WATER PUMP SYSTEMS

PRIVATE WELL CONFERENCE 2018

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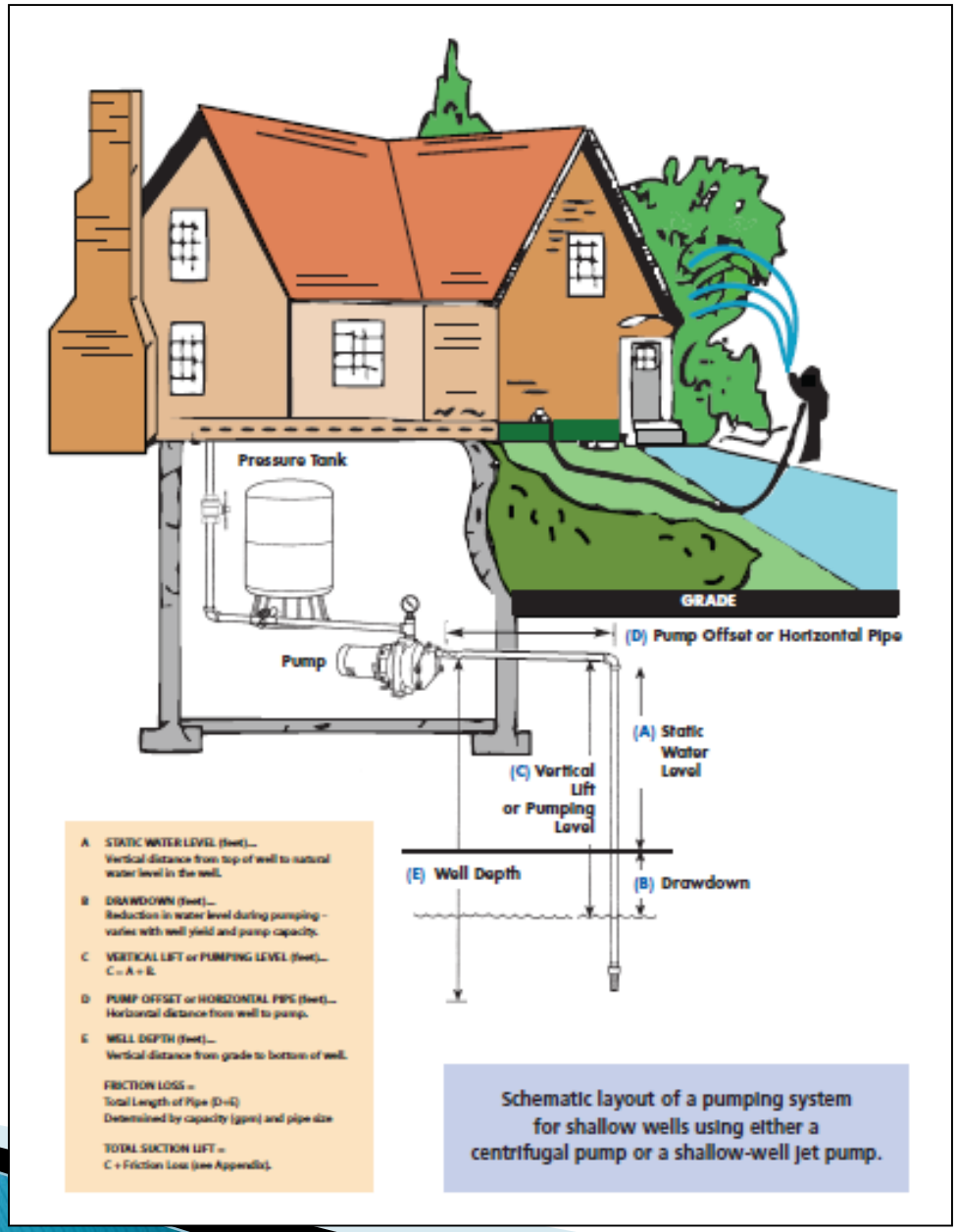
WELL DRILLER – PUMP INSTALLER
CERTIFIED OPERATOR

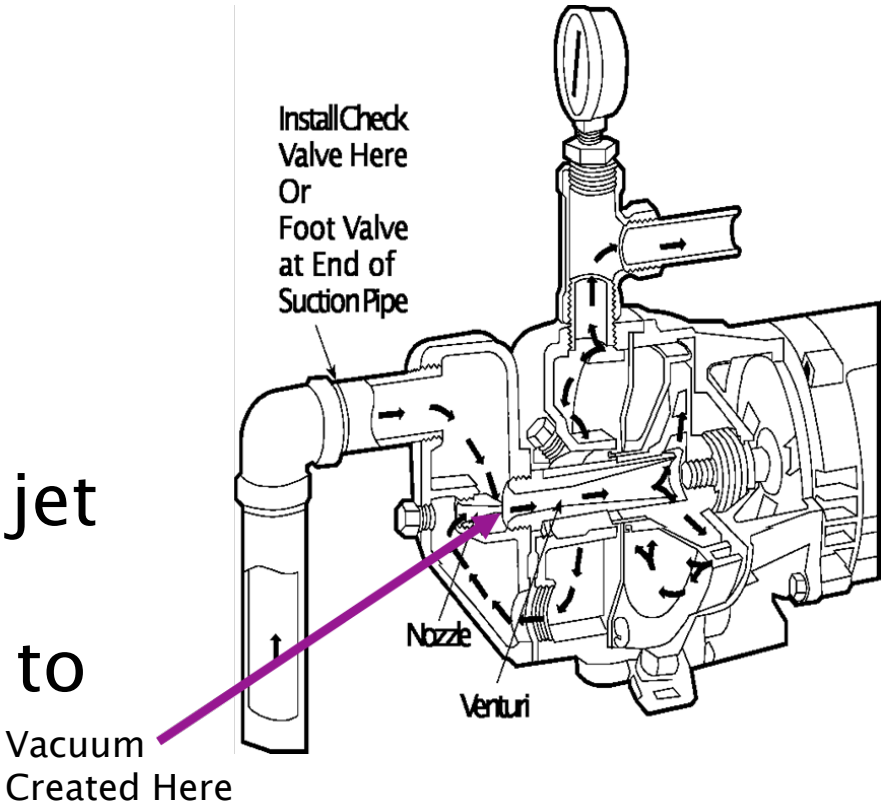
Typical Jet System



Schematic layout of a pumping system for shallow wells using either a centrifugal pump or a shallow-well jet pump.

