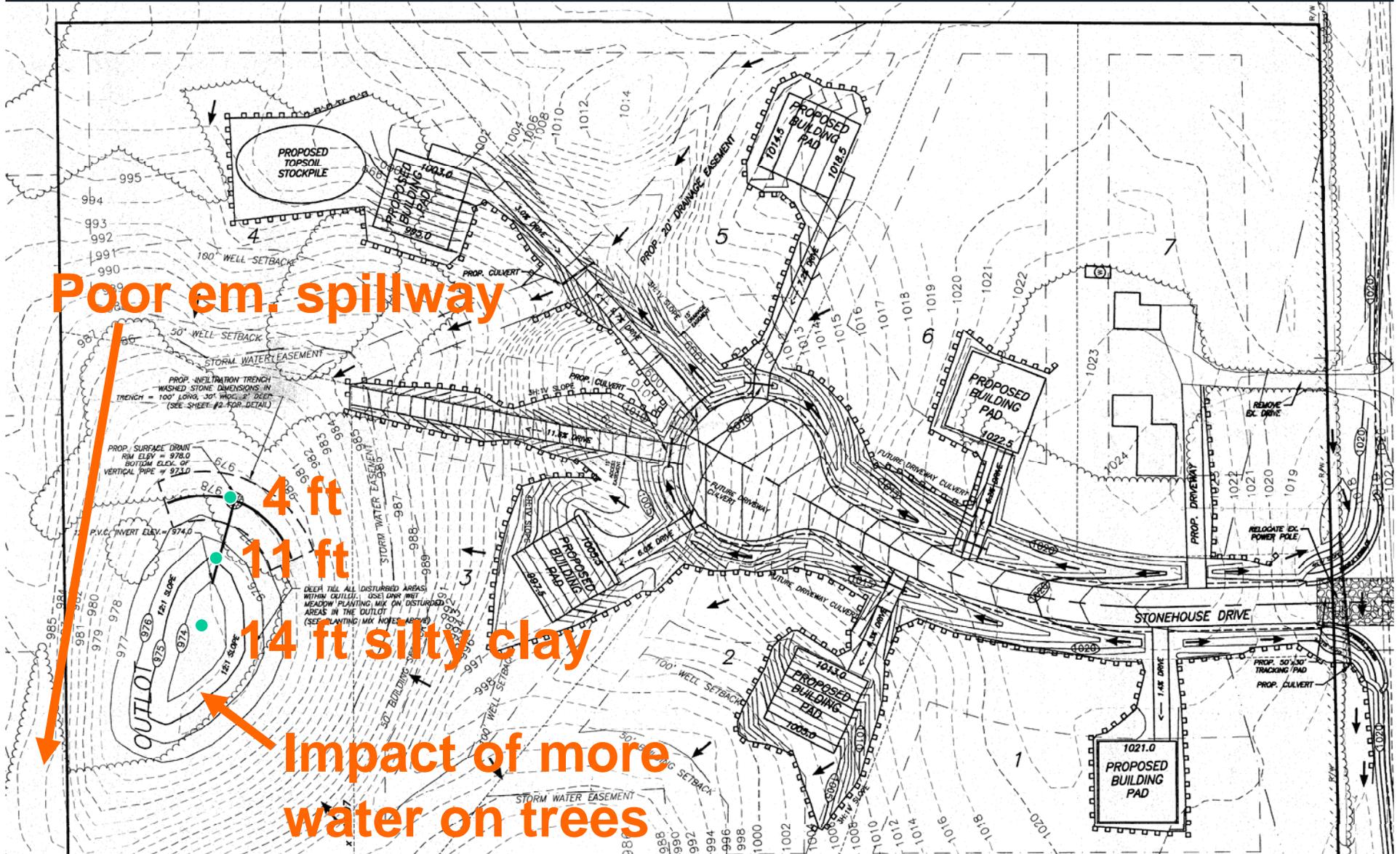
Other Site Constraints

- Environmental corridor
- Existing kettles
- Lack of relief pathway
- Steep slopes
- Re-development site
- Limited space, property value

Kettle Formation



Use of existing depressions, kettles



- 
- In-fill TSS removal requirement 40%
 - DNR / SLAMM credit Hydrodynamic Separators 10-15%



- Underlot SWM costly
- Value of real estate
- Infiltration or detention
- Permeable pavement



Questions?