OSS Commercial Designer Workshop

Dose Tank and Effluent Pumps

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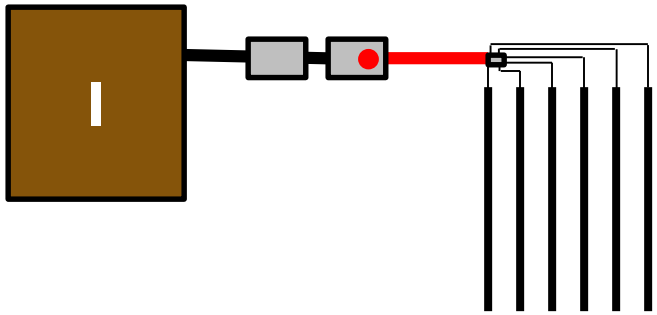
November 7, 2017

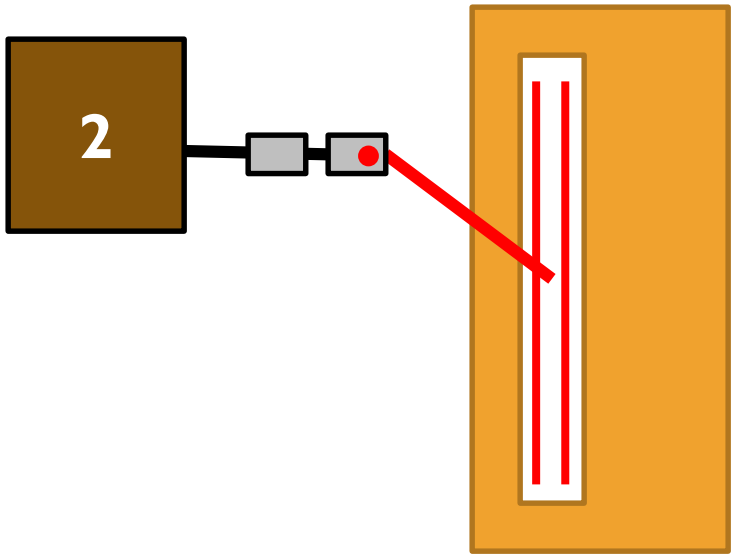
Indiana State Department of Health

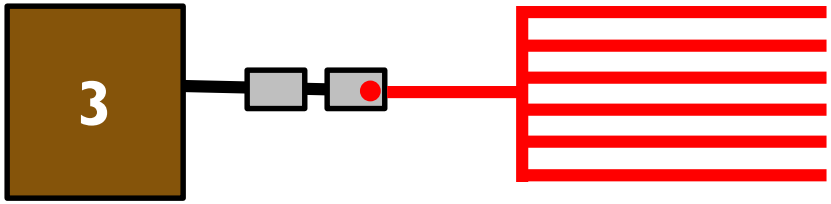
Systems with Pumps



Subsurface Trench
Flood Dosed

Elevated Sand Mound
Pressure Distribution



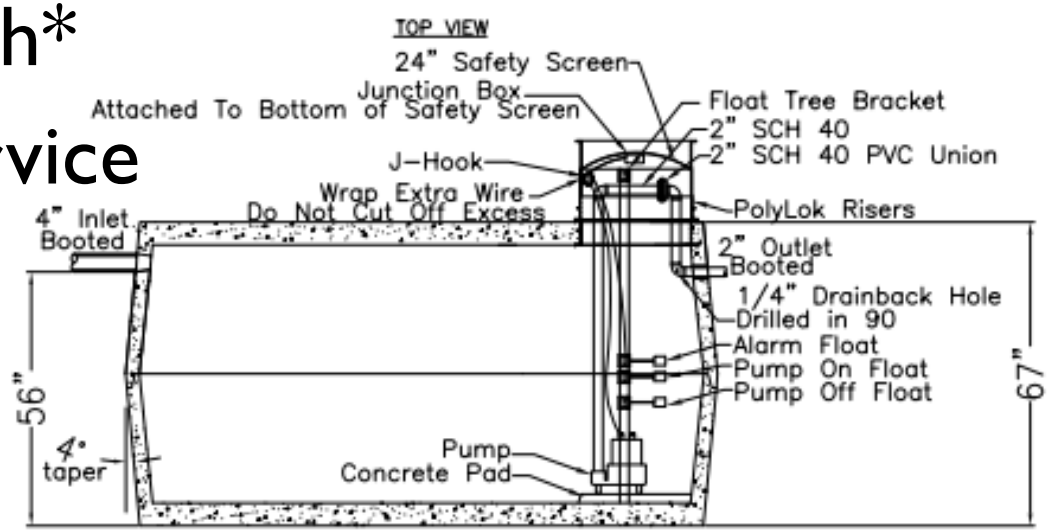


Subsurface Trench
Pressure Distribution

Dosing Tank:
Material and Design specs

- Manufacturer
- Materials
- Capacity
- Connectors
- Gallon per inch*
- Access for service
- Components

Use a Manufacturer's cut sheet



Dose Tank

- Cross section view
- Gal/in or gal/ft
- Manufacturer
- Working capacity
- Maximum bury depth (if >2', manuf. statement)

- ☐ Pump curves provided on plans
- ☐ Acceptable pump selection
- ☐ Quick disconnect
- ☐ Lifting rope or chain
- ☐ Guide rails (required if DDF > 750 gpd)
- ☐ NEMA 4X electrical box
- ☐ Pump and alarm on separate circuit

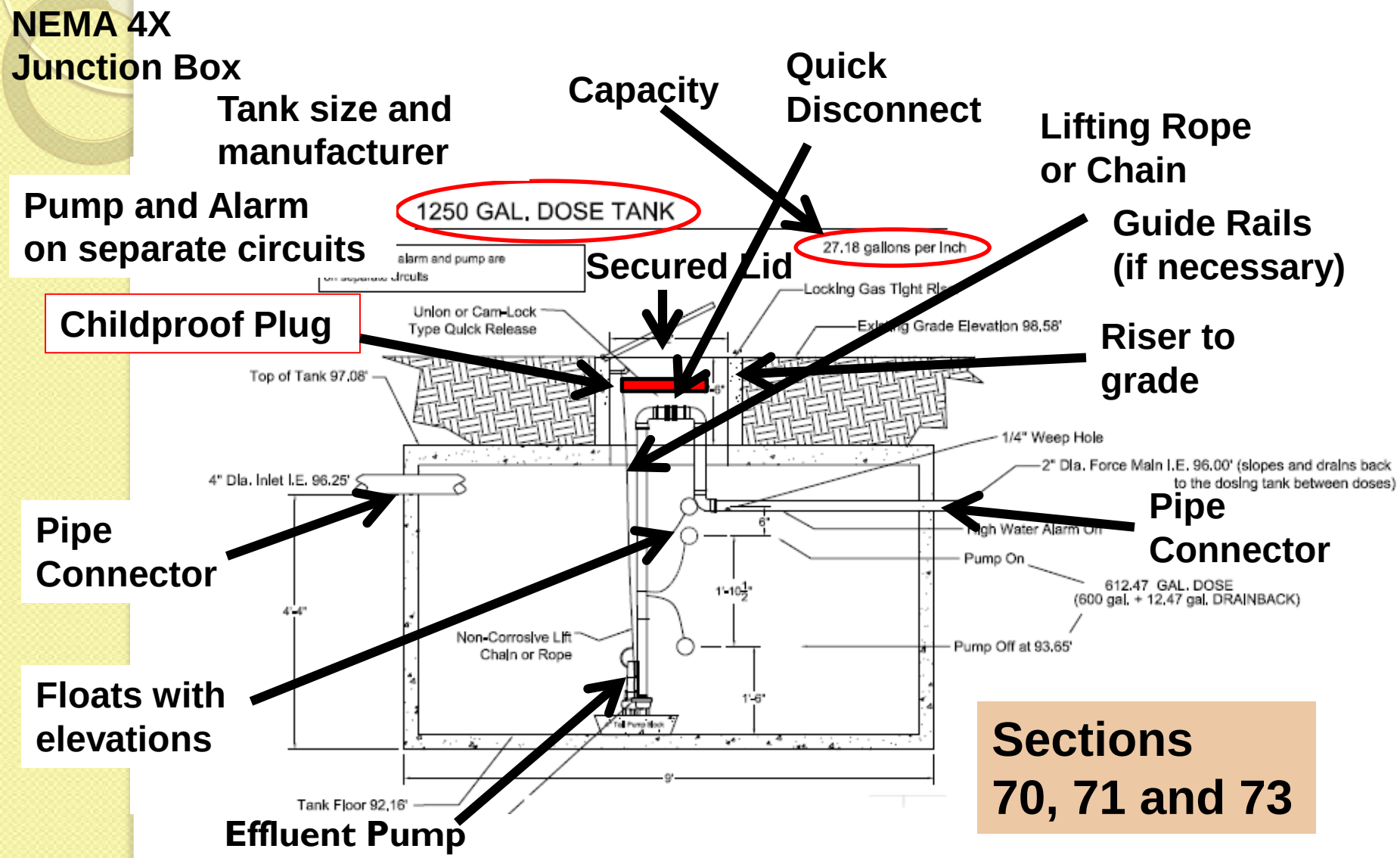
☐ *Check here if no "Dosing Tanks, Pump and Force Mains" in this project and skip to the next section.*

YES	N/A	Dosing Tank, Pump and Force Main	Example Drawing	Meets or Exceeds	Does Not Meet	Additional Information	N/A	
		Cross section view provided with all necessary information (see example drawing)?						494

	Dose Tank #1	Dose Tank #2	Dose Tank #3
Tank Manufacturer:			
Material:			
Tank Liquid Capacity:			
Tank Connector Mfgr:			
k Connector Model #:			

Adequately sized and lockable access ports?					508
If dosing tank(s) will be buried greater than 2', plans must include manufacturer's maximum bury depth rating.					510
Lid installed above floodplain elevation?					512

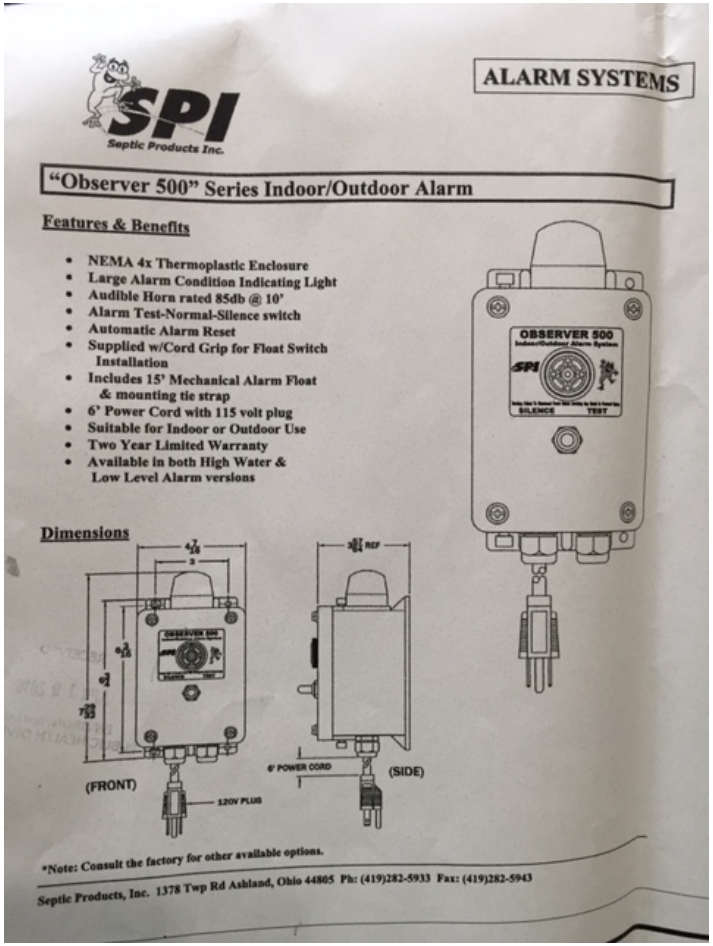
Dose Tank Cross Section



Sections 70, 71 and 73

Alarm

- Visible / Audible
- Separate circuit from pump
- Location?



SPI Septic Products Inc.

ALARM SYSTEMS

"Observer 500" Series Indoor/Outdoor Alarm

Features & Benefits

- NEMA 4x Thermoplastic Enclosure
- Large Alarm Condition Indicating Light
- Audible Horn rated 85db @ 10'
- Alarm Test-Normal-Silence switch
- Automatic Alarm Reset
- Supplied w/Cord Grip for Float Switch Installation
- Includes 15' Mechanical Alarm Float & mounting tie strap
- 6' Power Cord with 115 volt plug
- Suitable for Indoor or Outdoor Use
- Two Year Limited Warranty
- Available in both High Water & Low Level Alarm versions

OBSERVER 500

Dimensions

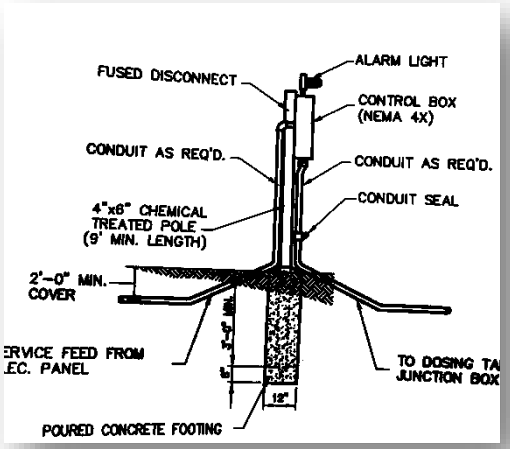
(FRONT) (SIDE)

*Note: Consult the factory for other available options.

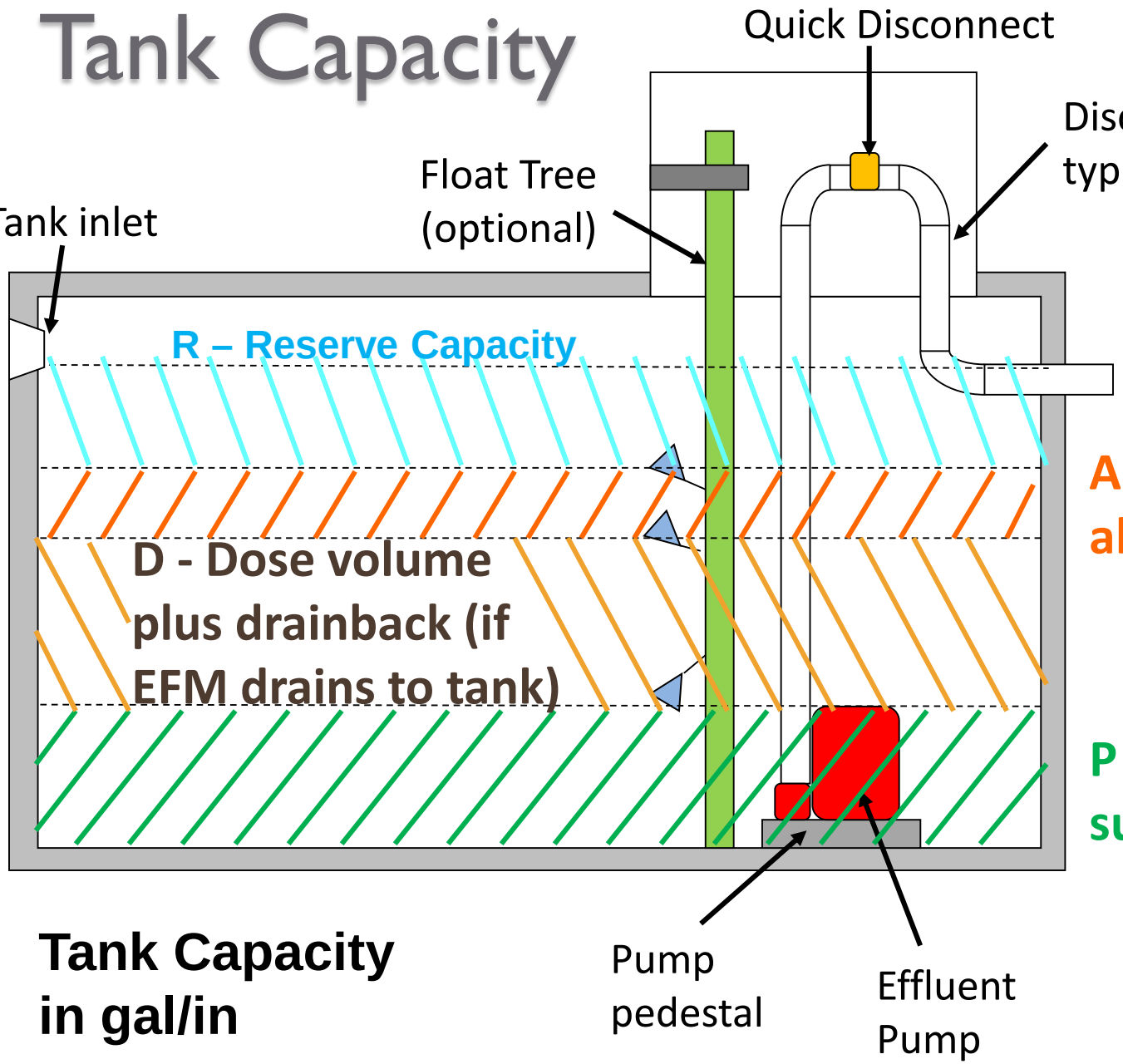
Septic Products, Inc. 1378 Twp Rd Ashland, Ohio 44805 Ph: (419)282-5933 Fax: (419)282-5943

Floats/controls/junction box

- Liquid level sensors are only controls allowed in the dosing tank.
- NEMA 4X box junction box
  - Not in the tank
  - Installed in riser?
  - Optimally outside the tank and riser
- Control box