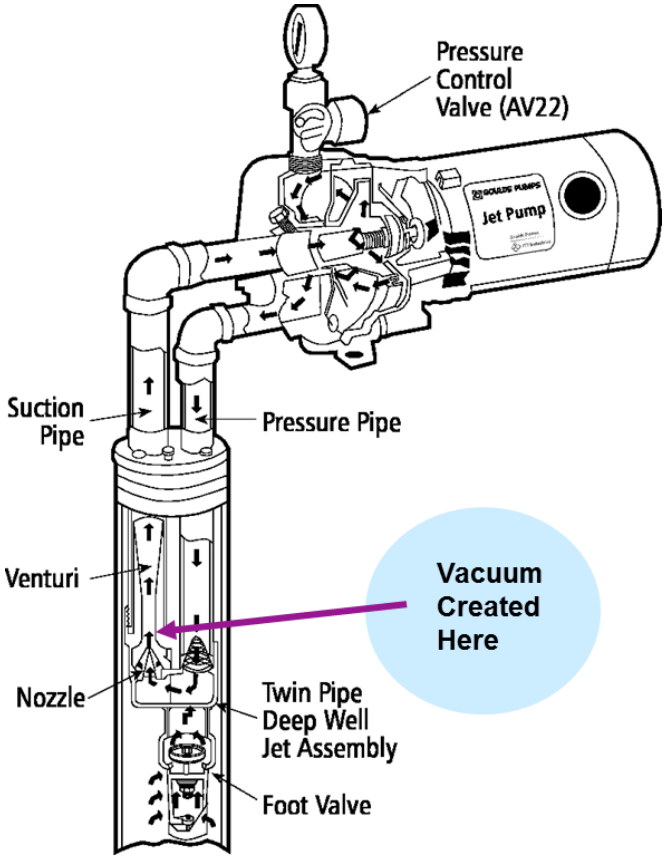
Shallow Well Jet

- Identified by one pipe going to well
- Jet may be built-in or bolted on as a separate jet assembly
- Capable of pumping up to 25’



Deep Well Jet

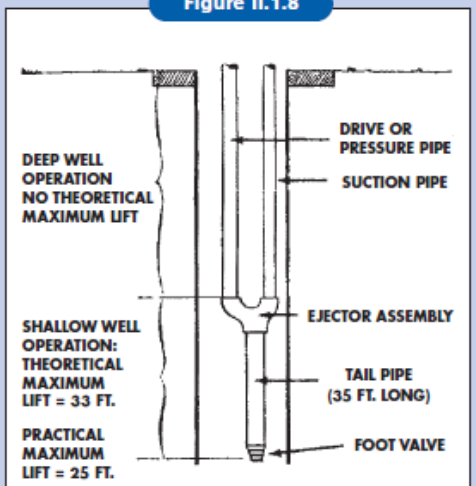
- Identified by two pipes going to well
- Larger pipe is Suction
- Smaller pipe is Drive Water or Pressure Pipe
- Capable of pumping up to 220’ with a multi-stage jet pump



Over Pumping

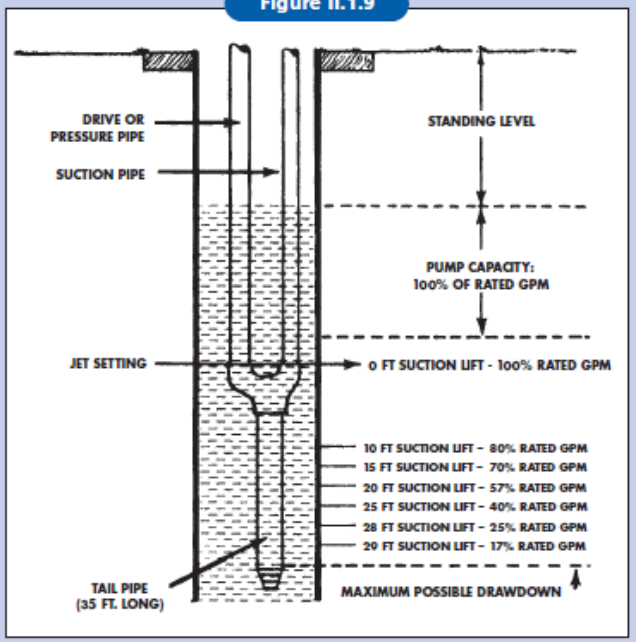
- Low yield wells
- 35ft Tail Pipe eliminates risk
- Must use foot valve
- Flow decreases with draw down

Figure II.1.8



Tail pipe installation
in a deep-well jet system.
This device prevents over-pumping
or excessive drawdown of weak wells.

Figure II.1.9



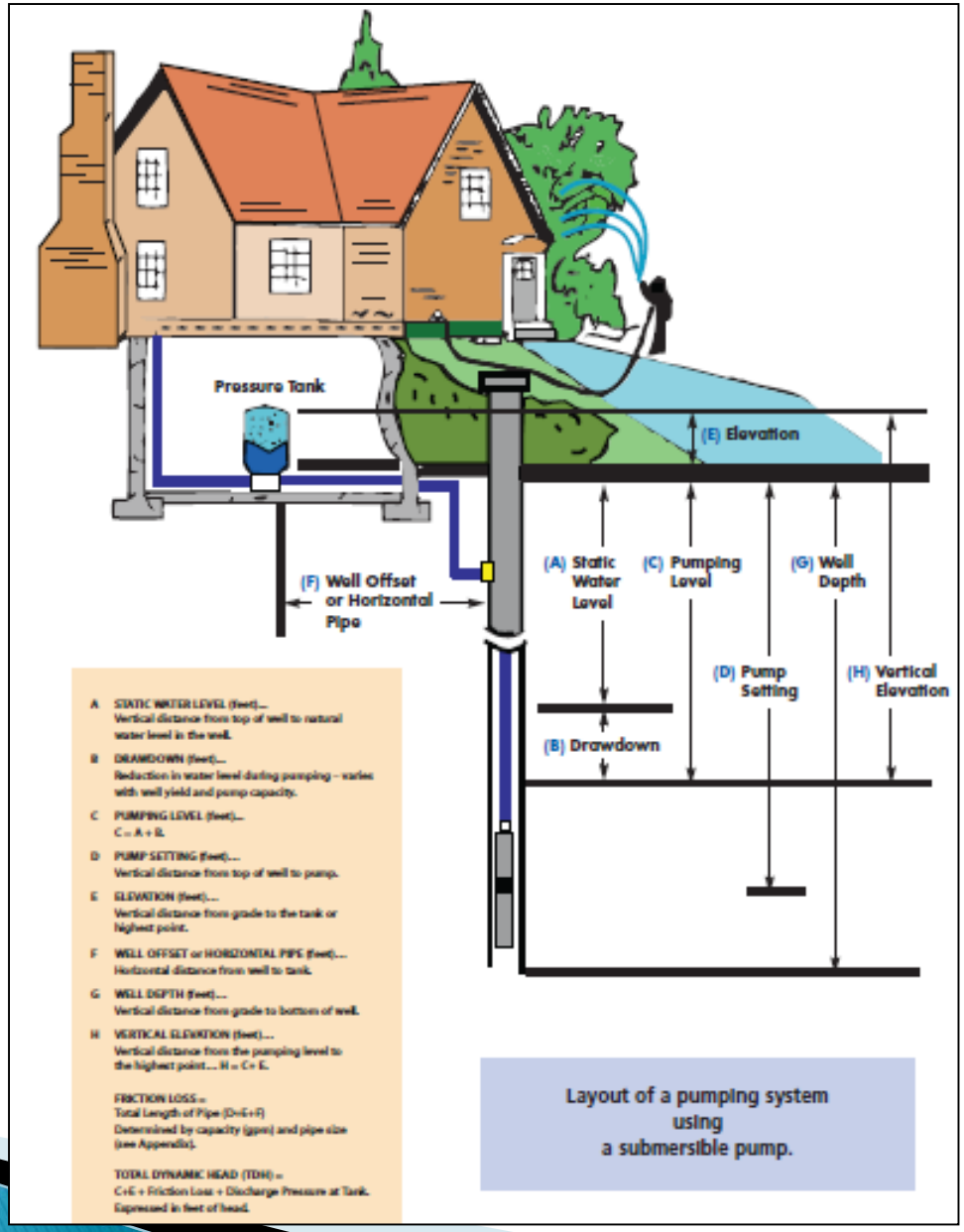
With tail pipe, pump delivery remains at 100 percent of capacity down to the ejector level. If water falls below that, flow decreases in proportion to drawdown as shown by figures. When delivery equals well inflow, the water level remains constant until the pump shuts off.

