

Infiltration Basins and Trenches

Infiltration Practices Workshop

March 14, 2007

- *Leif Hauge, PE, Waukesha County*
 - *Specific requirements of County ordinance*
 - *1003 Infiltration Basin Design Standard*
- *Pete Wood, PE, WDNR*
 - *Design considerations, Soils, construction*
 - *Maintenance*
- *Neal O'Reilly, PE, Hey and Associates*
 - *Case studies, design, construction, problem solving*
 - *Lessons learned and plan improvement*

Infiltration Basin Definition

- Open Impoundment
- Excavation or Embankment
- Flat floor, usually densely vegetated
- Soils selected or engineered for adequate drainage

Benefits

- Reduces runoff volume and peaks
- Reduces pollutant loadings
- Reduces thermal impacts to stream
- Groundwater recharge
- Preserves base flow in streams

Dimensions

- Depth
 - Not to exceed 24 inches
 - maximum draw down within 24-72 hours (to preserve vegetation)
 - Internally drained areas special cases
- 4:1 side slopes
- 1 foot freeboard
- Maintenance access, 15-ft minimum, outside of flow channels

Construction

- Divert flow around basin until site is largely stabilized, including home construction
- Use tracked vehicles or dig from side
- Mitigate compaction, use chisel plow
- Soil amendment with compost, topsoil
- Use native vegetation to structure soil, enhance infiltration
- Planting implementation plan required



-- Soil Amendment in Progress

A wide-angle photograph of a grassy field. The foreground is dominated by tall, green grasses with numerous small white flowers. To the left and right, there are clusters of yellow wildflowers. The middle ground shows a dense field of taller, brownish-purple grasses. In the background, a residential area is visible with several houses, trees, and a clear blue sky with light clouds.

Native grasses



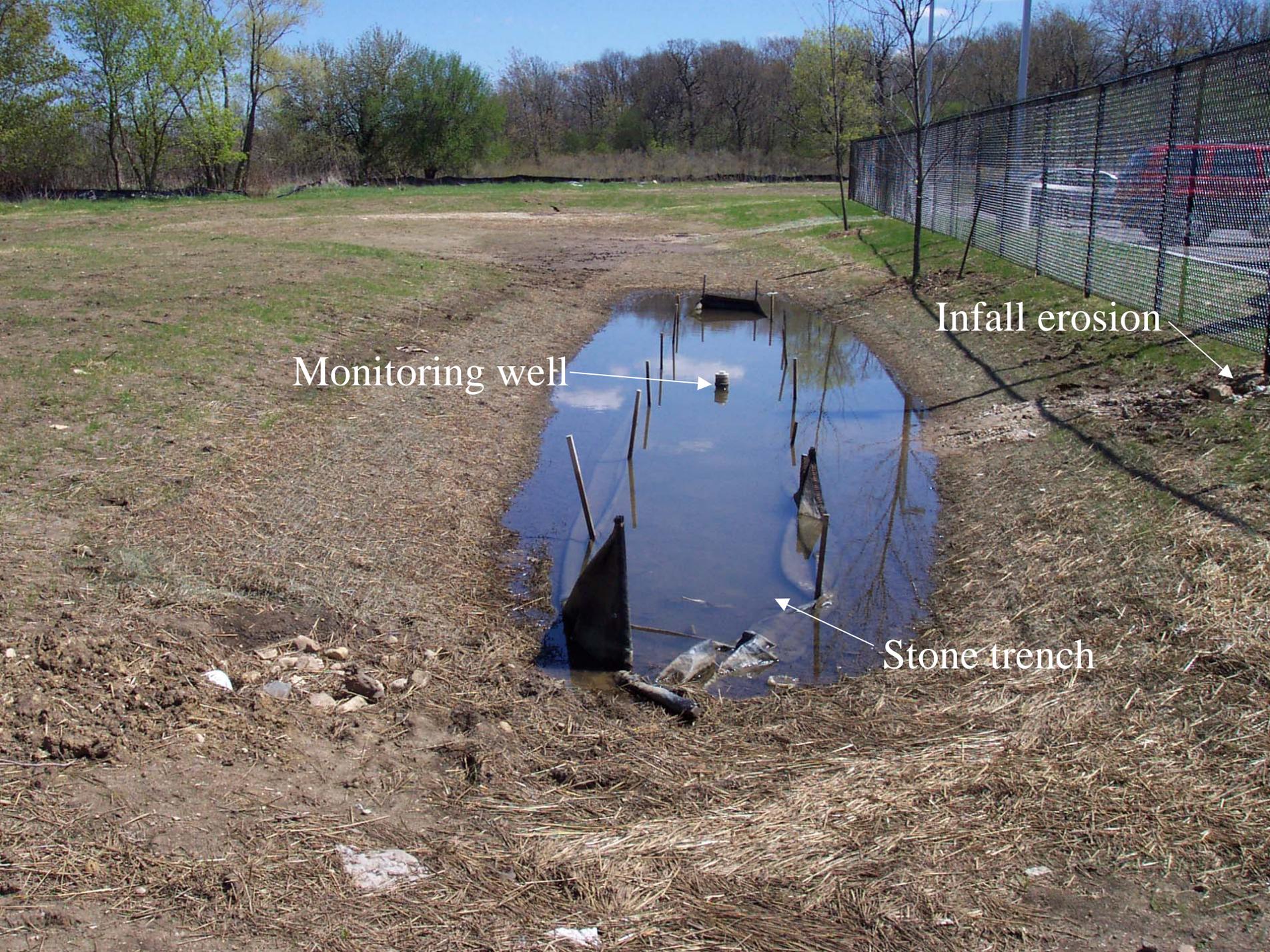
Home construction uphill from infiltration basin



