Subsurface Drainage Questions

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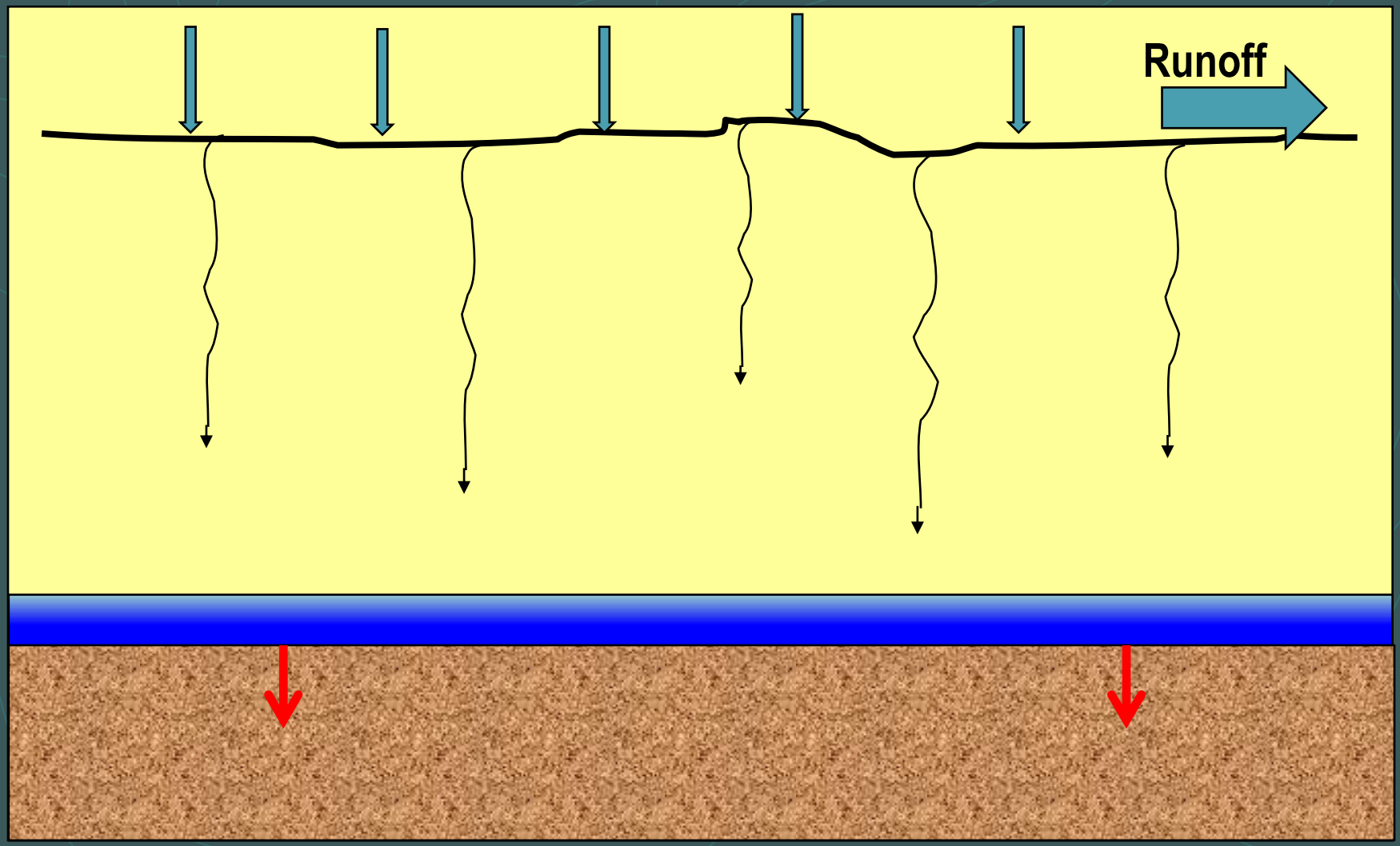
Questions???

- Do pump stations make sense in areas with no gravity drainage?
  - No outlet for either surface water or tile water?
  - Can't gravity drain the water from tile?
- Does pattern tiling replace surface drainage?
- Where do we use whole area (pattern) tiling versus targeted drainage?

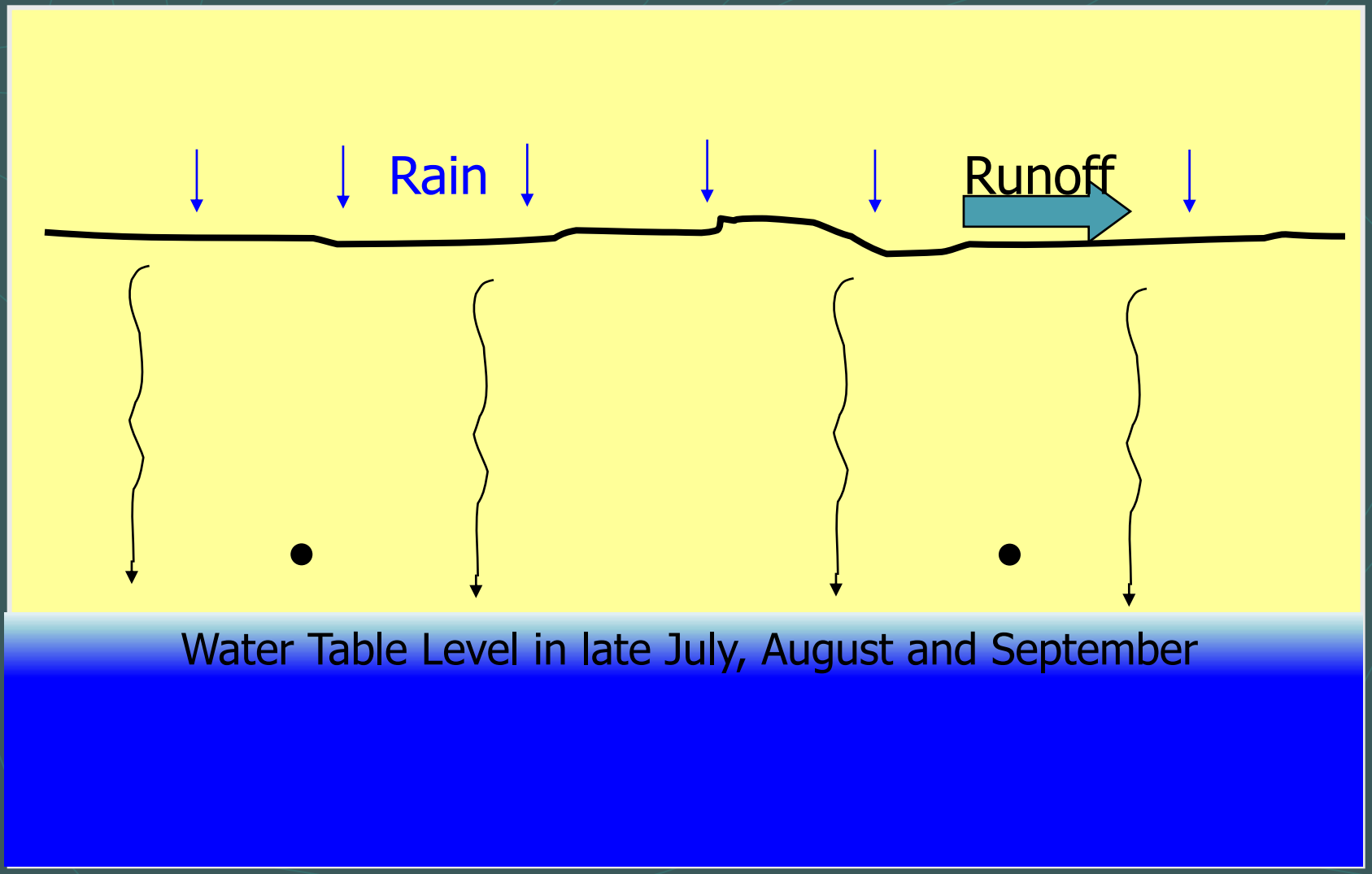
Field Drainage - Observations

- When dealing with water flow from a field, whether surface and subsurface drainage:
  - Every field is unique
  - No “one right” way to tile
  - Most important: local knowledge of field and water flow in the area