Tank Capacity



Required dosing tank capacity = P + D + F

A - High water alarm

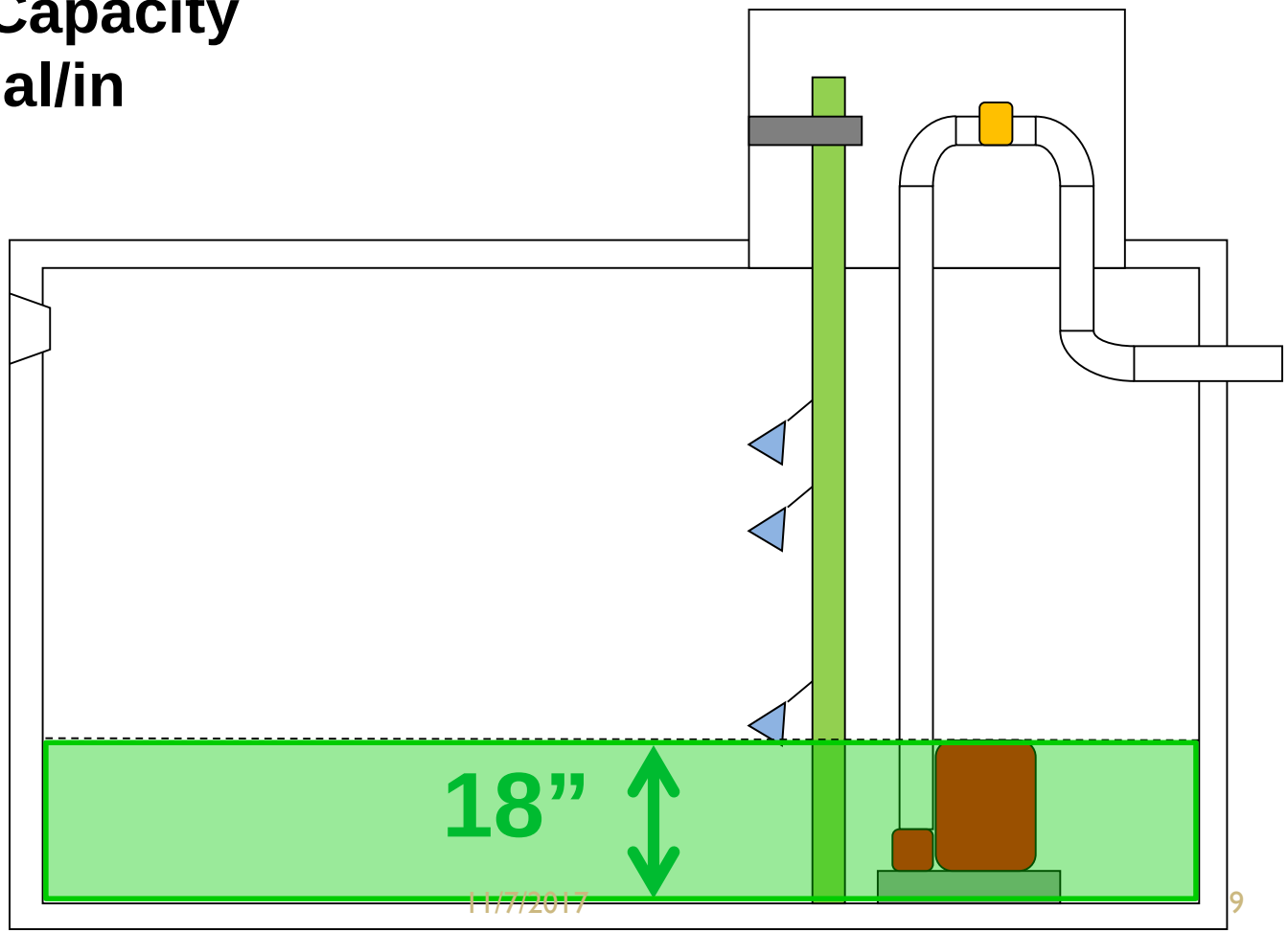
P - Keep pump submerged

Tank Capacity in gal/in

Dose Tank Capacity

Keep the pump submerged…

Tank Capacity
20.5 gal/in

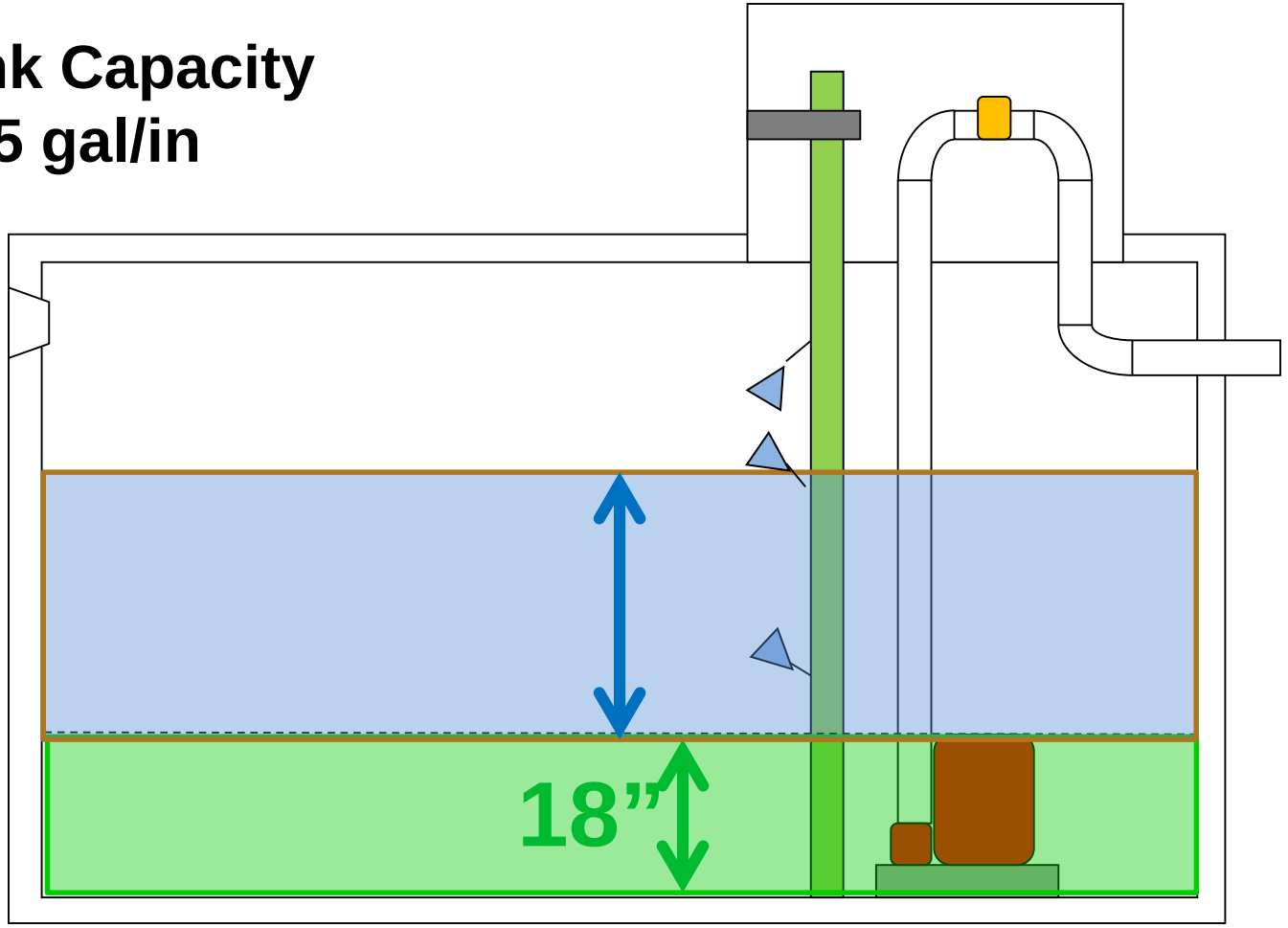


369 gal

Dose Tank Capacity

Total Dose = Dose to SAF + Drainback

Tank Capacity
20.5 gal/in



369 gal

Dose Volume

- Dose to soil absorption field

Flood dosed	**1 DDF**
Subsurface trench pressure distribution	**1 DDF or ¼ DDF Dependent upon SLR**
Elevated sand mound pressure distribution	**¼ DDF**
Sand lined system	**Dependent upon product used (1/3, 1/6, 1 DDF)**

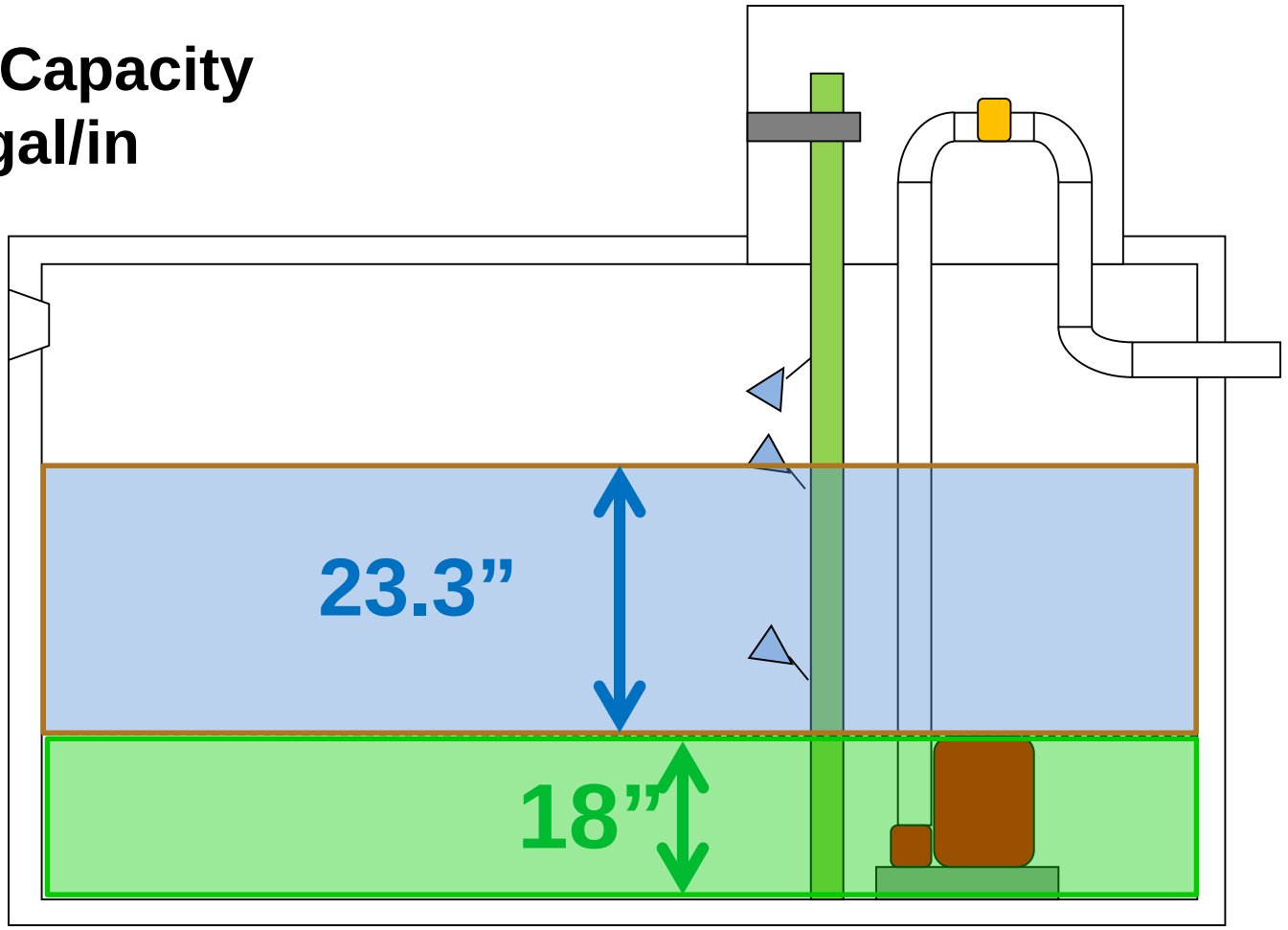
- Drainback
  - Length of pipe X gallons/inch

