

# SUBSURFACE SEWAGE DISPOSAL SYSTEMS

FOR THE COMMUNITY CENTER AND BUILDINGS C, D, E, F, G, AND H

## FOUR MILE VILLAGE

### BOXFORD, MASSACHUSETTS



SITE PLAN 1"=250'

#### SHEET INDEX

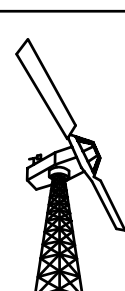
- C1 TITLE SHEET
- C2 SITE PLAN
- C3 - C4 DETAILS
- C5 - C11 PROFILES

DRAWN BY: TM	CHECKED BY: PAB	APPROVED BY: PAB
DATE: 07/09/15	ISSUE FOR: PERMIT	PROJECT NO.: 2038
DRAWING NO.: <b>C1</b>	DRAWING TITLE: TITLE SHEET	
SHEET 1 OF 11		



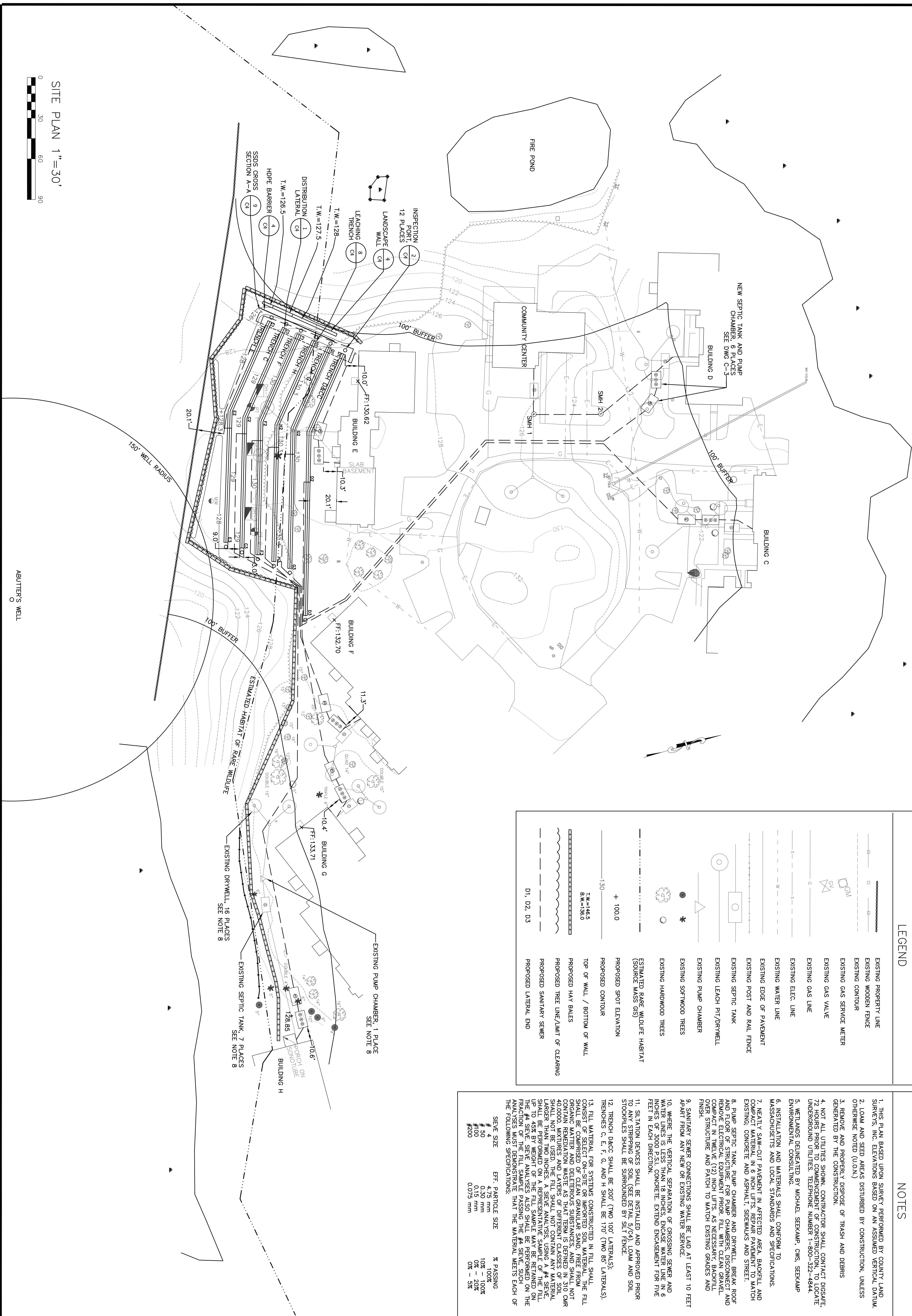
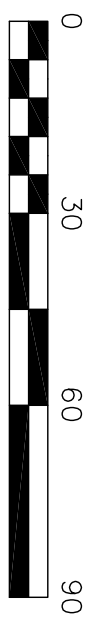
REV. NO.	DATE	REVISION DESCRIPTION	MADE BY	CHKD BY	APVD BY
1	09JULY15	DEP & BCC COMMENTS			

PROJECT:	SEWAGE DISPOSAL SYSTEM FOUR MILE VILLAGE C/O BETHANY COMMUNITY SERVICES
CLIENT:	BOXFORD FRIENDSHIP FOUNDATION 10 PHOENIX WAY HAVERHILL, MA 01832



**Bergman & Associates, Inc.**  
Engineers  
20 WASHINGTON STREET  
HAVERHILL, MA 01832-5524  
(978) 372-1125 TEL  
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SITE PLAN 1"=30'