Restrictive Sub-Layer - High Water Table



How Water Flows into Tile Lines



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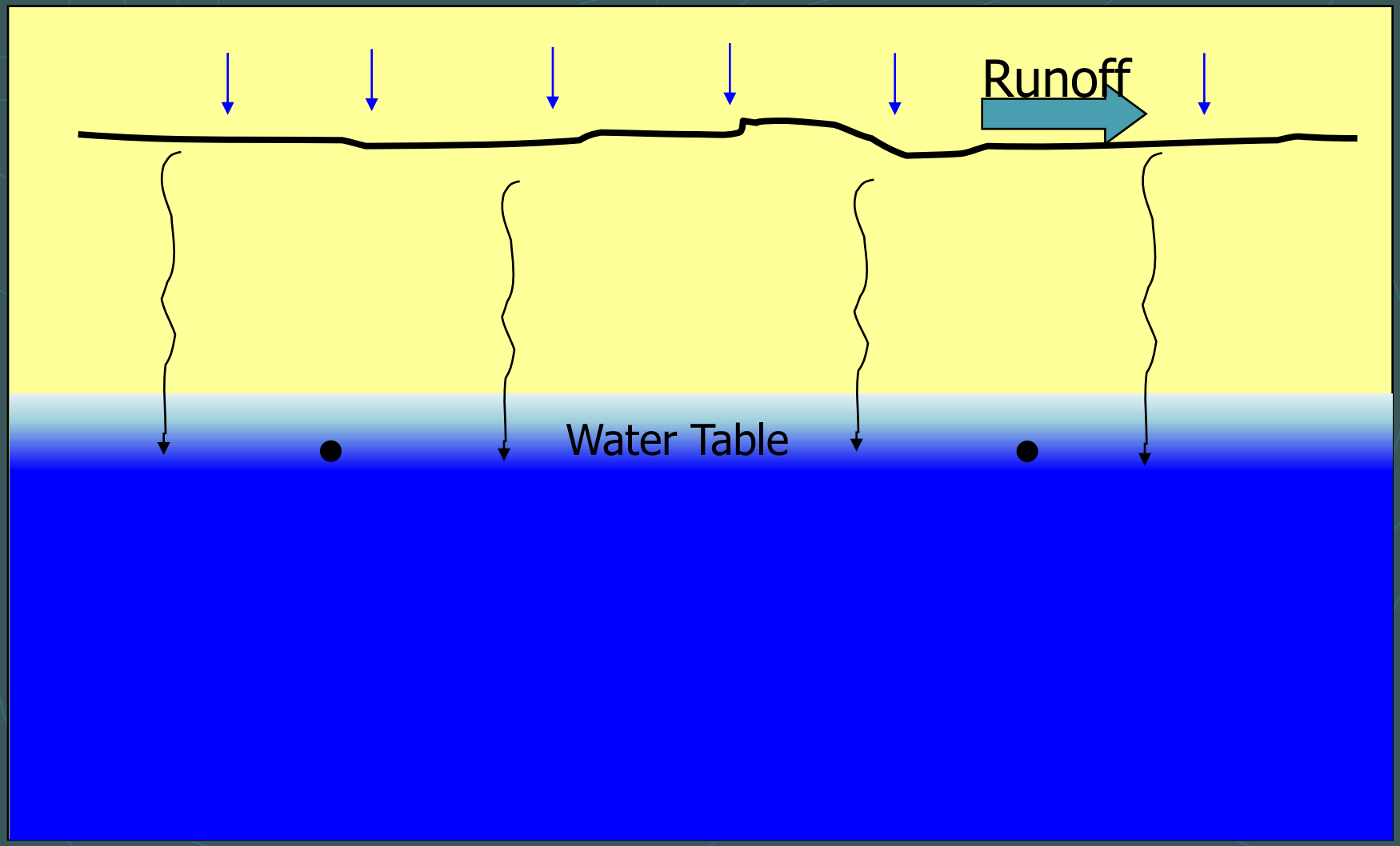

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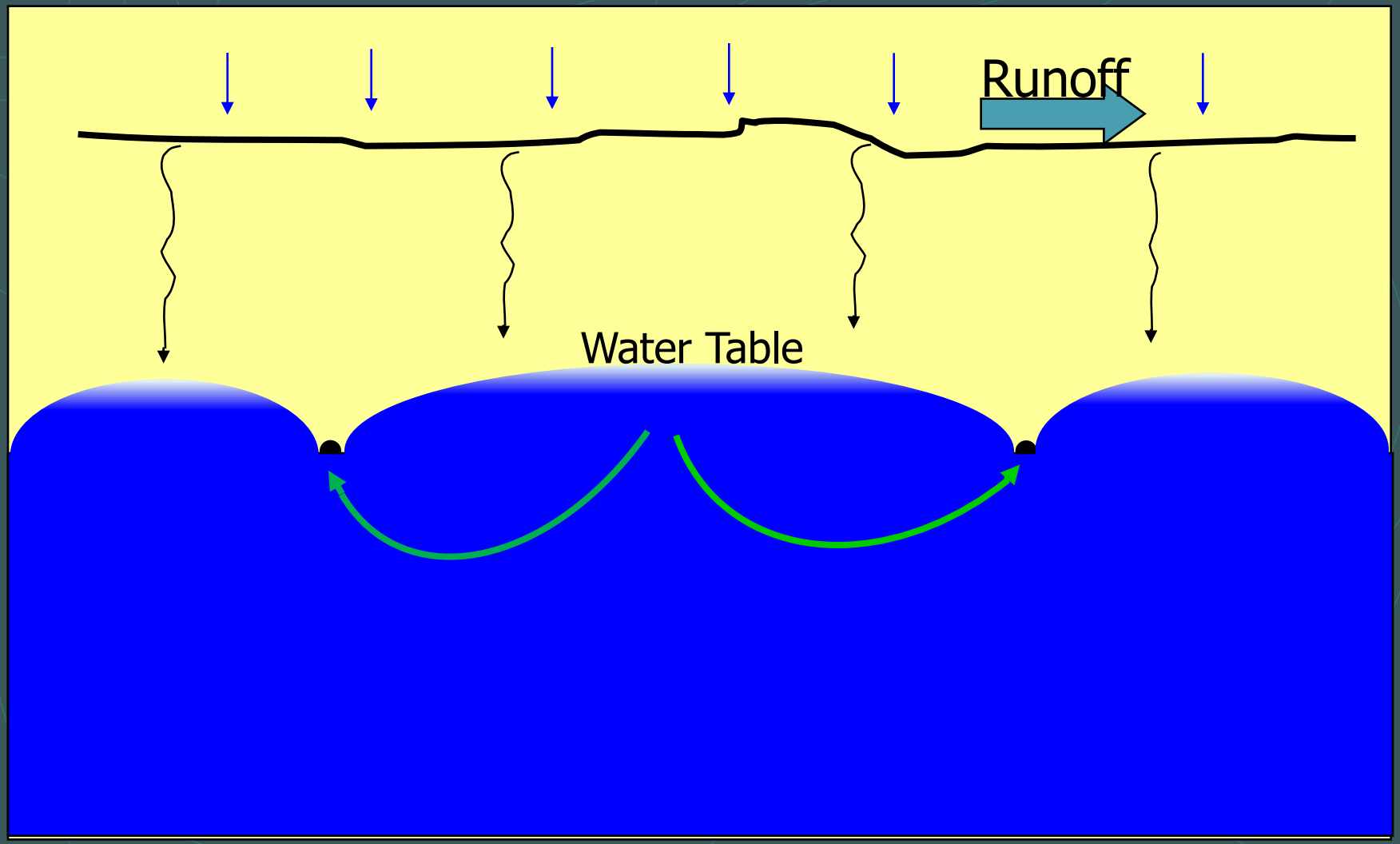

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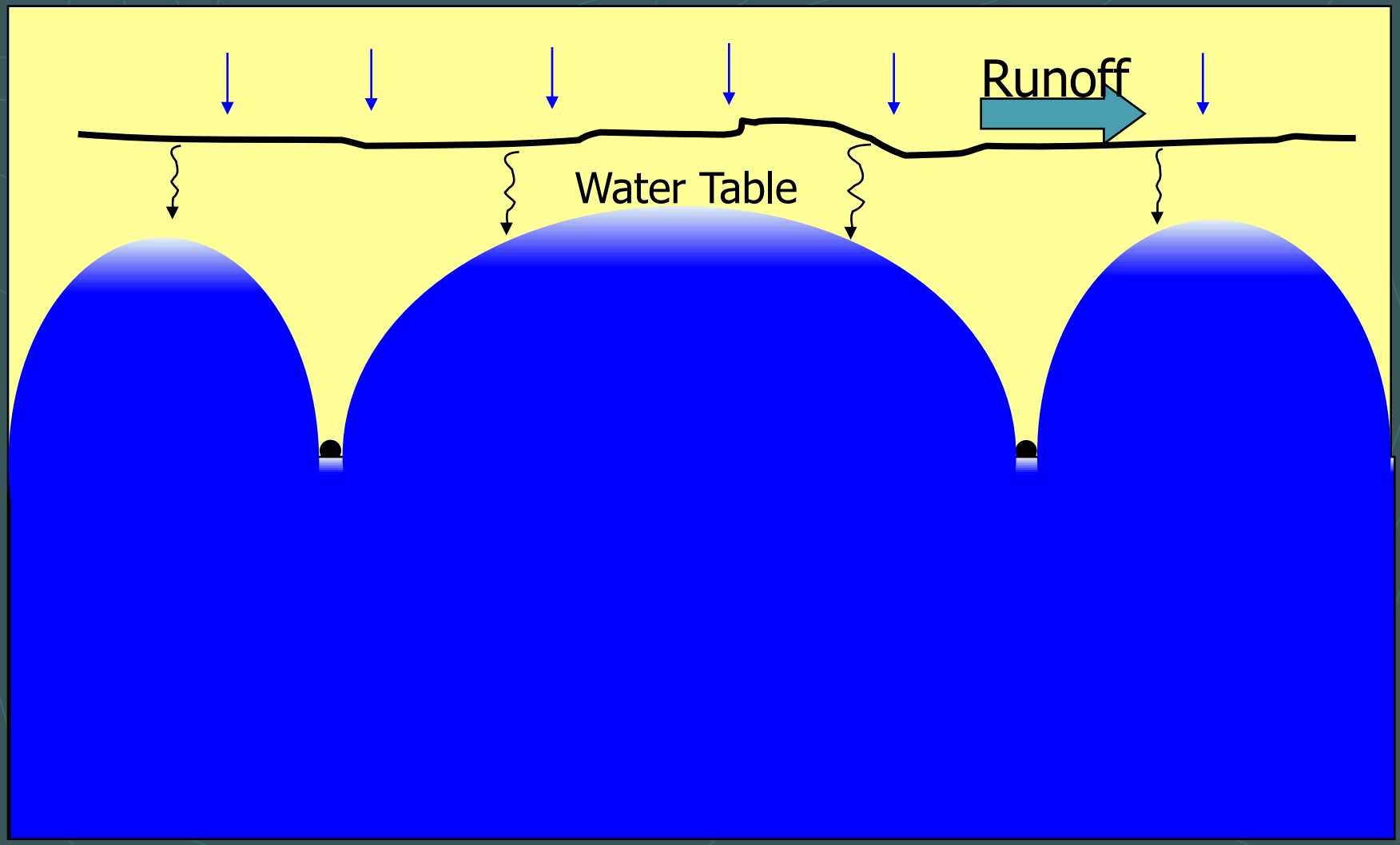