Jet Pump – Pros & Cons

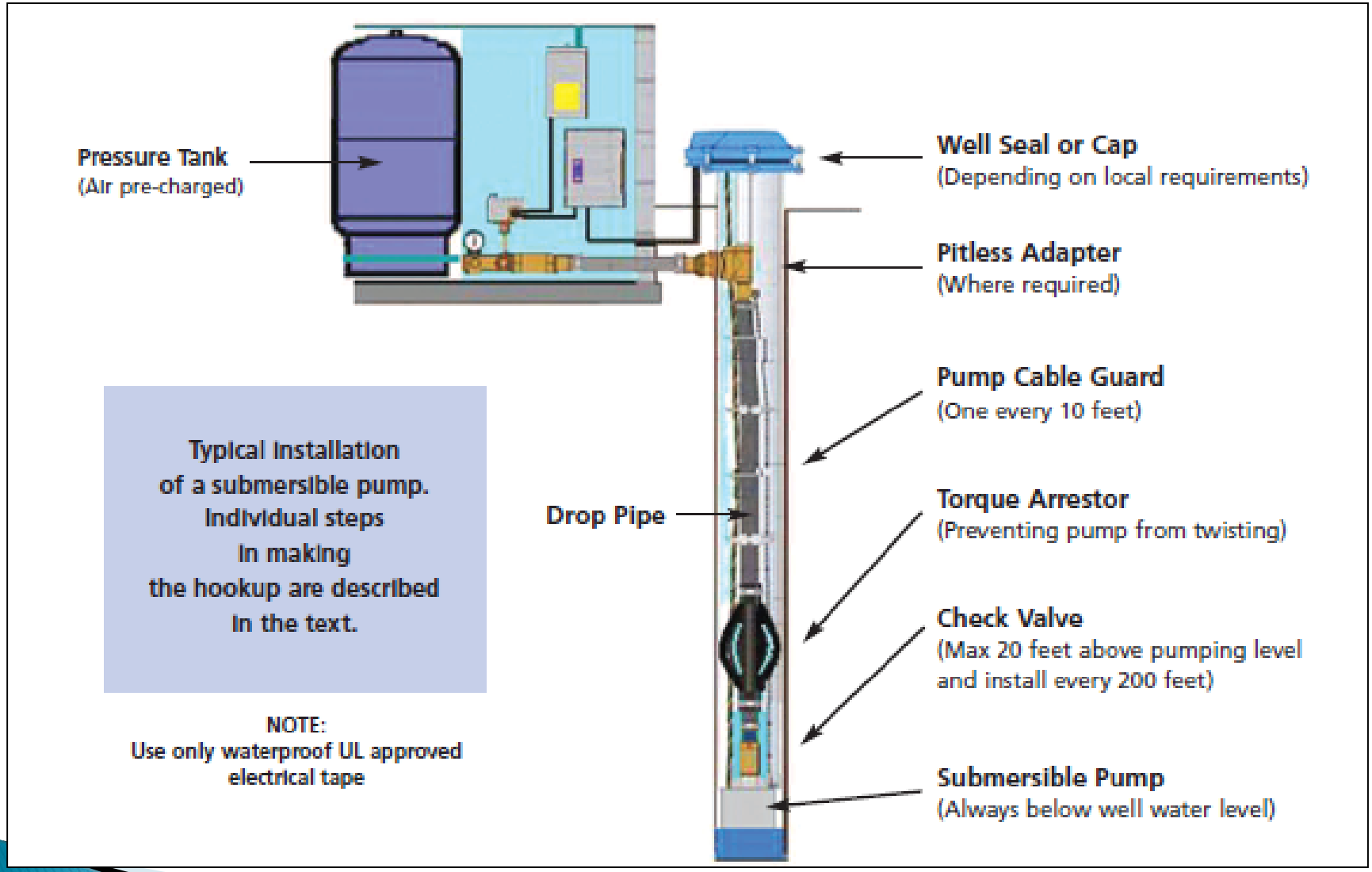
- Jet pumps are cost effective
- No special equipment to install
- They are accessible if something goes wrong
- Up to 1.5 HP can run on 115 Volts
- Can pump limited amounts of air with ease

