Vegetable Farm Irrigation

Matt Steiman
Dickinson College Farm

Dickinson College Farm

Irritation System?

- Irrigation is expensive, resource intensive, time consuming, and potentially frustrating!
- Do what you can to reduce or avoid the need to irrigate:
  - Mulch, Organic Matter, Cultivation
  - Example: Beech Grove Farm (Nordell)

Rules of Thumb!

- Don't wait until crops are dry to figure out how to water them.
- Plan ahead to develop a system that works when you need it
- Irrigation person should like problem solving, be technically inclined, OK with walking back and forth, late hours
- Scale up as your farm and budget grows

Planning

Water Source?

- The amount of water you have available will determine how much and what type of irrigation you can achieve
- Well, Spring, Creek, Rainwater Catchment, City Water?

Storage

•Water storage is essential for dry times, unless your source is consistent (creek, etc.)

Pond:

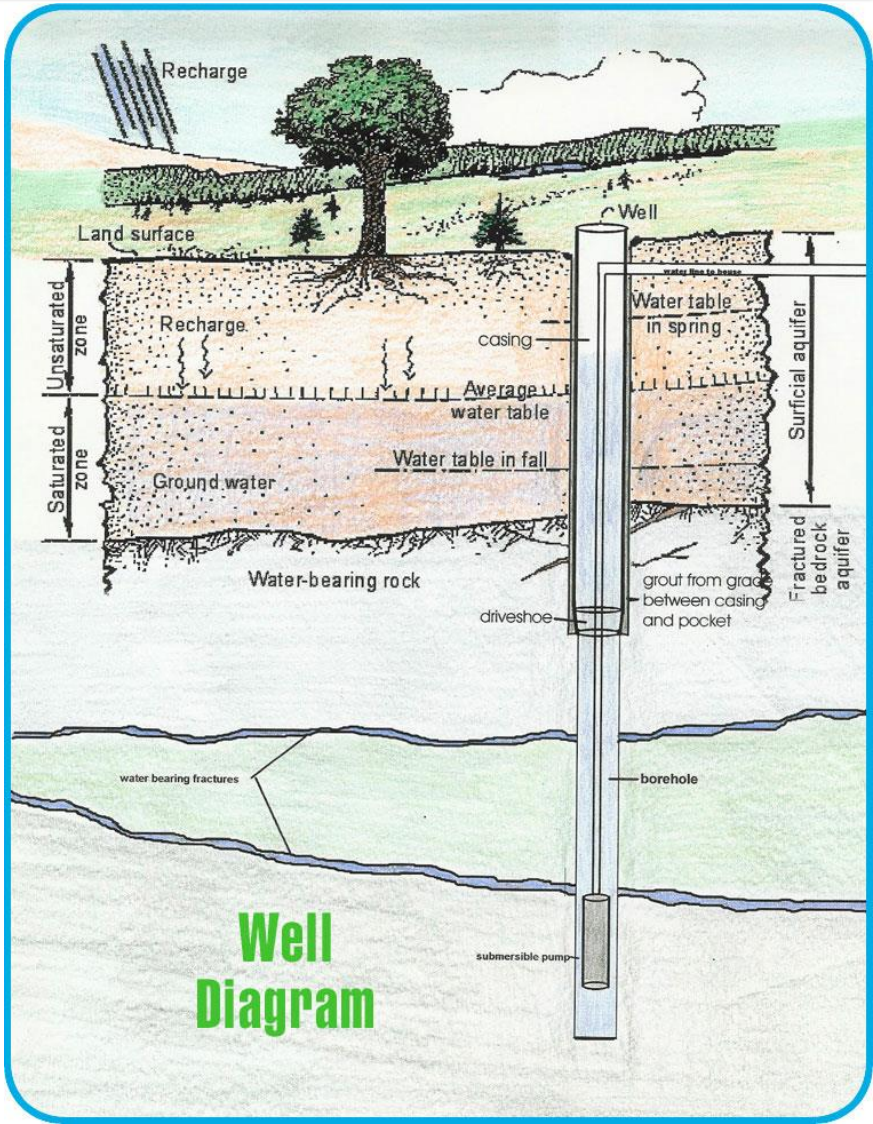
- Aesthetics, Wildlife Habitat, Fish, Swimming?
- Maintenance, Algae, Liability?

System options

- Direct pump from consistent source
- Pump from stored water
- Gravity feed
- Solar pumping
- Combinations?