Dose Tank Capacity

Total Dose = Dose to SAF + Drainback

450 gal 28 gal

Tank Capacity
20.5 gal/in



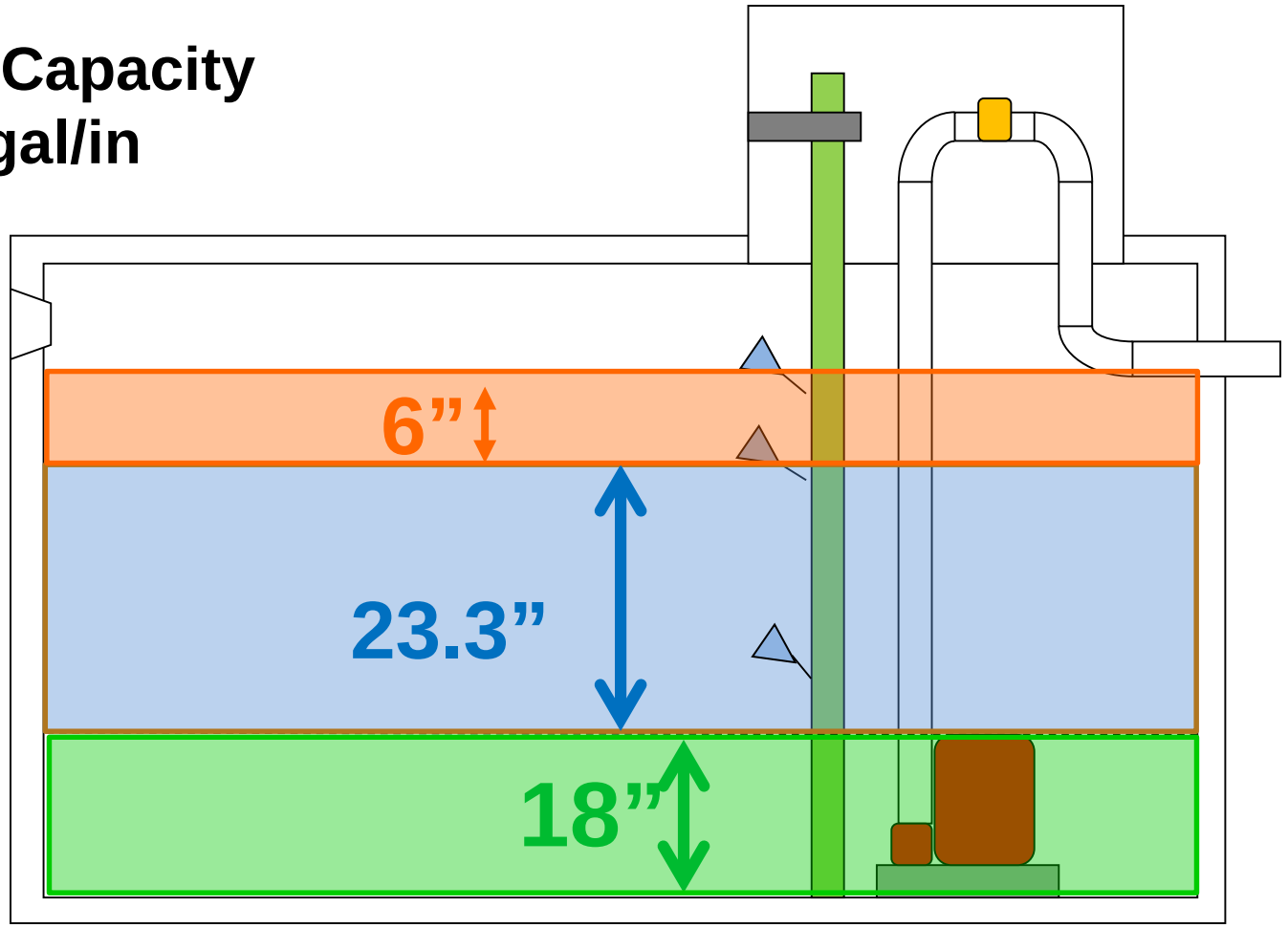
478 gal

369 gal

Dose Tank Capacity

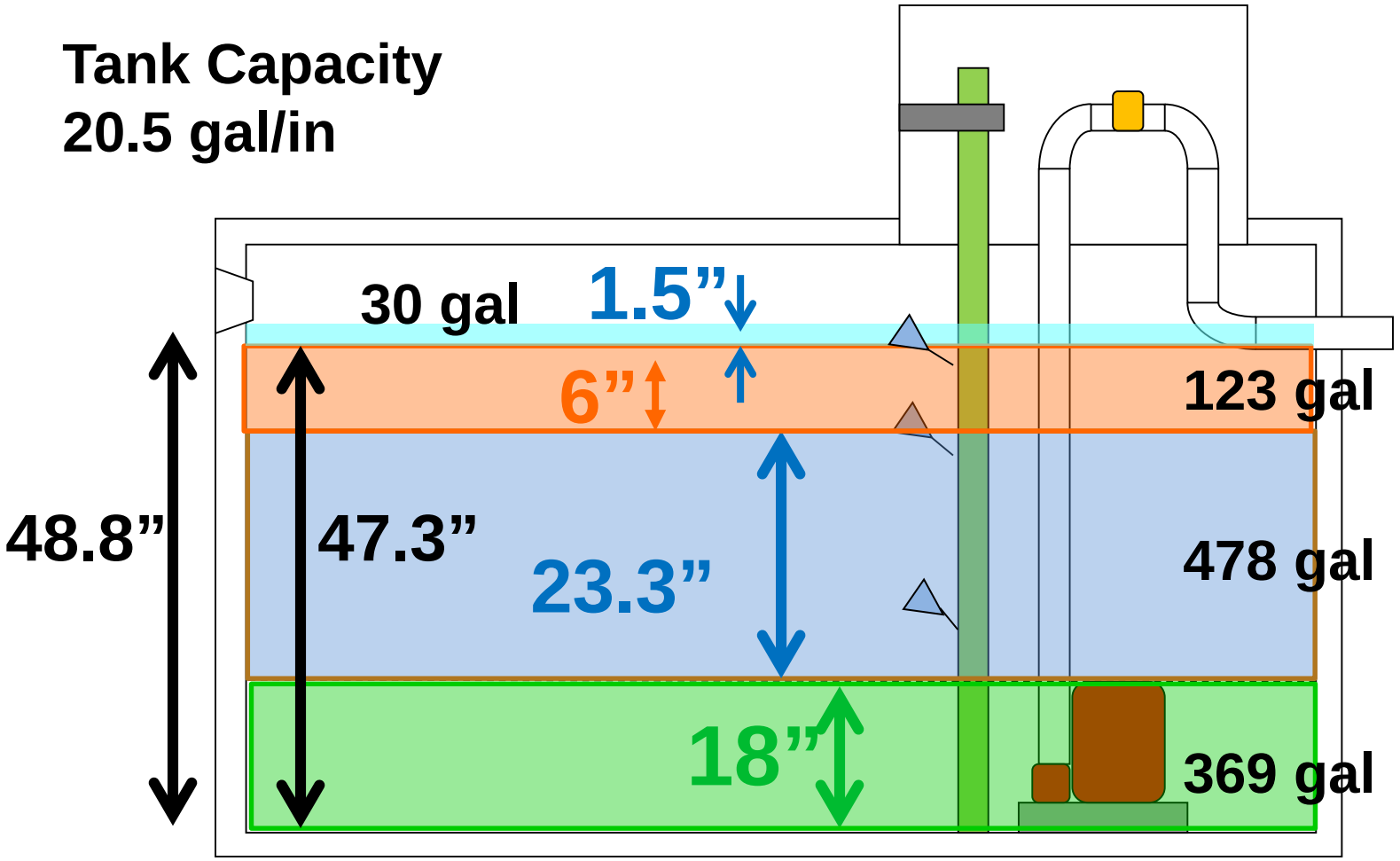
High Water Alarm

Tank Capacity
20.5 gal/in

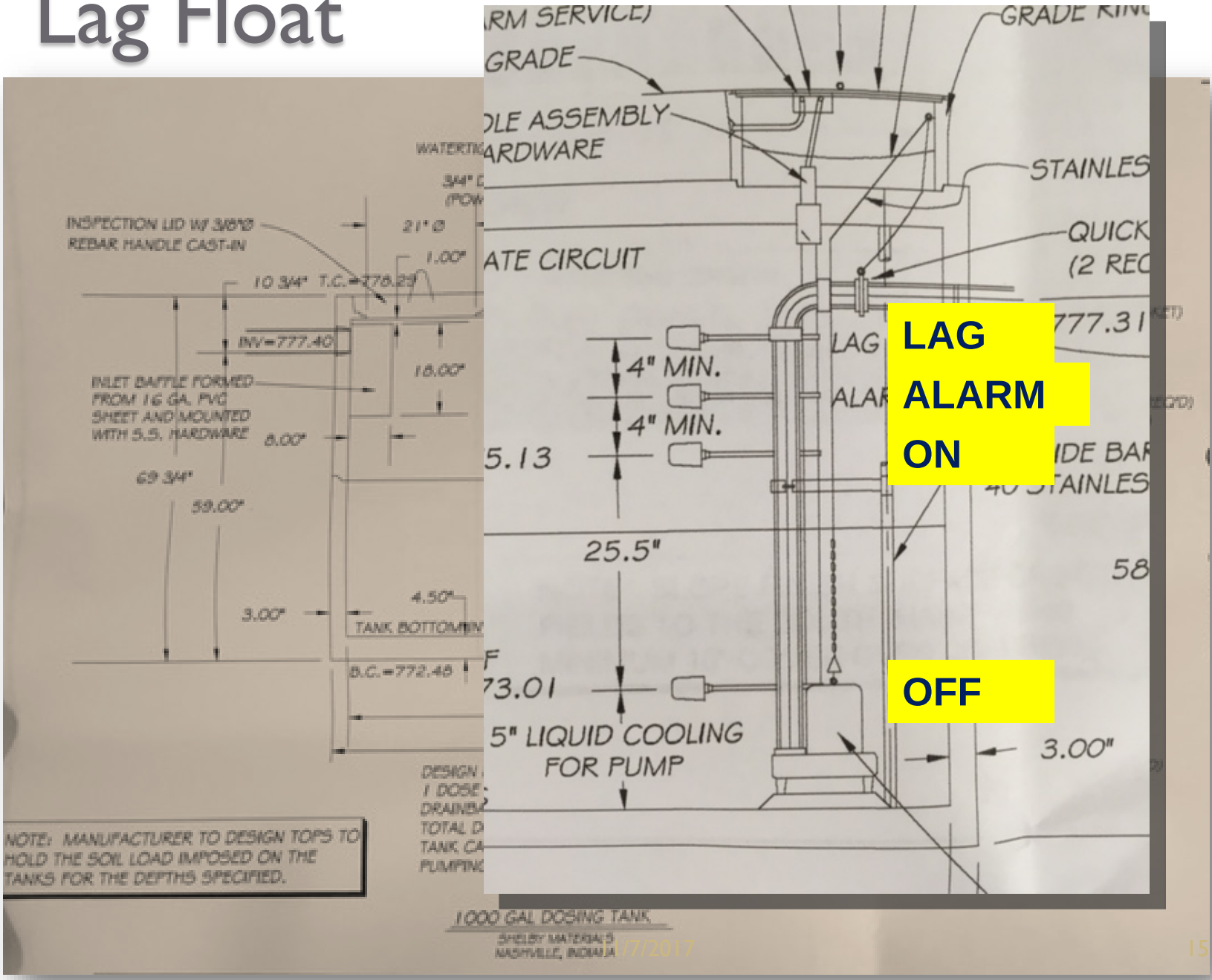


Dose Tank Capacity

Reserve Capacity



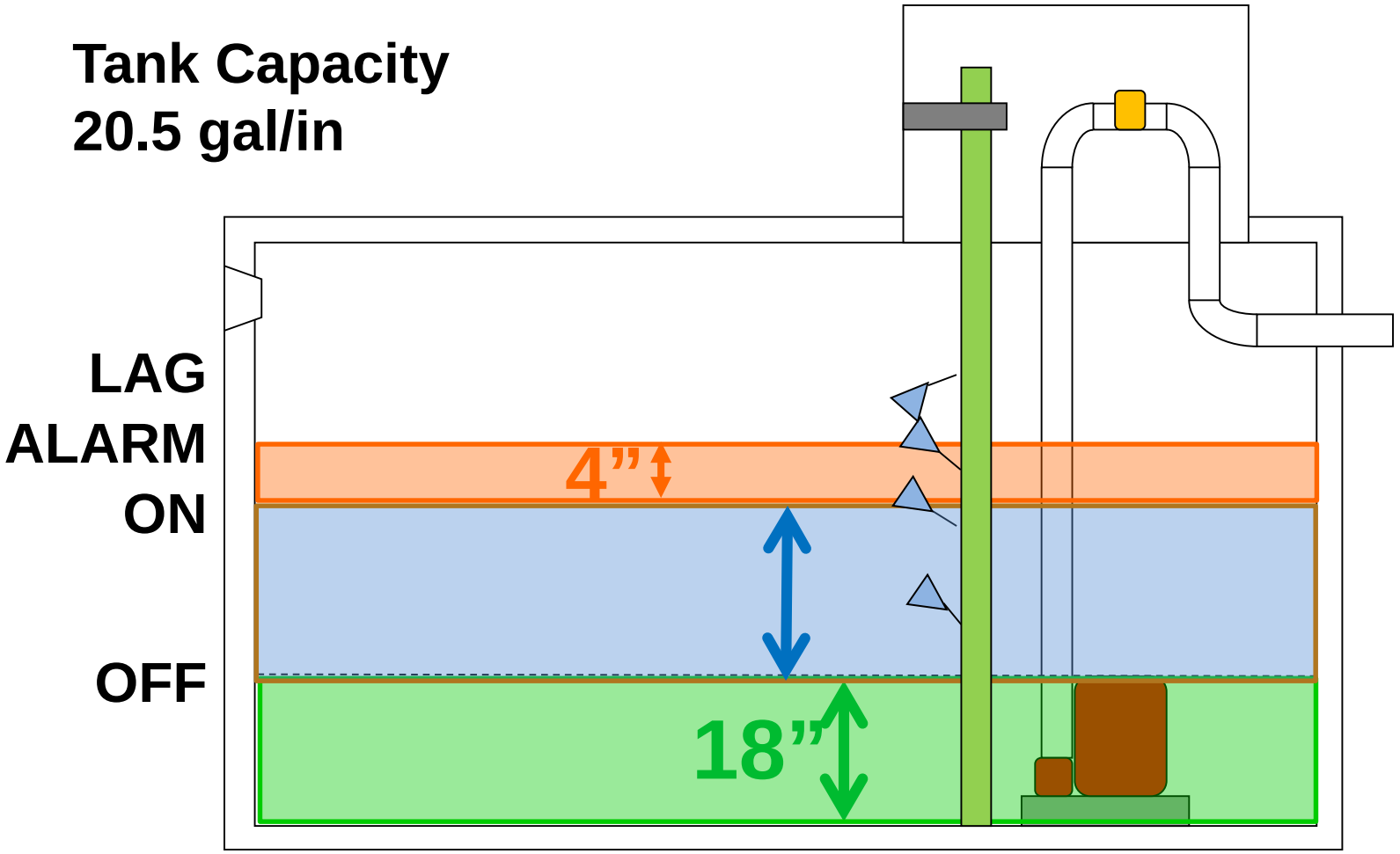
Lag Float


GRADE
LE ASSEMBLY
ARDWARE
STAINLES
QUICK
(2 REC
ATE CIRCUIT
777.31
LAG
ALAR
4" MIN.
4" MIN.
5.13
LAG
ALARM
ON
OFF
25.5"
3.00"
5" LIQUID COOLING
FOR PUMP
INSPECTION LID W/ 3/8"Ø
REBAR HANDLE CAST-IN
21"Ø
1.00"
10 3/4"
INV=777.40
18.00"
INLET BAFFLE FORMED
FROM 16 GA. PVC
SHEET AND MOUNTED
WITH S.S. HARDWARE
8.00"
69 3/4"
59.00"
3.00"
4.50"
TANK BOTTOM
B.C.=772.48
73.01
NOTE: MANUFACTURER TO DESIGN TOPS TO
HOLD THE SOIL LOAD IMPOSED ON THE
TANKS FOR THE DEPTHS SPECIFIED.
1000 GAL DOSING TANK
SHELBY MATERIALS
NASHVILLE, INDIANA

Dose Tank Capacity

Lag Float

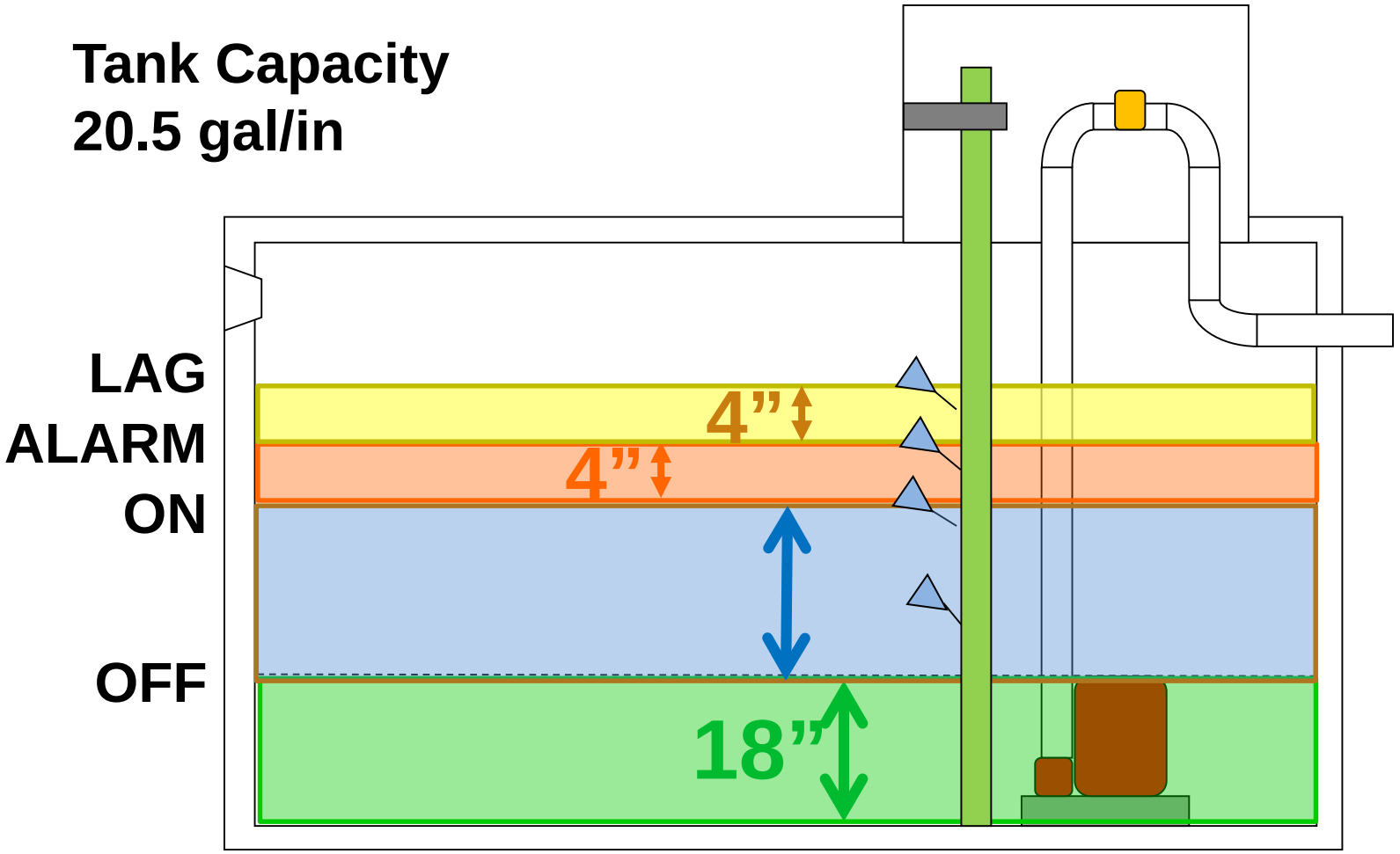
Tank Capacity
20.5 gal/in



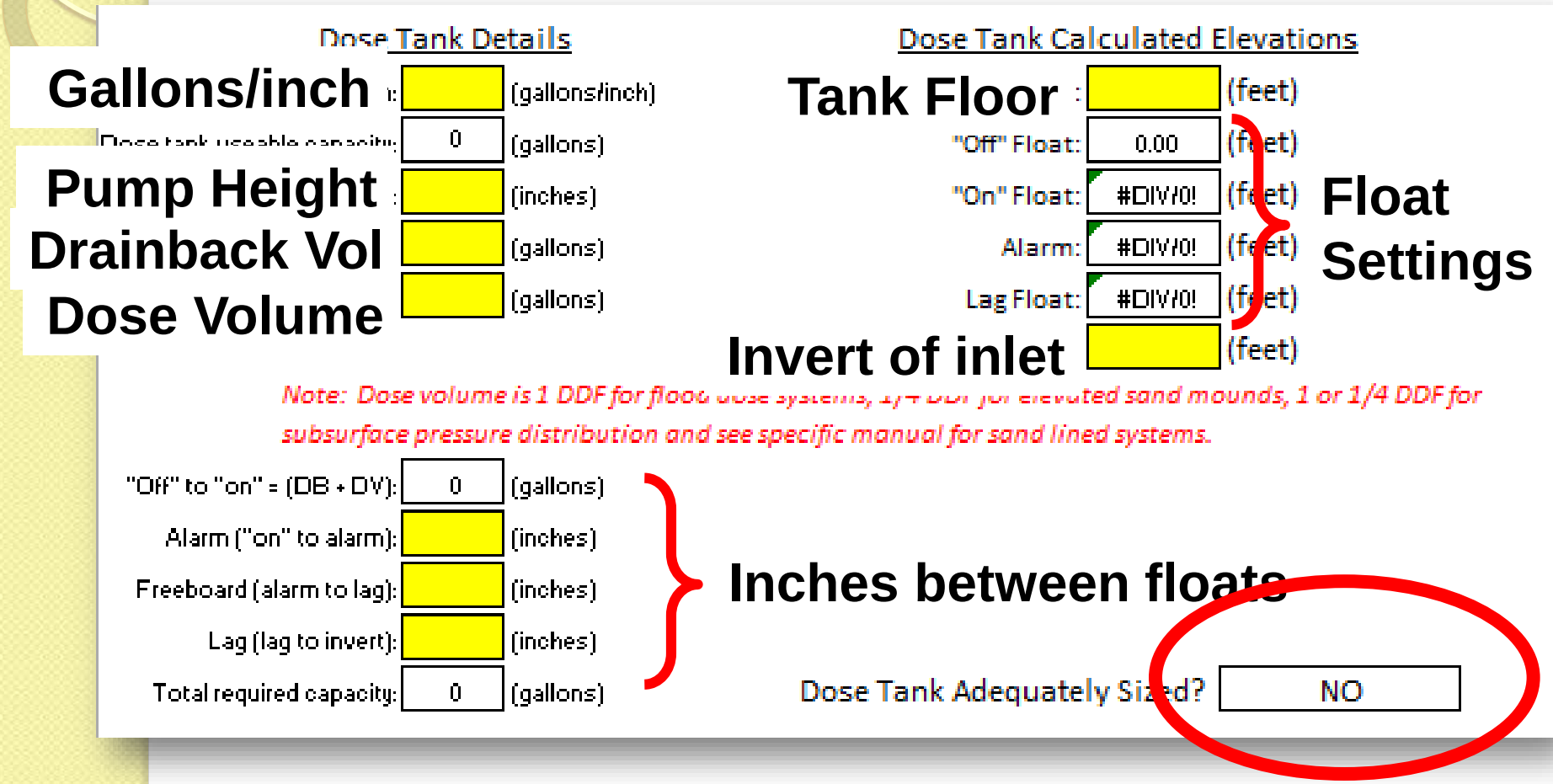
Dose Tank Capacity

Lag Float

Tank Capacity
20.5 gal/in

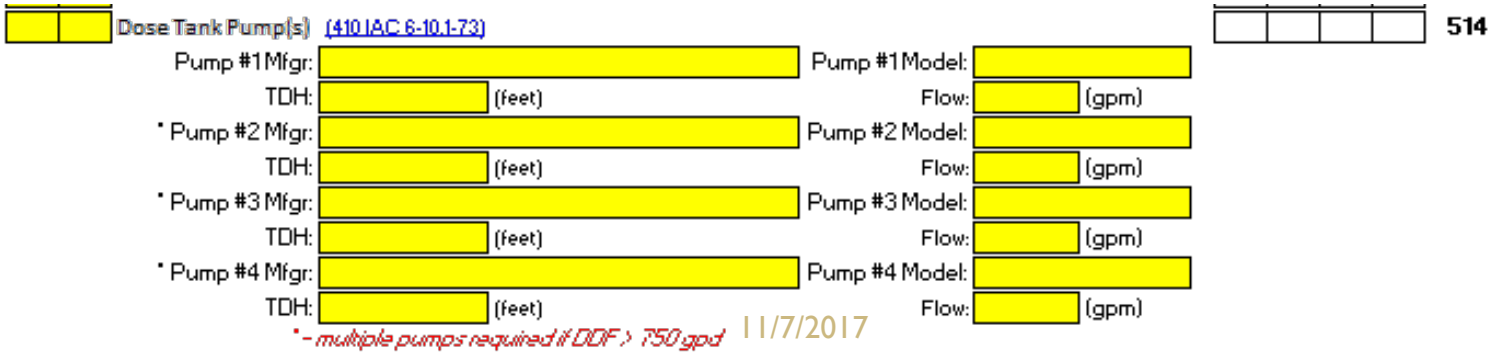


Dose Tank Sizing



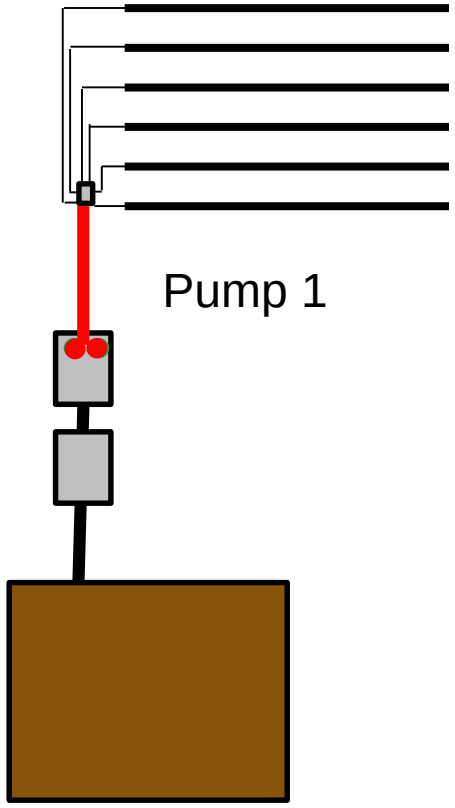
Effluent Pump

- Section 73 of the rule
- Effluent pump
  - Not a grinder or sump pump
  - Sewage pump?
- Pump must fit the system
  - Flow
  - Total Dynamic Head
- Multiple pumps required for DDF over 750 gpd