Ongoing topsoil mining operations

Maintenance

- Quarterly inspection
- Failure = standing water
- Monitoring well in trench
- Drawdown, sediment removal, replant
- Control of invasive species
 - Mow native vegetation 1-2 times/year
 - Burn native vegetation every 3 years
 - Spot spraying
- Maintenance agreement required



Monitoring well



Infall erosion

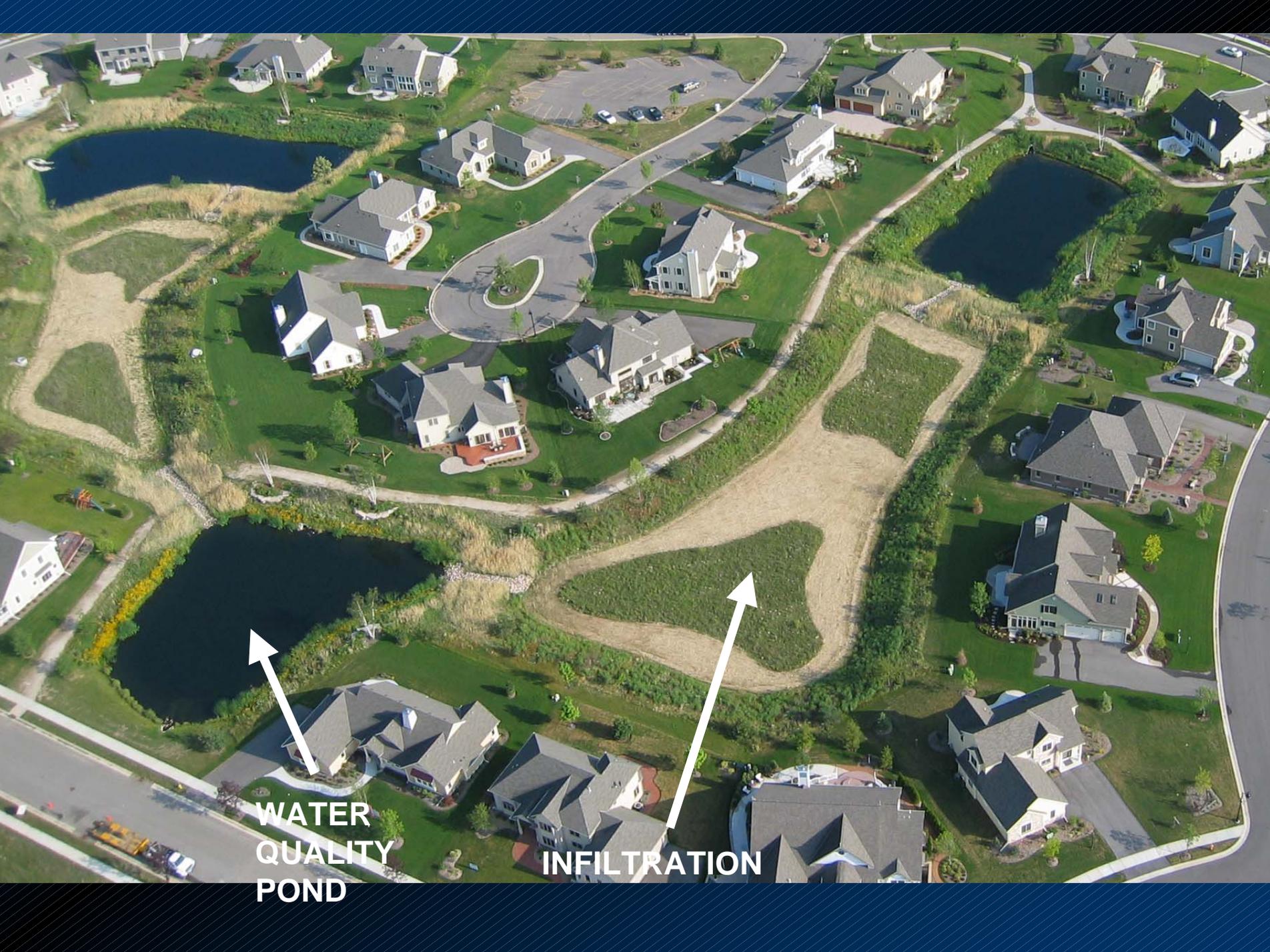


Stone trench



Pre-Treatment Requirements

- 60% TSS removal on an average annual basis for residential
- 80% for commercial, industrial, institutional
- Wet detention, swales, filter strips