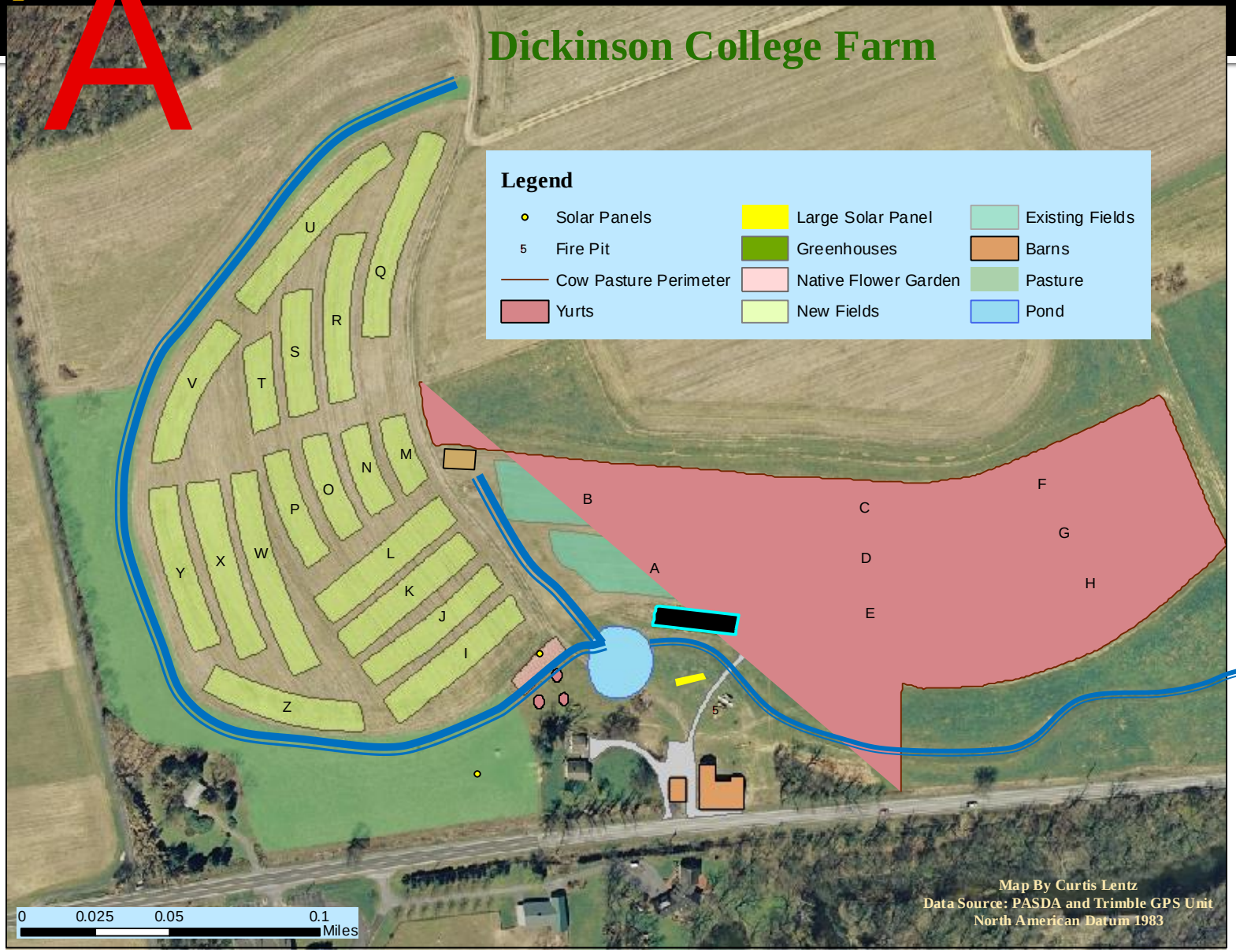
Water source: well

- About 20 gallons per minute, 24/7
- "Boiling Springs"
- Solar powered via grid tied solar array



Water source: rainwater swale

Layout A


Dickinson College Farm
Legend
Solar Panels
Fire Pit
Cow Pasture Perimeter
Yurts
Large Solar Panel
Greenhouses
Native Flower Garden
New Fields
Existing Fields
Barns
Pasture
Pond
U
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F
G
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0
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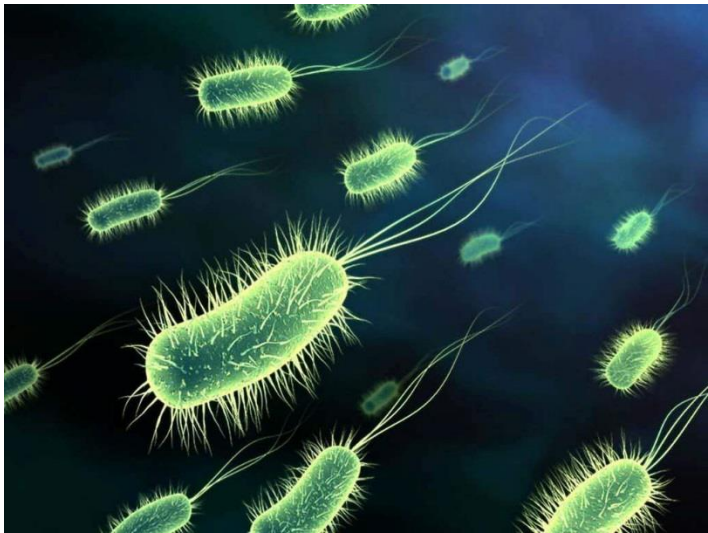
Miles
Map By Curtis Lentz
Data Source: PASDA and Trimble GPS Unit
North American Datum 1983

Water quality

- Best Practice:
  - Test water periodically for pathogens and contaminants
  - Keep livestock out of water source and areas upstream



Water testing

PSU Ag Analyitical Lab:

$35 per sample for irrigation water - E Coli

PENNSTATE

College of Agricultural Sciences

Search College

Agricultural Analytical Services Lab

- Soil Testing
- **Water Testing**
  - Drinking Water Testing
  - Livestock Drinking Water
  - Irrigation Water for Nurseries and Greenhouses
  - Irrigation Water for Turfgrasses
  - Pond and Lake Water
  - **Farm Food Safety (GAP) Water Testing**
- Plant Analysis
- Manure Testing
- Compost Testing
- Biosolids Testing
- Green Roof Media Testing
- Greenhouse (Soilless) Media Testing

Submitting Samples

AgSci » Agricultural Analytical Services Lab » Water Testing » **Farm Food Safety (GAP) Water Testing**

Share

Farm Food Safety (GAP) Water Testing

This program offers bacterial testing of irrigation and postharvest processing water for fresh fruit and vegetable production to promote farm food safety and Good Agricultural Practices.