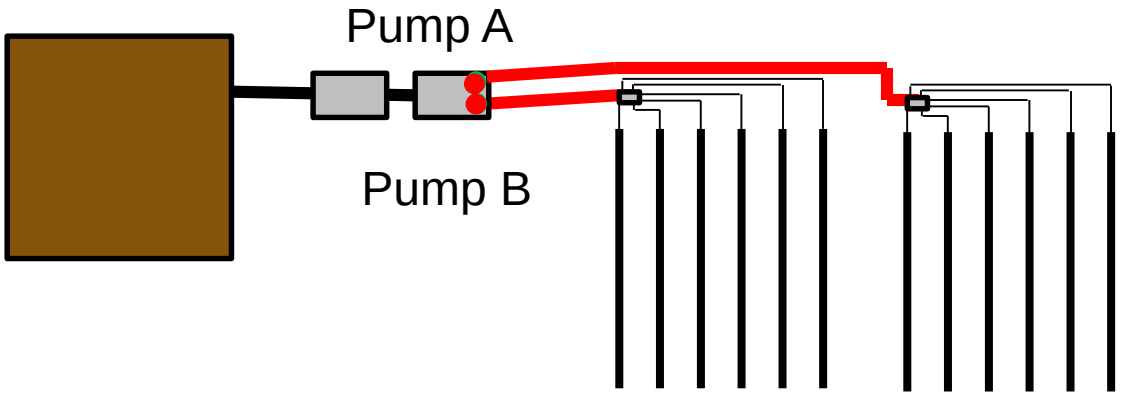
Design Flexibility

Multiple Pumps



- Common Force Main
  - Dose volume = 1 DDF

- Separate Force Main
  - Dose volume = 1/X DDF to each SAF



Where X = the number of SAFs designed

Sizing the Effluent Pump

System flow

- Flood Dosed

Table VIII - Required Effluent Pump Discharge Rates for Subsurface Trench Flood Dosed On-site Sewage Systems	
Design Daily Flow	Discharge Rate in Gallons per Minute
150-299	30-35
300-449	30-35
450-599	30-45
600-749	30-60
750-899	38-75
900+	45-90

Pump run time
10-15 minutes

- Pressure Distribution

Total number of perforations **X** **Perforation Discharge Rate**

Perforation Discharge Rate is dependent upon residual head required
3' residual head – 1.28 gpm per ¼" hole
2.5' residual head – 1.17 gpm per ¼" hole

Total Dynamic Head

Flood Dosed

(or pump assisted)

- **Static Head**
  - Pump off to highest elevation
- **Friction Loss**
  - Length, diameter of effluent force main
  - Equivalent length of fittings
  - Other?

Pressure Distribution

(subsurface or elevated)

- **Static Head**
  - Pump off to highest elev.
- **Friction Loss**
  - Length, diameter of EFM
  - Fittings
  - Other?
- **Residual Head**
  - ESM – 3'
  - Sub PD – 2.5' or 3'

Residual Pressure

Friction Loss

Table XI

Table XI - Plastic Pipe Fittings: Friction Loss - Equivalent Length of Straight Pipe (ft.)*							
Fitting:	1"	1 ¼"	1 ½"	2"	2 ½"	3"	4"
90° elbow, standard sharp radius	5.3	6.7	7.5	[illegible]	9.3	11.1	13.1
90° elbow, long sweep radius	[illegible]	[illegible]	4.0	[illegible]	6.9	7.9	12.0
45° elbow, standard	[illegible]	[illegible]	2.1	[illegible]	3.1	4.0	5.1
Tee Flow (run flow)	[illegible]	[illegible]	2.7	[illegible]	5.1	6.2	8.3
Tee Flow (branch flow)	6.0	7.0	8.0	12.0	15.0	16.0	22.0
Gate Valve	0.6	0.8	1.0	1.5	1.6	2.0	3.0
Male/Female adapter	2.0	2.8	3.5	4.5	5.5	6.5	9.0

*Assigned values. Other values for friction loss may be used if documentation from the pipe manufacturer is provided with the plan submittal.

Table X

Table X - Friction Losses in Plastic Pipe (per 100 feet of pipe) Pipe Diameter, Flow (gpm), Velocity (v)2, and Friction Loss Head (Hf)1														
Flow (gpm)	1"		1 ¼"		1 ½"		2"		2 ½"		3"		4"	
Q	v	H_f	v	H_f	v	H_f	v	H_f	v	H_f	v	H_f	v	H_f
1	0.37	0.11												
2	0.74	0.38	0.43	0.10										
3	1.11	0.78	0.64	0.21	0.47	0.10								
4	1.49	1.31	0.86	0.35	0.63	0.16								
5	1.86	1.92	1.07	0.52	0.79	0.24								
6	2.23	2.70	1.29	0.71	0.95	0.33	0.57	0.10						
8	2.97	4.59	1.72	1.19	1.26	0.56	0.77	0.17						
10	3.71	6.90	2.15	1.78	1.58	0.83	0.96	0.25	0.67	0.11				
15	5.57	14.7	3.22	3.76	2.37	1.74	1.43	0.52	1.01	0.22				
20	7.43	25.2	4.29	6.42	3.16	2.96	1.91	.87	1.34	0.37	0.87	0.13		
25	9.28	38.6	5.37	9.74	3.94	4.46	2.39	1.29	1.68	0.54	1.09	0.19		
30			6.44	13.6	4.73	6.27	2.87	1.81	2.01	0.76	1.30	0.26		
35			7.51	18.2	5.52	8.40	3.35	2.42	2.35	1.01	1.52	0.35	0.88	0.10
40			8.59	23.6	[illegible]	[illegible]	3.83	3.12	2.68	1.28	1.74	0.44	1.01	0.12
45			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.85	[illegible]	[illegible]	1.95	0.55	1.13	0.15
50			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.35	[illegible]	2.17	0.67	1.26	0.18
60			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.62	[illegible]	[illegible]	2.60	0.94	1.51	0.25
70			[illegible]	[illegible]	[illegible]	[illegible]	6.70	8.86	4.69	3.67	3.04	1.25	1.76	0.33
80							7.65	11.5	5.36	4.69	3.47	1.59	2.02	0.42
90							8.60	14.3	6.03	5.83	3.91	1.99	2.27	0.52
100									6.70	7.13	4.34	2.42	2.52	0.63
125									8.38	10.9	5.43	3.72	3.15	0.96
150											6.51	5.16	3.78	1.34
175											7.60	6.90	4.41	1.79
200											8.68	8.93	5.04	2.27
225													5.67	2.84
250													6.30	3.37
275													6.93	4.13
300													7.56	4.87
325													8.19	5.70

[1] This figure is based on flows for PVC Schedule 40 pipe (flow coefficient: C-150). Other values for friction loss [illegible] al. Calculations using the Hazen-Williams equation may be used if provided with the plan submittal.

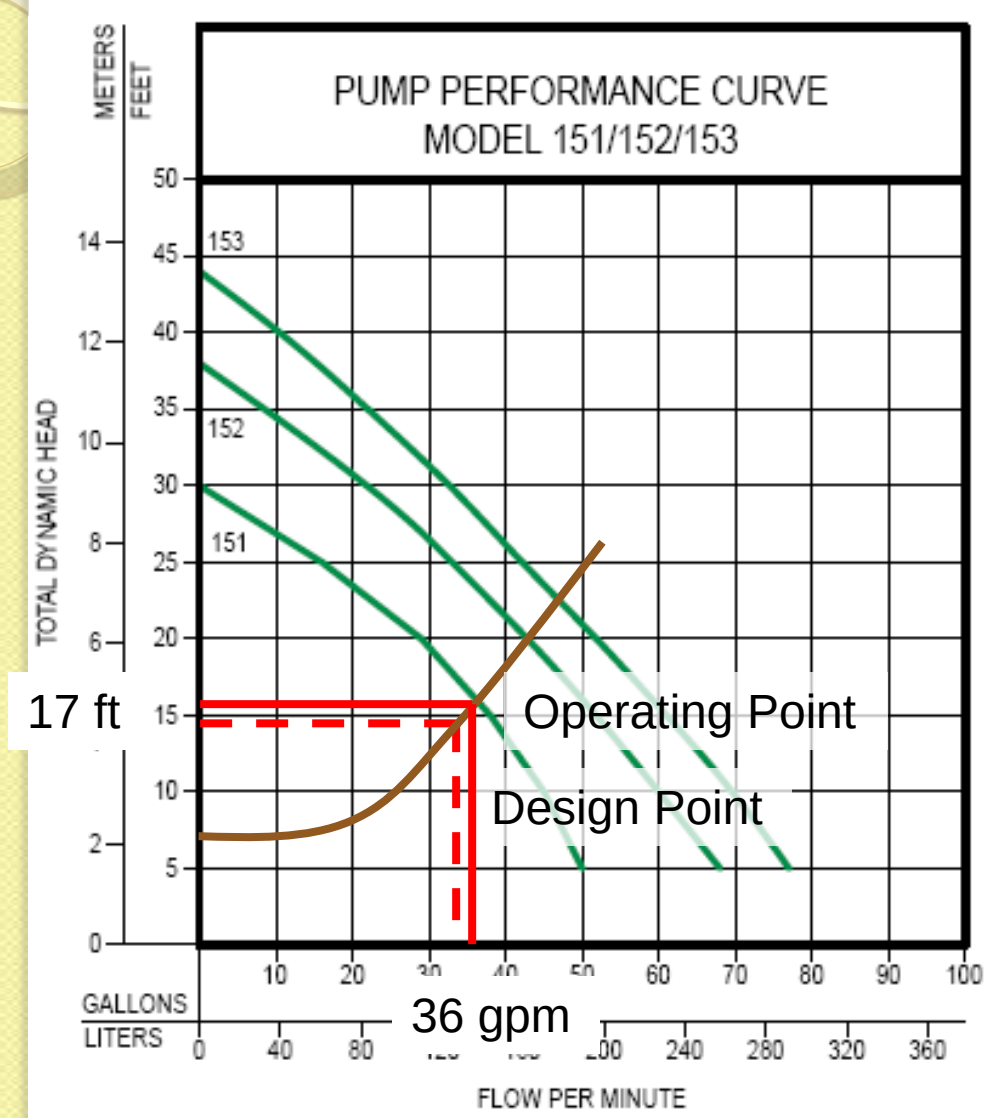
[2] Flow velocity must be at least 2 fps; flow velocities above 5 fps should be avoided.

- Velocity 2-5 fps
- Equivalent Length of pipe for fittings
- Effluent force main must drain, unless installed below the frost line.

Table IX

Table IX - Frost Penetrations in Indiana (in inches)							
Adams	60	Franklin	48	Lawrence	48	Rush	54
Allen	60	Fulton	60	Madison	60	St. Joseph	60
Bartholomew	48	Gibson	42	Marion	54	Scott	36
Benton	60	Grant	54	Marshall	60	Shelby	54
Blackford	60	Greene	54	Martin	48	Spencer	36
Boone	54	Hamilton	54	Miami	60	Starke	60
Brown	48	Hancock	54	Monroe	48	Steuben	60
Carroll	60	Harrison	36	Montgomery	60	Sullivan	54
Cass	60	Hendricks	[illegible]	Morgan	[illegible]	Switzerland	42
Clark	36	Henry	[illegible]	Newton	[illegible]	[illegible]	60
Clay	54	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	60
Clinton	54	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	48
Crawford	36	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	36
Daviess	48	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	60
Dearborn	48	Jay	60	Parke	60	Vigo	60
Decatur	48	Jefferson	42	Perry	36	Wabash	60
Dekalb	60	Jennings	48	Pike	42	Warren	60
Delaware	60	Johnson	54	Porter	60	Warrick	36
Dubois	42	Knox	48	Posey	42	Washington	36
Elkhart	60	Kosciusko	60	Pulaski	60	Wayne	54
Fayette	54	LaGrange	60	Putnam	54	Wells	60
Floyd	36	Lake	60	Randolph	54	White	60
Fountain	60	LaPorte	60	Ripley	48	Whitley	60

Pump Curve

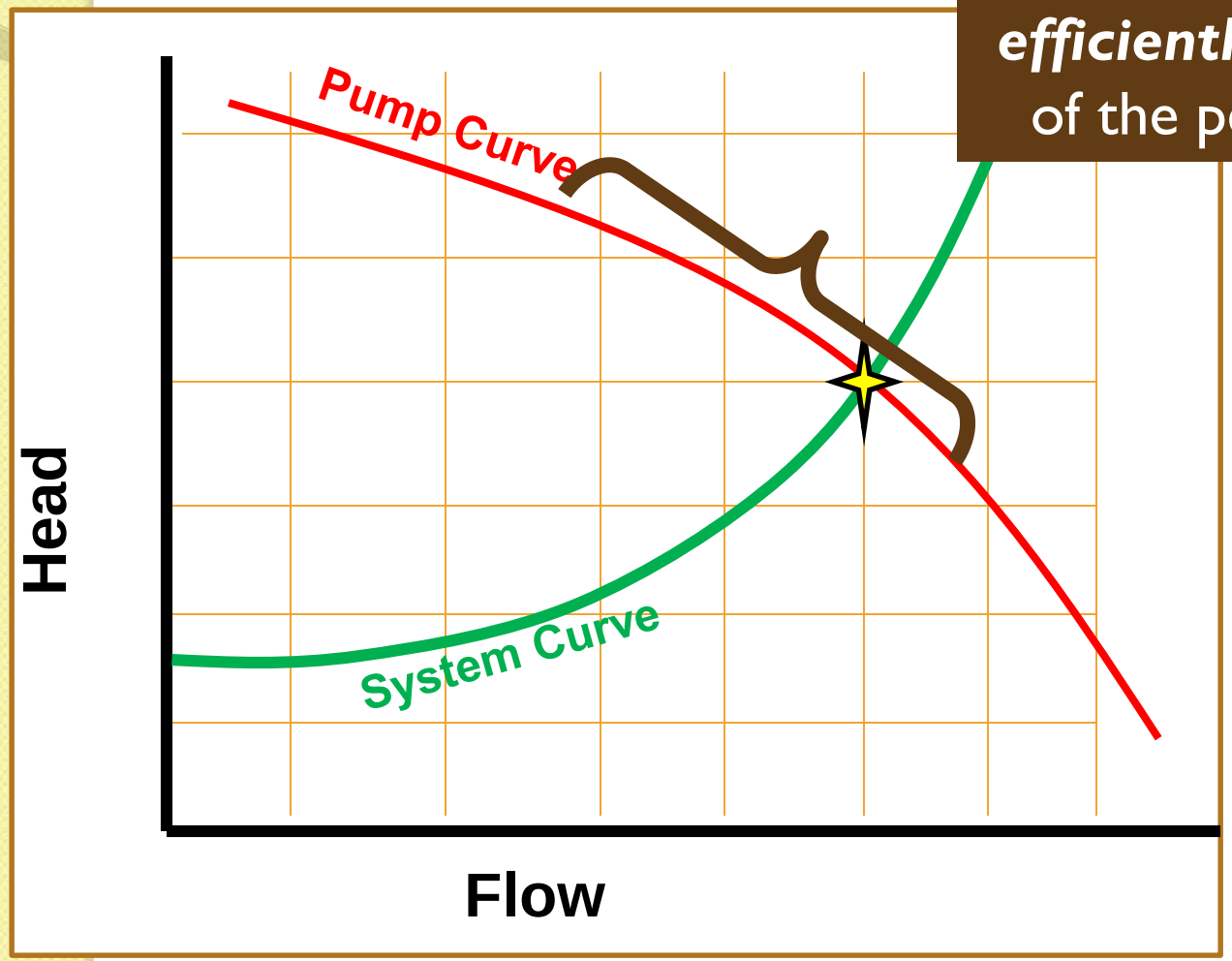


Plot

- ✓TDH
- ✓Flow
- ✓Design Point
- ✓Operating Point

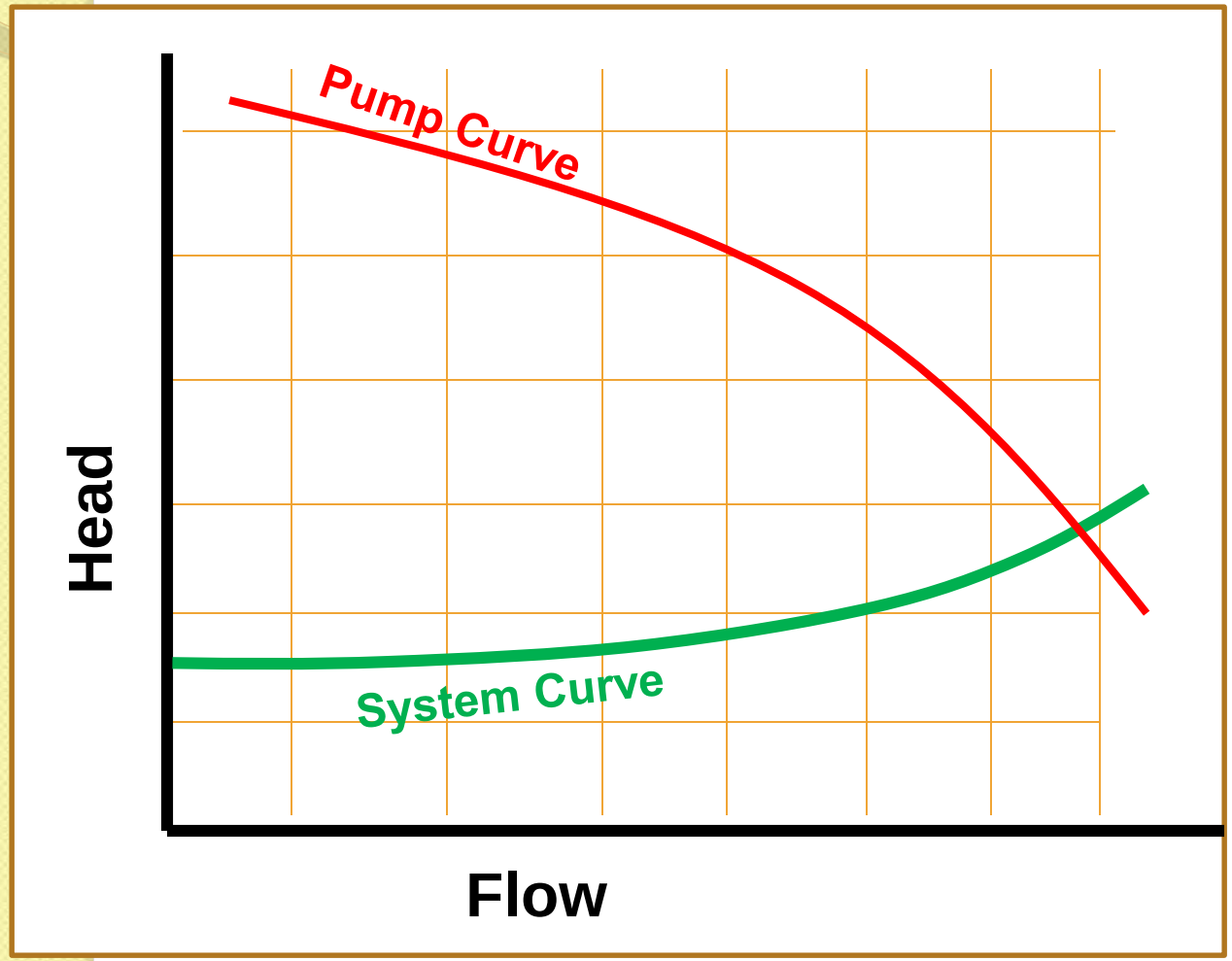
Pump Curves and System Curves

The pump performs ***most efficiently*** in the middle 1/3 of the performance curve



The point of intersection of the two curves is where the pump will operate in the system.