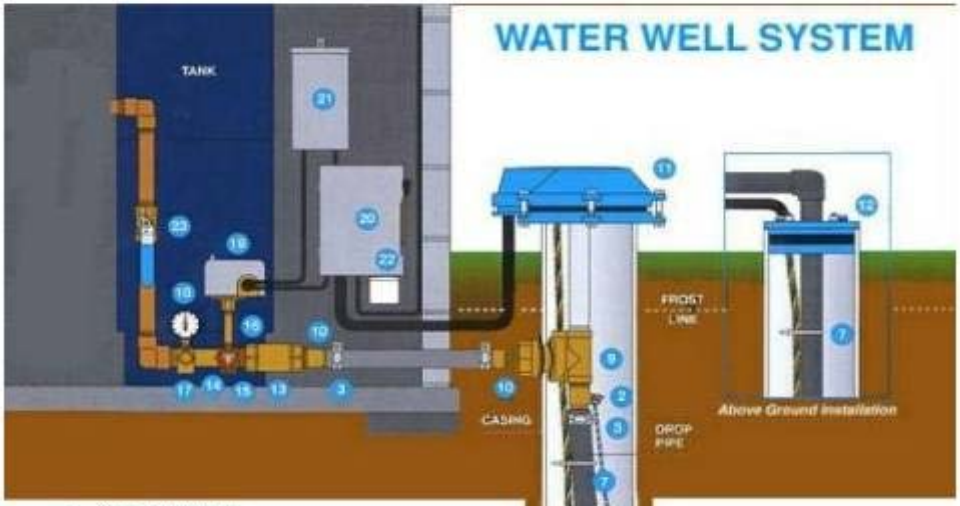
- Homeowners like to adjust them
- Pressure and TDH are limited due to motor's thrust limitations
- Require Priming – can be challenging
- Noisy compared to a Submersible

Typical Submersible System



Submersible Components

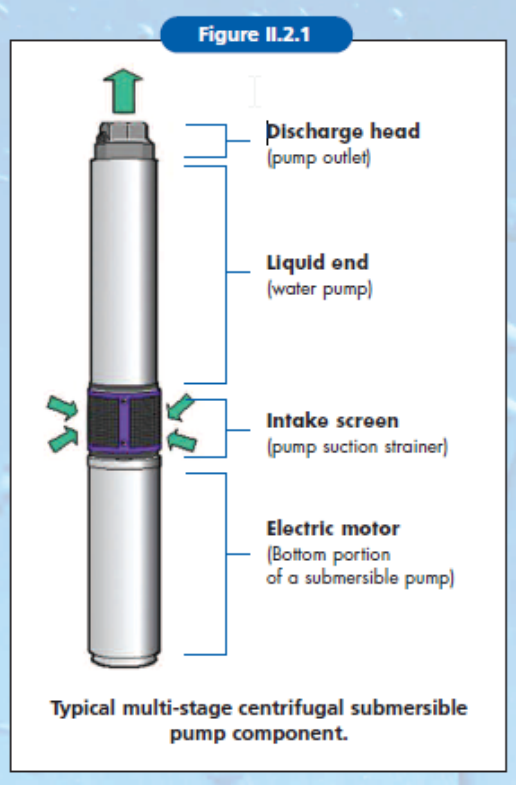


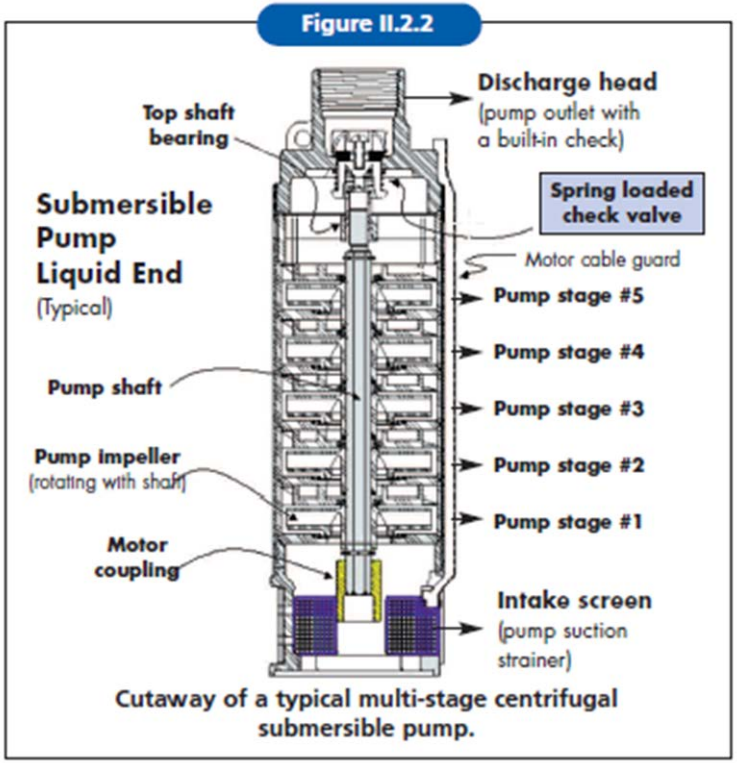


1. CHECK VALVE
2. BRASS ROPE ADAPTER
3. IDEAL CLAMP
4. HEAT SHRINK SPLICE KIT
5. TORQUE ARRESTOR
6. SAFETY ROPE
7. CABLE TIE
8. CABLE GUARD
9. PITLESS ADAPTER
10. BRASS INSERT FITTING
11. WATERTIGHT WELL CAP
12. WELL SEAL
13. CHECK VALVE
14. TANK TEE
15. DRAIN VALVE
16. BRASS NIPPLE
17. RELIEF VALVE
18. PRESSURE GUAGE
19. PRESSURE SWITCH
20. SAFETY SWITCH
21. PUMP SAVER
22. LIGHTNING ARRESTOR
23. BALL VALVE

**Please Note:*
This diagram is for visual identification of well parts and is not necessarily typical of a standard well, pump and tank installation.