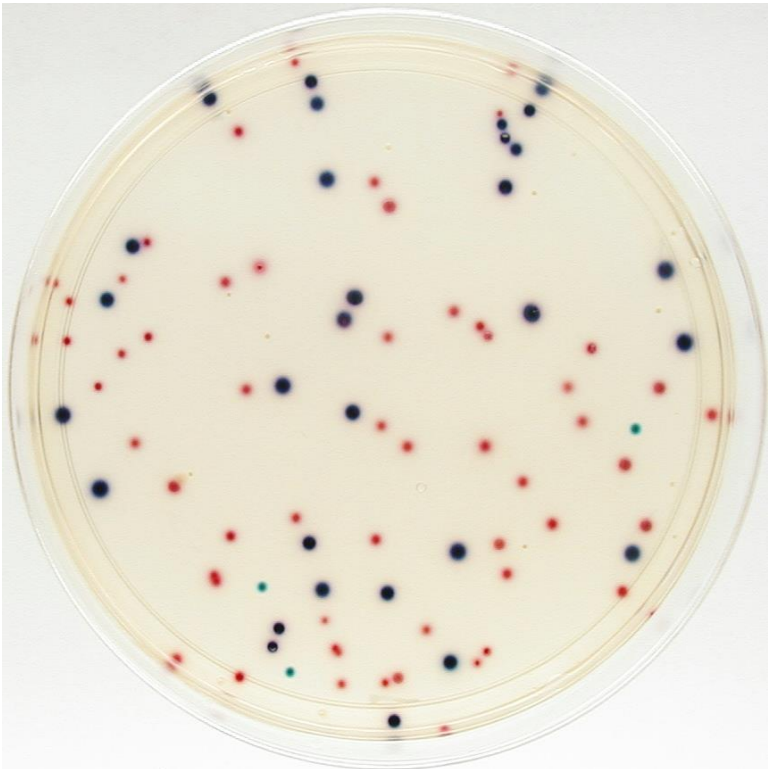
Pennsylvania fresh produce growers can be proud of the wholesome and nutritious fruits and vegetables they grow. Unfortunately, recent food borne illness traced to fresh produce has raised concern among consumers about the safety of our fresh food supply. Growers have a responsibility to minimize the risk of microbial contamination on the farm. Producers should evaluate their farm practices and begin to implement *Good Agricultural Practices*.

Importance of water testing

One of the most important factors growers need to consider is the safety of water that comes into contact with the harvestable portion of the crop, including water used for irrigation, frost protection, and post-harvest cooling and washing. When present, pathogenic microorganisms in water pose a significant risk to the safety of fresh produce it comes into contact with.