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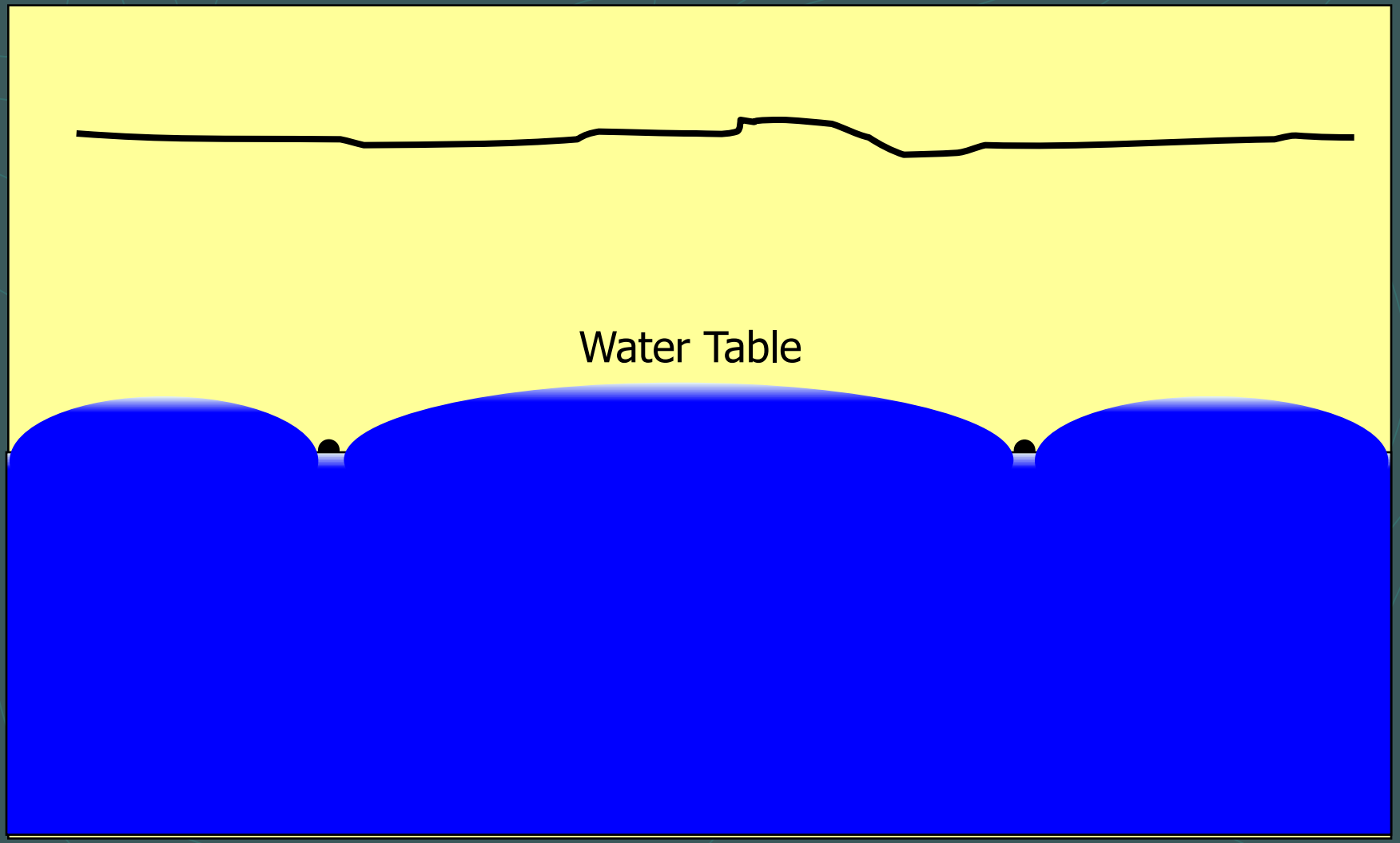


