Comparison of Primary and Secondary Treated Wastewater in Drip Dispersal

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- Question
  - When using drip dispersal, should the quality of the effluent be a design parameter?
  - Will primary-quality effluent cause significant differences in the design and operation of drip systems as compared to secondary-quality effluent?

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- Concerns
  - Will higher strength wastewater form a clogging layer that could change the hydraulic characteristics of the soil?
  - Is the distribution of the effluent into the soil sufficiently dispersed such to maintain aerobic conditions even with higher BOD loading?

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- Argument
  - Drip can maximize soil-water-oxygen contact
  - Aerobic conditions can be maintained
  - Dosing and resting cycles
- Thus
  - Biomat formation will be minimal even with higher strength effluent
  - With forward-flushing of drip laterals and back flushing of filters, the drip system will work well with high-strength effluent

Hypothesis

- No significant difference….
  - In biomat formation
  - In emitter clogging
    - Recognizing that the flushing schedule will be modified for the primary-quality water
    - Both laterals and filters
  - In the quality of the soil-water beneath the application of effluent
    - Organic carbon
    - Total nitrogen
    - Soil micro-organisms

Difficulties of Field Research

- Have to minimize variables
  - Need consistent and dependable source of wastewater
- Need to install two identical drip fields
  - Same soil type
  - One field receives septic tank effluent
  - The other field receives secondary-quality effluent
  - Wastewater needs to be from the same source

Partial Solution

- Subdivision with STEP system
  - Approximately 100 homes
  - Recirculating sand filter
  - Drip dispersal with 90,000 feet of drip tubing

Measured Parameters

- Soil Solution
  - Suction cup lysimeters
  - Randomly selected locations within drip field
  - Each field has 12 lysimeters
    - Three at 12”
    - Three at 24”
    - Three at 36”
    - Three at 48”
      - (or to bedrock)

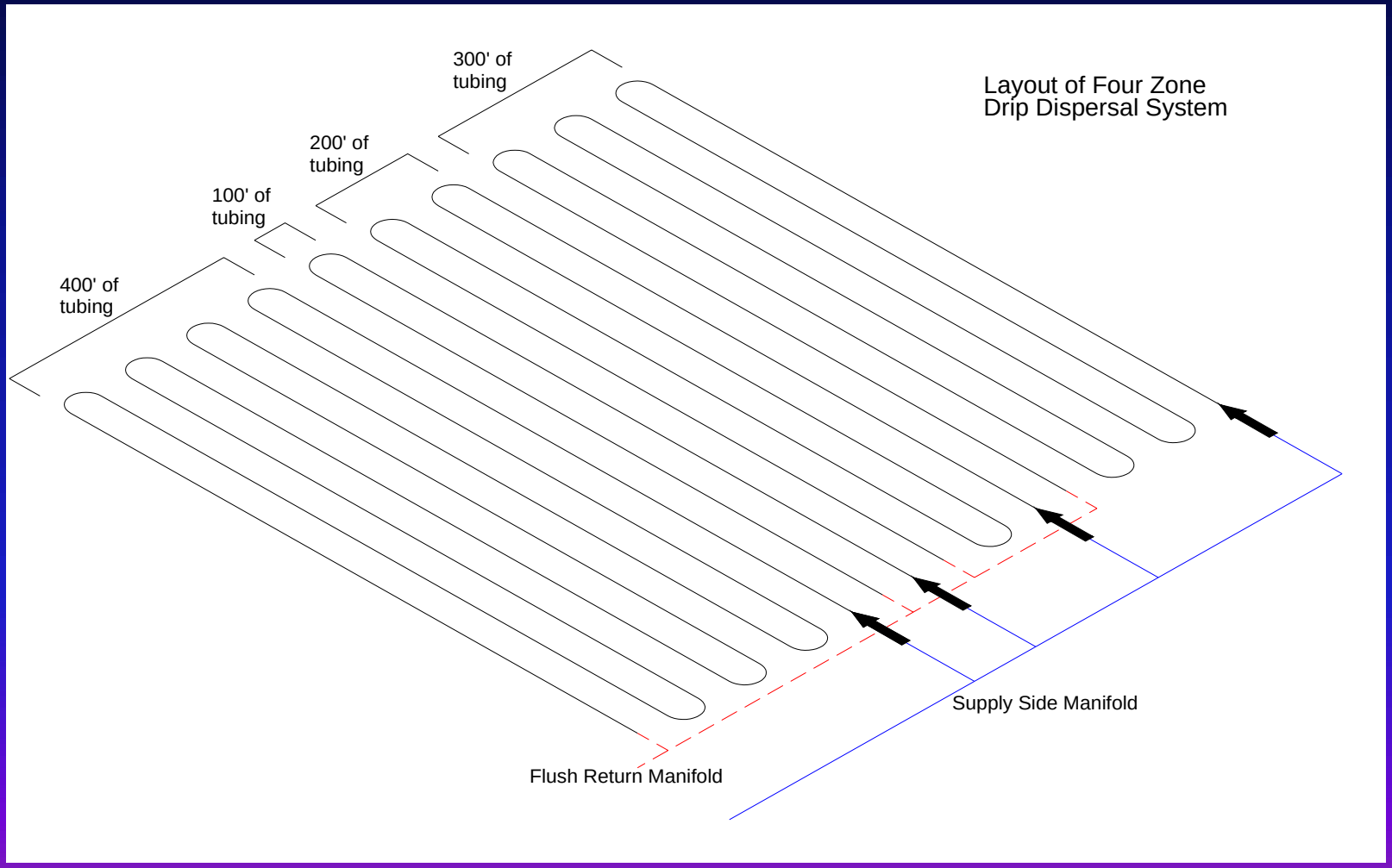
Installation of Sensors in Very Heavy Soil