LEGEND

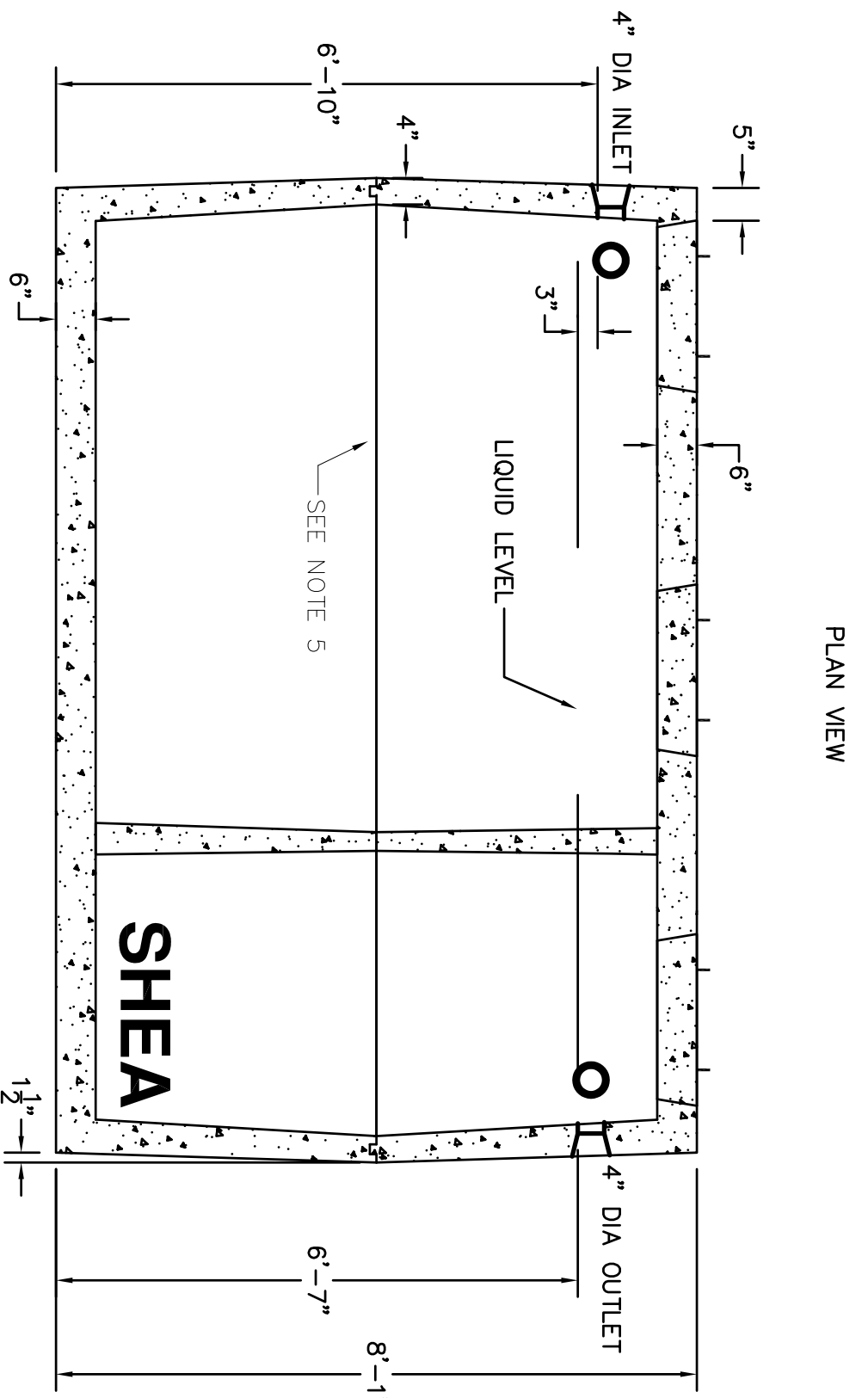
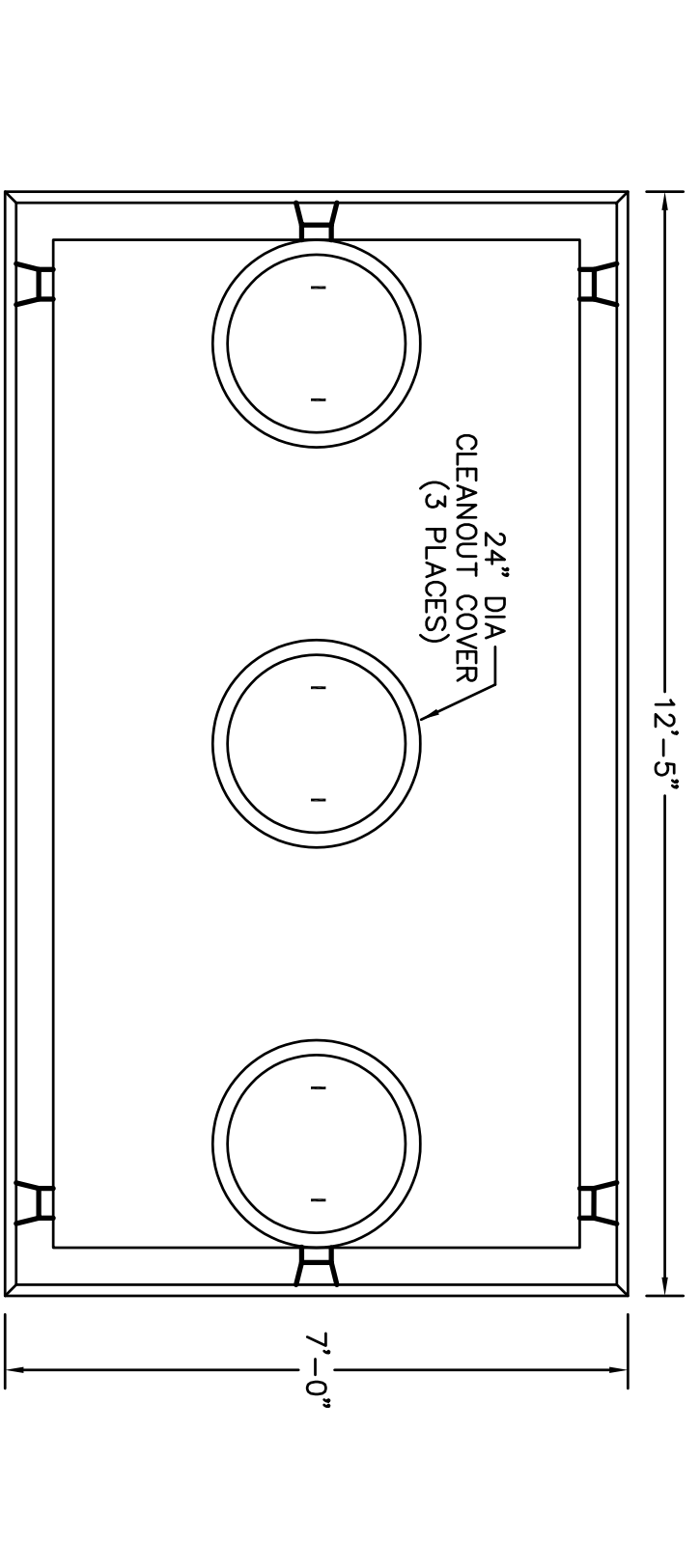
	EXISTING PROPERTY LINE
	EXISTING WOODEN FENCE
	EXISTING CONTOUR
	EXISTING GAS SERVICE METER
	EXISTING GAS VALVE
	EXISTING GAS LINE
	EXISTING ELEC. LINE
	EXISTING WATER LINE
	EXISTING EDGE OF PAVEMENT
	EXISTING POST AND RAIL FENCE
	EXISTING SEPTIC TANK
	EXISTING LEACH PIT/DRYWELL
	EXISTING PUMP CHAMBER
	EXISTING SOFTWOOD TREES
	EXISTING HARDWOOD TREES
	ESTIMATED RARE WILDLIFE HABITAT (SOURCE MASS GIS)
	PROPOSED SPOT ELEVATION
	PROPOSED CONTOUR
	TOP OF WALL / BOTTOM OF WALL
	PROPOSED HAY BALES
	PROPOSED TREE LINE/LIMIT OF CLEARING
	PROPOSED SANITARY SEWER
	PROPOSED LATERAL END