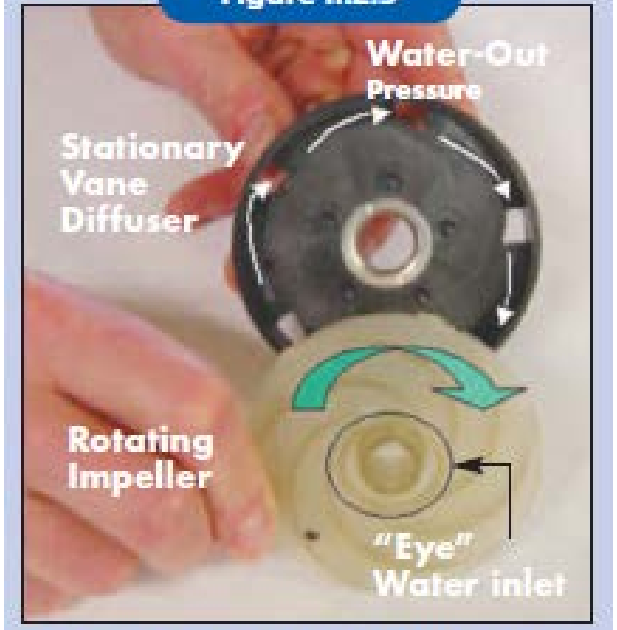
Submersible Pump Components





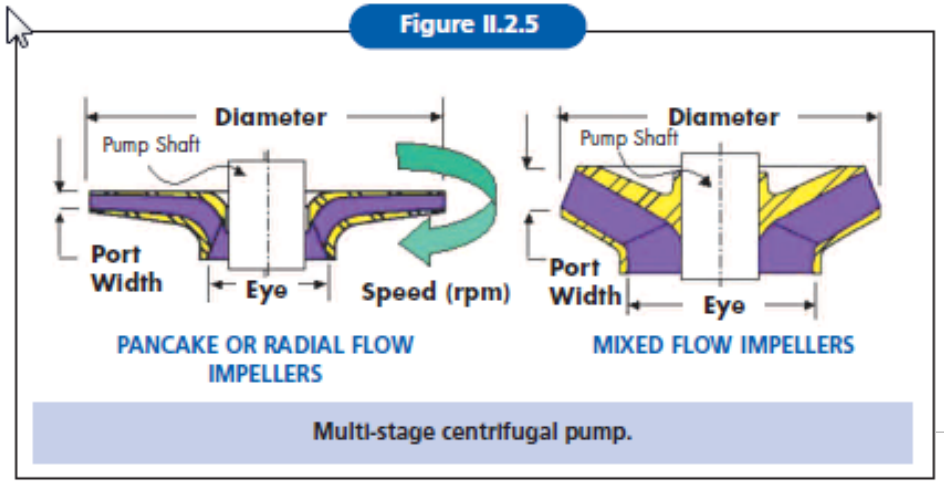
Submersible Hydraulics

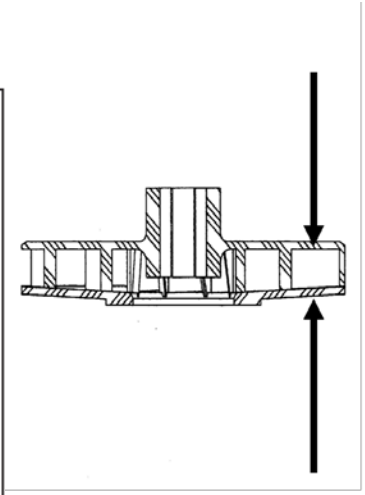
- Each stage does the same flow
- Each stage does an equal share of head
  - In a 10 stage pump each stage makes 10% of head
  - In a 10 gpm pump each stage pumps 10 gpm
- Installing a 1 HP motor on a ½ hp water end (pump) will not increase flow or total head.



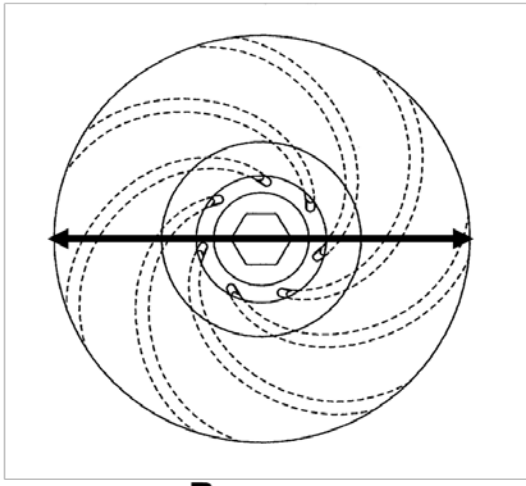
Front side: The bottom of a submersible pump stage.

Impellers





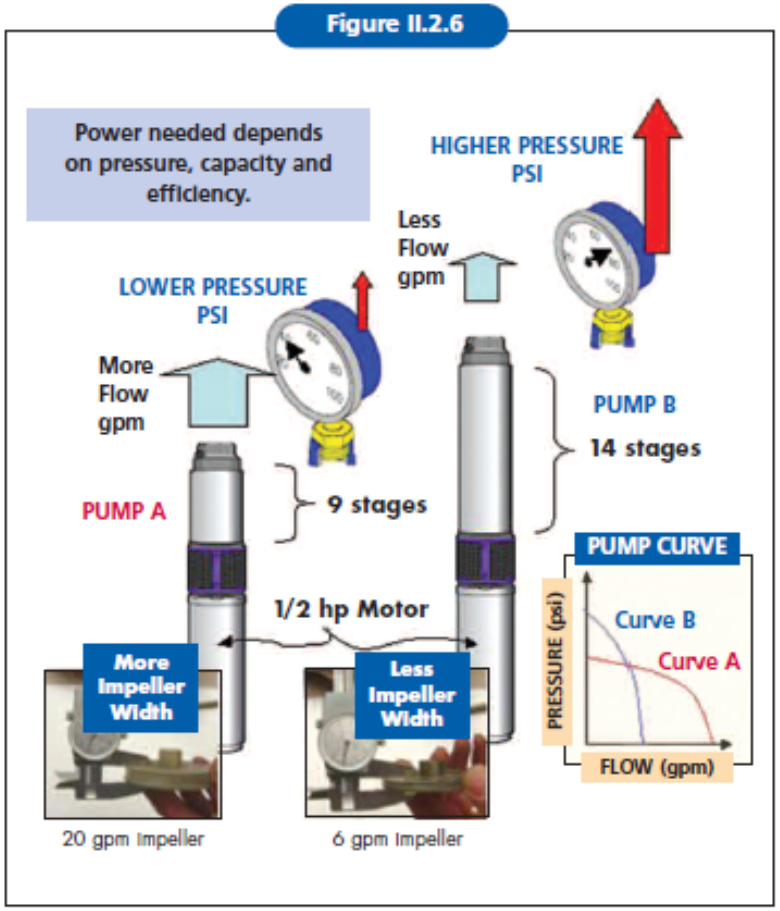
Capacity



Pressure

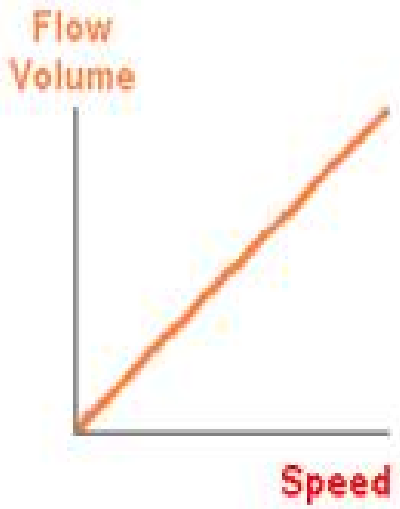
Sizing

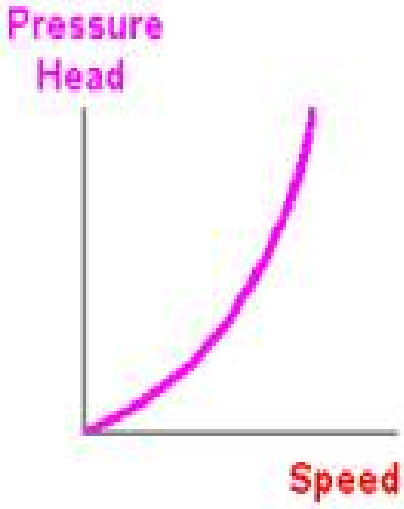
- Impeller diameter, number of stages and rpm's dictate flow, total head created and HP required
- Increasing or decreasing motor speed will:
  - Change flow in direct relation to speed
  - Change head to the square of the speed change
  - Change HP to the cube of the speed change