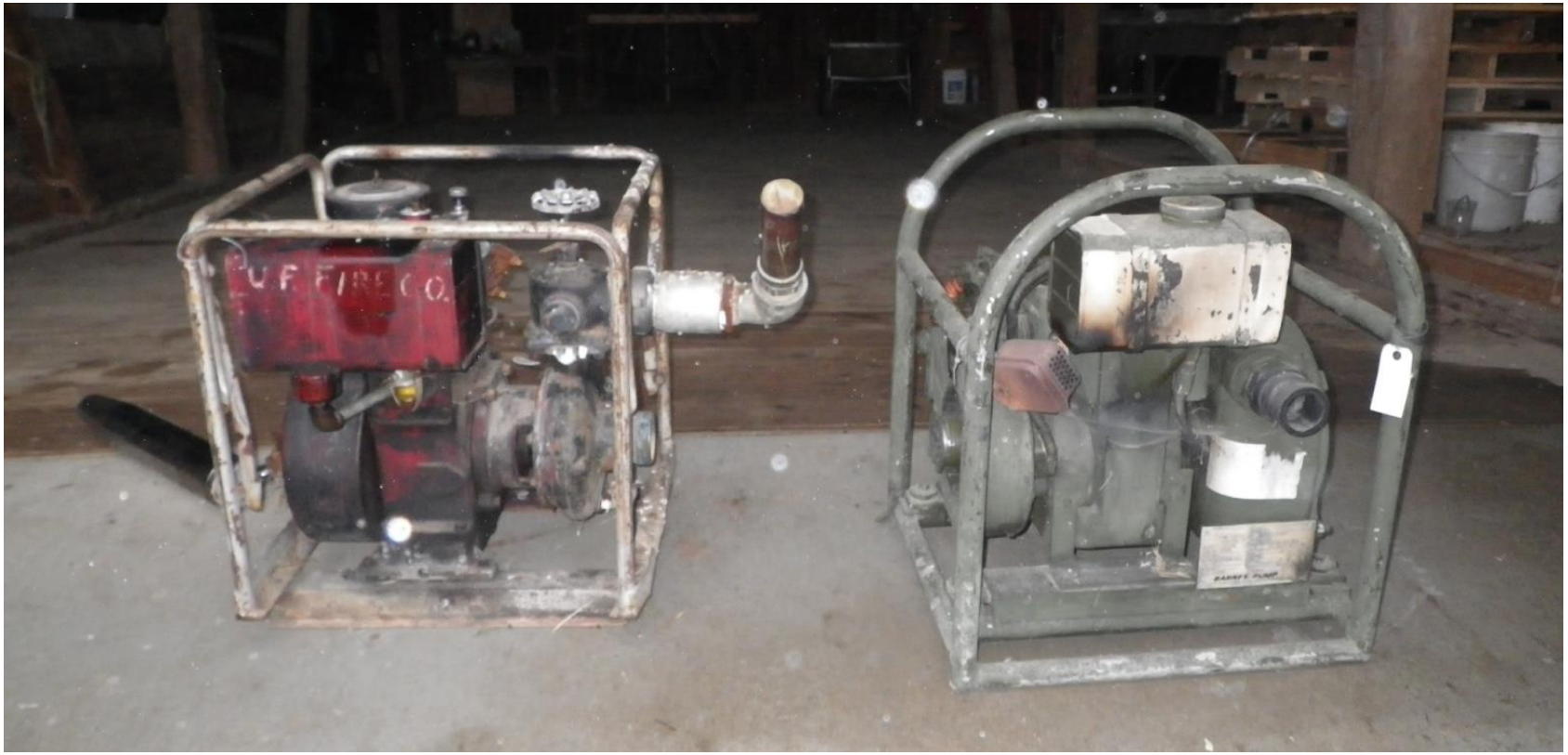
Home water testing

- Coliscan EasyGel: Micrology Labs
- $31 for ten test kit



Water delivery: Gas Pumps

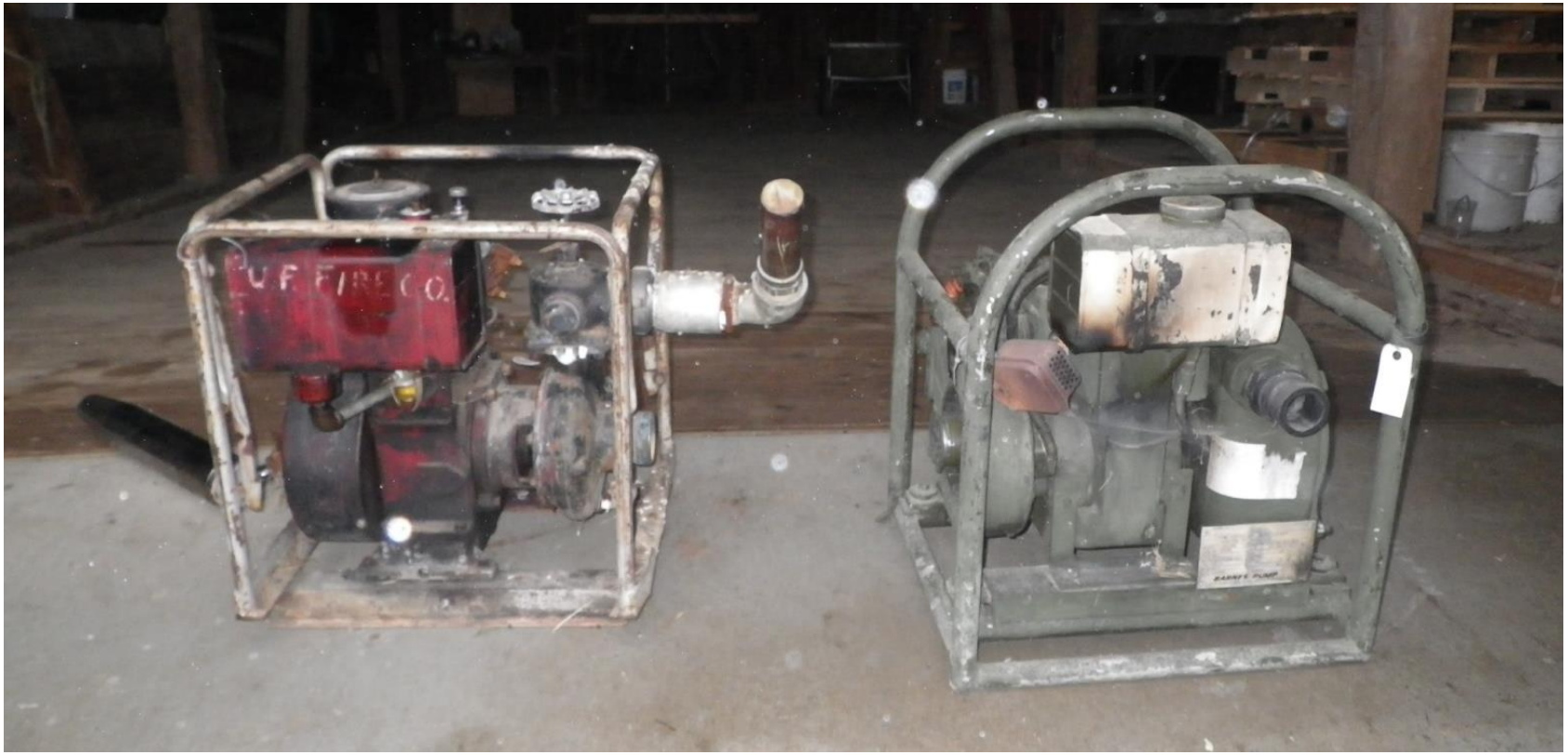
- Small engine gas pumps are effective, affordable and common
- Good way to get started for moderate investment