NOTES

- THIS PLAN BASED UPON SURVEY PERFORMED BY COUNTY LAND SURVEYS, INC. ELEVATIONS BASED ON AN ASSUMED VERTICAL DATUM. OTHERWISE NOTED (U.O.M.)
- LOAM AND SEED AREAS DISTURBED BY CONSTRUCTION, UNLESS OTHERWISE NOTED (U.O.M.)
- REMOVE AND PROPERLY DISPOSE OF TRASH AND DEBRIS GENERATED BY THE CONSTRUCTION.
- NOT ALL UTILITIES SHOWN. CONTRACTOR SHALL CONTACT DISSAFE, 72 HOURS PRIOR TO COMMENCEMENT OF CONSTRUCTION, TO LOCATE UNDERGROUND UTILITIES. TELEPHONE NUMBER 1-800-322-4844.
- WETLANDS DELINEATED BY MICHAEL SERKAMP, CWS, SERKAMP ENVIRONMENTAL CONSULTING.
- INSTALLATION AND MATERIALS SHALL CONFORM TO MASSACHUSETTS AND LOCAL STANDARDS AND SPECIFICATIONS.
- NEATLY SAW-CUT PAVEMENT IN AFFECTED AREA, BARRICELL AND COMPACT MATERIAL IN 6 INCH LIFT. REPAIR PAVEMENT TO MATCH EXISTING CONCRETE AND ASPHALT, SIDEWALKS AND STREET.
- NEW SEPTIC TANK, PUMP CHAMBER AND DRYWELL, BREAK ROOM AND FLOOR OF STRUCTURE, FOR PUMP CHAMBERS, DISCONNECT AND REMOVE ELECTRICAL EQUIPMENT FROM, FILL WITH CLEAN GRAVEL. OVER STRUCTURE AND PATCH TO MATCH EXISTING GRADES AND FINISH.
- SANITARY SEWER CONNECTIONS SHALL BE LAID AT LEAST 10 FEET APART FROM ANY NEW OR EXISTING WATER SERVICE.
- WHERE THE VERTICAL SEPARATION OF CROSSING SEWER AND WATER LINES IS LESS THAN 18 INCHES, ENCASE WATER LINE IN 6 INCHES OF 3000 P.S.I. CONCRETE. EXTEND ENCASUREMENT FOR FIVE FEET IN EACH DIRECTION.
- SITUATION DEVICES SHALL BE INSTALLED AND APPROVED PRIOR TO ANY STRIPPING OF SOIL (SEE DETAIL 5/24) LOAM AND SOIL STOCKPILES SHALL BE SURROUNDED BY SILT FENCE.
- TRENCH D&CC SHALL BE 200' (TWO 100' LATERALS); TRENCHES C, E, F, G, AND H SHALL BE 170' (TWO 85' LATERALS).
- FILL MATERIAL FOR SYSTEMS CONSTRUCTED IN FILL SHALL CONSIST OF FRICTURE RESISTING MATERIALS. THE FILL SHALL BE COMPRISED OF CLEAN GRANULAR SAND, FREE FROM ORGANIC MATTER AND DELETERIOUS SUBSTANCES, AND SHALL NOT CONTAIN REMEDIATION WASTE AS THAT TERM IS DEFINED IN 310 CMR 40.0000. MIXTURES AND LAYERS OF DIFFERENT CLASSES OF SOIL SHALL NOT BE USED. THE FILL SHALL NOT CONTAIN ANY MATERIAL THAT IS NOT DESCRIBED IN THIS SPECIFICATION. A REPRESENTATIVE SAMPLE OF THE FILL, UP TO 45% BY WEIGHT OF THE FILL SAMPLE MAY BE RETAINED ON THE FRACTION OF THE FILL SAMPLE PASSING THE #4 SIEVE, SUCH ANALYSES MUST DEMONSTRATE THAT THE MATERIAL MEETS EACH OF THE FOLLOWING SPECIFICATIONS.

SEIVE SIZE	EFF. PARTICLE SIZE	% PASSING
# 4	4.75 mm	100%
# 50	0.30 mm	10% - 100%
#100	0.15 mm	0% - 20%
#200	0.075 mm	0% - 5%

DRAWN BY: TM DATE: 07/09/15 DRAWING NO.: C2 SHEET 2 OF 11	CHECKED BY: PAB ISSUE FOR: PERMIT	APPROVED BY: PAB PROJECT NO.: 2038 SITE PLAN		PROJECT: SEWAGE DISPOSAL SYSTEM FOUR MILE VILLAGE C/O BETHANY COMMUNITY SERVICES CLIENT: BOXFORD FRIENDSHIP FOUNDATION 10 PHOENIX WAY HAVERHILL, MA 01832	<p><b>Bergman &amp; Associates, Inc.</b> Engineers</p> 20 WASHINGTON STREET HAVERHILL, MA 01832-5524 (978) 372-1125 TEL (978) 372-1130 FAX
REV. NO. 1 DATE 09JULY15 REVISION DESCRIPTION DEP & BCC COMMENTS		MADE BY CHKD BY APVD BY			



NOTES:

1. CONCRETE: 4,000 PSI MINIMUM AFTER 28 DAYS.
2. DESIGN CONCRETS WITH 310 OMR, 15,000 DEP TITLE 5 RECS, FOR SEPTIC TANKS.
3. ALL REINFORCEMENT PER ASTM C1227.
4. TONGUE & GROOVE JOINT SEALED WITH BUTYL RESIN.
5. TEES AND BAFLES SOLD SEPARATELY.
6. PROVIDE H-20 LOADING.

ITEM NO. TK 3000H WEIGHT 25,900LB

SEPTIC TANK 3000 GALLON

PERCOLATION TEST DATA

TEST NO.	DATE	BOTTOM OF PERC. HOLE 9'-6"	DEPTH FROM TOP OF PERC. HOLE
1	8/27/14	24"	<2 MPH
3	8/27/14	20"	<2 MPH

NAME OF APPROVING AUTHORITY: C. Shawn Kinginger, P.E.  
 MASS DEP H. CROSS STEPHENS Bergman and Associates, Inc.  
 DATE OF TEST: 8/27/14 (SUBFACE ELEVATION = 130.29)

DEPTH(H)	HORIZON	TEXTURE	COLOR	MOTTLING	OTHER
0-8	A	F. Shaly Loam	10YR5/2		M. V. Possible
8-24	BW	F. Loam Sand	2.5YR5/6		10% Cobble and Stones, M. V. Possible
24-30	BW	F. Loam Sand	2.5YR5/6		10% Cobble and Stones, F. M. Possible, None in Hand
30-120	C	M. to M. Sand	10YR7/4		2% Gravel, 20% Cobble and Stones, F. M. Possible, None in Hand