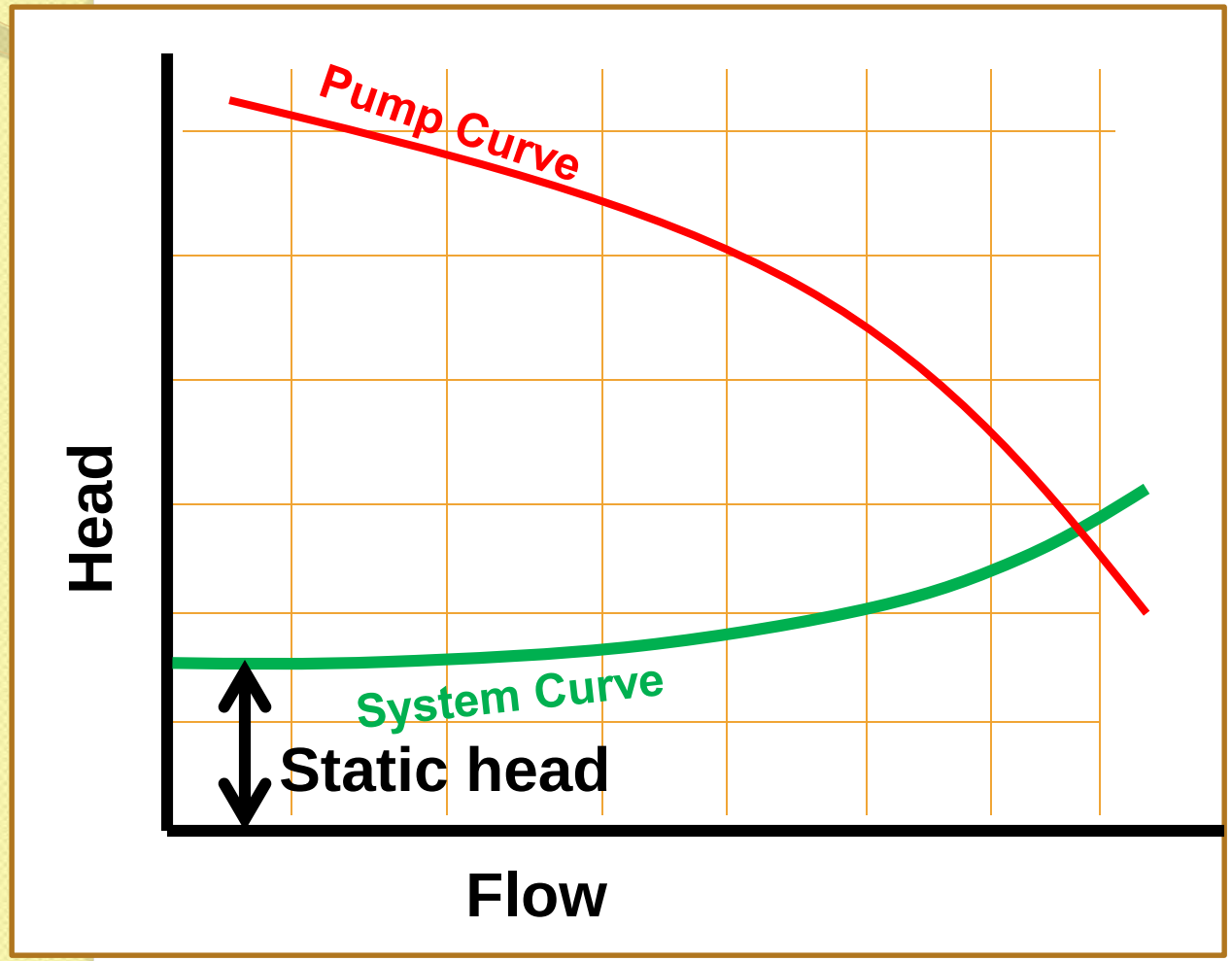
Pump Curves and System Curves



The pump needs to work efficiently within the parameters required by the system

Pump Curves and System Curves

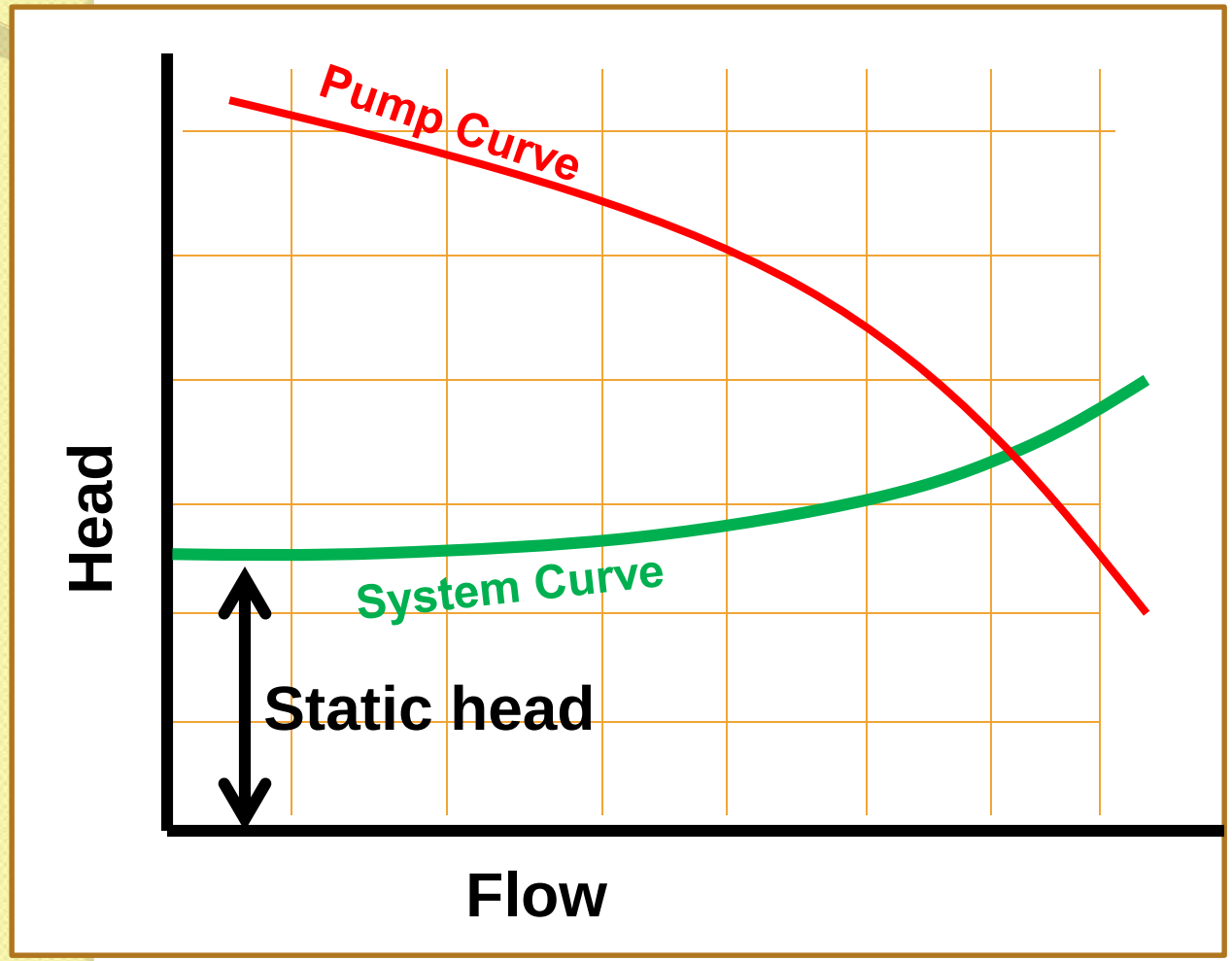
Modification of the system design



Increasing static head

Pump Curves and System Curves

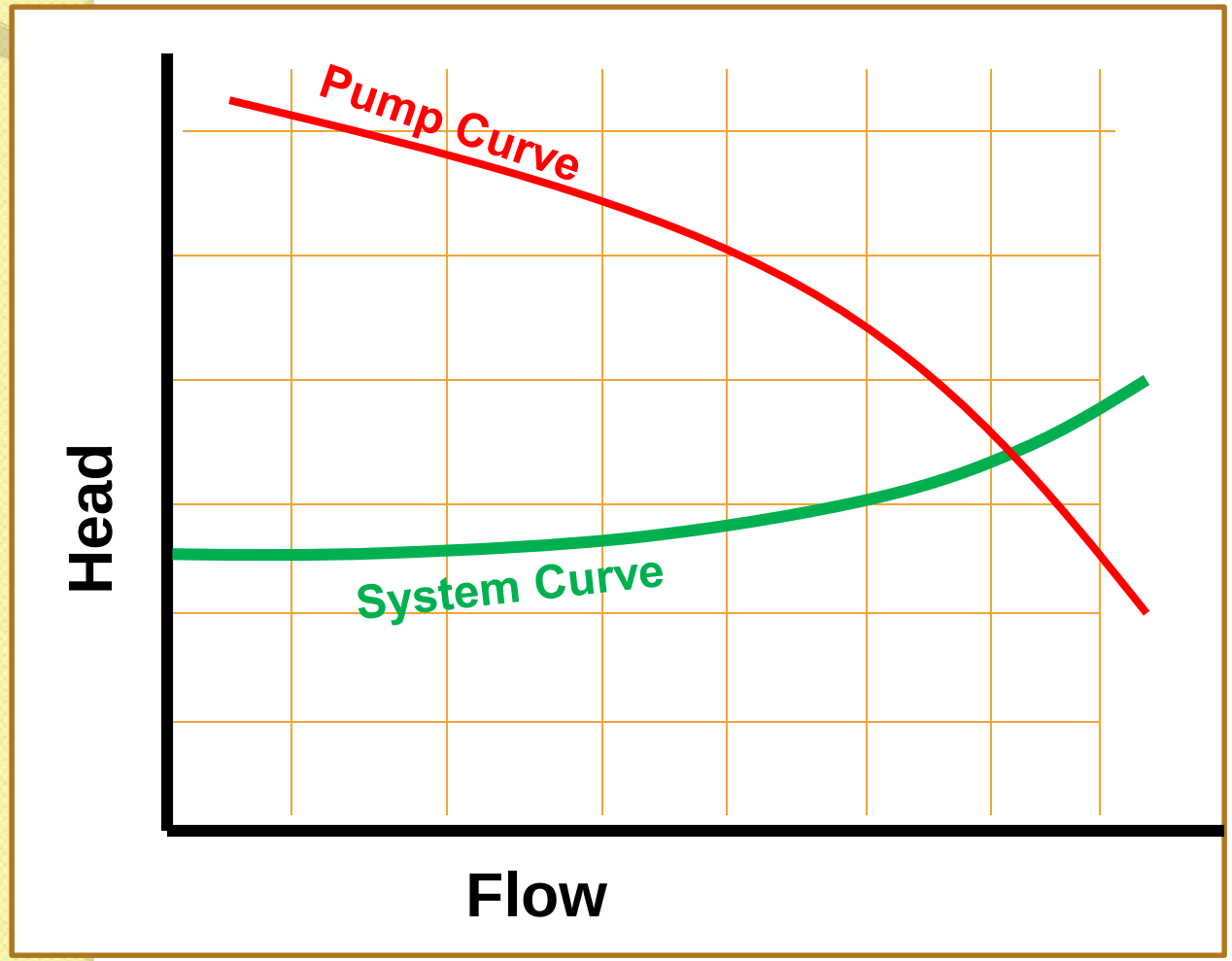
Modification of the system design



Increasing static head

Pump Curves and System Curves

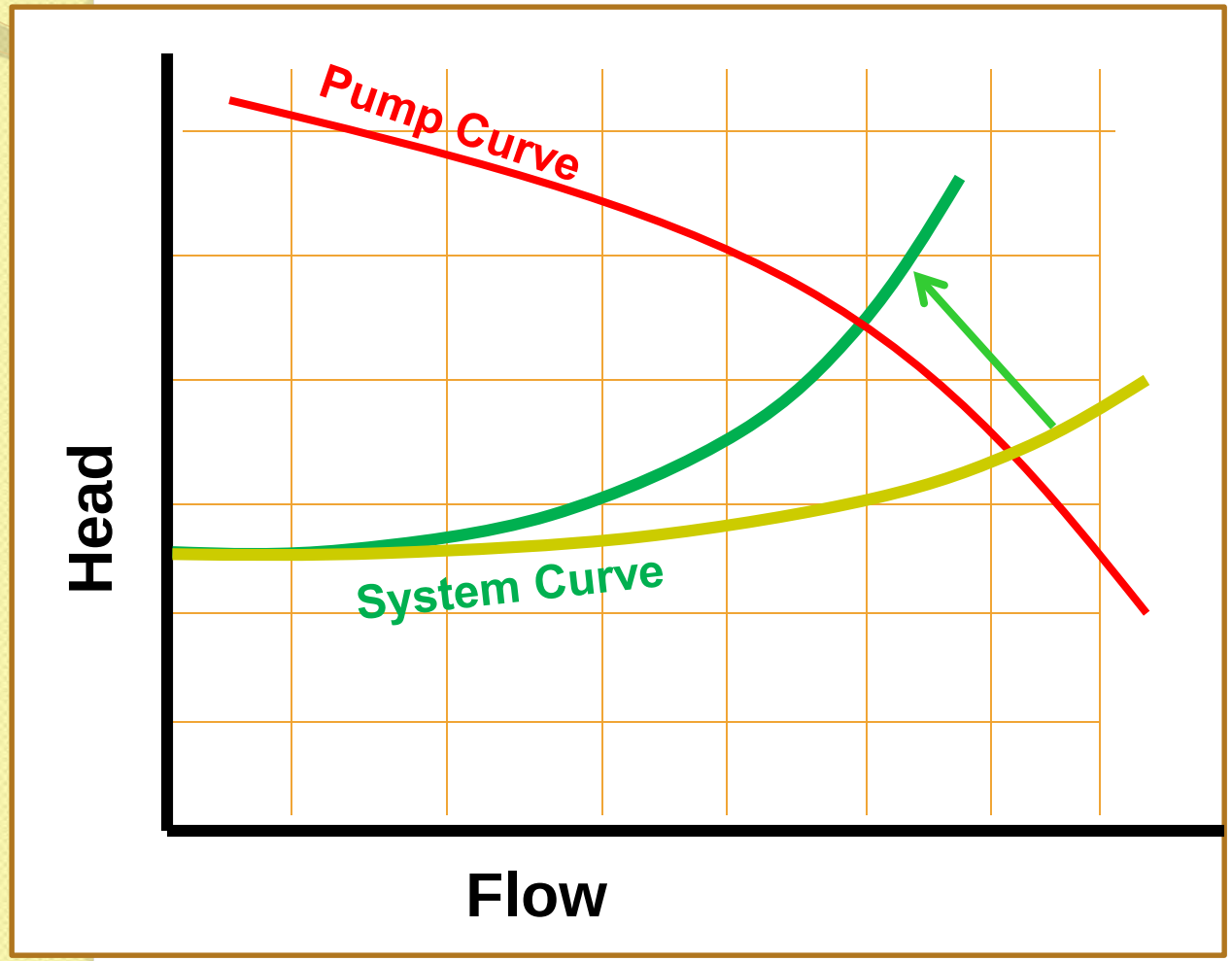
Modification of the system design



Increasing friction loss

Pump Curves and System Curves

Modification of the system design



Increasing friction loss

Decrease effluent force main diameter

Increase length of effluent force main or number of fittings

Pump Sizing Tools

- Manufacturer's Pump Sizing Spreadsheets
- St. Joseph County Pump Sizing Spreadsheets
- Sewage and Sump Pump Manufacturer's Association (SSPMA)
- IEHA Wastewater Management Committee guidance document and worksheets

Guidance Documents and Worksheets

- Product of IEHA WWMC
- Guidance Documents
  - Effluent pump sizing (pg 1-6)
  - Dose tank sizing (pg 8)
- Worksheets
  - Effluent Pump (pg 7)
  - Dose Tank (pg 9)
- Available on the website (www.iehaind.org)
- Based on requirements of 410 IAC 6-8.3
- Incorporates best practices
- Sizing must be compliant with the rule and any local ordinances.

IEHA WWMC guidance

Indiana Environmental Health Association
Wastewater Management Committee
http://iehaind.org/WMCGuidance.htm

Residential Onsite Sewage Systems
Effluent Pump and Dose Tank Sizing Guidance Document

This document provides assistance on sizing effluent pumps and dosing tanks based on the requirements in Rule 410 IAC 6-8.3. The guidance incorporates best practices as determined by the IEHA WWMC. Effluent pump and dose tank sizing must be in compliance with the rule and local ordinances. Questions on sizing requirements or system components should be directed to the local health department having jurisdiction over the project.

There are differences between sizing an effluent pump for a flood-dosed system, an elevated sand mound pressure distribution system and a subsurface trench pressure distribution system. These differences are noted in **bold** where applicable. The letters and numbers in the sections correspond to the sections of the pump and dose tank sizing worksheets.

A. Certain system parameters must be known prior to sizing an effluent pump for the system.
   1. The number of bedrooms and bedroom equivalents. See Sections 6 and 7 of the rule for definitions.
   2. Determine the Design Daily Flow of the system using the number of bedrooms and bedroom equivalents in the home.

      DDF = (Number of bedrooms & bedroom equivalents) X 150 gallons per day

   3. The system type and soil absorption field size (in square feet and lineal feet).
   4. The effluent force main diameter, in inches.
      a. For **subsurface trench flood dosed systems**, the minimum inside diameter of the effluent force main is 1" and the maximum inside diameter is 4".
      b. For **elevated sand mound and subsurface pressure distribution systems**, the minimum inside diameter of the effluent force main is 1½" and the maximum inside diameter is 4".
   5. The total length of the effluent force main, in feet.
   6. The length of the effluent force main that drains back to the dosing tank. This will be 0 if the effluent force main drains to the soil absorption field (not recommended for pressure distribution systems).