Iowa State University Bulletin - 1911

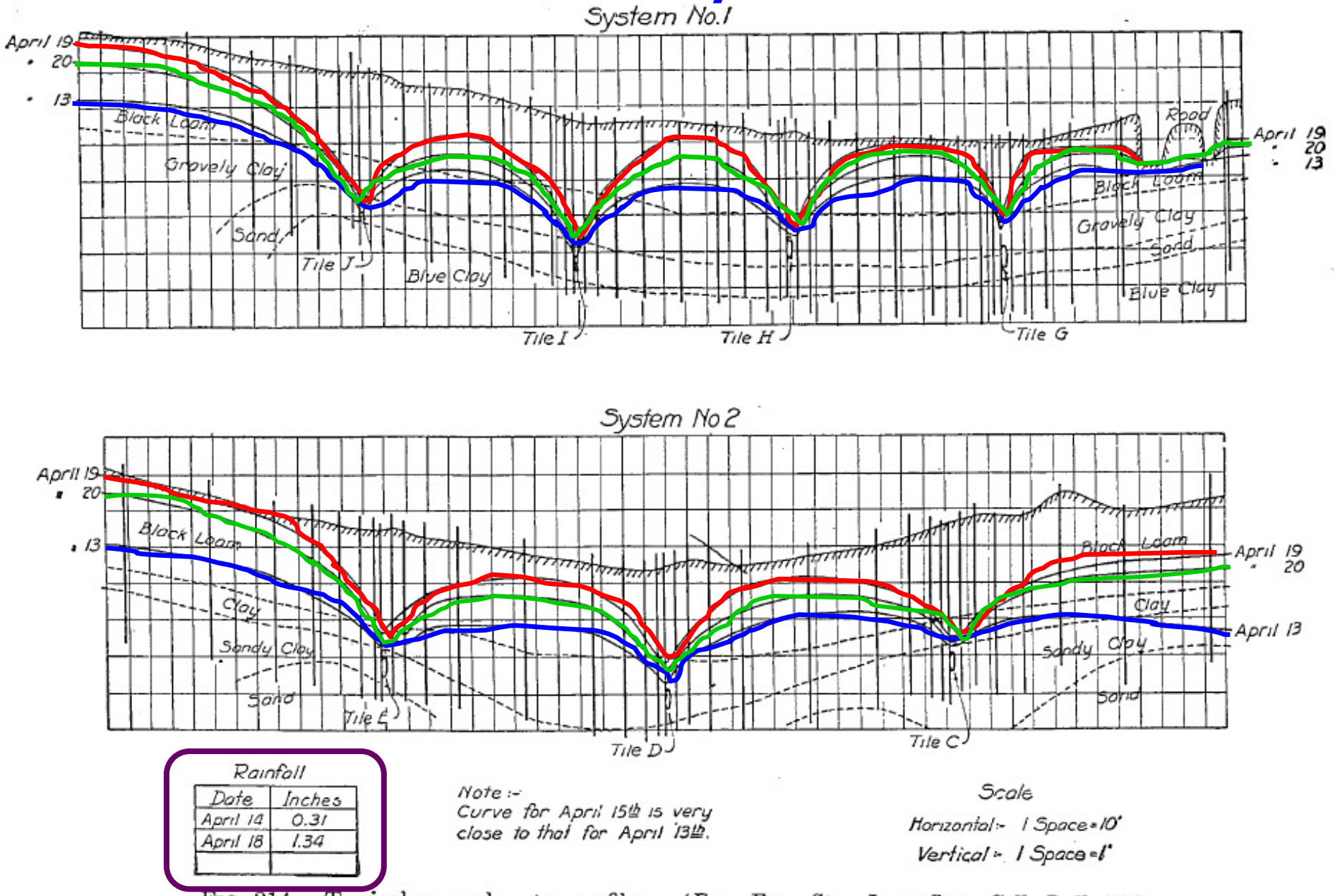
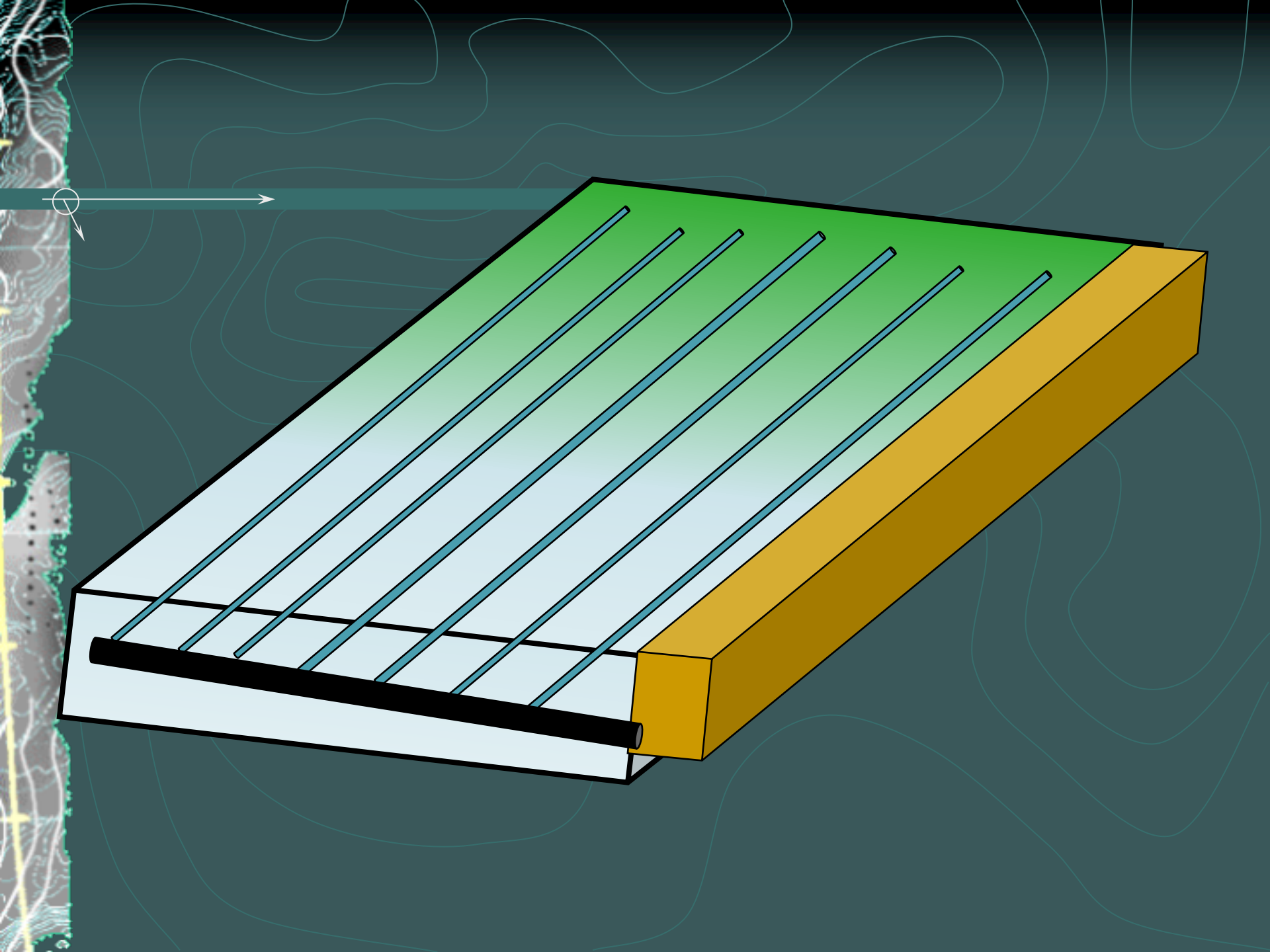
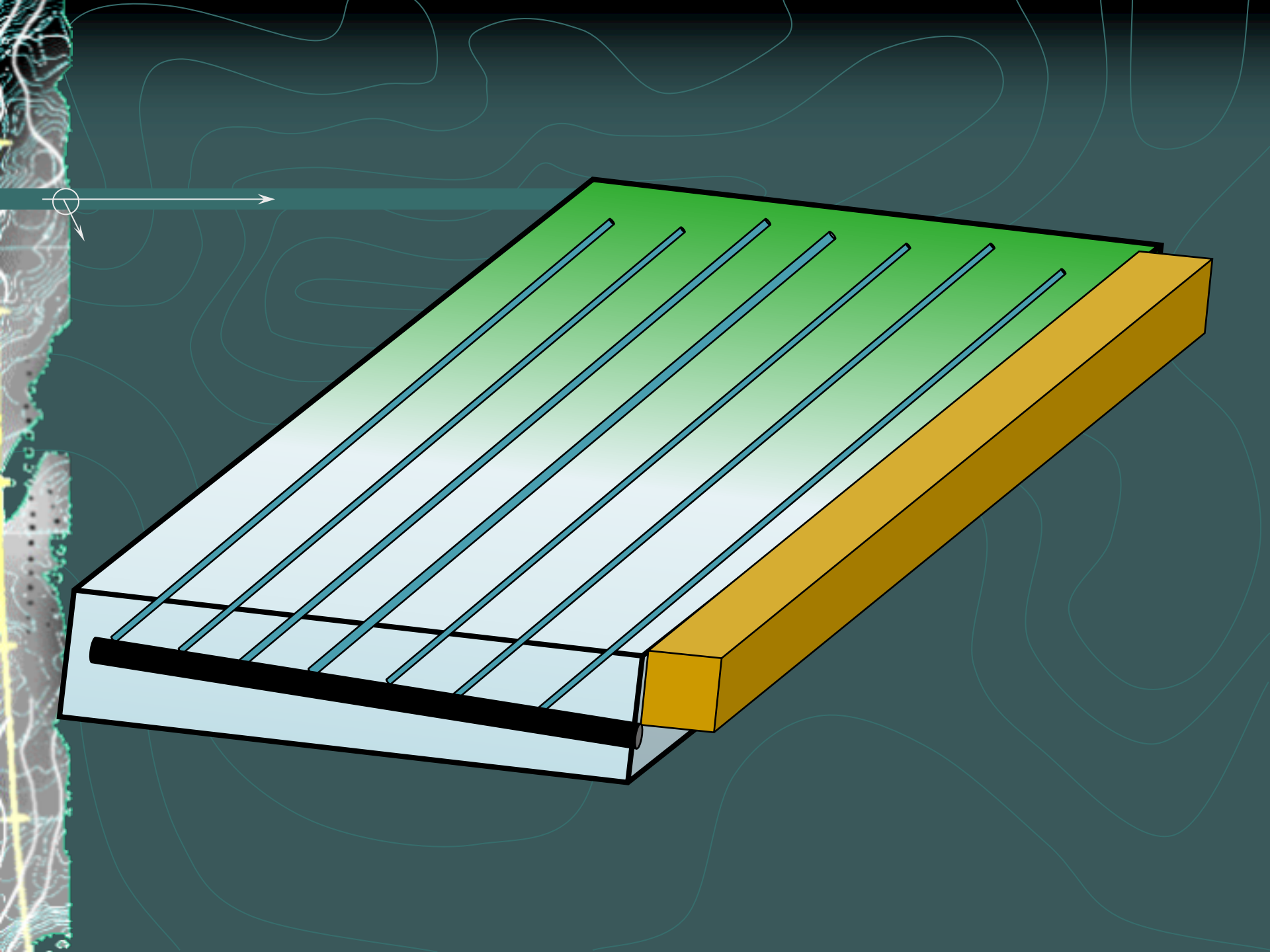
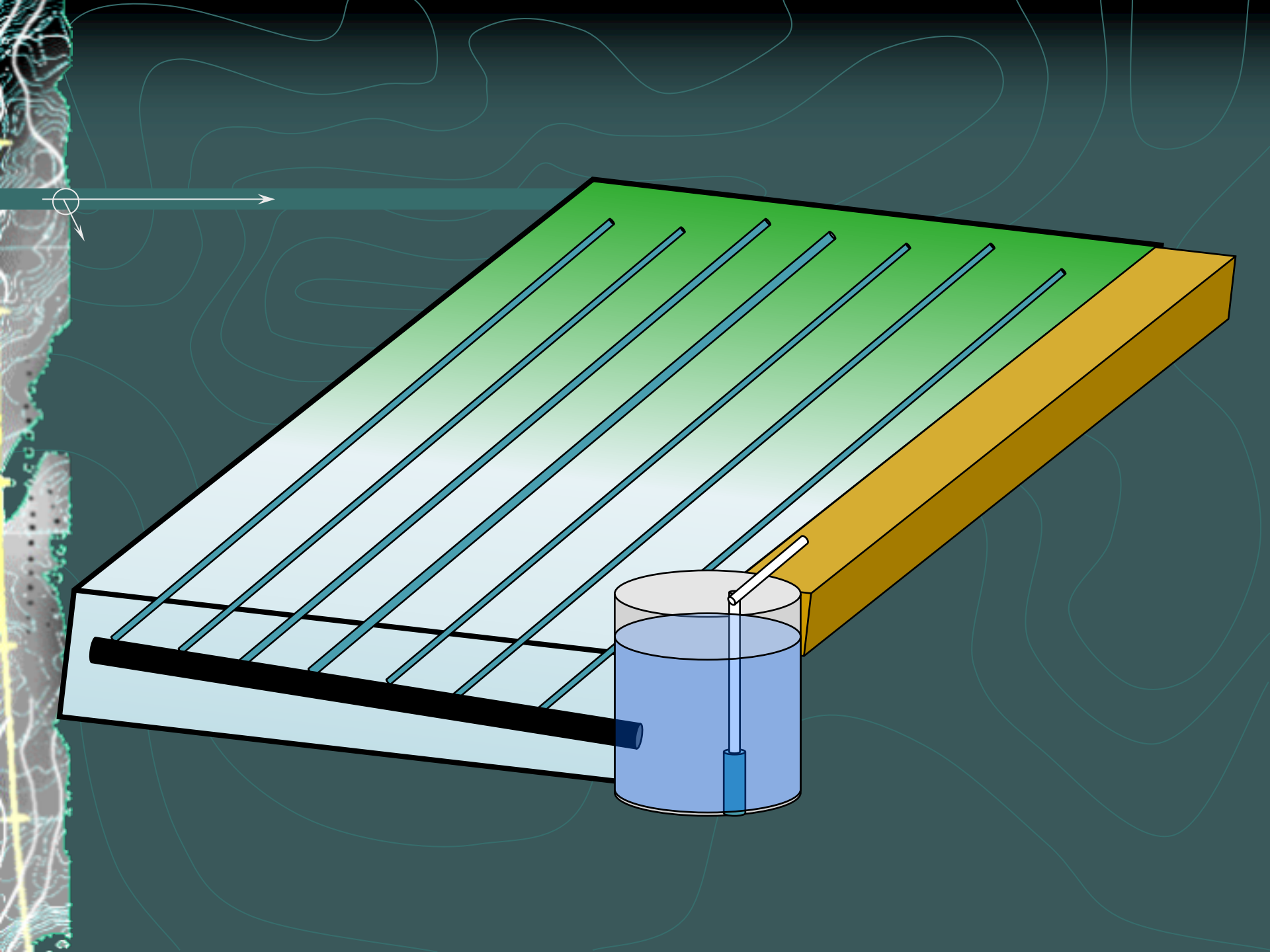