DEPTH(H)	HORIZON	TEXTURE	COLOR	MOTTLING	OTHER
0-8	A	F. Shaly Loam	10YR5/2		M. V. Possible
8-20	BW	F. Loam Sand	10YR4/6		10% Gravel, 30% Cobble and Stones, M. V. Possible
20-22	C1	F. Sand	10YR5/8		10% Gravel, 30% Cobble and Stones, F. M. Possible, None in Hand
2-120	C2	M. to Coarse S	2.5YR4/3		5% Gravel, 2-5% Cobble and Stones, M. Possible

DEPTH(H)	HORIZON	TEXTURE	COLOR	MOTTLING	OTHER
0-8	A	F. Shaly Loam	10YR5/2		M. V. Possible
8-20	BW	F. Loam Sand	10YR4/6		10% Gravel, 30% Cobble and Stones, M. V. Possible
20-120	C	F. to M. Sand	2.5YR5/4		5% Gravel, 2-5% Cobble and Stones, F. M. Possible, None in Hand

C. Shawn Kinginger, P.E.  
 C. SHAWN KINGINGER, P.E., CERTIFIED SOIL EVALUATOR #2600

DESIGN DATA — BUILDINGS C, E, F, G, H

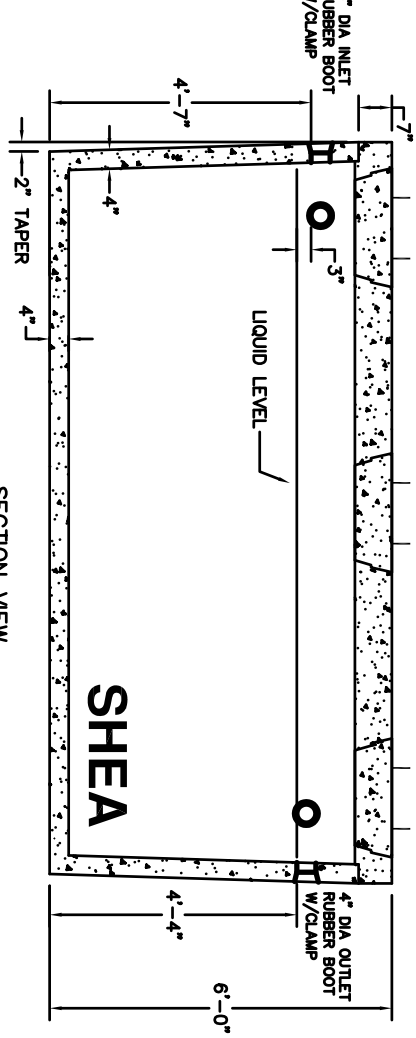
1. Hydraulic Loading  
 Designed for 8 elderly housing units  
 110 Gals. / unit x 8 units/ Building x 5 Buildings= 4400 Gallons/Day
2. Septic Tank Size  
 Average daily flow = 880 x 200% = 1760 (1ST COMPARTMENT)  
 Average daily flow = 880 x 100% = 880 (2ND COMPARTMENT)  
 Septic tank(s) provided = 3000 gals.
3. Design Percolation Rate = < 2 M.P.I. (Soil Class I)  
 Effluent Loading Rate = 0.74 GPD/SF
4. Leaching Area  
 Primary Leaching Area:  
 Sidewall area provided = 2 x 2' x 0.74 GPD / SF = 2.96 GPD/LF  
 Bottom area provided = 3' x 0.74 GPD / SF = 2.22 GPD/LF  
 Total area = 5.18 GPD/LF  
 170 LF Trenches x 5 Trenches x 5.18 GPD/LF = 4403 GPD

DESIGN DATA — BUILDING D & COMM. CENTER

1. Hydraulic Loading  
 Designed for 8 elderly housing units  
 110 Gals. / unit x 8 units/ Building x 1 Building = 880 Gallons/Day
2. Septic Tank Size  
 Average daily flow = 1000 x 200% = 2000 (1ST COMPARTMENT)  
 Average daily flow = 880 x 100% = 880 (2ND COMPARTMENT)  
 Septic tank(s) provided = 3000 gals.
3. Design Percolation Rate = < 2 M.P.I. (Soil Class I)  
 Effluent Loading Rate = 0.74 GPD / SF
4. Leaching Area  
 Primary Leaching Area:  
 Sidewall area provided = 2 x 2' x 0.74 GPD / SF = 2.96 GPD/LF  
 Bottom area provided = 3' x 0.74 GPD / SF = 2.22 GPD/LF  
 Total area = 5.18 GPD/LF  
 200 LF Trench x 1 Trench x 5.18 GPD/LF = 1036 GPD

PUMP CALCS

1. Volume (D & CC): 1000 gal + 1000 gal (emergency storage) = 2000 gals.  
 Volume (C, E, F, G, H): 880 gal + 1000 gal (emergency storage) = 1880 gals.  
 Pump chambers provided = 2000 gals.
2. Volume per ft./depth = 1 ft x 12.33 ft x 6.33 ft x 7.48 gal per cubic ft = 584 gal/ft
3. Approx. max transport length of 2" PVC = 560 ft (Bldg C)  
 Max drainback to pump chamber = 560 ft x ((2")/2)/12" per ft) 2 x π x 7.48 gal per cubic foot = 91.4 gallons
4. 880 gal/day / 3 cycles/day = 294 gal/cycles  
 294 gal / 584 gal/ft = 0.5 ft  
 Set on/off of pump controls to 0.5 ft = 6" difference.