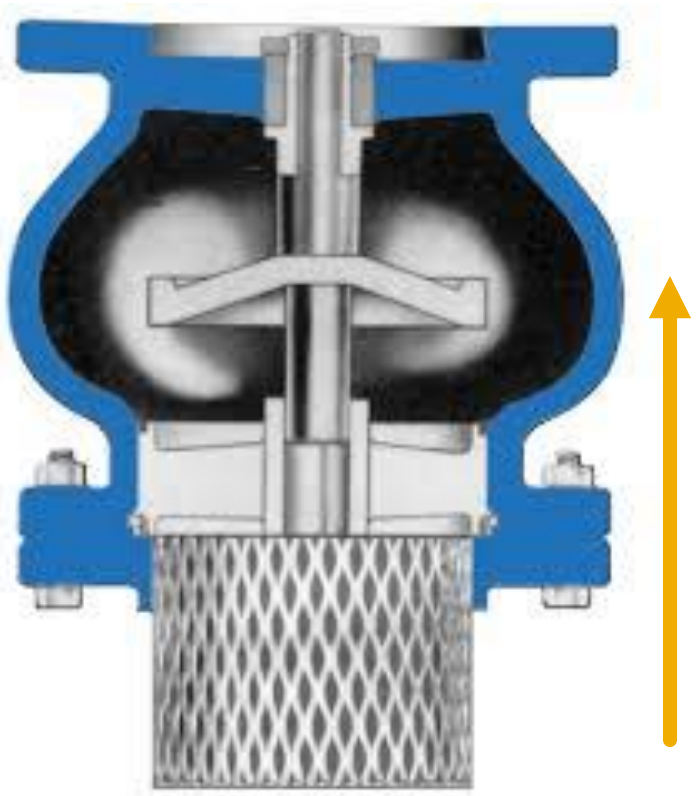
Gas Pumps, Cons

- Maintenance
- Fuel & Oil Consumption
- Mess near water source

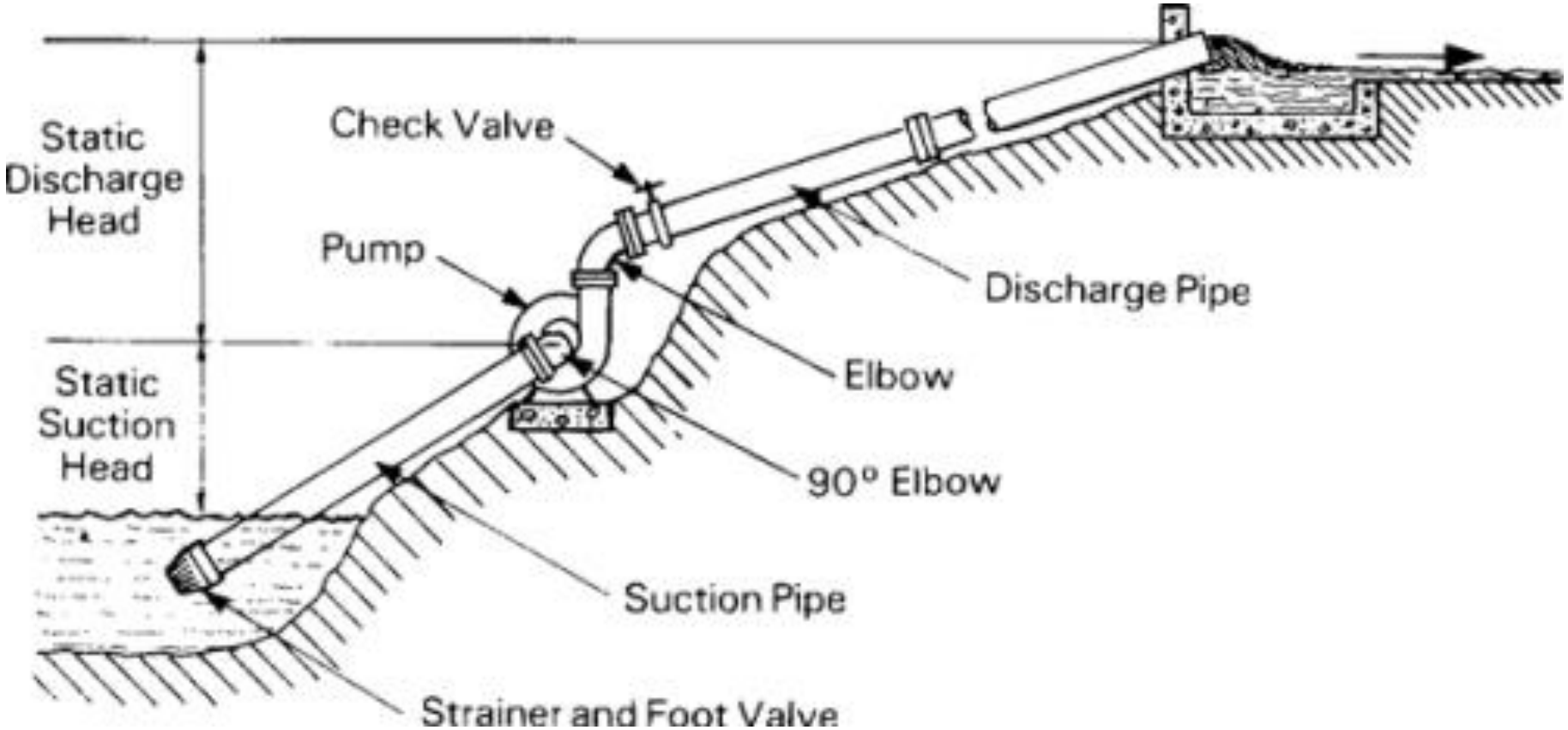
Noise, Aesthetics



Suction pipe & foot valve



Keep centrifugal pump close to water source



Electric pump: 10 HP, 200 GPM

Electric pump benefits!

- Quiet, clean
- Push button start/ stop
- Remote start possibilities

Electric pump: 10 HP, 200 GPM

Electric pump benefits!

- Can be connected to grid tied solar electric power
- Bigger pump can run multiple fields at one time

Variable Frequency Drive

VFD:

- Advanced electronic pump motor controller
- Allows adjustment of pump speed to deliver the water that you need
- Saves energy
- Automation options

Pump House w 1400 Watts PV

Utility interactive solar (grid tied)

Pump system costs:

- Gas pumps: $100 used & up
- Diesel pumps $2,000 to $4,000 and up

- Electric pump system:
  - Pump, VFD and associated components $4,000
  - Pump house: $6,000 custom built
  - Solar option $11,000 installed
- Well pump and well: Approx $5000 plus wire from power source