B. Determine the required pump discharge rate
   1. **Subsurface Trench Flood Dosed Systems**, use Table VII below from Rule 410 IAC 6-8.3-76(b).

Table VII - Required Effluent Pump Discharge Rates for Subsurface Trench Flood Dosed Onsite Sewage Systems	
Number of Bedrooms	Discharge Rate in Gallons per Minute
1	30
2	30
3	30-45
4	30-60
5	38-75
6	45-90

For systems with a range of acceptable flow rates in Table VII, it is recommended to choose a flow rate in the middle of the acceptable range. This will accommodate an increase or decrease in design flow rate if other system parameters dictate a needed change.

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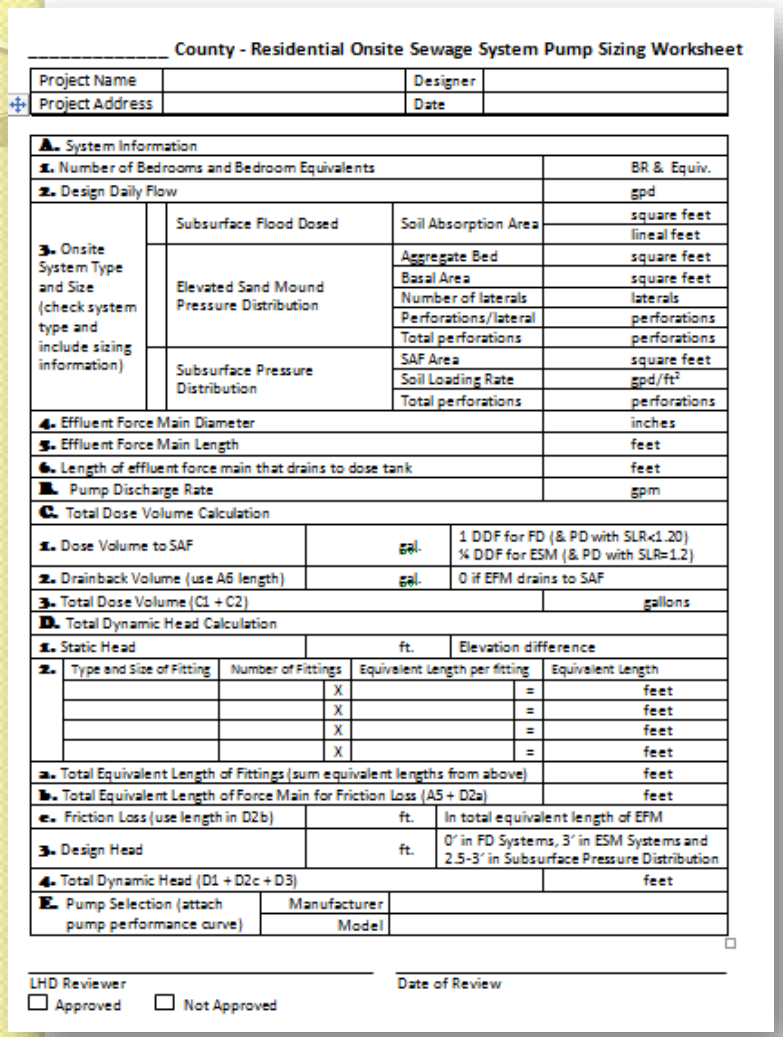
IEHA WWMC guidance



_____ County - Residential Onsite Sewage System Pump Sizing Worksheet

Project Name		Designer	
Project Address		Date	

A. System Information			
1. Number of Bedrooms and Bedroom Equivalents			BR & Equiv.
2. Design Daily Flow			gpd
3. Onsite System Type and Size (check system type and include sizing information)	Subsurface Flood Dosed	Soil Absorption Area	square feet
			lineal feet
	Elevated Sand Mound Pressure Distribution	Aggregate Bed	square feet
		Basal Area	square feet
		Number of laterals	laterals
		Perforations/lateral	perforations
		Total perforations	perforations
	Subsurface Pressure Distribution	SAF Area	square feet
		Soil Loading Rate	gpd/ft²
		Total perforations	perforations
4. Effluent Force Main Diameter			inches
5. Effluent Force Main Length			feet
6. Length of effluent force main that drains to dose tank			feet
B. Pump Discharge Rate			gpm
C. Total Dose Volume Calculation			
1. Dose Volume to SAF	gal.	1 DDF for FD (& PD with SLR<1.20) ¼ DDF for ESM (& PD with SLR=1.2)	
2. Drainback Volume (use A6 length)	gal.	0 if EFM drains to SAF	
3. Total Dose Volume (C1 + C2)			gallons
D. Total Dynamic Head Calculation			
1. Static Head	ft.	Elevation difference	

2. Type and Size of Fitting	Number of Fittings		Equivalent Length per fitting		Equivalent Length
		X		=	feet
		X		=	feet
		X		=	feet
		X		=	feet

a. Total Equivalent Length of Fittings (sum equivalent lengths from above)	feet
b. Total Equivalent Length of Force Main for Friction Loss (A5 + D2a)	feet

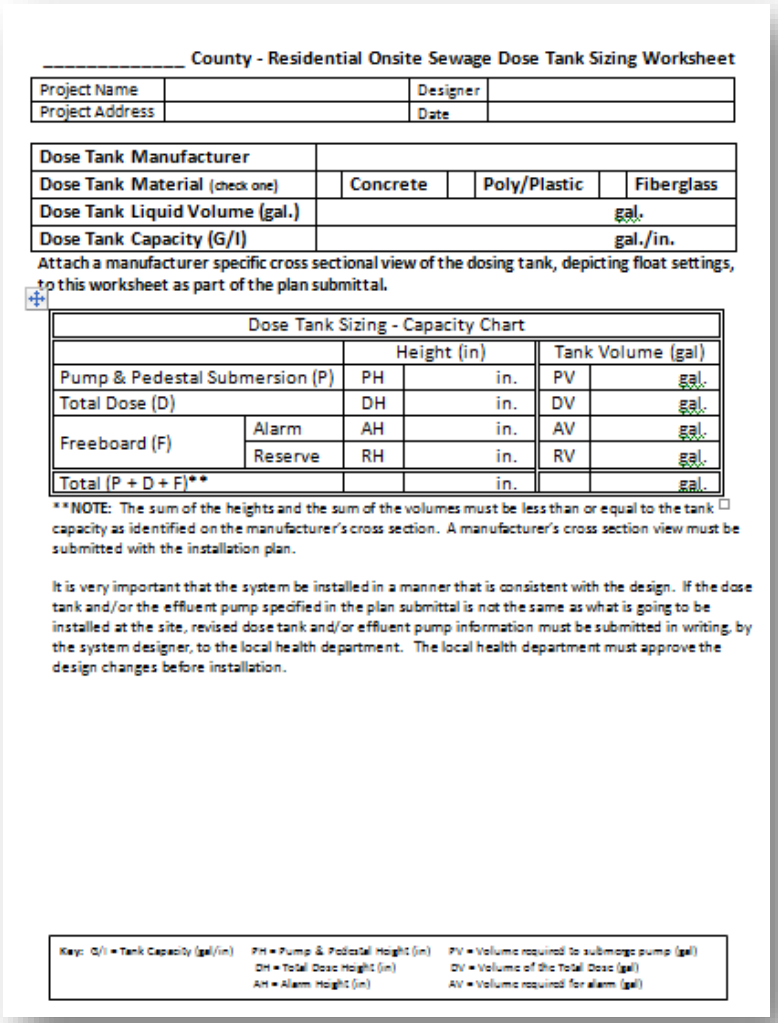
c. Friction Loss (use length in D2b)	ft.	In total equivalent length of EFM
3. Design Head	ft.	0′ in FD Systems, 3′ in ESM Systems and 2.5-3′ in Subsurface Pressure Distribution
4. Total Dynamic Head (D1 + D2c + D3)		feet

E. Pump Selection (attach pump performance curve)	Manufacturer	
	Model	

LHD Reviewer

☐ Approved ☐ Not Approved

Date of Review



_____ County - Residential Onsite Sewage Dose Tank Sizing Worksheet

Project Name		Designer	
Project Address		Date	

Dose Tank Manufacturer					
Dose Tank Material (check one)		Concrete		Poly/Plastic	Fiberglass
Dose Tank Liquid Volume (gal.)					gal.
Dose Tank Capacity (G/I)					gal./in.

Attach a manufacturer specific cross sectional view of the dosing tank, depicting float settings, to this worksheet as part of the plan submittal.

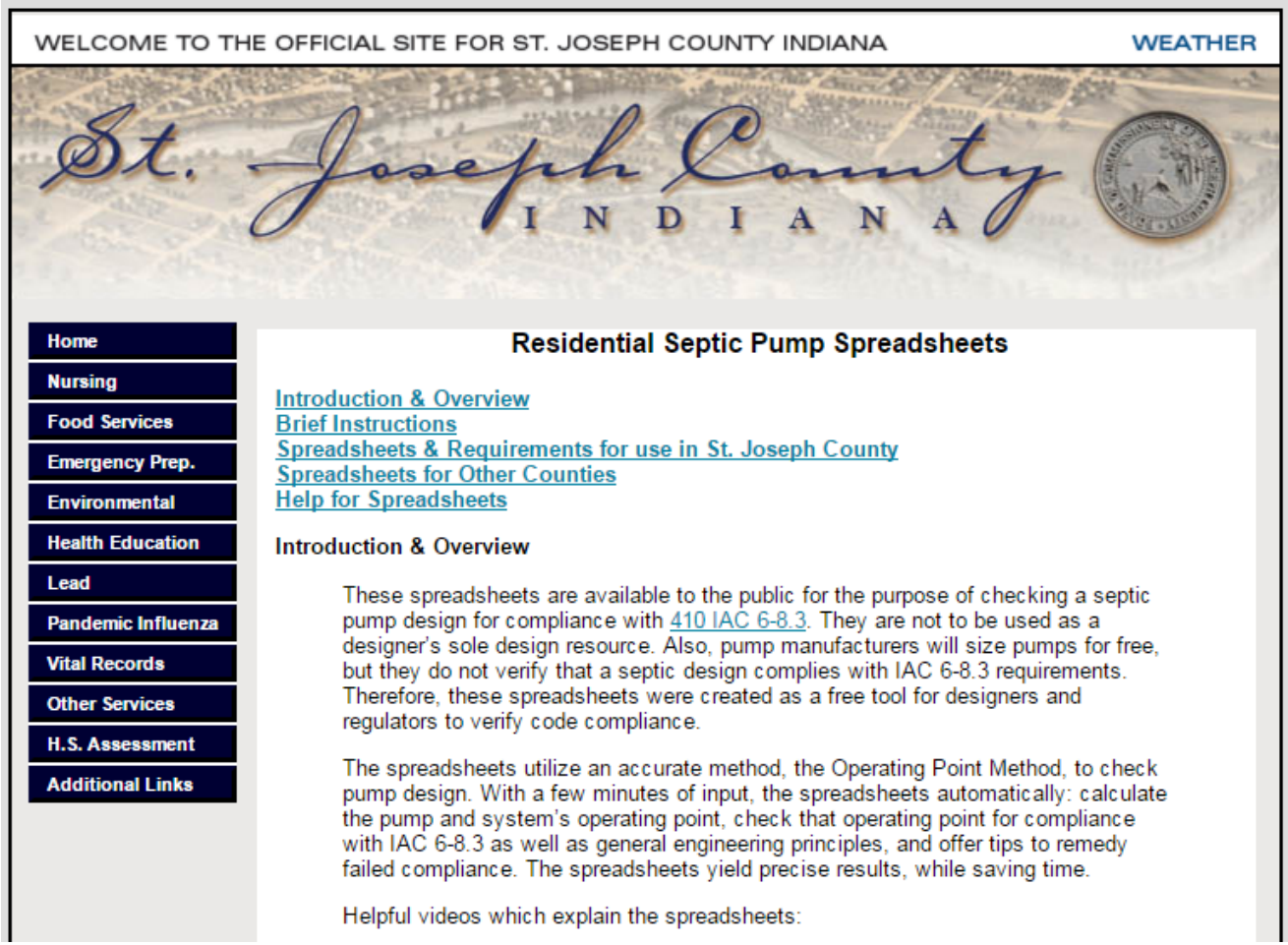
Dose Tank Sizing - Capacity Chart					
		Height (in)		Tank Volume (gal)	
Pump & Pedestal Submersion (P)		PH	in.	PV	gal.
Total Dose (D)		DH	in.	DV	gal.
Freeboard (F)	Alarm	AH	in.	AV	gal.
	Reserve	RH	in.	RV	gal.
Total (P + D + F)**			in.		gal.

**NOTE: The sum of the heights and the sum of the volumes must be less than or equal to the tank capacity as identified on the manufacturer's cross section. A manufacturer's cross section view must be submitted with the installation plan.

It is very important that the system be installed in a manner that is consistent with the design. If the dose tank and/or the effluent pump specified in the plan submittal is not the same as what is going to be installed at the site, revised dose tank and/or effluent pump information must be submitted in writing, by the system designer, to the local health department. The local health department must approve the design changes before installation.

Key: G/I = Tank Capacity (gal/in) PH = Pump & Pedestal Height (in) PV = Volume required to submerge pump (gal)
DH = Total Dose Height (in) DV = Volume of the Total Dose (gal)
AH = Alarm Height (in) AV = Volume required for alarm (gal)

Flood Dosed Example



http://www.stjosephcountyindiana.com/departments/sjchd/spreadsheets.htm

St. Joseph pump spreadsheet

Hold Harmless Agreement		
This spreadsheet may be used to check the engineering design of a previously designed residential septic pump to a gravity absorption system. By using this spreadsheet, the user agrees to take full responsibility for the input, output, consequential conclusions and will hold harmless St. Joseph County and any affiliates thereof of any liability. This spreadsheet is not intended to be used as a dosing pump design spreadsheet, but rather is intended to check the suitability of the design for compliance to IAC 6-8.3 code & methodology.		
Does the User agree to the aforementioned statement & release St. Joseph County of and & all liability?	**NO**	**If "YES", type name below:** **Alice Quinn**

BRIEF INSTRUCTIONS (See "Help" Worksheet for detailed instructions)
* The Hold Harmless Agreement must be accepted in order to use the spreadsheet. * **ALL** cells in tan coloring **MUST** be filled out for the spreadsheet to perform correctly. * Cells that are not colored tan are not editable. * This spreadsheet should only be used to **check a previously designed, single, dosing pump & single forcemain to a gravity absorption field** to verify if the pump meets IAC 6-8.3 code requirements. **This is not a comprehensive pump selection tool.** See pump manufacturer representative for help selecting the best pump. * The Item Numbers on the "Design Check" worksheet correspond to the Item Numbers on the "Help" worksheet. * Quick Tip - If an operating point is too far to the right of the middle of the pump curve, then consider decreasing the forcemain size or selecting a smaller Hp pump.

St. Joseph pump spreadsheet

Property Address:	Permit #
123 Main, Anytown, IN	1234

INPUT DATA FROM PREVIOUS DESIGN

1. Select the previously designed dosing pump. If the pump is not on the list, then select "other" as the make and model and manually fill out the "Other Pump Curve" table to the right.

Make:	Barnes	Model:	SP33

2. Fill out previously designed force main geometry below:

Force Main Diameter (in):	2
Horizontal Length of Force Main (ft):	57
Vertical Length of Force Main* (ft):	3.50
Pump Off Elevation (ft):	987.60
Pump On Elevation (ft):	989.36
Top of Pump Elevation (ft):	987.50
Highest Elevation of Force Main (ft):	994.40
Where does Force Main drain after dose?	Dose Tank

3. Fill out previously designed force main fitting schedule table below. The table assumes the fitting is same size of the force main. If custom fitting/equivalent lengths are desired, then select "Other" under fitting type:

Type of Fitting	No. of Fittings	Equiv. Length per Fitting(ft)	'Other' Fitting Type	'Other' Equiv. Length per Fitting(ft)
90°Elbow,Std Sharp Inside Rad.	3	8.6		
45° Elbow, Standard	2	2.6		
Other	1	0.5	Pressure Filter	0.5
		0.0		
		0.0		

St. Joseph pump spreadsheet

3. Fill out previously designed force main fitting schedule table below. The table assumes the fitting is same size of the force main. If custom fitting/equivalent lengths are desired, then select "Other" under fitting type:

Type of Fitting	No. of Fittings	Equiv. Length per Fitting(ft)	'Other' Fitting Type	'Other' Equiv. Length per Fitting(ft)
90°Elbow,Std Sharp Inside Rad.	3	8.6		
45° Elbow, Standard	2	2.6		
Other	1	0.5	Pressure Filter	0.5
		0.0		
		0.0		

Total Equivalent Length of Straight Pipe Due to Fitting Friction Losses (ft) = 31.5

4. Describe the dosing tank geometry: Ave. Gal./In. | Ave. Gal./Inch = 21.8

5. How many bedrooms does the pump serve? DDF = | Enter Gallons to Right = 450

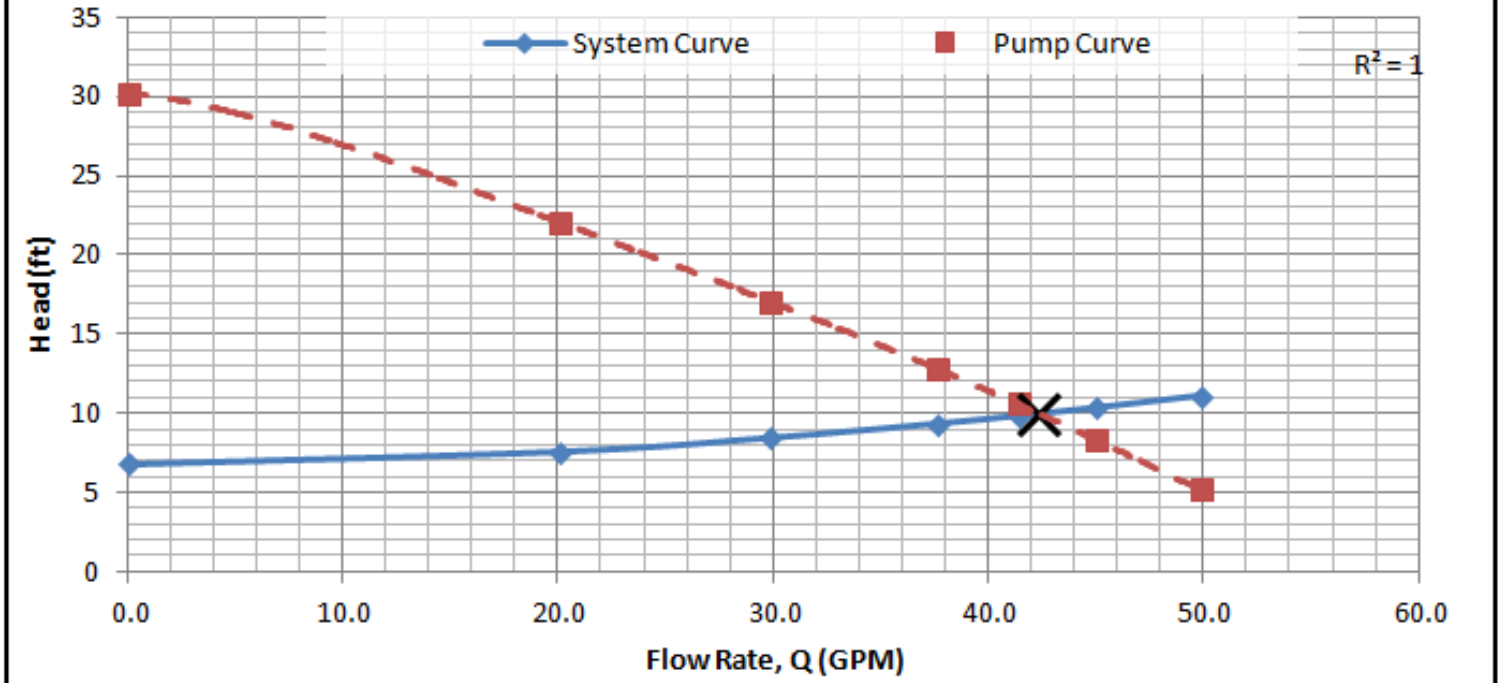
6. Is the Pump Curve (shown below) current with the manufacturer's website? And is the curve not excessively wavey? And is the R^2 value (shown on graph) greater than 0.97? See "Help" tab for detailed explanation.