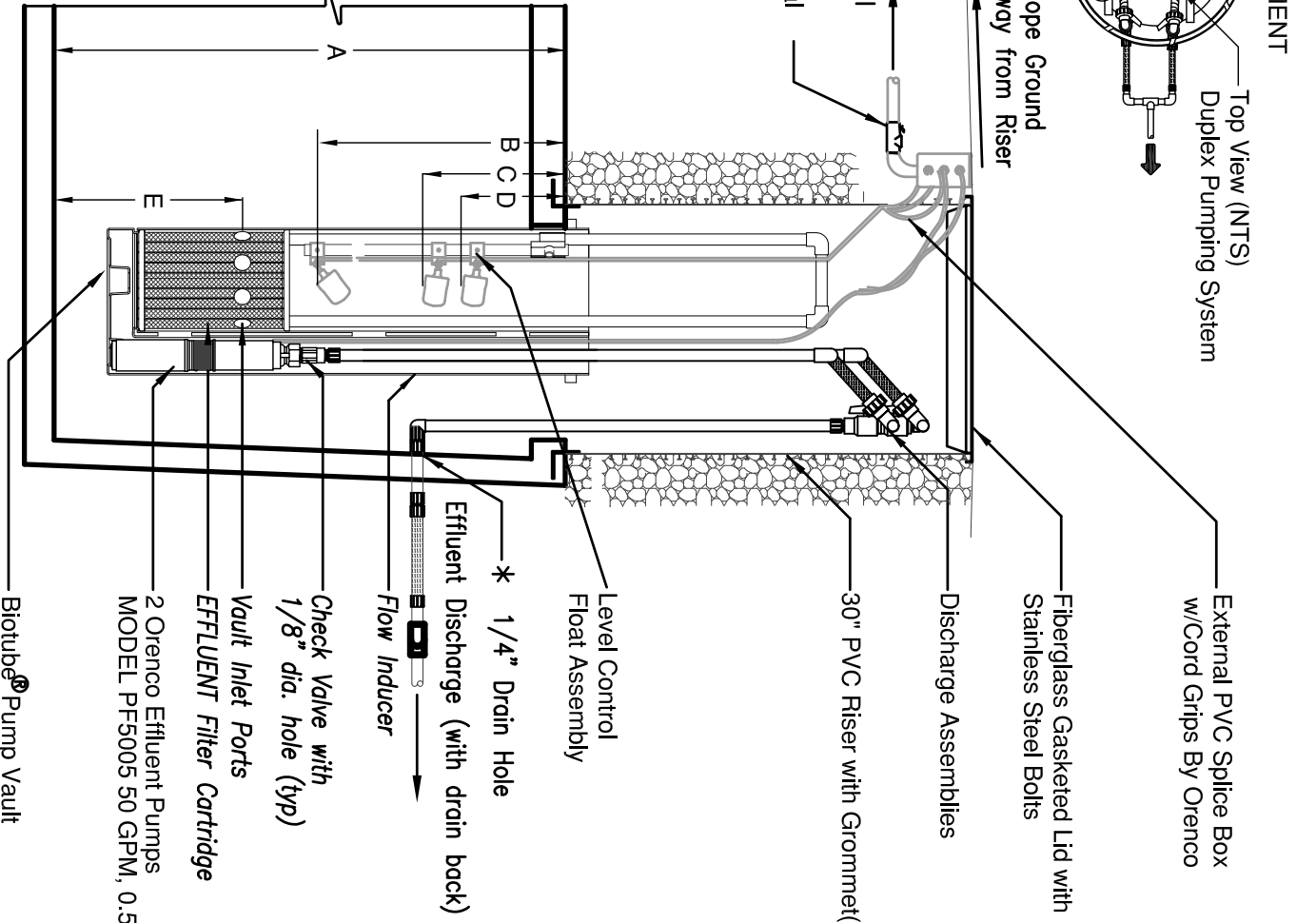


ITEM NO.	TK-3000H	STANDARD 21,250
WGT	25,900	21,250

NOTES:

1. CONCRETE: 4,000 PSI MINIMUM AFTER 28 DAYS.
2. DESIGN CONCRETS WITH 310 OMR, 15,000 DEP TITLE 5 RECS, FOR SEPTIC TANKS.
3. ALL REINFORCEMENT PER ASTM C1227.
4. TEE AND GAGE BAFLE SOLD SEPARATELY.
5. TONGUE & GROOVE JOINT SEALED WITH BUTYL RESIN.
6. PROVIDE H-20 LOADING.

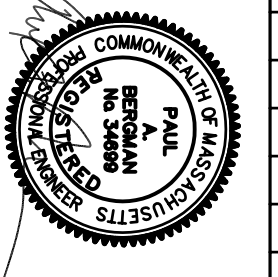
DIMENSION FROM THE TOP OF TANK	DESCRIPTION
A=63"	TOP OF TANK TO THE BOTTOM OF TANK
B=36"	OFF FLOAT LOCATION
C=30"	ON FLOAT LOCATION
D=28"	HIGH LEVEL ALARM FLOAT LOCATION AND 24-HOUR STORAGE



PACKAGED DUPLEX EFFLUENT PUMPING SYSTEM FOR COLD WEATHER APPLICATIONS  
 PROPAPK BY ORENCO  
 1  
 C3  
 DETAIL  
 NTS

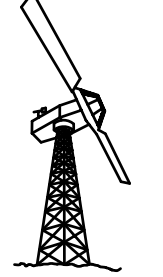
GENERAL NOTES

1. LOCATIONS OF EXISTING UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE. ALL UTILITIES MAY NOT BE SHOWN. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PROTECTING UNDERGROUND UTILITIES WHETHER OR NOT SHOWN ON THE SITE PLANS.
2. PROPERTY LINES SHOWN ON THE SITE PLAN ARE APPROXIMATE.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OR REPLACEMENT OF ANY EXISTING IMPROVEMENTS DAMAGED DURING CONSTRUCTION UNLESS NOTED OTHERWISE.
4. FINISH RIM ELEVATION OF SEWER MANHOLE OR SEPTIC TANK STRUCTURES SHALL MATCH EXISTING GRADES, UNO.
5. WORK ON THE SEWAGE DISPOSAL SYSTEM SHALL BE PERFORMED BY A LICENSED DISPOSAL WORKS INSTALLER
6. THE CONTRACTOR SHALL VERIFY THE LOCATION AND RELATIVE ELEVATIONS OF THE BENCH MARKS PRIOR TO COMMENCEMENT OF CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER.
7. PERCOLATION TESTS PERFORMED IN ACCORDANCE WITH REGULATIONS 15.104 & 15.105
8. WASHED STONE IN THE SOIL ABSORPTION SYSTEM SHALL HAVE LESS THAN 0.2 PERCENT MATERIAL FINER THAN THE A 200 SIEVE, AS DETERMINED BY AASHTO TEST METHODS T-11 AND T-27.
9. PIPING SHALL CONSIST OF PVC SCH 40 UNLESS OTHERWISE NOTED.
10. ANY ALTERATIONS TO THE DESIGN OF THIS PLAN SHALL BE APPROVED BEFOREHAND BY BERGMAN AND ASSOCIATES.
11. HEAVY MACHINERY SHALL NOT BE PERMITTED TO PASS OVER THE SOIL ABSORPTION SYSTEM.
12. THE MASS DEP SHALL REQUIRE INSPECTION OF CONSTRUCTION BY THE DESIGN ENGINEER OR BY AN AGENT OF THE MASS DEP, AND REQUIRE SUCH PERSON TO CERTIFY IN WRITING THAT THE WORK HAS BEEN COMPLETED IN ACCORDANCE WITH THE TERMS OF THE PERMIT AND THE APPROVED PLANS.
13. NO PERMANENT STRUCTURES SHALL BE CONSTRUCTED OVER THE LEACHING AREA.
14. FOR PROPER PERFORMANCE, BOTH CHAMBERS OF THE SEPTIC TANK SHALL BE INSPECTED AT LEAST ONCE A YEAR, WHEN THE TOTAL DEPTH OF THE SOIL AND SOLIDS EXCEEDS 1/3 THE LIQUID DEPTH OF THE TANK, THE TANK SHOULD BE PUMPED. THE RESULTS OF THE INSPECTION OR PUMPING SHALL BE REPORTED TO THE APPROVING AUTHORITY.
15. CONSTRUCTION WITHIN 100 FEET OF THE WETLAND RESOURCE AREA, AS DEFINED IN THE MASSACHUSETTS WETLANDS REGULATIONS (310 OMR 10.0), SHALL NOT BE PERFORMED UNTIL AN ORDER OF CONDITIONS HAS BEEN OBTAINED FROM THE LOCAL CONSERVATION COMMISSION.
16. THERE ARE NO DRINKING WATER WELLS WITHIN 150' OF THE PROPOSED SEWAGE DISPOSAL SYSTEM UNLESS NOTED OTHERWISE.
17. ADDITIONAL BALLAST NOT REQUIRED FOR SEPTIC TANKS.
18. NO GARBAGE GRINDERS ALLOWED TO FLOW INTO THE SEPTIC SYSTEM.
19. MAGNETIC TAPE SHALL BE PLACED OVER SYSTEM COMPONENTS BEFORE BACKFILLING.
20. BACKWASH FROM DOMESTIC WATER TREATMENTS SHALL NOT BE DISCHARGED INTO THE SUBSURFACE SEWAGE DISPOSAL SYSTEM. INSTEAD BACKWASH SHALL FLOW TO A DRY WELL OR ONTO GROUND PER 310 OMR 15.004(9)
21. CONTRACTOR SHALL VERIFY ALL BUILDING INVERTS OUT.
22. SEWAGE DISPOSAL SYSTEM COMPONENTS ARE GREATER THAN 400 FEET FROM SURFACE WATER RESERVOIRS AND GREATER THAN 200 FEET FROM TRIBUTARIES TO SURFACE WATERS.