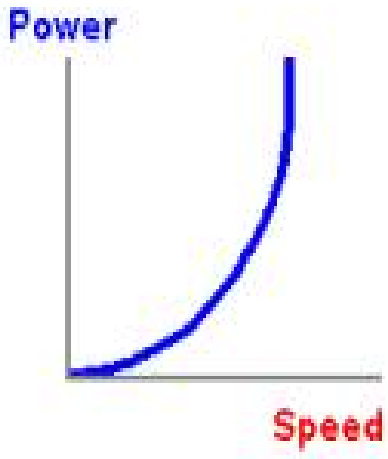


Affinity Laws

- VFD's can be used to maintain flow or pressure in a system.
- Speed changes: Flow, Pressure, Hp





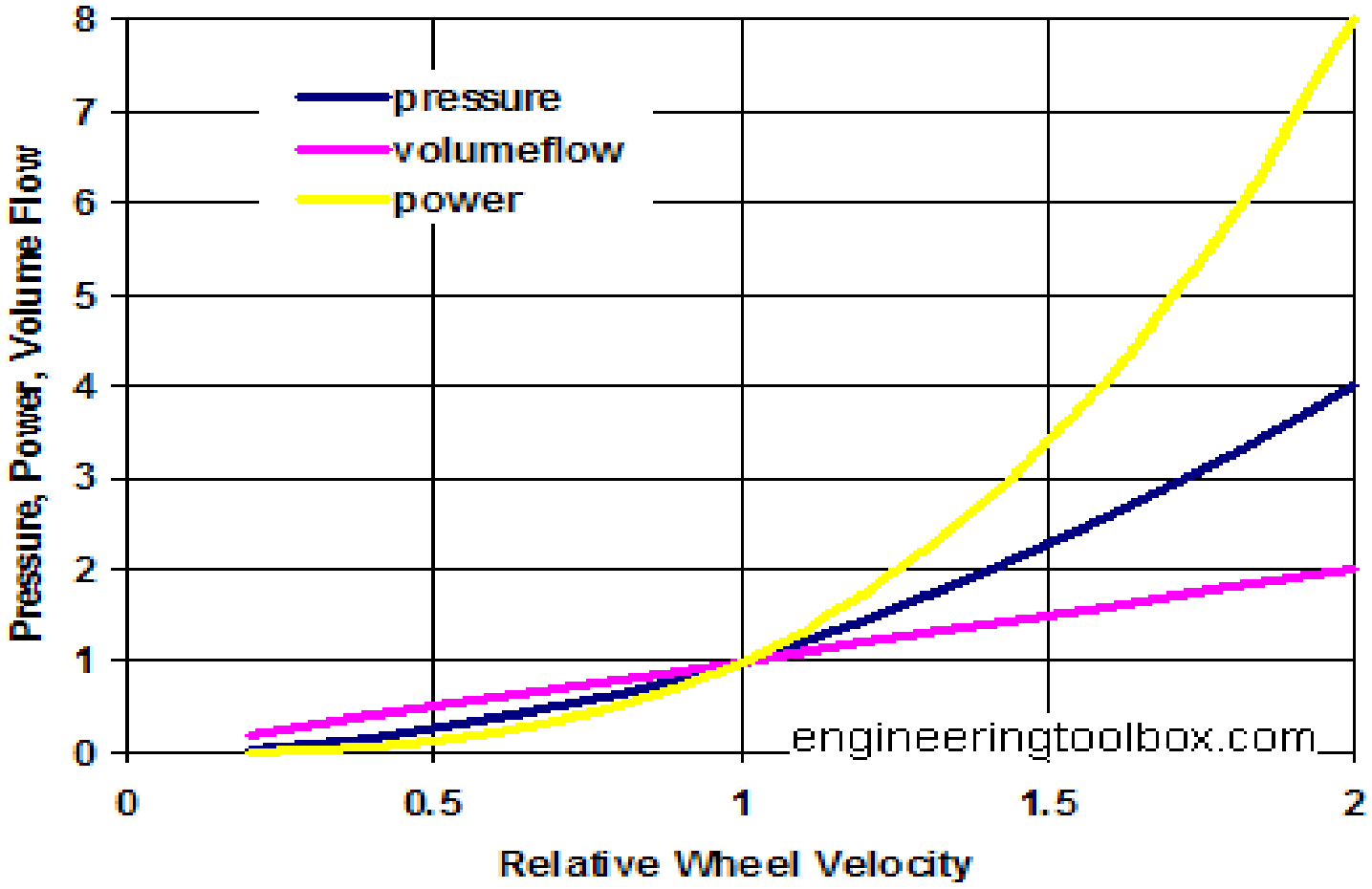


$$\frac{Flow_1}{Flow_2} = \frac{RPM_1}{RPM_2}$$

$$\frac{Head_1}{Head_2} = \left(\frac{RPM_1}{RPM_2}\right)^2$$

$$\frac{Power_1}{Power_2} = \left(\frac{RPM_1}{RPM_2}\right)^3$$

Affinity Laws

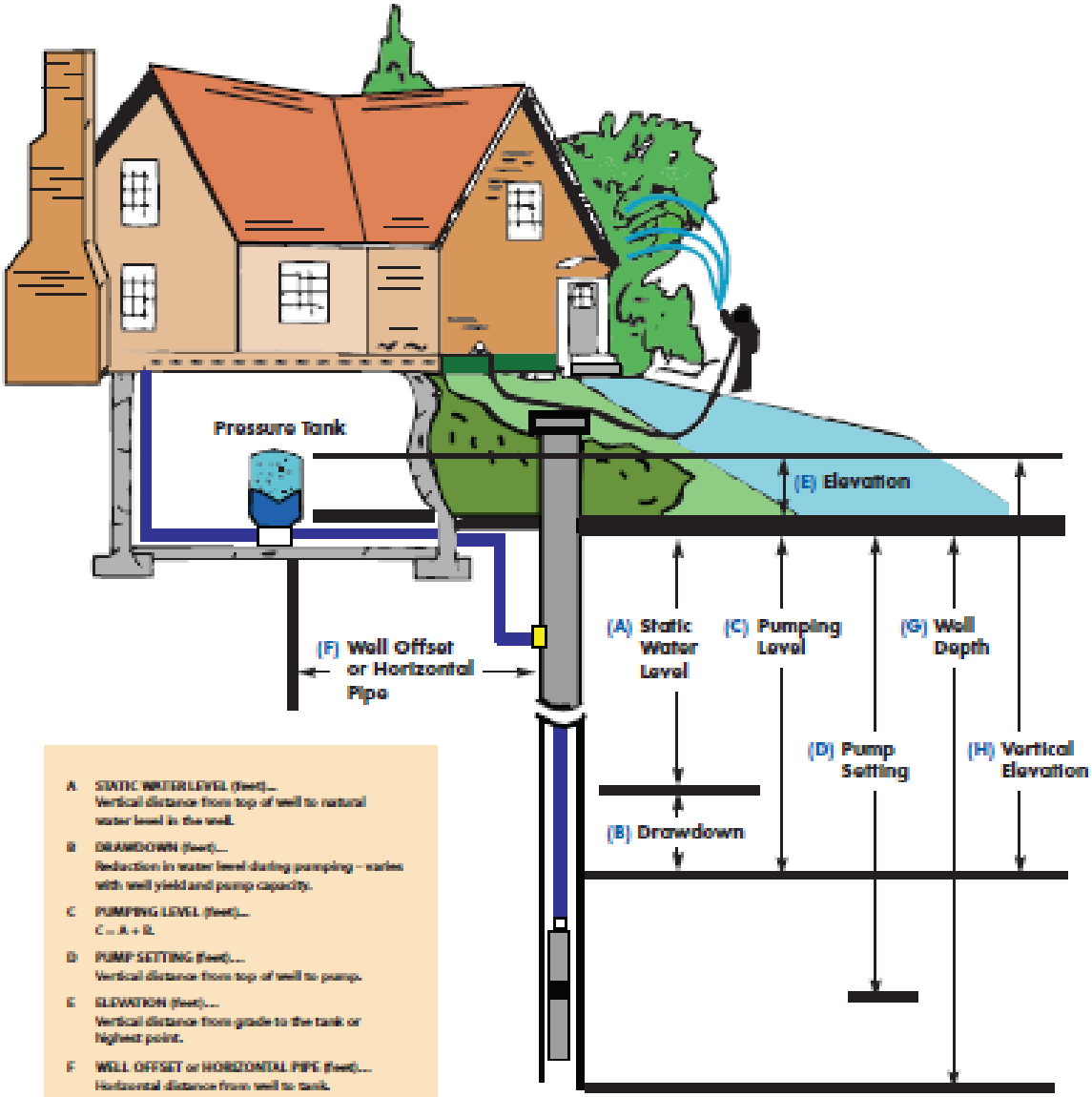


Submersible Pump Benefits

- Subs are more efficient than jet pumps
- Submersibles can pump from greater depths (more pressure) than jets
- They are easier to install than deep well jet pumps
- Variable speed use
- Subs can make more pressure than most jet pumps
- A sub can pump can offer higher flow rates than a deep well jet pump
- They are quiet and out of the reach of owners
- Several corrosion and abrasion resistant materials available

Considerations for Proper Pump Selection

- Adequate capacity (GPM) for present and future use.
- Adequate pressure for present and future use and for the possibility of a lower water level in the well
- Cost of the pump
- Cost of labor to install the pump