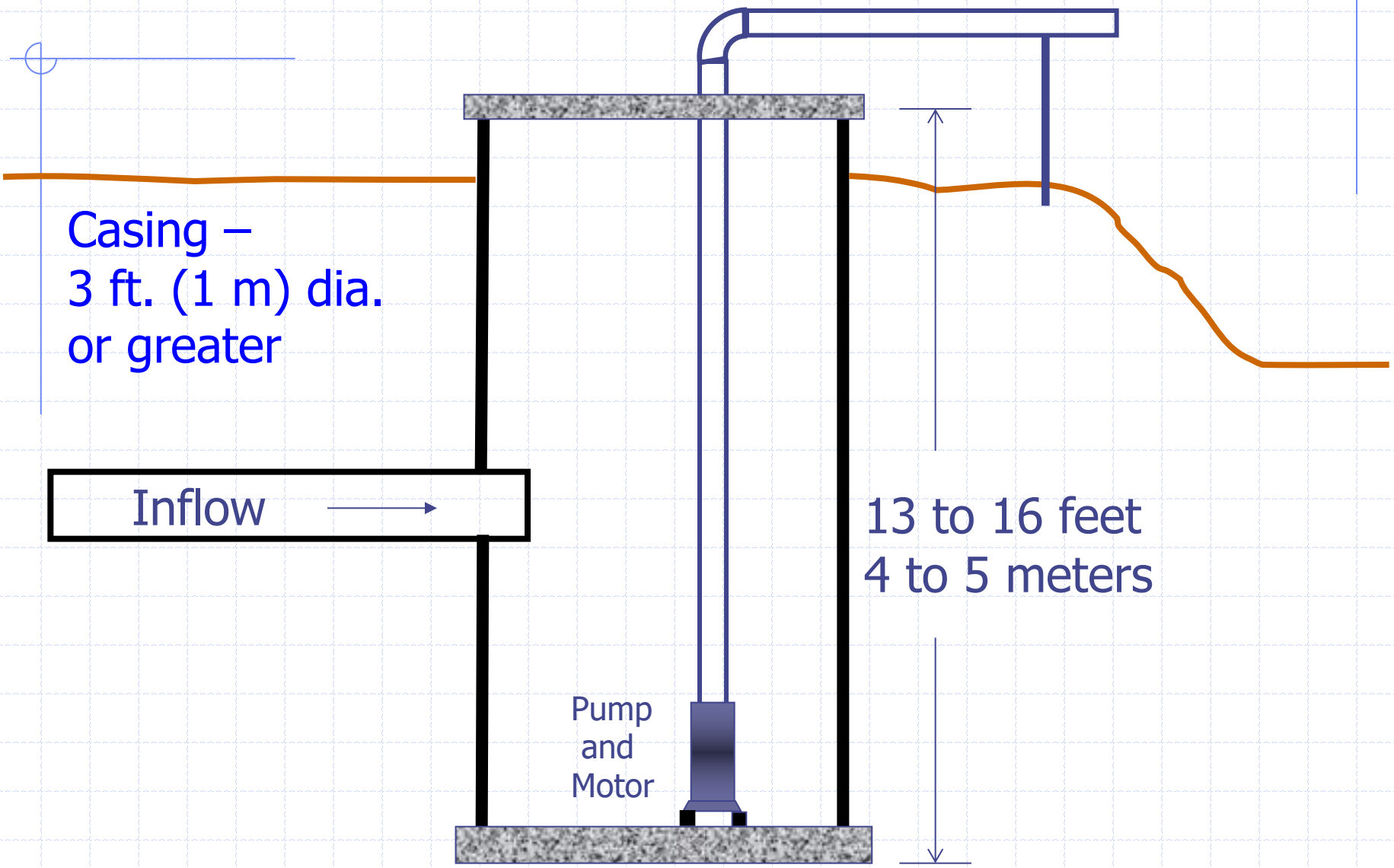
FIG. 214.—Typical ground-water profiles. (*Eng. Exp. Sta., Iowa State Coll. Bull.* 52.)







Typical Pump Station



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  - No outlet for either surface water or tile water?
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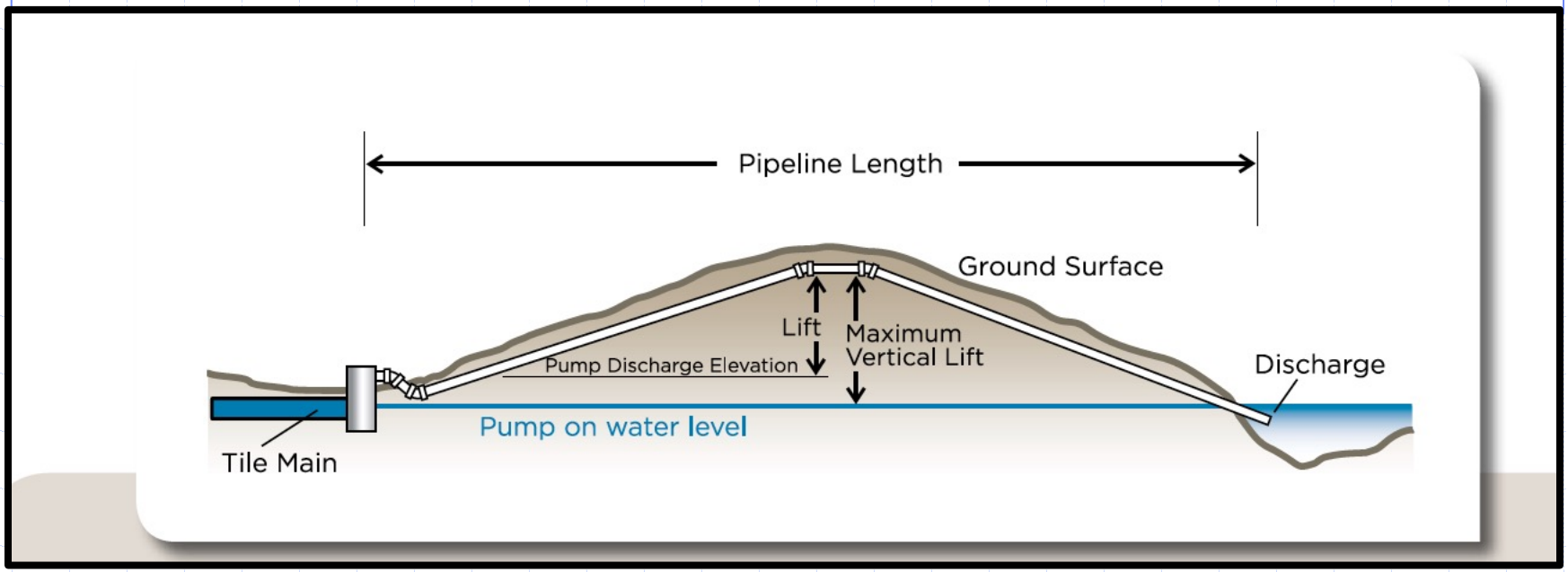
- Where do we use whole area (pattern) tiling versus targeted drainage?

Creating an Outlet - Pumping



Why Do We Need Field Size Pump Stations?