**WATER
QUALITY
POND**

INFILTRATION

Basin failed due to construction sediment



Removed 8 inches of sediment

Stone trench

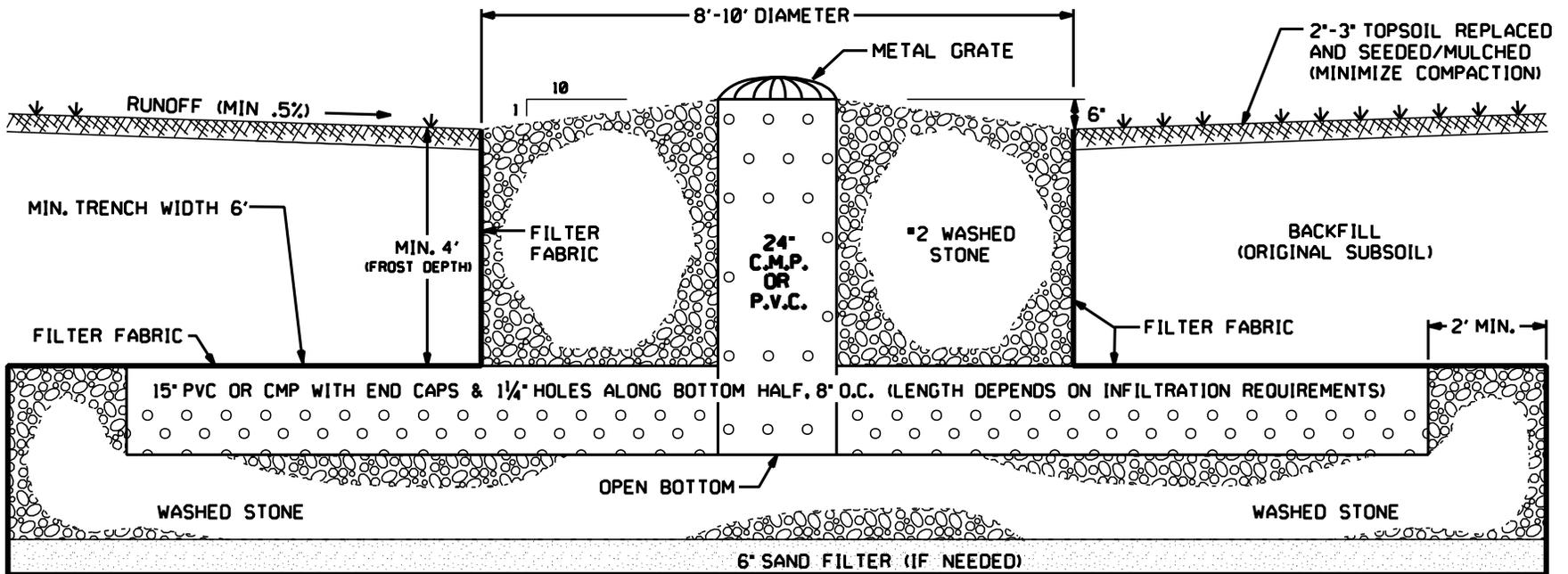


Frozen Ground Problems



Surface drain →





Filtering layer measured from bottom of trench

Must be registered with WDNR

Trenches vs Injection Wells

- Injection well if:
 - Narrowest top dimension not wider than it is deep
 - Contains piping
- Regulated by NR 815
 - Class V
 - Requires WDNR approval
 - Must be relatively clean, pre-treated
 - Submit reporting form to Bureau of Drinking Water and Groundwater

This information is collected under the authority of the Safe Drinking Water Act.

Notice: Code of Federal Regulations (40 CFR 144.26 Inventory Requirements): owners or operators of all injection wells authorized by rule shall submit inventory information to an approved State Underground Injection Control Program. Personal information collected on this form will be used for inventory purposes. Information will be made accessible to requesters under Wisconsin's Open Records laws (s. 19.32 to 19.39, Wis. Stats.) and requirements.

Date Prepared (Year, Month, Day)	Facility ID Number	Transaction Type (Please check one of the following) <input type="checkbox"/> Deletion <input type="checkbox"/> Entry Change <input type="checkbox"/> First Time Entry <input type="checkbox"/> Replacement
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Facility Name and Location										
Last Name		First	Mi	Latitude: DEG	MIN	SEC	Longitude: DEG	MIN	SEC	W
Street Address / Route Number				Township	Range	Section	¼ Section			
City / Town			State	ZIP Code	County	Tribal Land <input type="checkbox"/> Yes <input type="checkbox"/> No				

Legal Contact					
Type <input type="checkbox"/> Owner <input type="checkbox"/> Operator	Last Name	First	Mi	Telephone Number (incl. area code)	
Organization			Ownership		
Street / P.O. Box			<input type="checkbox"/> Private <input type="checkbox"/> County / Local Government <input type="checkbox"/> State <input type="checkbox"/> Federal <input type="checkbox"/> Specify Other _____		
City / Town		State	ZIP Code		

Well Information								
WELL CLASS	WELL TYPE	TOTAL NUMBER OF WELLS	WELL OPERATION STATUS					KEY:
			UC	AC	TA	PA	AN	
								DEG - Degree MIN - Minute SEC - Seconds SECT - Section ¼ SECT - Quarter Section AC - Active UC - Under Construction PA - Permanently Abandoned and Approved by State AN - Permanently Abandoned and Not Approved by State TA - Temporarily Abandoned and Not Approved by State

Comments (Optional):