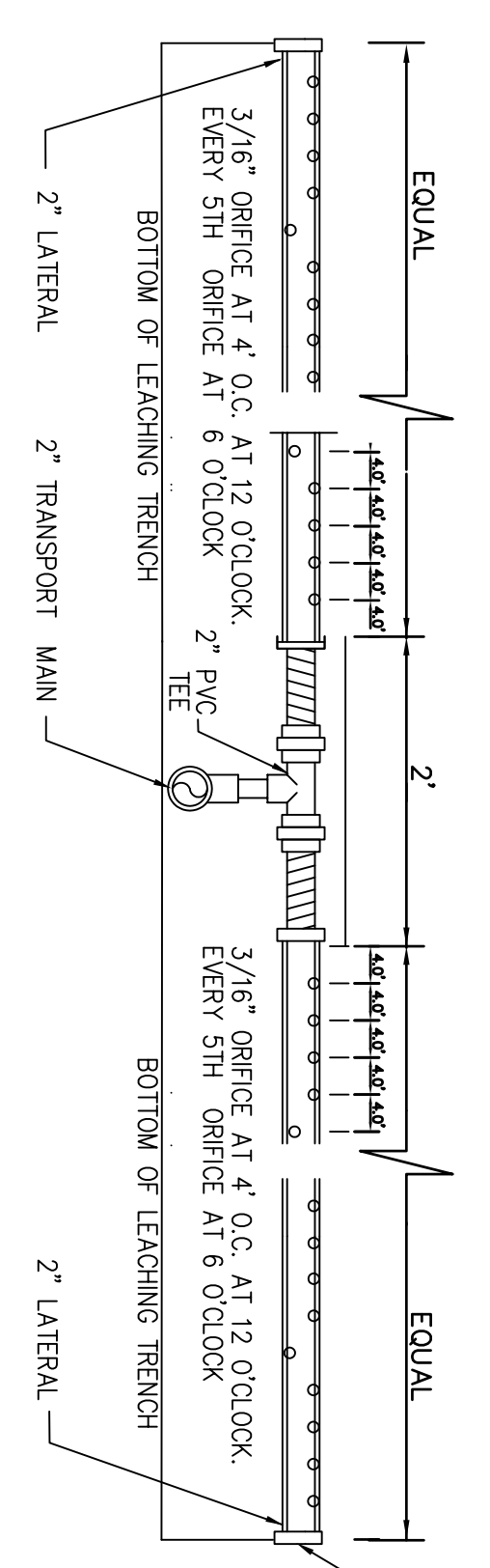
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DRAWING NO.:	33	DRAWING TITLE:	DETAILS AND NOTES		
SHEET 3 OF 11					