Topography and Outlet Conditions

Flat Ground, Shallow Ditches


Culvert through road is at a higher elevation than the tile main

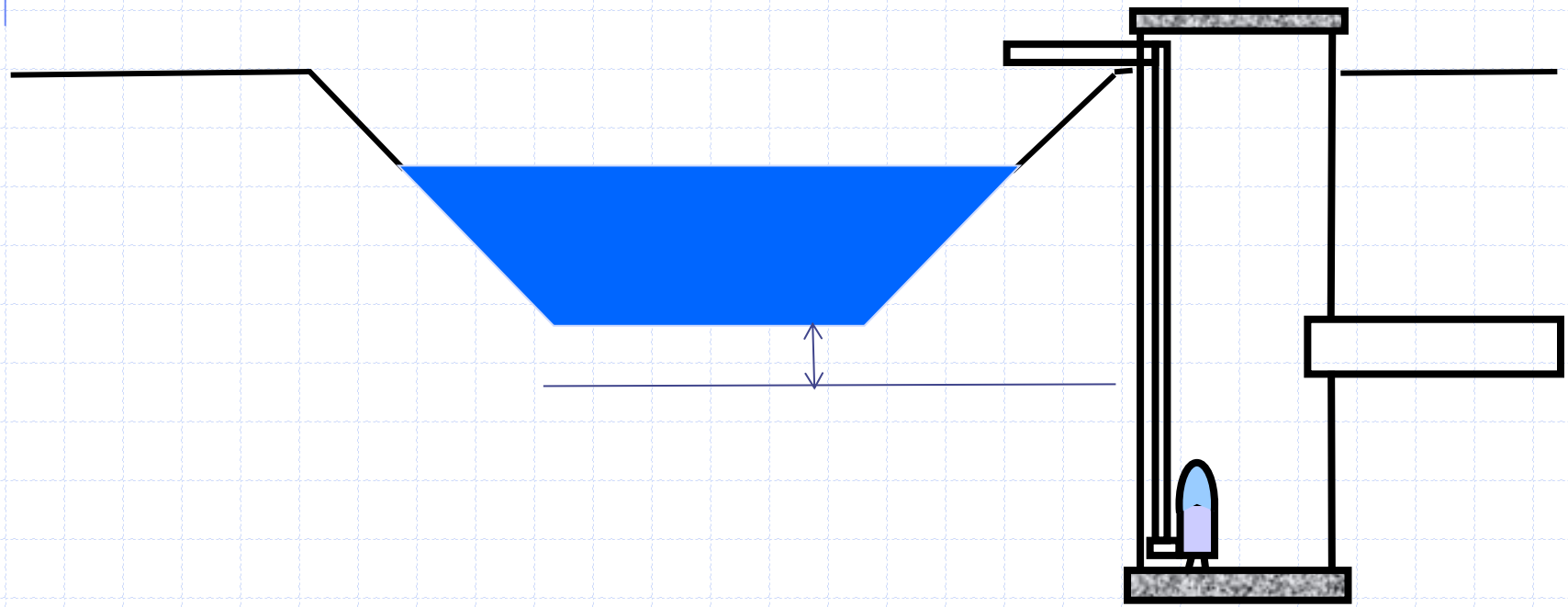
Receiving Ditch Stays Full for Several Days

Tile Outlet before Rain


Tile Outlet Submerged
6 Days After Rain Event

Additional Reasons for Pump Stations

- Control when water leaves the field
- Gain more grade on laterals



Lift Pump Problem Areas

- Low areas that can be flooded
- Very near water bodies (lake, river, etc.)
- Shallow aquifers or sand lenses

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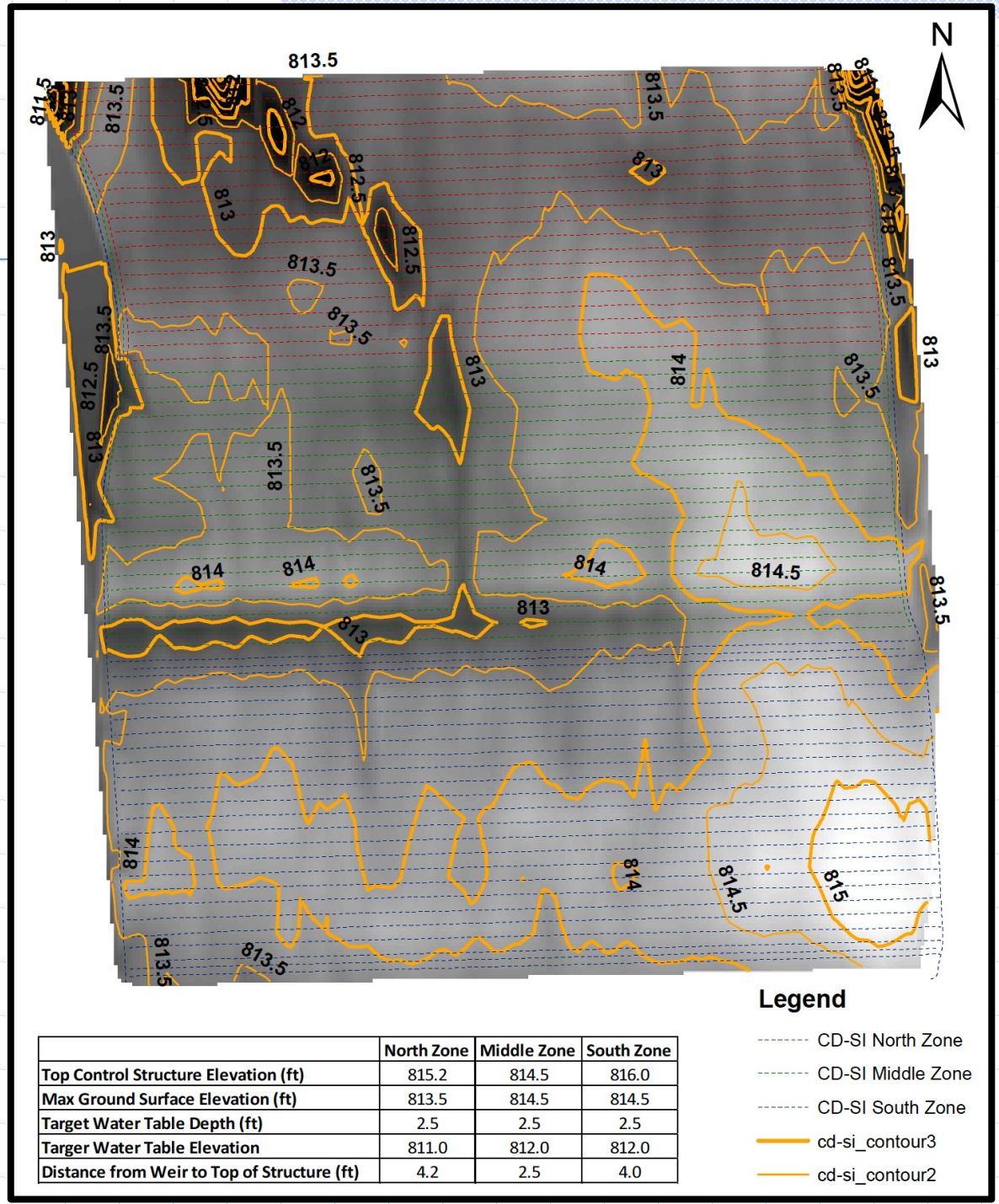

	North Zone	Middle Zone	South Zone
Top Control Structure Elevation (ft)	815.2	814.5	816.0
Max Ground Surface Elevation (ft)	813.5	814.5	814.5
Target Water Table Depth (ft)	2.5	2.5	2.5
Targer Water Table Elevation	811.0	812.0	812.0
Distance from Weir to Top of Structure (ft)	4.2	2.5	4.0