- Hand augers are good work-out devices
  - portable hydraulically-driven soil probes are easier on the back

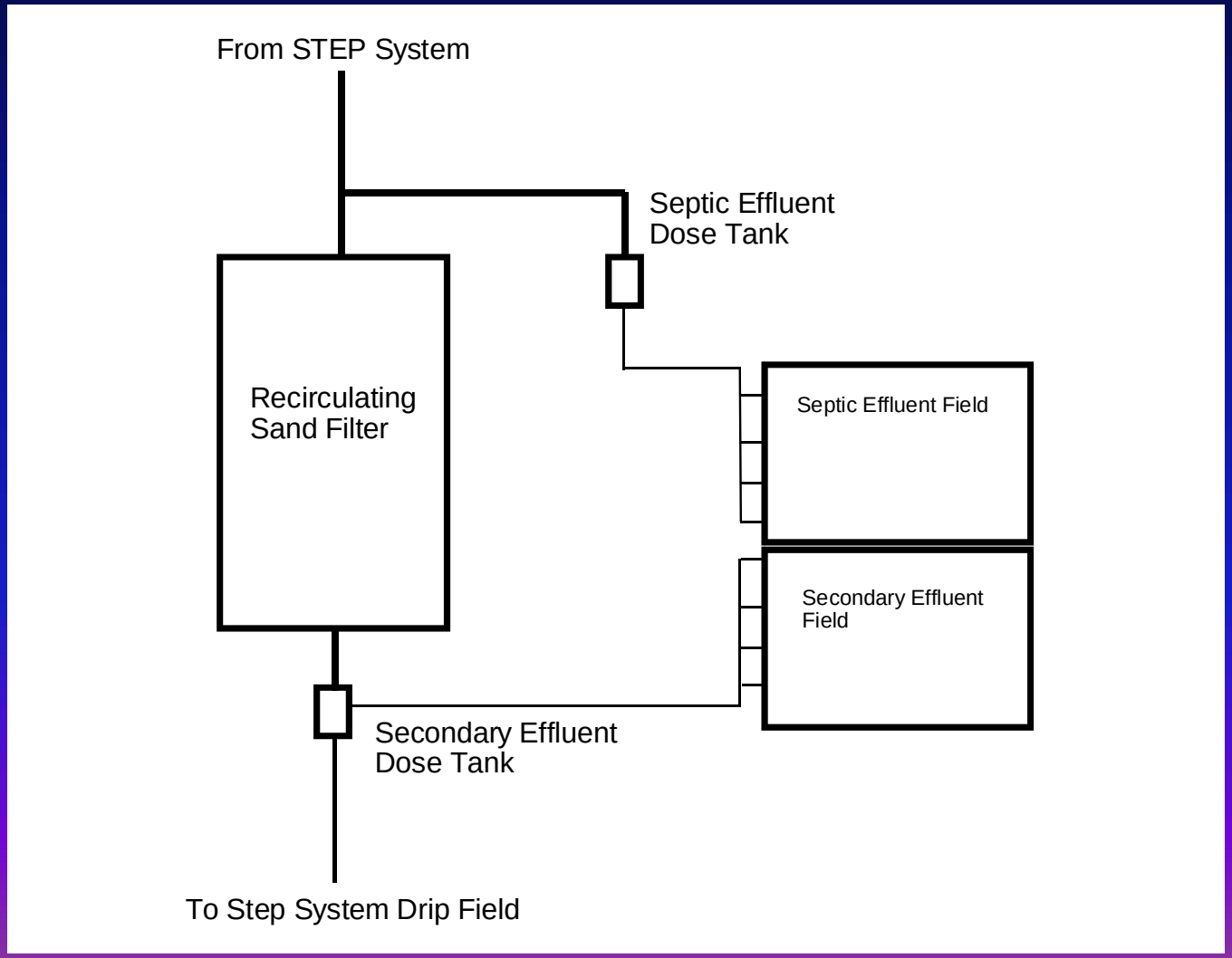
Creating Two Drip Fields

- 1000 feet of tubing in each field
  - Laterals on two-foot spacing
  - Emitters on two-foot spacing
  - 0.62 gallon per hour emission, pressure compensated
  - Vibratory plow
  - Four zones each field

Layout – One Field



Layout – Big Picture



Before RSF

- Septic tank effluent
  - Tapped into pressurized sewer line that feeds into the recirculating sand filter
  - Butterfly valve directs effluent to dose tank

After RSF

- Secondary quality effluent
  - Dose pump placed in same tank used to pressurize the drip lines

Soil Loading

- Load at full design rate
  - Soil rated at 0.1 gpd/ft^2
  - Each field is 2000 ft^2
  - 200 gallons per day per field
  - Receive this water everyday
  - grows great grass