Reporting Form

Fueling Area

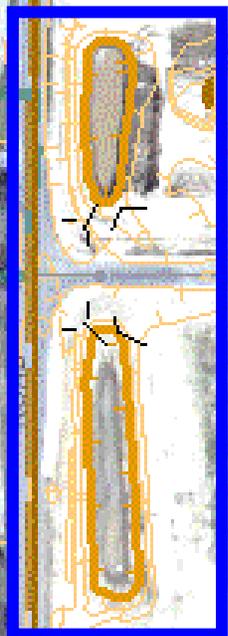


No Pre-Treatment

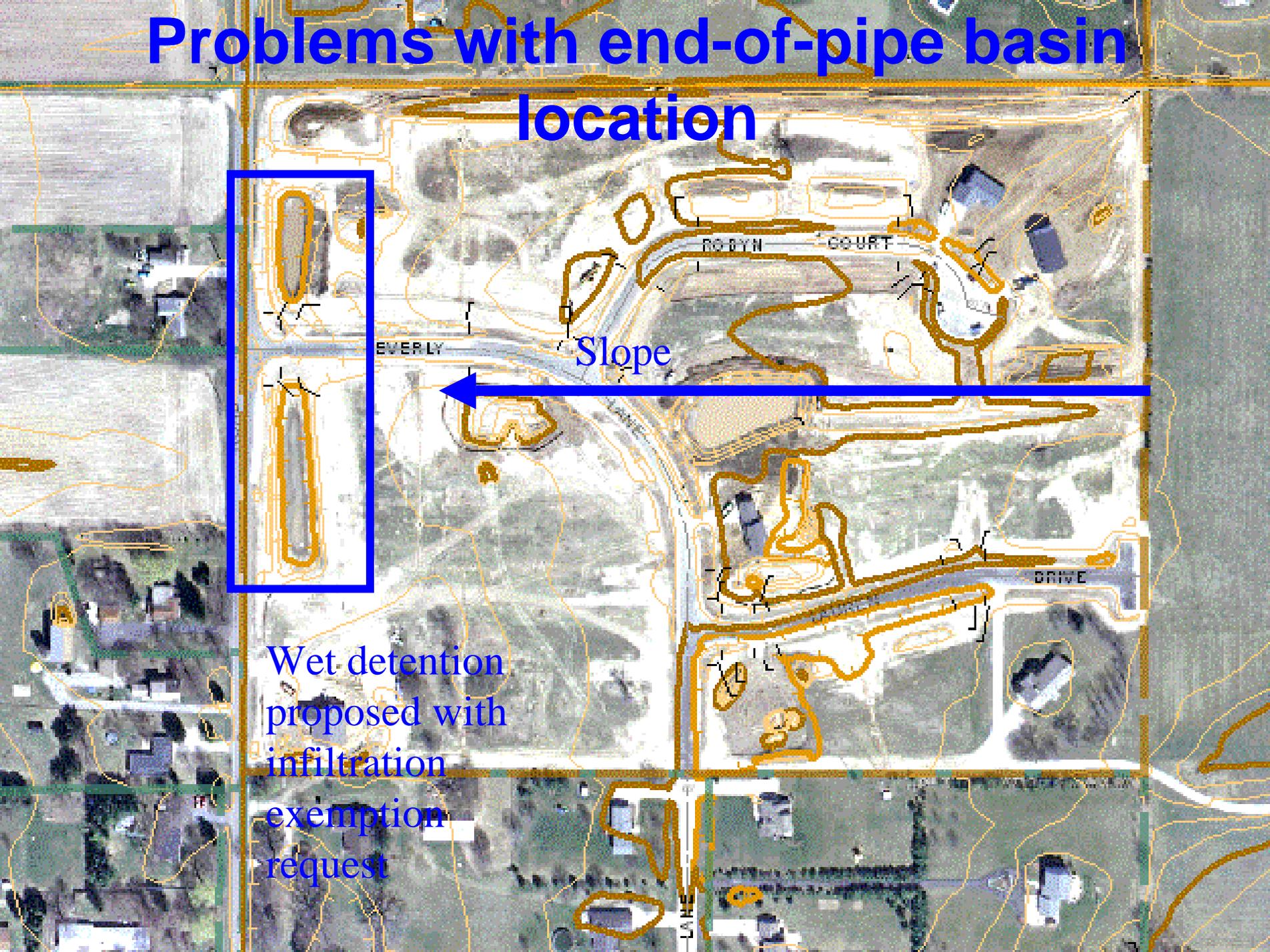
Any Filtering Layer?