Pressure Transducer > VFD > Well Pump

Well: 300 GPM at 225 Feet

Well, drive, pump, etc : $23,000

Shed $4000

Well feeds irrigation AND house, barn

Always on

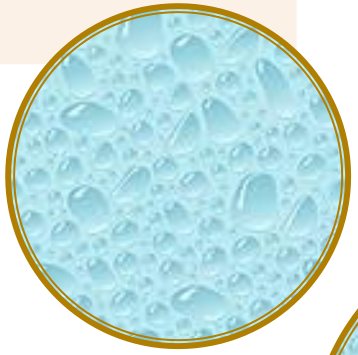
Water delivery: Blue Vinylflow

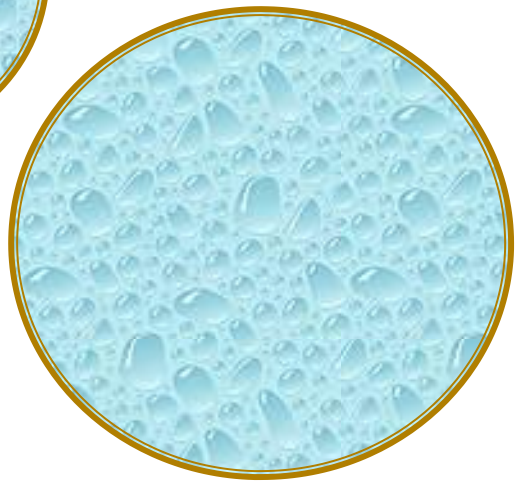
Friction Loss in Long Pipe Runs

- When pumping large volumes of water over long distances, some pressure and flow will be lost to friction in the pipe
- Depends on the diameter of the tube and flow rate of the water

Friction Loss, PSI per 100 feet

Gallons per minute	2 inch	3 inch
40	1.1	
60	2.4	1.0
80	4.1	
100	6.0	1.2
200	22.0	3.5





100 GPM, 1500 feet:

- Lose 15 x 6 = 90 PSI with 2”

- Lose 15 x 1.2 = 18 PSI with 3”

Take home message

- For long runs, use larger diameter pipe
- Project the maximum amount of flow you expect to need and size for that, or higher
- Especially important with buried pipe!

Fittings for Blue VinylFlow

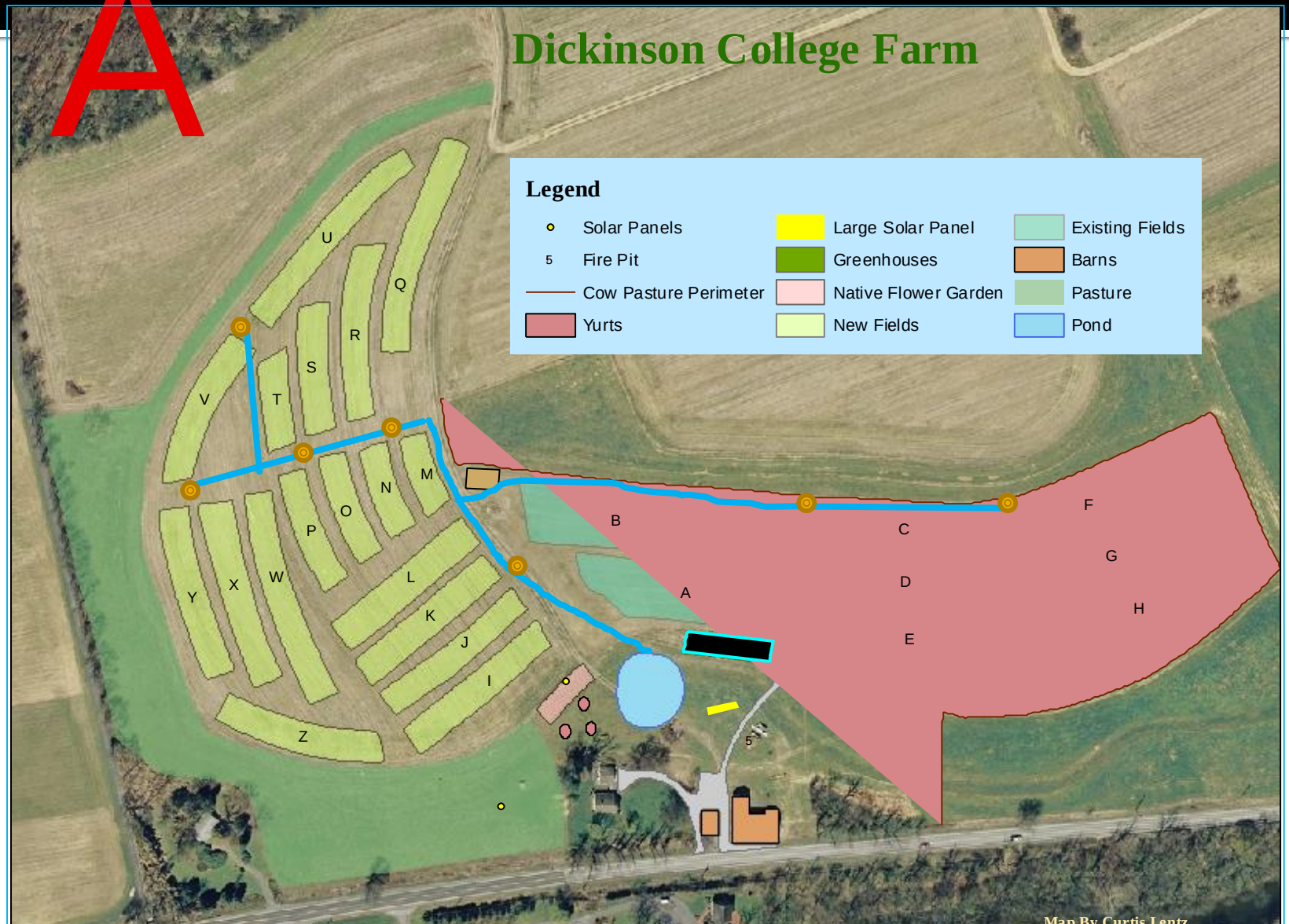
Cordless drill with 5/16 nut driver!