- Cost of materials to install the pump(piping, fittings, accessories, well pit)
- Power supply
- Space needed to install the pump,
- Cost and ease of servicing the pump
- Operating cost



A STATIC WATER LEVEL (feet)...
Vertical distance from top of well to natural water level in the well.

B DRAWDOWN (feet)...
Reduction in water level during pumping – varies with well yield and pump capacity.

C PUMPING LEVEL (feet)...
C = A + B.

D PUMP SETTING (feet)...
Vertical distance from top of well to pump.

E ELEVATION (feet)...
Vertical distance from grade to the tank or highest point.

F WELL OFFSET or HORIZONTAL PIPE (feet)...
Horizontal distance from well to tank.

G WELL DEPTH (feet)...
Vertical distance from grade to bottom of well.

H VERTICAL ELEVATION (feet)...
Vertical distance from the pumping level to the highest point... H = C+ E.

FRICTION LOSS =
Total Length of Pipe (D+E+F)
Determined by capacity (gpm) and pipe size (see Appendix).

TOTAL DYNAMIC HEAD (TDH) =
C+E + Friction Loss + Discharge Pressure at Tank.
Expressed in feet of head.

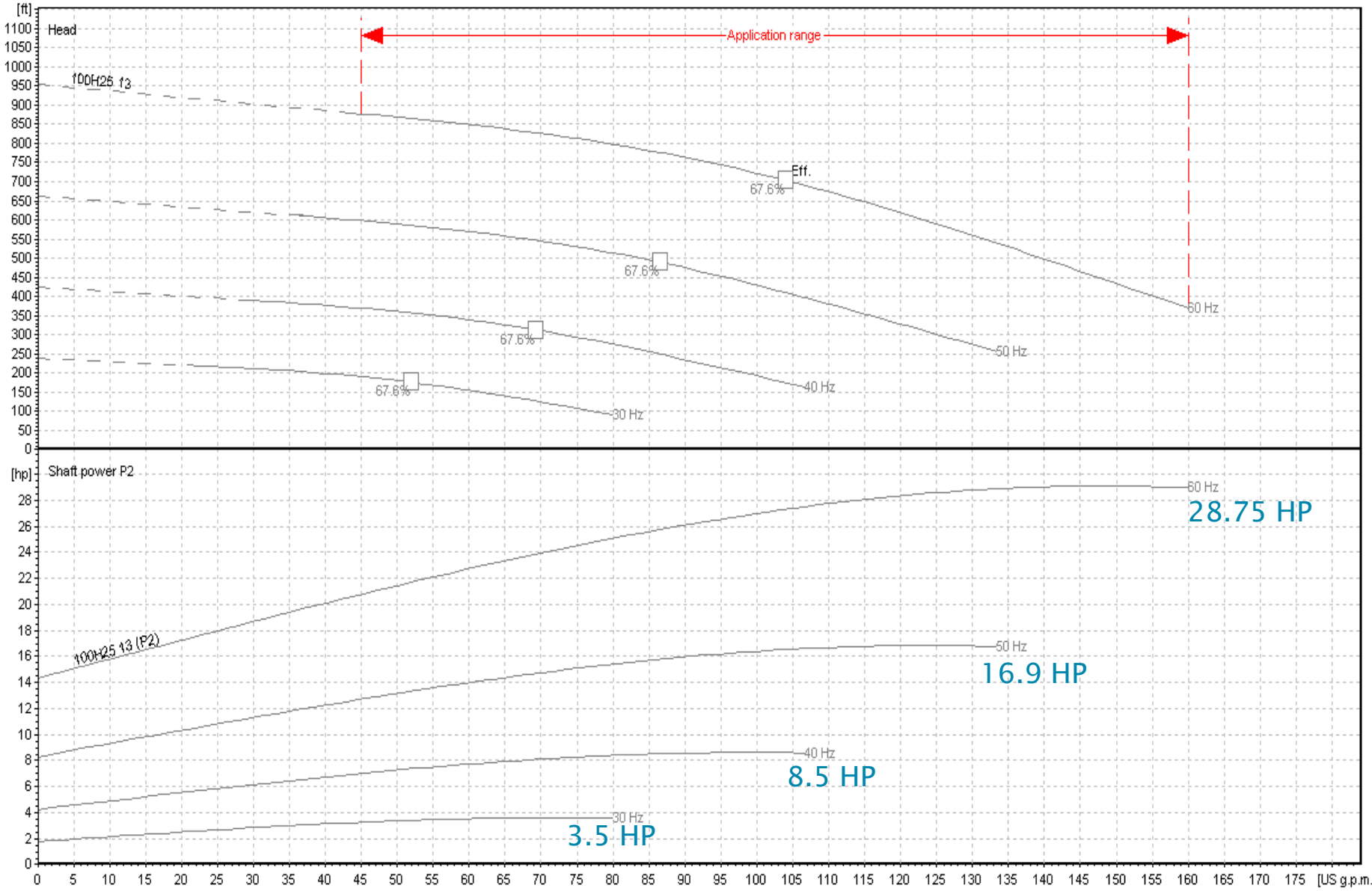
Layout of a pumping system using a submersible pump.