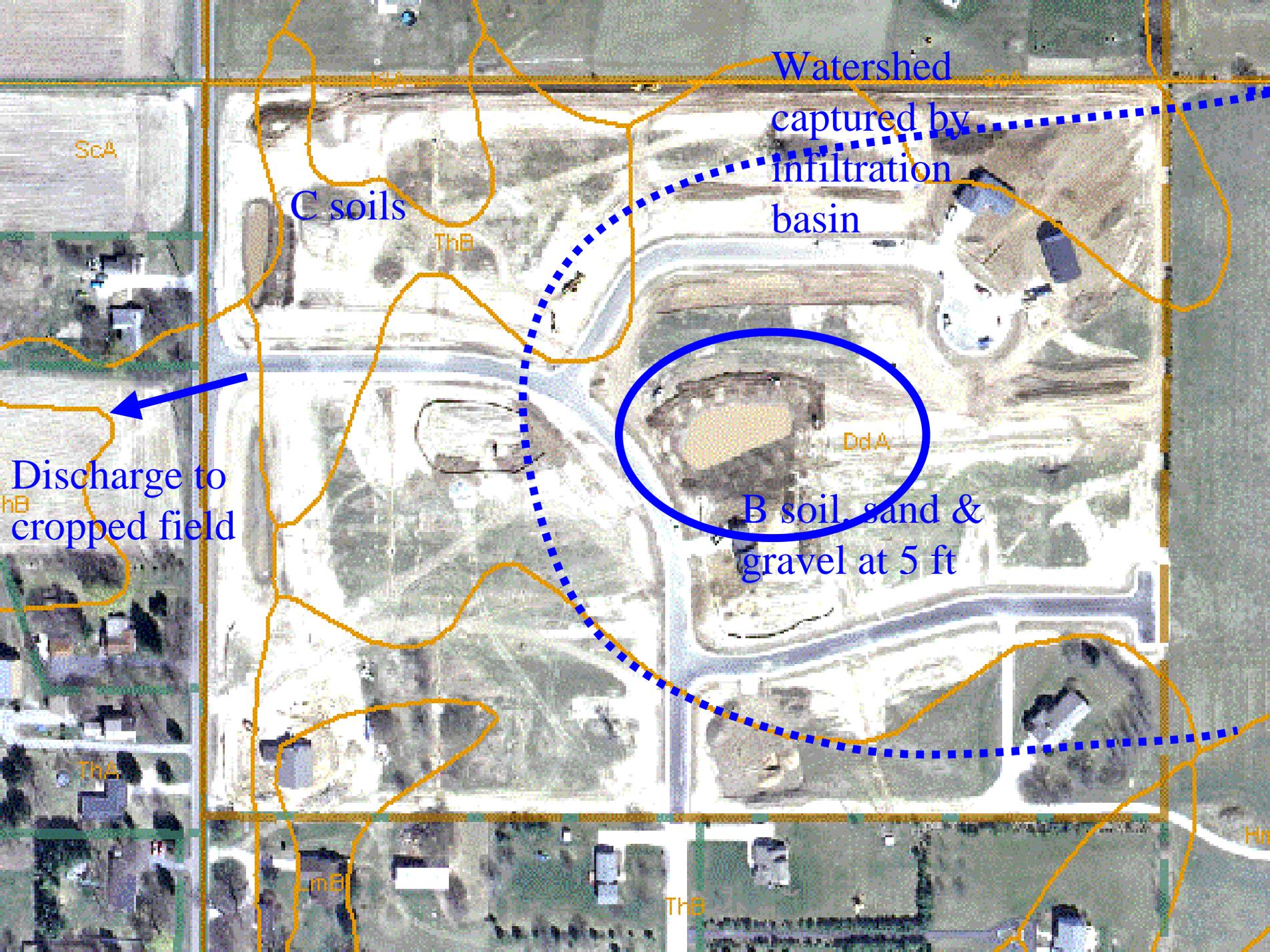


Problems with end-of-pipe basin location



Wet detention
proposed with
infiltration
exemption
request





Watershed
captured by
infiltration
basin

C soils

ThB

DdA

B soil, sand &
gravel at 5 ft

Discharge to
cropped field

ScA

ThB

ThA

FF

mE

ThE

Th

Infiltration Basin With Engineered Soils And Forebay (per WDNR CPS 1003)