Sample Collection

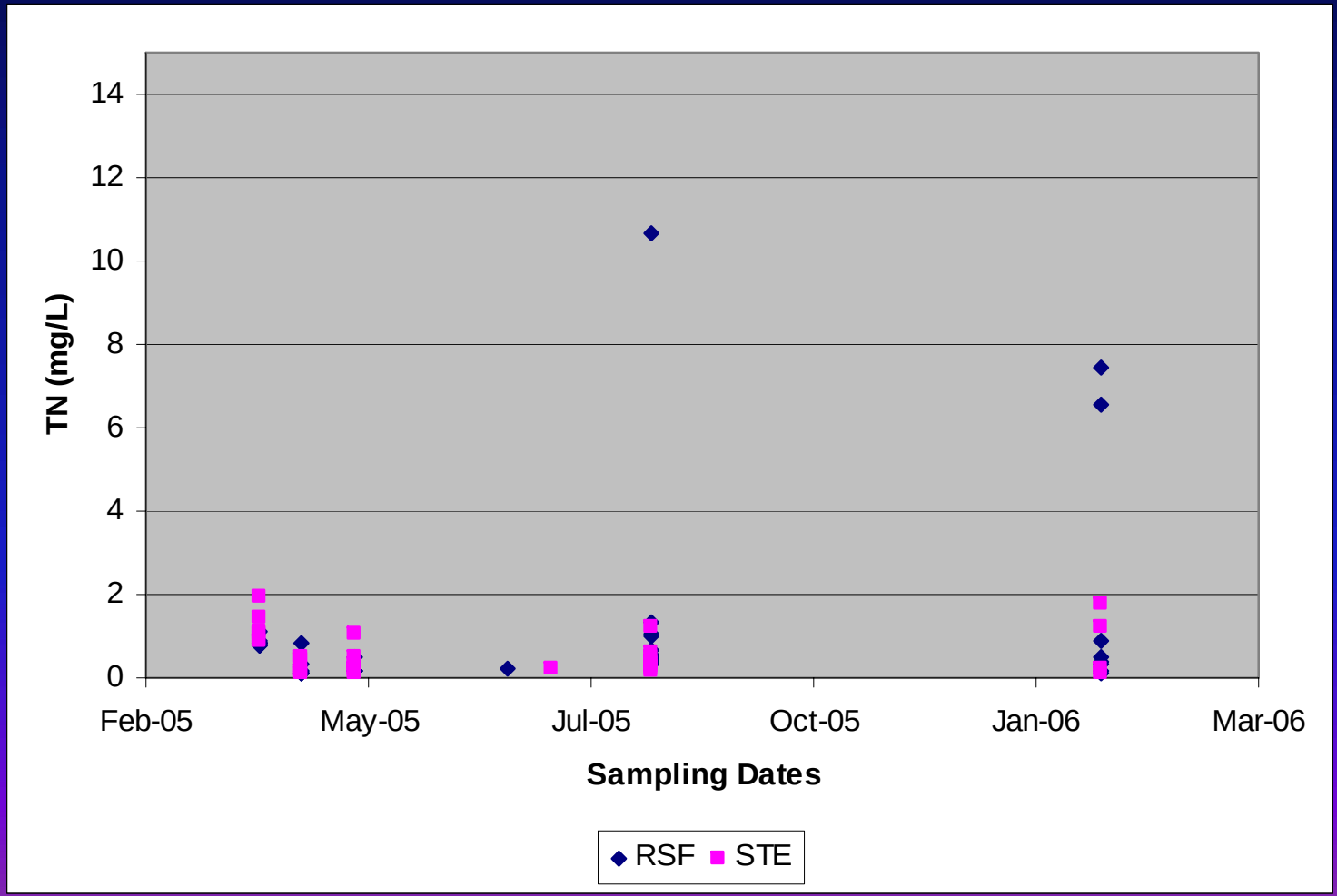
- Collect soil-solution samples
  - pull a vacuum, typically on a Friday
  - pull samples on Monday
- During summer
  - often not enough soil-water available for sampler

Nothing Conclusive, Yet

- Approximately nine months of operation
  - samples from drawn from STE and RSF lysimeters are not statistically different
    - total nitrogen
    - total phosphate
    - total carbon
    - chemical oxygen demand
  - current samples are not different from background
    - three sets of samples taken before initiation of land application