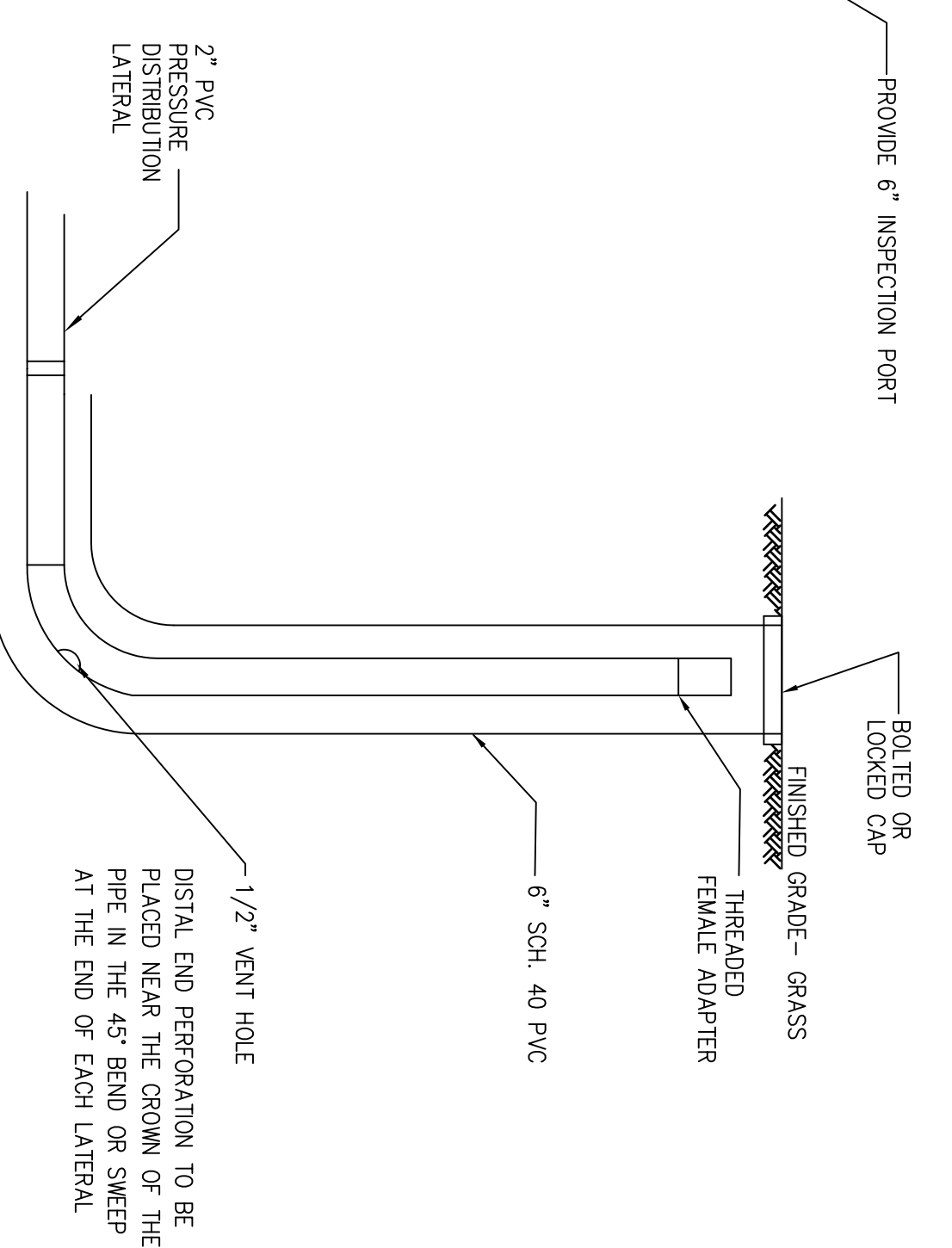
**NOTES**

1. INSTALL ORIFICE SHIELDS AT ORIFICE LOCATIONS. USE POLYLOK HYDROSHIELD BY POLYLOK 888-765-9665.
2. PRIOR TO BACKFILLING, A CLEAR WATER TEST SHALL BE CONDUCTED. VERIFY THE DISTAL HEAD PRESSURE AND THAT EACH LATERAL IS DISCHARGING EQUAL HEAD.
3. PROVIDE SCHEDULE 40 PVC PIPE ACCORDING TO ASTM D-2665
4. THOROUGHLY CLEAN ALL LATERALS PRIOR TO INSTALLATION.