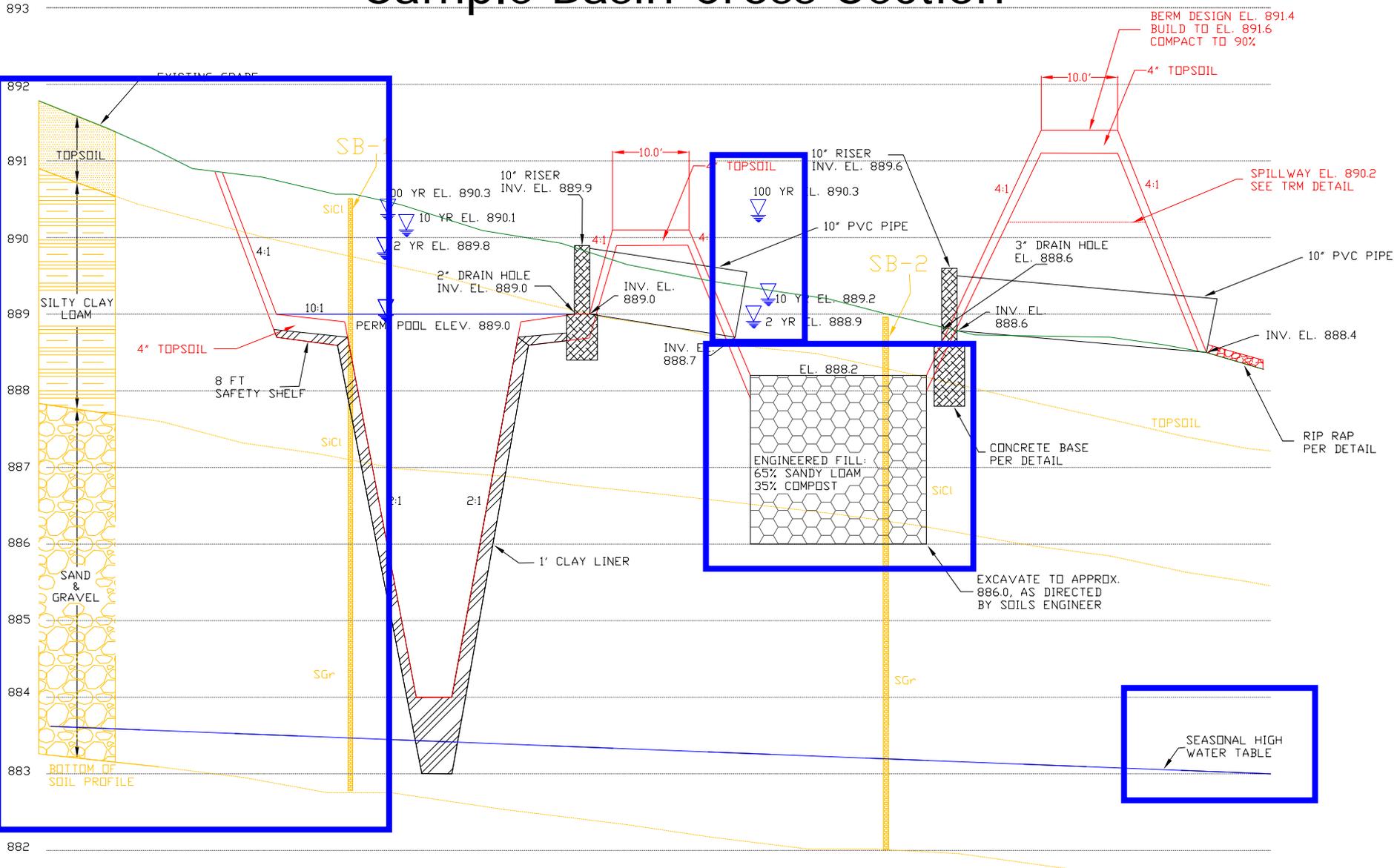
Date Inspector's
Initials

Construction Inspections

1. Before engineered soil is installed in the infiltration area, verify that:
 - a. Basin was over-excavated to expose permeable soil (as determined by soil scientist).
 - b. Compost used to amend soil meets WDNR Specification S100.
 - c. Correct mixture of engineered soil is used (40% sand, 30% topsoil, 30% compost).
2. Before berm material is placed, verify that:
 - a. Topsoil, stumps, and vegetation are stripped in basin berm footprint
 - b. *A 2' x 8' keyway is excavated under berm (if forebay permanent pool will pond >3 ft against embankment).*
 - c. The specified material is used to construct basin berm.
3. Before a forebay liner is placed, verify that:
 - a. Basin interior slopes do not exceed maximum pitches (4:1 above water, 10:1 safety shelf, 2:1 below safety shelf)
 - b. Basin bottom and shelf elevations are correct; and
 - c. The safety shelf is at least 8 feet wide.
4. Before the berm is re-compacted around outlet pipes following installation, verify that:
 - a. The correct pipe diameter, drain hole diameter, and materials are used.
 - b. The outlet pipe and riser elevations are correct.
 - c. Anti-seep collars are installed on outlet pipes.
5. Before topsoil is re-applied, verify that:
 - a. A *compacted 1-foot clay* liner is installed up to the forebay permanent pool elevation.
 - b. The **compaction requirement** of 90% Proctor is met by sampling at a minimum of *five* locations along embankment.
 - c. The berm elevation is 5% above design height (above existing grade) to allow for setting.