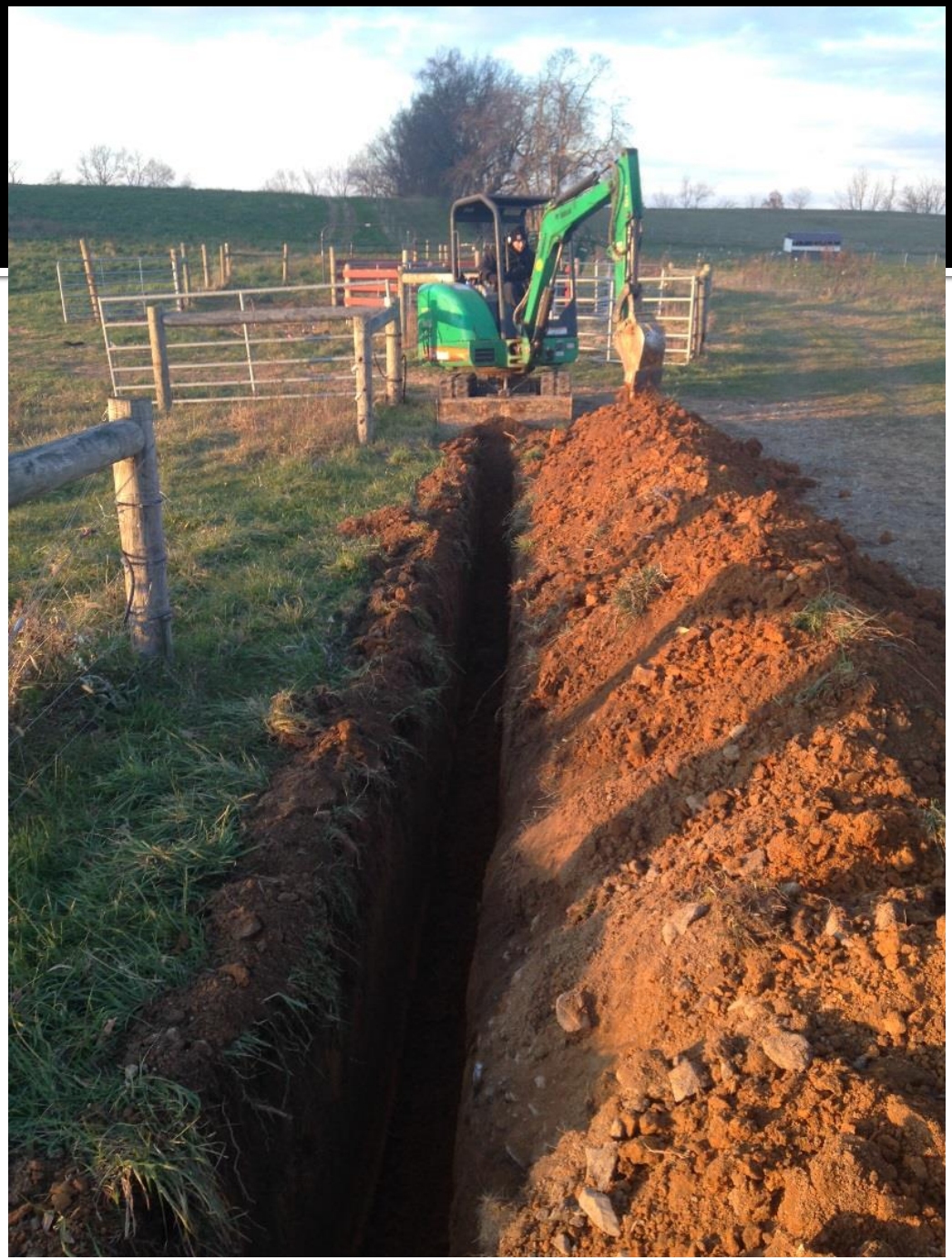
Pros and Cons of Blue Vinylflow

- PRO:
  - Affordable, versatile, easy to work with
  - Temporary, reusable
  - Long lasting (Vinylflow lasts several seasons)
  - No commitments
- CON:
  - Gets in the way of vehicle & equipment traffic
  - Leaks over time with abuse
  - Gets lost in the grass, mower damage etc.