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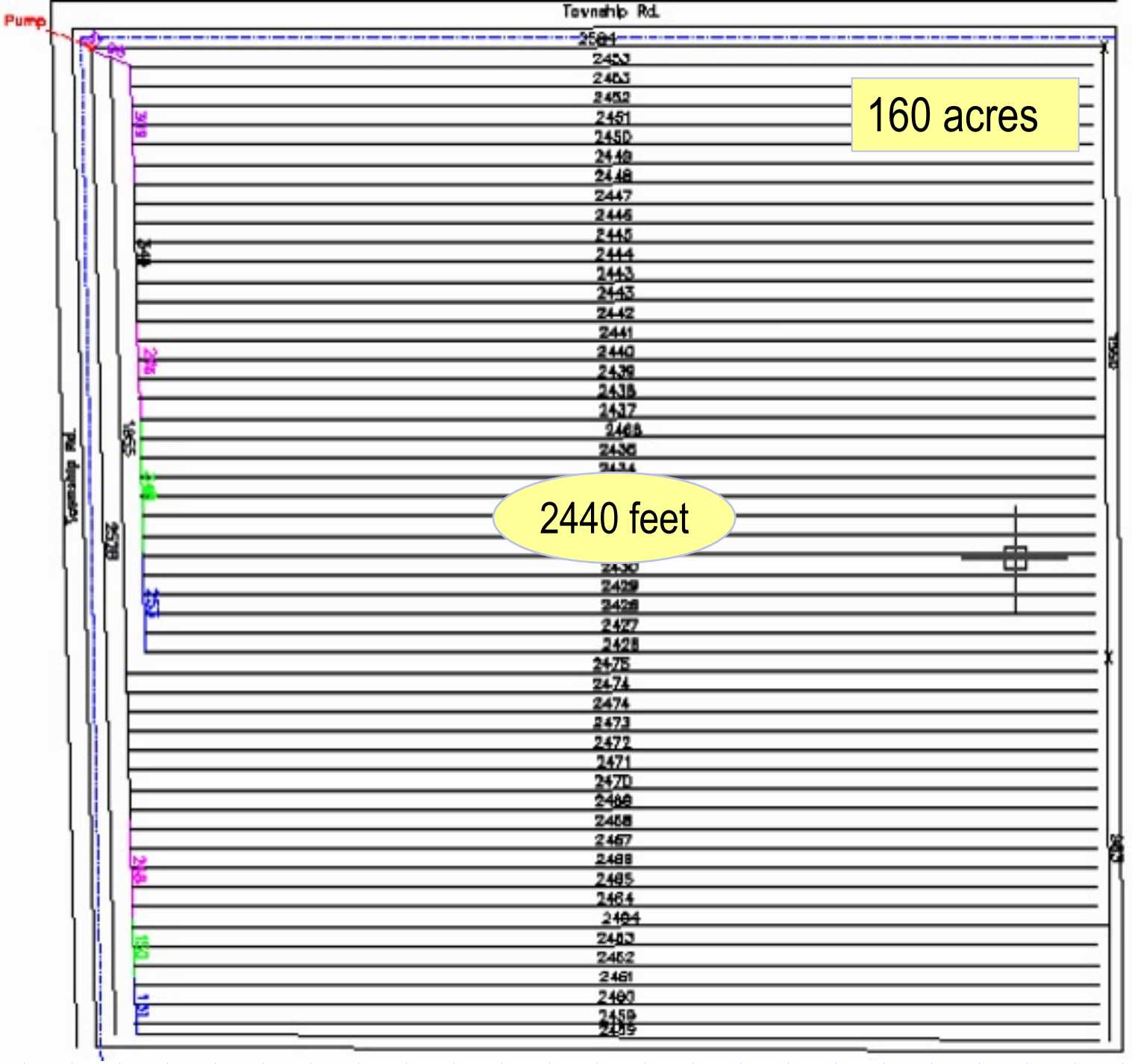
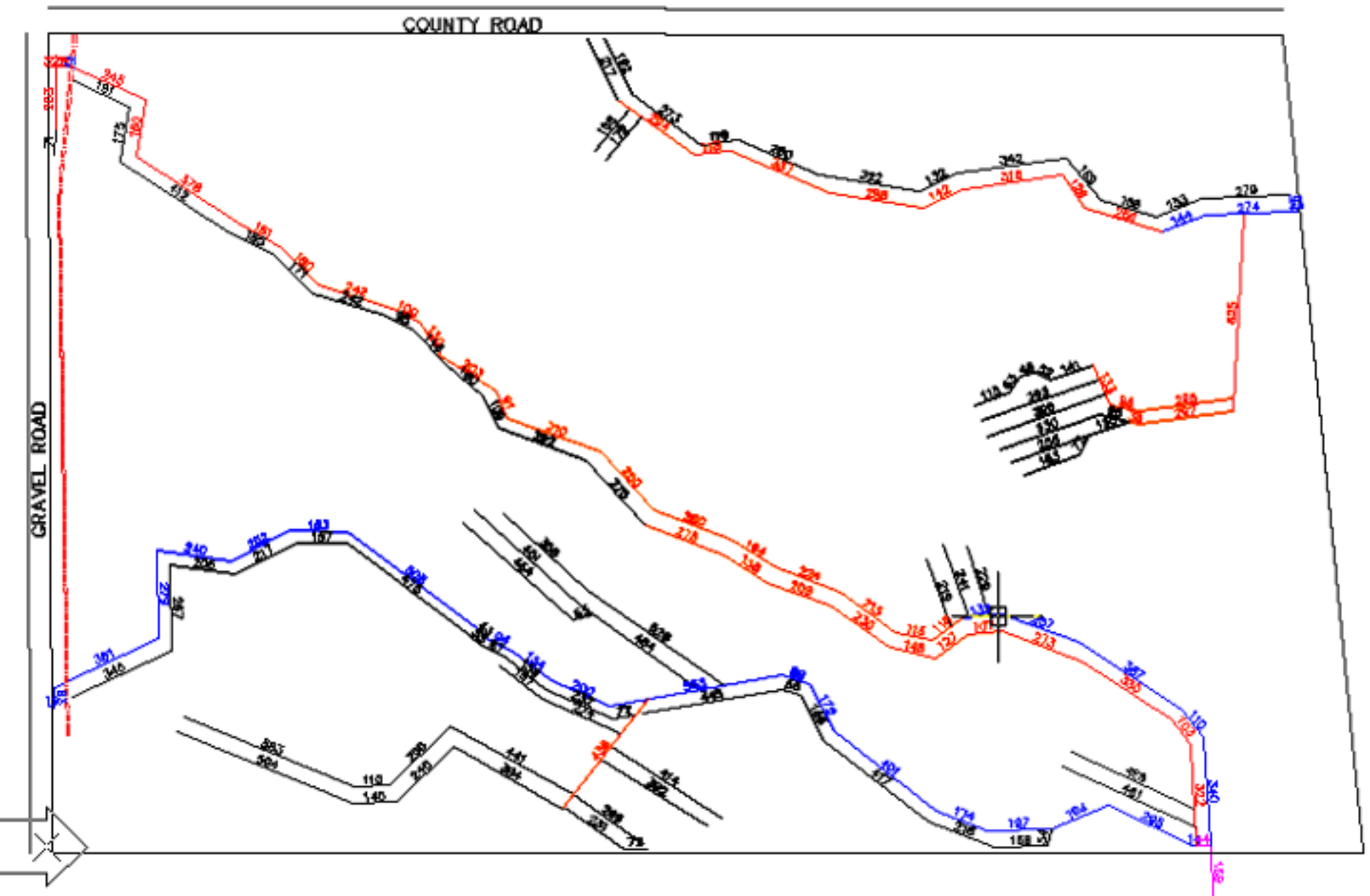
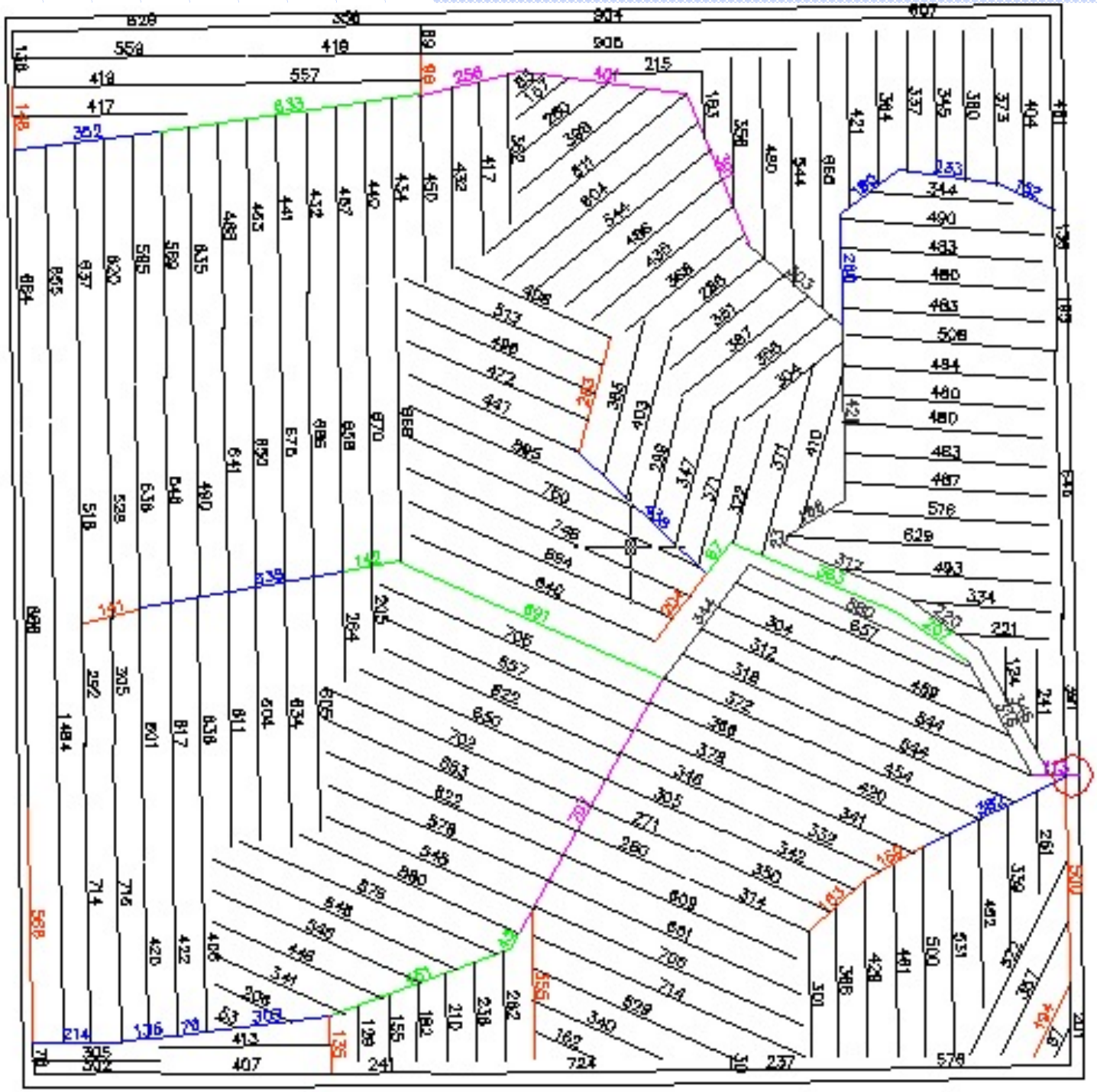