6. Verify that compaction mitigation procedures were followed (deep tilling).and compost / loamy sand topsoil mixture is applied to surface of infiltration area.
7. Verify that **topsoil is re-applied** to all other surfaces above and **including the forebay safety shelf.**
8. Basin bottom elevation, safety shelf elevation, berm elevation, outlet elevations, spillway elevations are correct (part of as-built survey). **Basin dewatering** is required to verify bottom elevation and to facilitate sediment removal following construction and site stabilization.

Establishment of warm-season (native) and wetland plantings will be separately verified by
RLA, of Inc.

Sample Basin Cross-Section



Planting Verification

Planting Verification Letter (minimum requirements)

DATE:

TO: Land Resources Division
Waukesha County Department of Parks and Land Use

FROM: (Landscape Architect or other qualified professional's name and qualification)

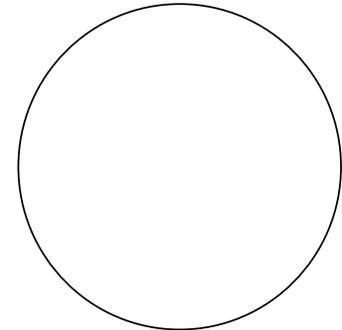
RE: Planting Verification for the following project:

Project Name: _____

Section _____, Town of _____

Permit # _____

This correspondence shall serve as verification that I have performed ___ transect surveys of the designated -warm season or wetland planting areas described in the approved plans for the storm water facilities for the above-referenced project and that the plantings have a minimum coverage of 70% and match the species descriptions on the plans. Copies of the transect survey results are attached, along with a location map.



(Signed L.A. stamp must be included, if applicable)