2011 Improvement: Buried Main

A





Mini Excavator:
$100-$200 per day

Operator:
$22 per hour

- Installed 2080 feet of 4” SDR 26 pipe
- Bell and Gasket for easy install

Dig straight

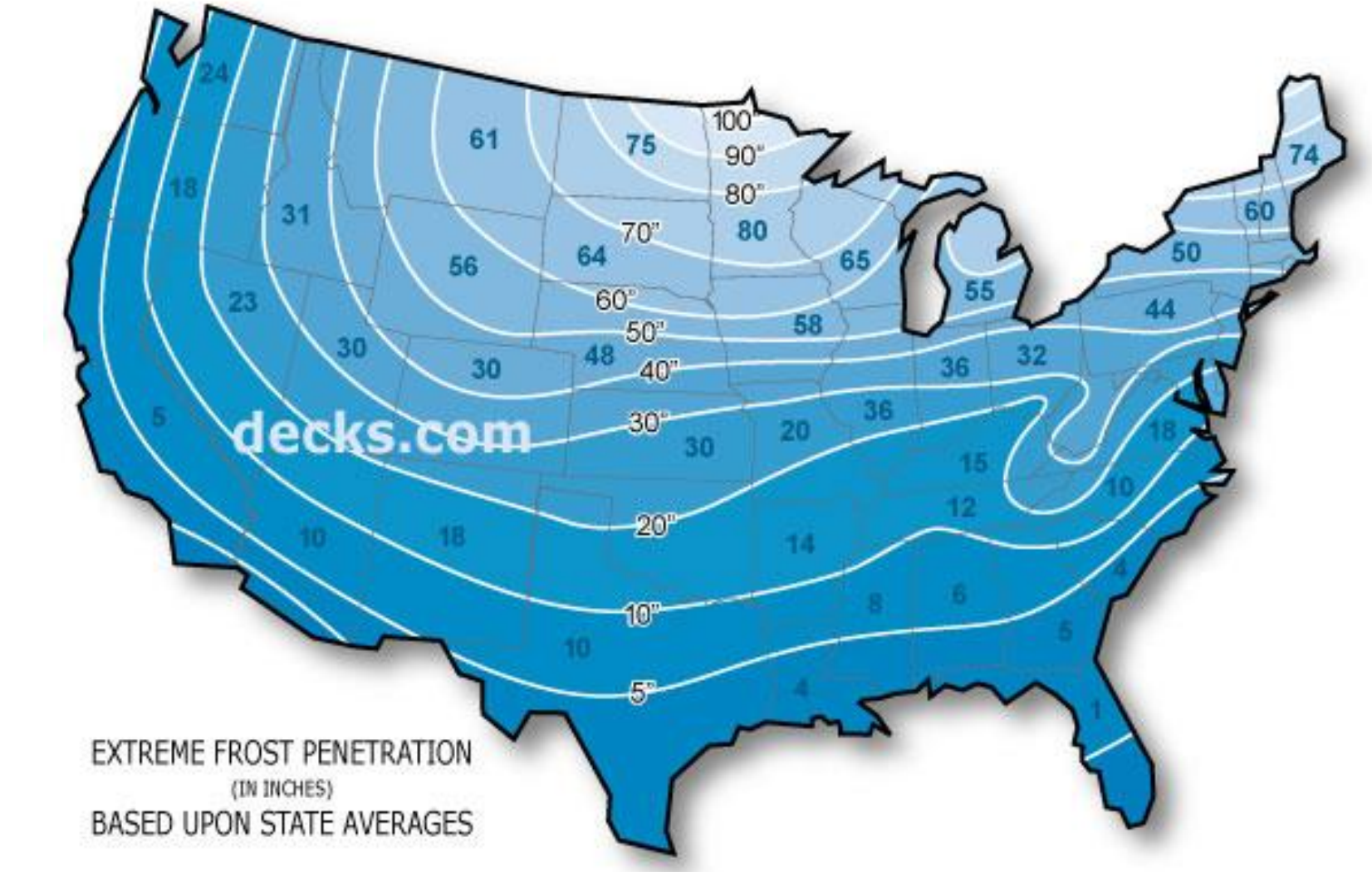
Minor flex over long runs

Rocks at all joints for thrust blocks

Off-set valves in case of accidents

T posts and Pits

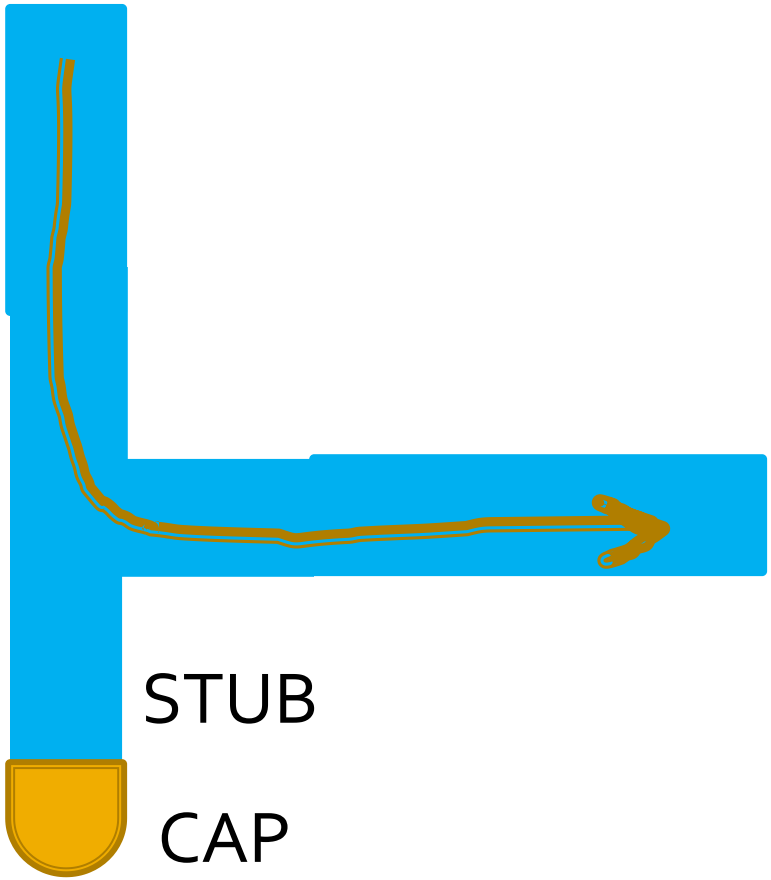
BELOW FROST DEPTH?



- 18-24 inches deep –
- (not frost proof)

Drain valves in pits

Leave a stub for expansion



Compression coupling for repair

OVERHEAD IRRIGATION

Overhead Sprinklers

- Aluminum pipe lasts for decades if cared for
- Great for watering in direct seed crops:
  - Lettuce, salad, spinach, carrots, beans, broccoli, etc.
- One pipe can be moved around the farm

- Water and energy intensive
- Risk of evaporation & low efficiency
- Labor intensive to move, run at night
- Increased weed pressure due to thorough wetting
- Costly if purchased new

4 Inch Rosebud style pipe