When well capacity is less than demand

- When well capacity cannot meet peak demand
  - Additional storage
    - Using water in well as storage
    - Storage tanks


WELL PUMP LOCKOUT
TREATED SUPPLY TO STORAGE

Pump Selection Software Curve



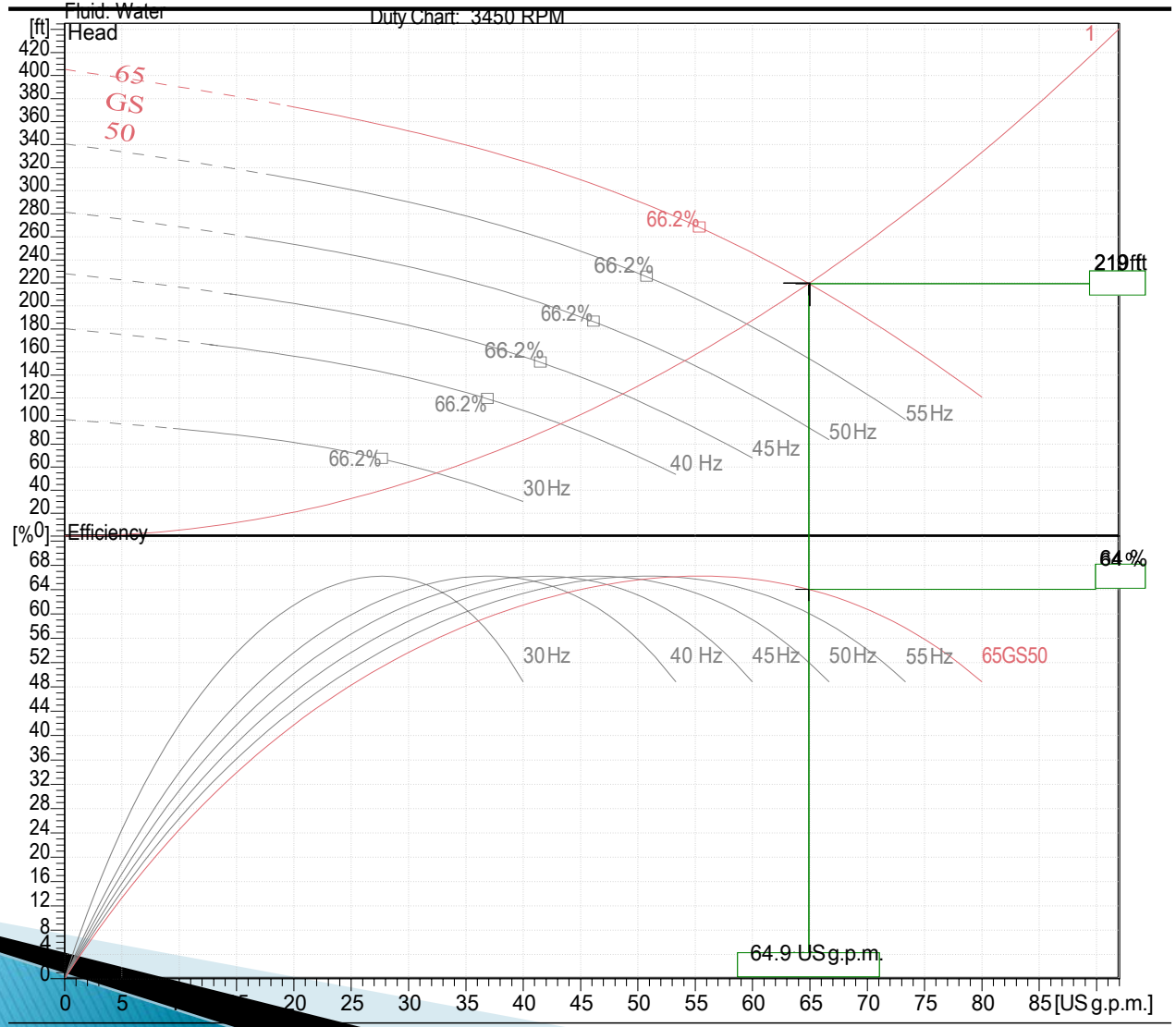
GOULDS WATER TECHNOLOGY
a xylem brand

Performance Data

35-85GS Series
Submersible Pumps
MODEL : 65GS50

Hydraulic Data				Motor Data	4 Inch eGSHC Submersible High Capacity
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	Voltage / Phase / Enclosure	Model
80 US g.p.m.	65 US g.p.m.	405 ft	220 ft		65GS50

Submittal Prepared for: _____ Job: _____
Engineer: _____ Contractor: _____
Submittal Prepared by: _____ Company: _____
Submittal Date: 26.03.2018 Approved by: _____ Date: _____



Important items to review

- Well depth
- Well production
- Static/pumping levels
- Daily demand
- Peak demand
- Water quality
- Filter service flow
- Ability to backwash filter

For a well system to operate properly and efficiently all of these items need to be considered