Response

'YES' to all 3 Questions

St. Joseph pump spreadsheet

ANALYSIS



Pump & System Curves							
Pump Head (ft)	30.2	22.1	17.1	12.8	10.6	8.3	5.2
System Head (ft)	6.8	7.6	8.5	9.3	9.8	10.3	11.1
Flow Rate (gpm)	0.0	20.0	29.8	37.6	41.4	45.0	49.8

7. Operating Point **Q (GPM) = 42.4** **Head (ft) = 10.0**

St. Joseph pump spreadsheet

IAC 6-8.3 CHECK - DOSING PUMP & FORCEMAIN DESIGN TO GRAVITY ABSORBTION FIELD					
Barnes SP33		CHECKED BY: Alice Quinn			
8. Does the dosing pump apply DDF in one dose?	YES	Dose =	460gal	Req. Dose* =	460gal
9. Does the dosing pump operate at a flow rate within the required Daily Design Flow Rate?	YES	Min. Required DDF (gpm) =			30
		Max. Required DDF (gpm) =			45
10. Is the effluent velocity between 2-5 ft/s?	YES	Effluent Velocity (ft/s) =			4.33
11. Will the pump always be submerged?	YES				
12. Is effluent protected from freezing?	YES				

* The required dose is equal to the DDF (Daily Design Flow) to the soil absorption field (IAC 6-8.3-12) + the drainback volume of force main, if applicable. See the "Help" page for more info.

GENERAL PUMP DESIGN CHECK** (NOT REQUIRED BY IAC-6-8.3 CODE)			
13. Check for the position of the operating point within the pump performance curve. It should not be close to an extremety.	Questionable	Pump operates within the middle x% of the performance curve (%)=	70%
14. Is the pump run time greater than 10 minutes?	YES	Pump run time (min) =	10.86

**These checks are rules of thumb. Please verify with manufacturer for recommendations.

TIPS
Move operating point to middle of curve by changing forcemain size, pump selection, and/or elevation difference.

St. Joseph pump spreadsheet

Pros

- 7 Brands of pumps plus custom pump entry
- Easily compare different models or manufacturers
- Checks for code compliance
- Additional Engineering checks
- Points out errors and provides tips to correct
- Videos, help tabs, and visual aids

Concerns

- No wiggle room (pressure distribution systems)
- 3 spreadsheets for 3 types of systems
  - Flood dose
  - Pressure Trench
  - Elevated sand mound

Example 2

- ESM

Zoeller Company

System Head Curve and Pump Selection Tool

www.clarusenvironmental.com

Design Tools

System and Pump Curve Generator

Zoeller Company

System Head Curve and Pump Selection Tool

Static Head Information

Static Head - elevation difference from low water to outfall	5.7 feet
System high point above outfall?	No

Friction Head Information

Pipe

How many different pipes in the system (not counting laterals)?	2	
Pipe 1 Length	7 feet	
Pipe 1 Size	2 inches	
Pipe 1 Class	SCH 40	
Pipe 2 Length	57 feet	
Pipe 2 Size	3 inches	100 X Total Flow
Pipe 2 Class	SCH 40	
Pipe 3 Length		
Pipe 3 Size		
Pipe 3 Class		
Pressurized Laterals?	Yes	Flow Deviation 5.3% *
How many are dosed at once?	4	
Length of one lateral	35 feet	
Size of lateral	1 1/4 inches	
Class of lateral	SCH 40	

Fittings & Discharge Assemblies

Type	Size	Quantity
90 Elbow	2 inches	5
Tee (branch flow)	3 inches	2
45 Elbow	3 inches	2

Special Friction Considerations

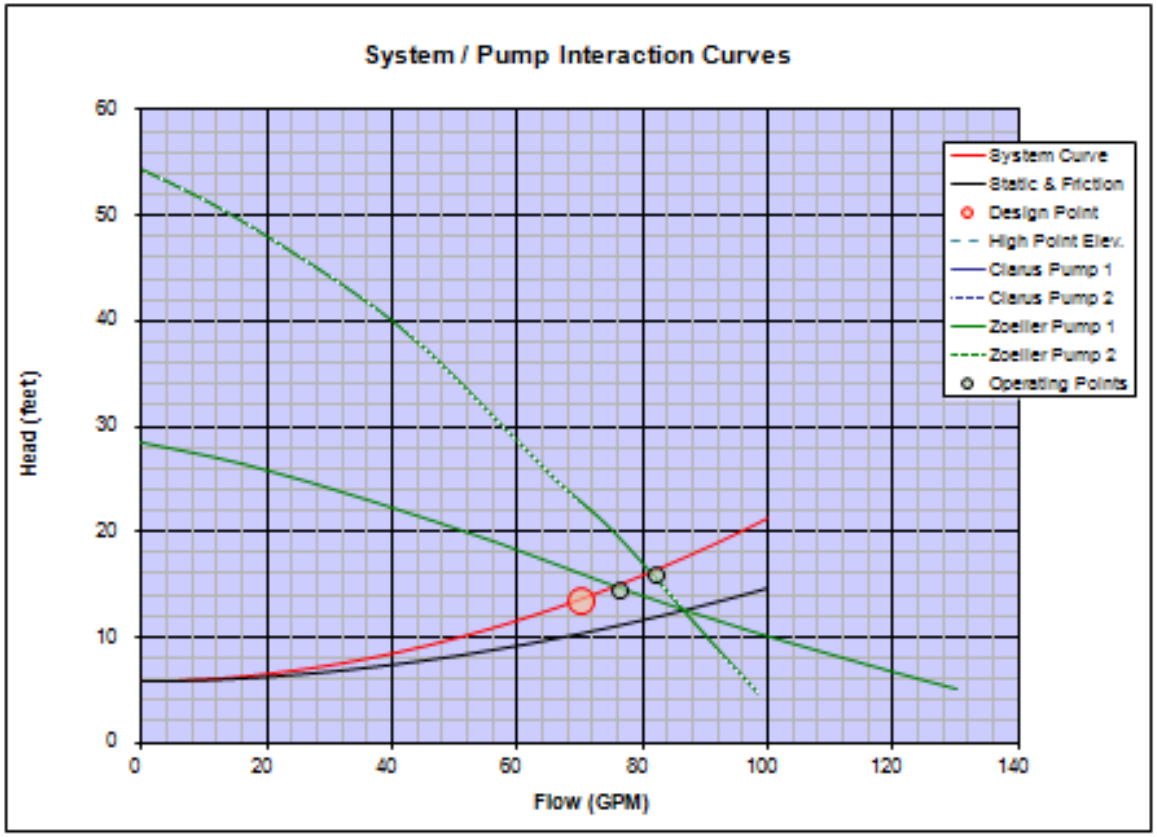
Weep Hole	Yes	1/4 "
Add-In Friction	10 % of Pipe Loss	
Automatic Ballcheck Valve?	No	
Pressure Filter?	Yes	100 X Total Flow

Operating Head Information

Design Type	Low Pressure Pipe
Required Pressure	3 feet
Number of Orifices	52
Size of Orifices	1/4 "
Spider Valve Orifice Sizes (Data originates from Spider Valve Sizing Tab)	

Factors and Coefficients

Hazen-Williams C Factor	150
Discharge Coefficient (Cd)	0.64
Lateral Design Mode	On



NOTE: THE DISPLAYED PUMP CURVES HAVE BEEN ADJUSTED TO ACCOUNT FOR THE EFFECT OF THE WEEP HOLE

Pump Selection — 60 Hz — Frequency

Clarus Environmental Pumps — Operating Point

Clarus Pump 1	
Clarus Pump 2	

Zoeller Pump Company Pumps

Zoeller Pump 1	328/4328, 1hp, 60Hz	75.7 GPM @ 14.8'
Zoeller Pump 2	151/4151, 0.5hp, 60Hz	81.5 GPM @ 15.2'

Design Point: 83.5 GPM @ 15.5' TDH

Curve Zoom Range: 100 GPM

Project Data		Notes:
Project Name:	ISDH Designer Workshop Sample	
Project Address:	Indiana Government Center North 100 N. Senate Ave. Indianapolis, IN 46204	
Contact Info:	Alice Quinn 317-518-4588 aquinn@isdh.in.gov	

* For Flow Deviations between 5% and 10%, consult local code for acceptability. Less than 5% is ideal.

Version 4.00

Clarus / Zoeller Pump Curve Generator

Static Head Information

Static Head - elevation difference from low water to outfall	5.7 feet
System high point above outfall?	No

Friction Head Information

Pipe

How many different pipes in the system (not counting laterals)?	2	
Pipe 1 Length	7 feet	
Pipe 1 Size	2 inches	
Pipe 1 Class	SCH 40	
Pipe 2 Length	57 feet	
Pipe 2 Size	3 inches	50 % Total Flow
Pipe 2 Class	SCH 40	
Pipe 3 Length		
Pipe 3 Size		
Pipe 3 Class		

Pressurized Laterals?	Yes	Flow Deviation Along Lateral 6.9% *
How many are dosed at once?	4	
Length of one lateral	36 feet	
Size of lateral	1 1/4 inches	
Class of lateral	SCH 40	

Zoeller Company

System Head Curve and Pump Selection Tool

Static Head Information

Static Head - elevation difference from low water to outfall	5.7 feet
System high point above outfall?	No

Friction Head Information

Pipe

How many different pipes in the system (not counting laterals)?	2	
Pipe 1 Length	7 feet	
Pipe 1 Size	2 inches	
Pipe 1 Class	SCH 40	
Pipe 2 Length	57 feet	
Pipe 2 Size	3 inches	100 X Total Flow
Pipe 2 Class	SCH 40	
Pipe 3 Length		
Pipe 3 Size		
Pipe 3 Class		

Pressurized Laterals?	Yes	Flow Deviation 5.3% *
How many are dosed at once?	4	
Length of one lateral	35 feet	
Size of lateral	1 1/4 inches	
Class of lateral	SCH 40	

Fittings & Discharge Assemblies

Type	Size	Quantity
90 Elbow	2 inches	5
Tee (branch flow)	3 inches	2
45 Elbow	3 inches	2

Special Friction Considerations

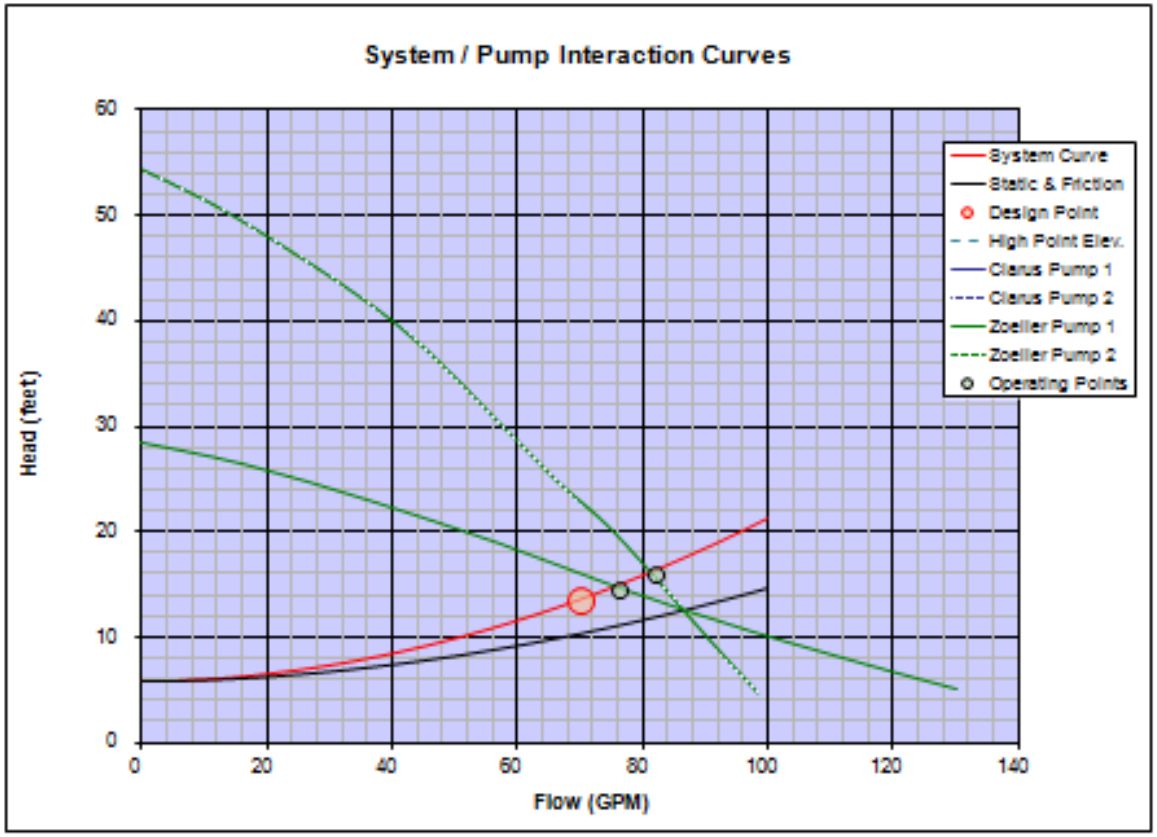
Weep Hole	Yes	1/4 "
Add-In Friction	10 % of Pipe Loss	
Automatic Ballcheck Valve?	No	
Pressure Filter?	Yes	100 X Total Flow

Operating Head Information

Design Type	Low Pressure Pipe
Required Pressure	3 feet
Number of Orifices	52
Size of Orifices	1/4 "
Spider Valve Orifice Sizes (Data originates from Spider Valve Sizing Tab)	

Factors and Coefficients

Hazen-Williams C Factor	150
Discharge Coefficient (Cd)	0.61
Lateral Design Mode	On



NOTE: THE DISPLAYED PUMP CURVES HAVE BEEN ADJUSTED TO ACCOUNT FOR THE EFFECT OF THE WEEP HOLE

Pump Selection 60 Hz Frequency

Clarus Environmental Pumps — Operating Point

Clarus Pump 1		
Flow Control Orifice?		
Clarus Pump 2		
Flow Control Orifice?		

Zoeller Pump Company Pumps

Zoeller Pump 1	328/4328, 1hp, 60Hz	75.7 GPM @ 14.8'
Zoeller Pump 2	151/4151, 0.5hp, 60Hz	81.5 GPM @ 15.2'

Design Point: 53.5 GPM @ 15.5' TDH

Curve Zoom Range: 100 GPM

Project Data		Notes:
Project Name:	ISDH Designer Workshop Sample	
Project Address:	Indiana Government Center North 100 N. Senate Ave. Indianapolis, IN 46204	
Contact Info:	Alice Quinn 317-518-4588 aquinn@isdh.in.gov	

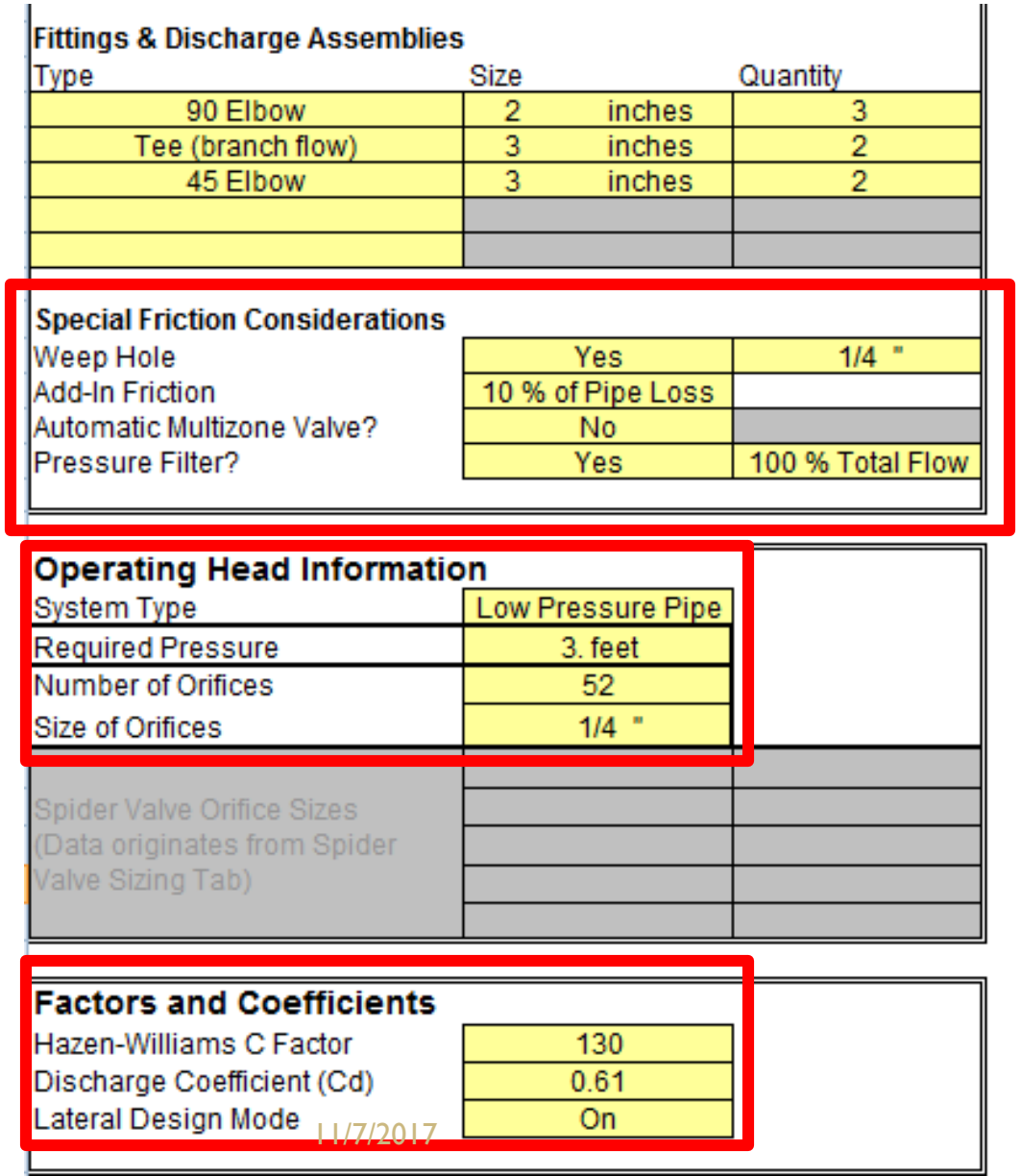
For Flow Deviations between 5% and 10%, consult local code for acceptability. Less than 5% is ideal.