Township Rd.
Pump
160 acres
2440 feet

200 acres - Tiled 45 acres

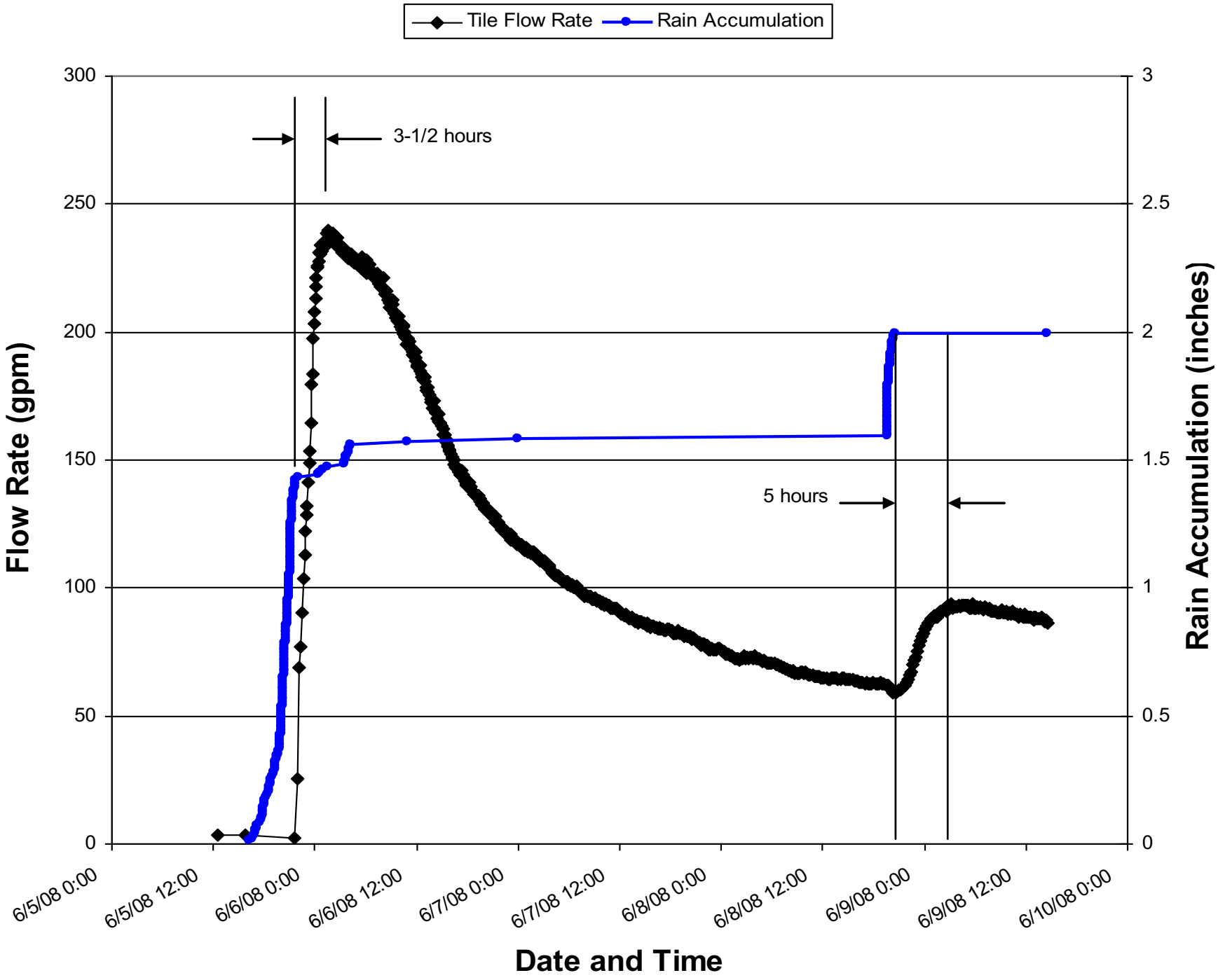




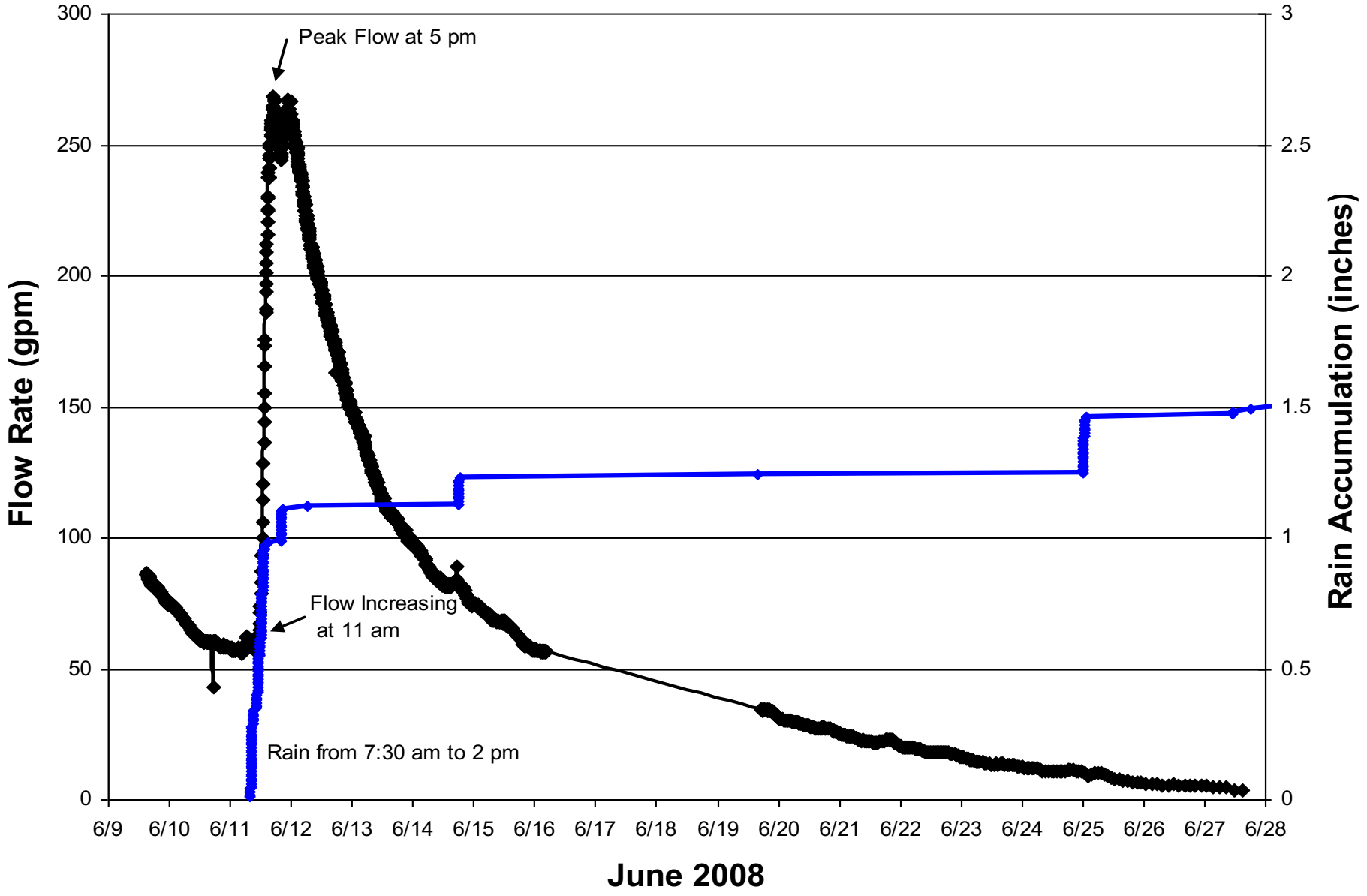
160 acres


Questions? Observations! Thoughts!!

Lift Station Hydrology


Tile Flow Rate
Rain Accumulation
3-1/2 hours
5 hours
Flow Rate (gpm)
Rain Accumulation (inches)
Date and Time
300
250
200
150
100
50
0
3
2.5
2
1.5
1
0.5
0
6/5/08 0:00
6/5/08 12:00
6/6/08 0:00
6/6/08 12:00
6/7/08 0:00
6/7/08 12:00
6/8/08 0:00
6/8/08 12:00
6/9/08 0:00
6/9/08 12:00
6/10/08 0:00

Tile Flow June 2008



Tile Flow - Lift Station in Cass County