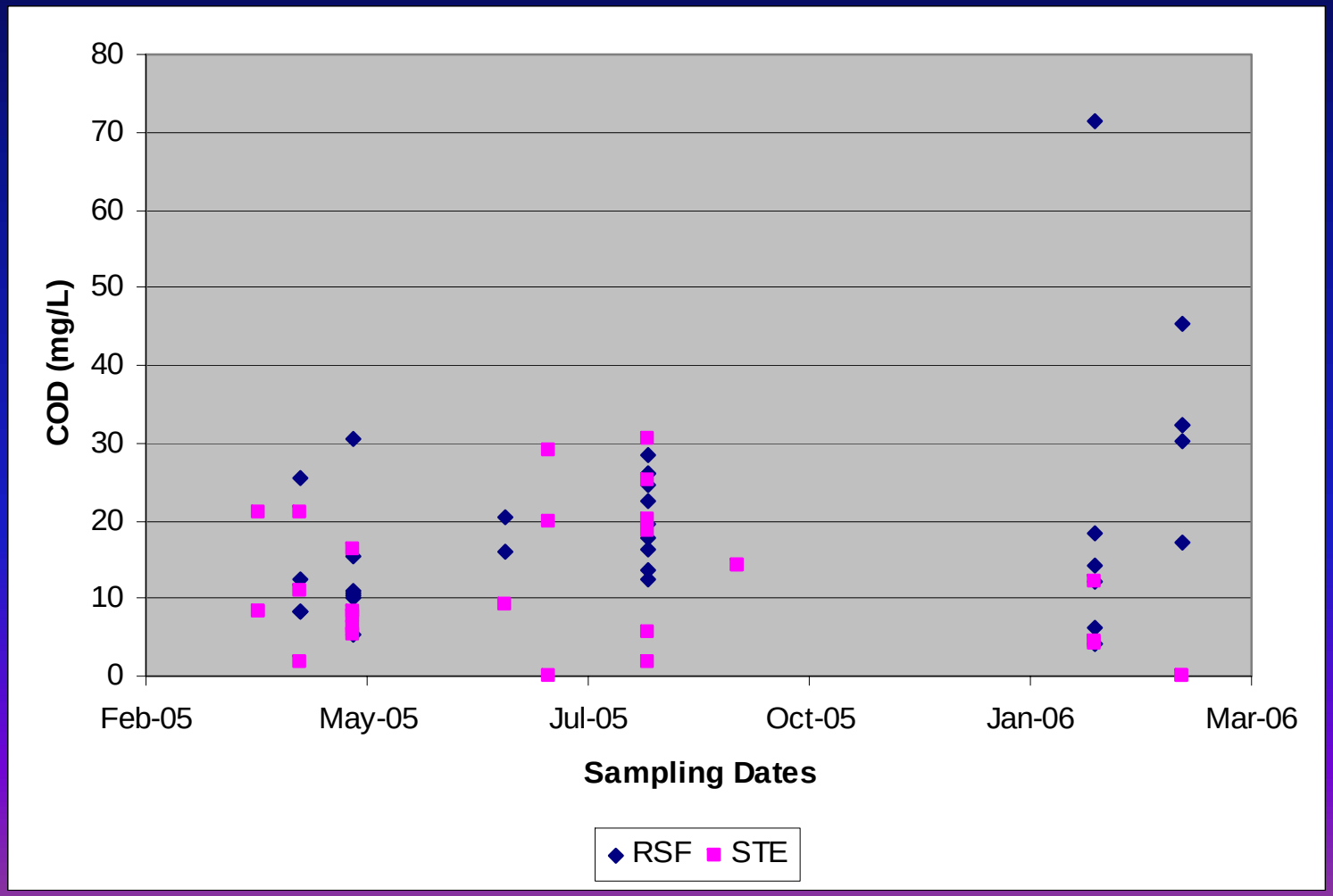
Total Nitrogen

Composite of 12”, 24”, 36”, & 48”
Suction Cup Lysimeters



Chemical Oxygen Demand

Composite of 12” 24” 36” & 48”
Suction Cup Lysimeters



Visual Differences ?

At this time,

- The soil is renovating the higher strength wastewater
- The water is going somewhere
  - 12” samples are rare - evapotranspiration
  - 48” samples were frequent – but soil was not saturated
- High strength side is slowly losing pressure due to emitter and filter clogging
  - however, lines and filters have not been flushed yet

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- THANKS!

Questions

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