Clarus / Zoeller Pump Curve Generator

Weep Hole
Add-in Friction
Multizone Valve
Pressure Filter

System Type
Residual Head
Orifice size and number

Hazen-Williams C Factor
Lateral Design Mode



Fittings & Discharge Assemblies

Type	Size		Quantity
90 Elbow	2	inches	3
Tee (branch flow)	3	inches	2
45 Elbow	3	inches	2

Special Friction Considerations

Weep Hole	Yes	1/4 "
Add-In Friction	10 % of Pipe Loss	
Automatic Multizone Valve?	No	
Pressure Filter?	Yes	100 % Total Flow

Operating Head Information

System Type	Low Pressure Pipe
Required Pressure	3. feet
Number of Orifices	52
Size of Orifices	1/4 "

Spider Valve Orifice Sizes (Data originates from Spider Valve Sizing Tab)

Factors and Coefficients

Hazen-Williams C Factor	130
Discharge Coefficient (Cd)	0.61
Lateral Design Mode	On

Zoeller Company

System Head Curve and Pump Selection Tool

Static Head Information

Static Head - elevation difference from low water to outfall	5.7 feet
System high point above outfall?	No

Friction Head Information

Pipe

How many different pipes in the system (not counting laterals)?	2	
Pipe 1 Length	7 feet	
Pipe 1 Size	2 inches	
Pipe 1 Class	SCH 40	
Pipe 2 Length	57 feet	
Pipe 2 Size	3 inches	100 X Total Flow
Pipe 2 Class	SCH 40	
Pipe 3 Length		
Pipe 3 Size		
Pipe 3 Class		
Pressurized Laterals?	Yes	
How many are dosed at once?	4	
Length of one lateral	35 feet	
Size of lateral	1 1/4 inches	
Class of lateral	SCH 40	

Flow Deviation 8.7% *

Fittings & Discharge Assemblies

Type	Size	Quantity
90 Elbow	2 inches	3
Tee (branch flow)	3 inches	2
45 Elbow	3 inches	2

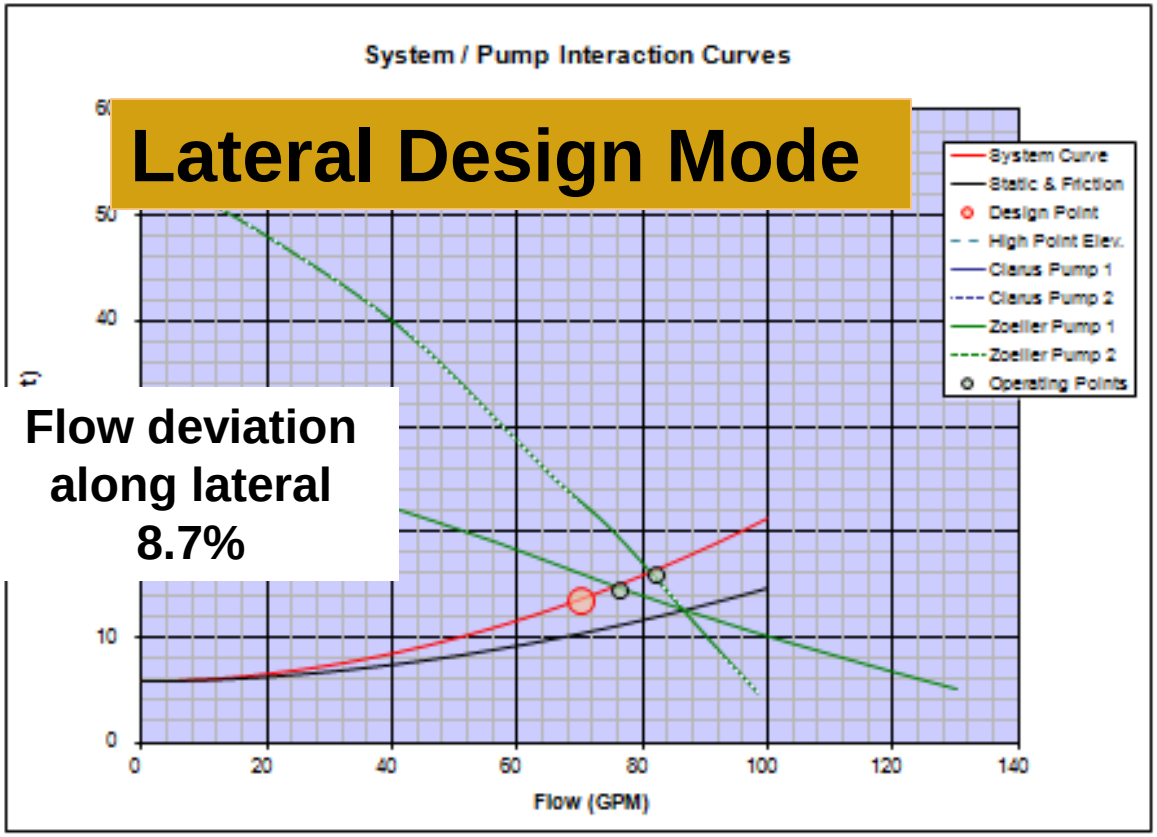
Special Friction Considerations

Weep Hole	Yes	1/4 "
Add-in Friction	10 % of Pipe Loss	
Automatic Ball Check Valve?	No	
Pressure Filter?	Yes	100 X Total Flow

Operating Head Information

System Type	Low Pressure Pipe
Required Pressure	3 feet
Number of Orifices	52
Size of Orifices	1/4 "

Discharge Coefficient (Cd) 0.61



NOTE: THE DISPLAYED PUMP CURVES HAVE BEEN ADJUSTED TO ACCOUNT FOR THE EFFECT OF THE WEEP HOLE

Pump Selecti 61 Hz Frequency

Clarus Environmental Pumps Operating Point

Design Point 63.5 GPM @ 15.2' TDH

Curve Zoom Range 100 GPM

Zoeller Pump 2 151/4151, 3.5hp, 60Hz 81.5 GPM @ 15.2'

Contact Info: ISDH Designer Workshop Sample, Indiana Government Center North, 100 N. Senate Ave., Indianapolis, IN 46204, Alice Quinn, 317-518-4588, aquinn@isdh.in.gov

Notes:

For flow deviations between 5% and 10%, consult local code for acceptability. Less than 5% is ideal.

For Flow Deviations between 5% and 10%, consult local code for acceptability. Less than 5% is ideal.

Zoeller Company

System Head Curve and Pump Selection Tool

Static Head Information

Static Head - elevation difference from low water to outfall	5.7 feet
System high point above outfall?	No

Friction Head Information

Pipe

How many different pipes in the system (not counting laterals)?	2	
Pipe 1 Length	7 feet	
Pipe 1 Size	2 inches	
Pipe 1 Class	SCH 40	
Pipe 2 Length	57 feet	
Pipe 2 Size	3 inches	100 X Total Flow
Pipe 2 Class	SCH 40	
Pipe 3 Length		
Pipe 3 Size		
Pipe 3 Class		

Pressurized Laterals?	Yes	Flow Deviation 5.3% *
How many are dosed at once?	4	
Length of one lateral	35 feet	
Size of lateral	1 1/4 inches	
Class of lateral	SCH 40	

Fittings & Discharge Assemblies

Type	Size	Quantity
90 Elbow	2 inches	5
Tee (branch flow)	3 inches	2
45 Elbow	3 inches	2

Special Friction Considerations

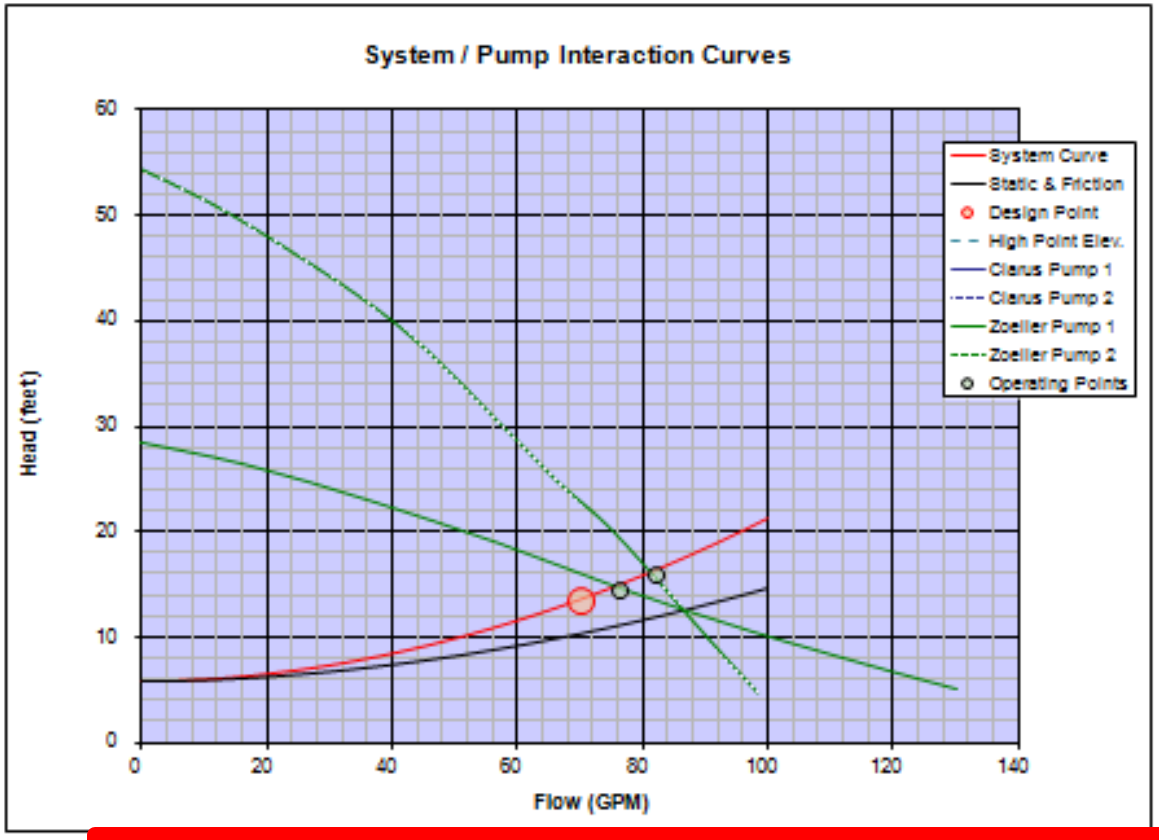
Weep Hole	Yes	1/4 "
Add-In Friction	10 % of Pipe Loss	
Automatic Ballcheck Valve?	No	
Pressure Filter?	Yes	100 X Total Flow

Operating Head Information

Design Type	Low Pressure Pipe
Required Pressure	3. feet
Number of Orifices	52
Size of Orifices	1/4 "
Spider Valve Orifice Sizes (Data originates from Spider Valve Sizing Tab)	

Factors and Coefficients

Hazen-Williams C Factor	150
Discharge Coefficient (Cd)	0.61
Lateral Design Mode	On



NOTE: THE DISPLAYED PUMP CURVES HAVE BEEN ADJUSTED TO ACCOUNT FOR THE EFFECT OF THE WEEP HOLE

Pump Selecti 60 Hz Frequency

Clarus Environmental Pumps — Operating Point

Clarus Pump 1	
Clarus Pump 2	

Zoeller Pump Company Pumps

Zoeller Pump 1	328/4328, 1hp, 60Hz	75.7 GPM @ 14.8'
Zoeller Pump 2	151/4151, 0.5hp, 60Hz	81.5 GPM @ 15.2'

Design Point: 69.5 GPM @ 15.5' TDH

Cover Zoom Range: 100 GPM

Project Data		Notes:
Project Name:	ISDH Designer Workshop Sample	
Project Address:	Indiana Government Center North 100 N. Senate Ave. Indianapolis, IN 46204	
Contact Info:	Alice Quinn 317-518-4588 aquinn@isdh.in.gov	

* For Flow Deviations between 5% and 10%, consult local code for acceptability. Less than 5% is acceptable.

Clarus / Zoeller Pump Curve Generator

Design Point

Zoom In

NOTE: THE DISPLAYED PUMP CURVES HAVE BEEN ADJUSTED TO ACCOUNT FOR THE EFFECT OF THE WEEP HOLE

Pump Selection	60 Hz	Frequency
Clarus Environmental Pumps		**Operating Points**
Clarus Pump 1		
Flow Control Orifice?		
Clarus Pump 2		
Flow Control Orifice?		
Zoeller Pump Company Pumps		
Zoeller Pump 1	270/4270, 1hp, 60Hz	73.1 GPM @ 15.4'
Zoeller Pump 2	161/4161, 0.5hp, 60Hz	79.9 GPM @ 17.2'

Design Point
70.7 GPM
@ 14.8 ' TDH

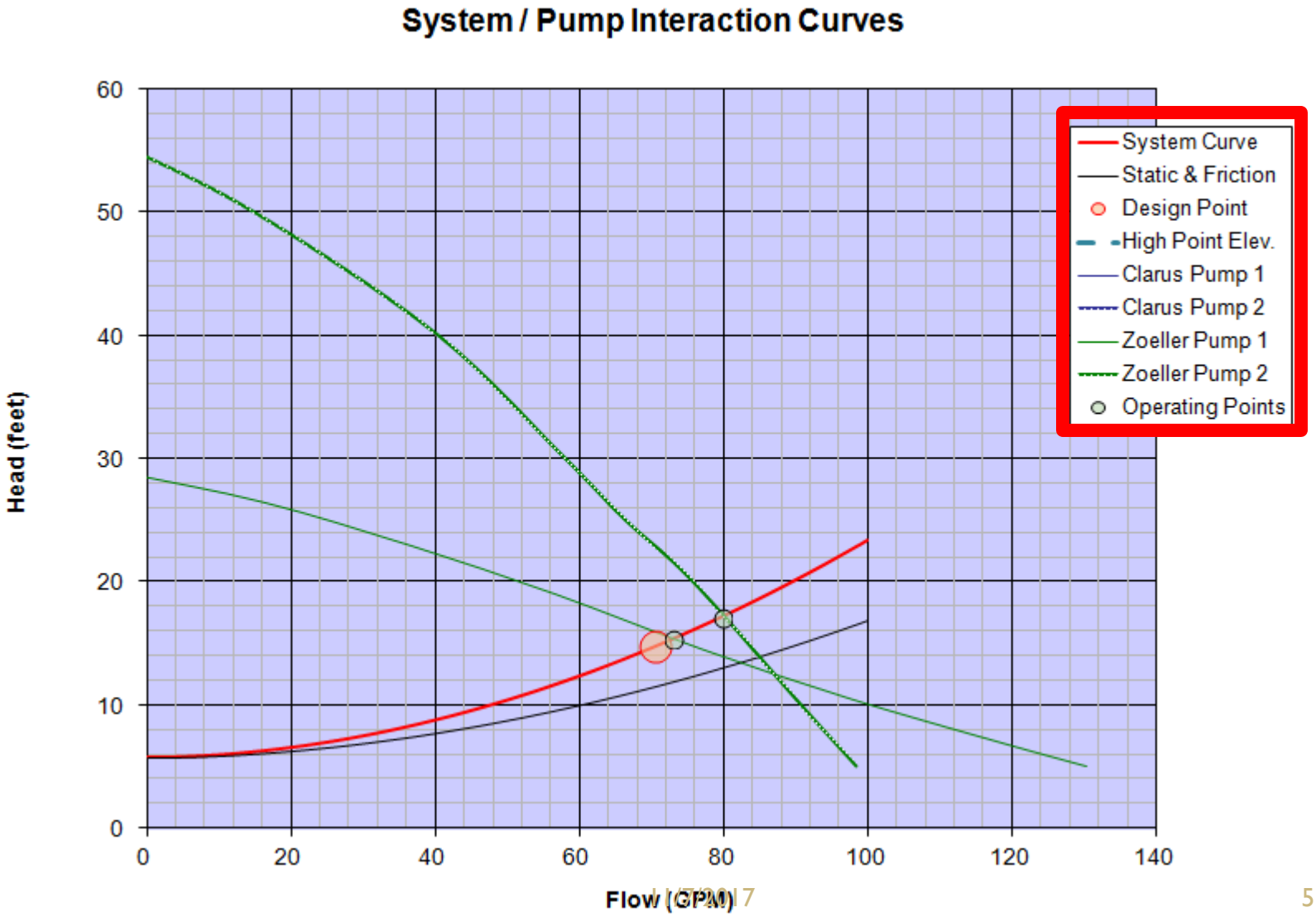
Curve Zoom Range	100 GPM

Project Data		Notes:
Project Name:	ISDH Designer Workshop Sample	
Project Address	Indiana Government Center North 100 N. Senate Ave. Indianapolis, IN 46204	
Contact Info:	Alice Quinn 317-518-4388 alquinn@isdh.in.gov	

Pick the pump(s)

Project Info and Notes

Clarus / Zoeller Pump Curve Generator



Clarus / Zoeller Pump Curve Generator

Pros

- Multiple force main sizes
- Easily compare 4 different pumps
- Adds in losses for weep hole
- Variable Hazen-Williams C factor
- Checks flow deviation along lateral
- Entry for "wiggle" room
- 1 spreadsheet for multiple system types
- Allows for use of other discharge assemblies (Spider valve, multizone valve, etc.)

Concerns

- Only 2 brands of pumps (Clarus and Zoeller)
- Does not check velocity

Resources

www.iehaind.org
Indiana Environmental Health Association
Wastewater Management Committee

http://www.stjosephcountyindiana.com/departments/sjchd/spreadsheets.htm

www.clarusenvironmental.com
Design Tools
System and Pump Curve Generator