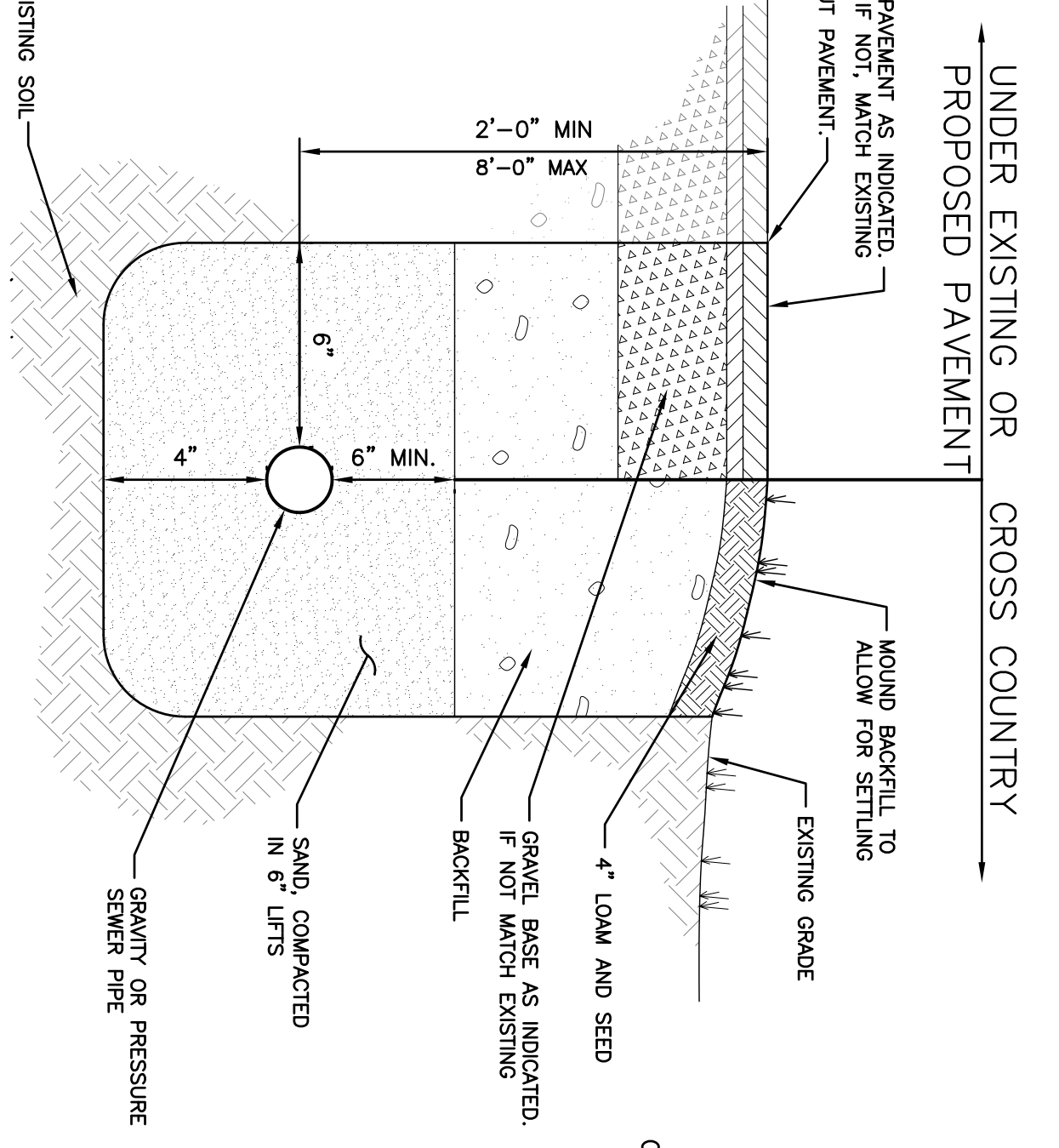
1 TYPICAL LATERAL SECTION NTS

2 SECTION C4

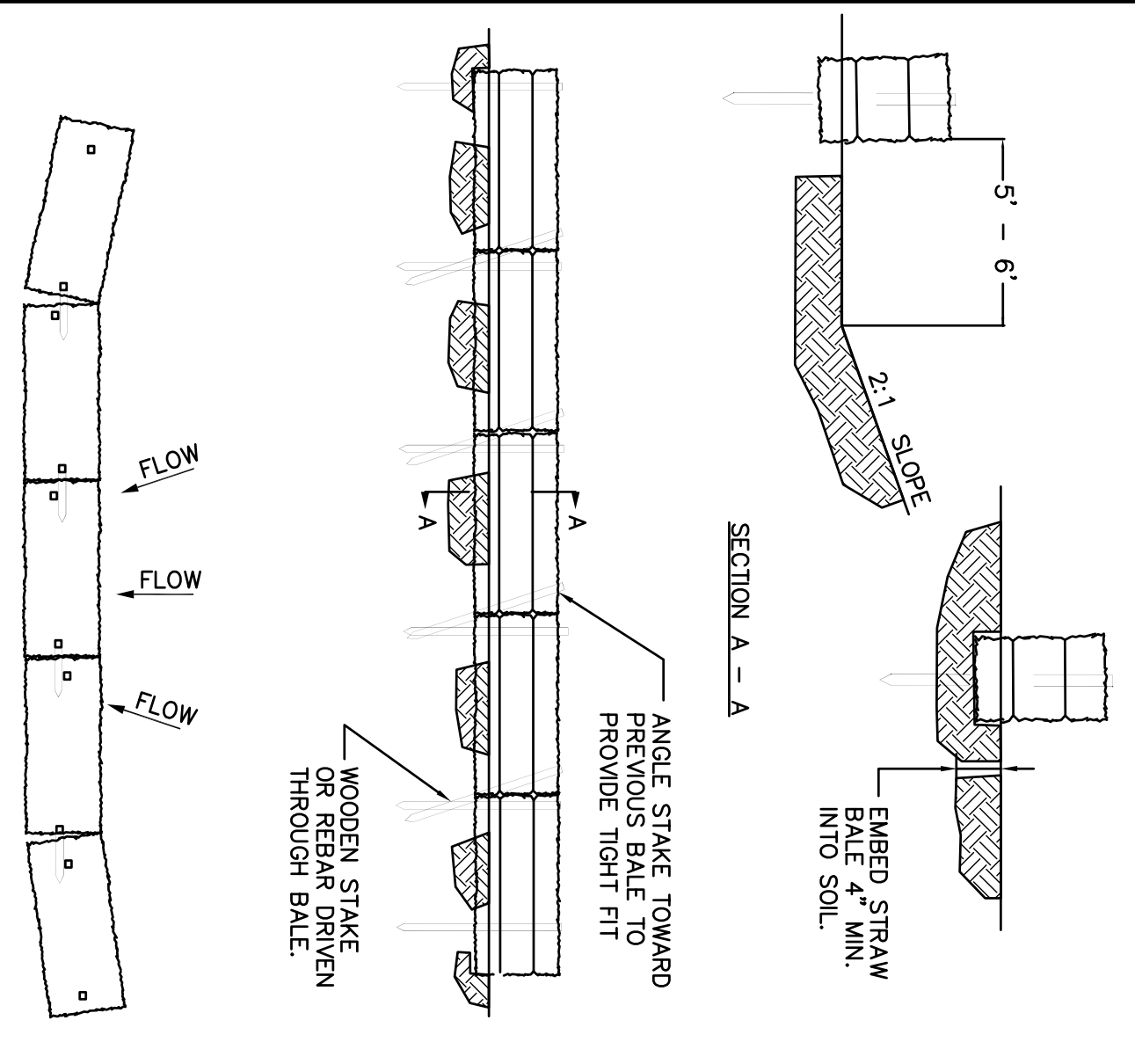
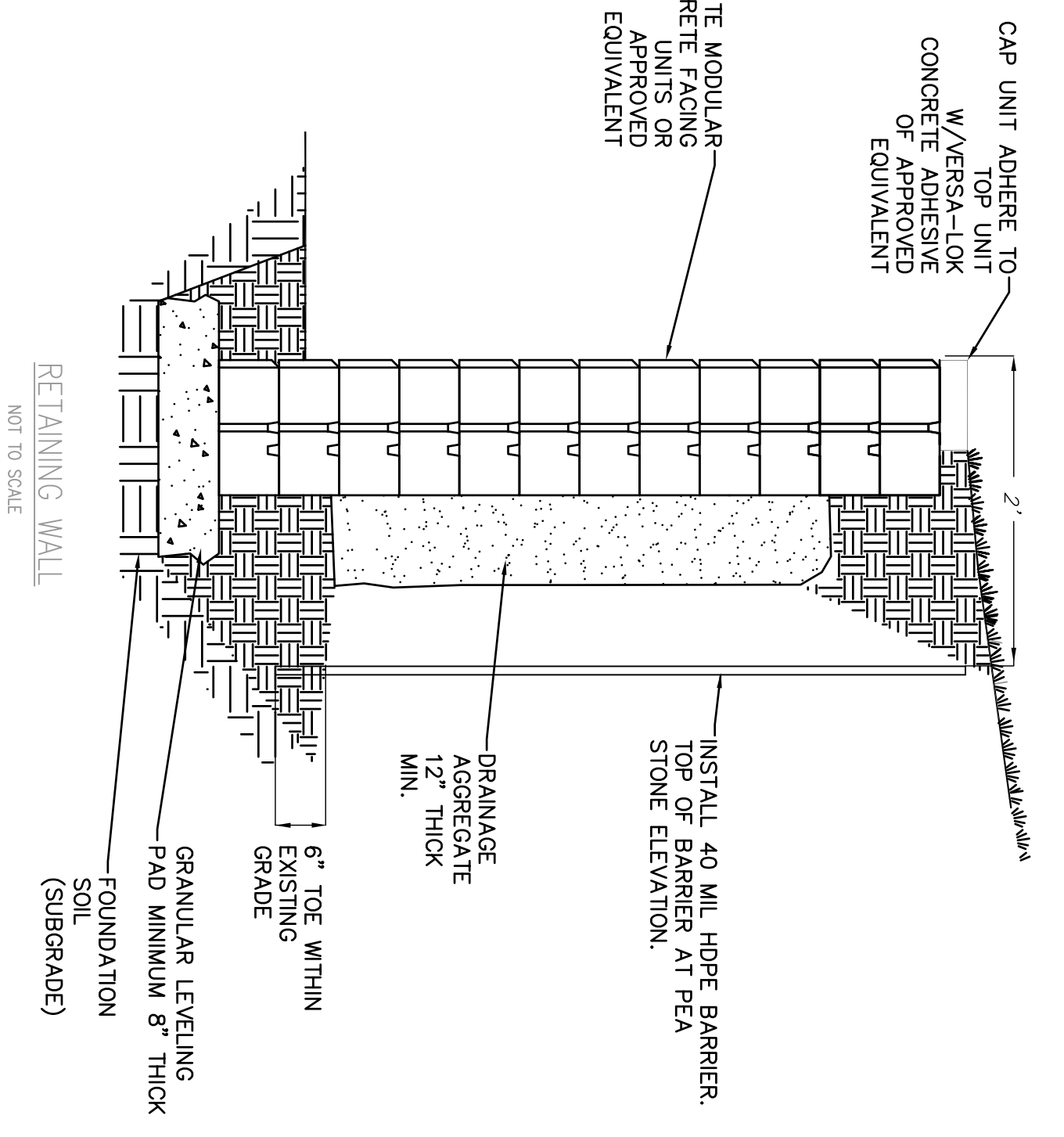
6" INSPECTION PORT AT LATERAL END



3 SEWER TRENCH DETAIL, TYP. NTS

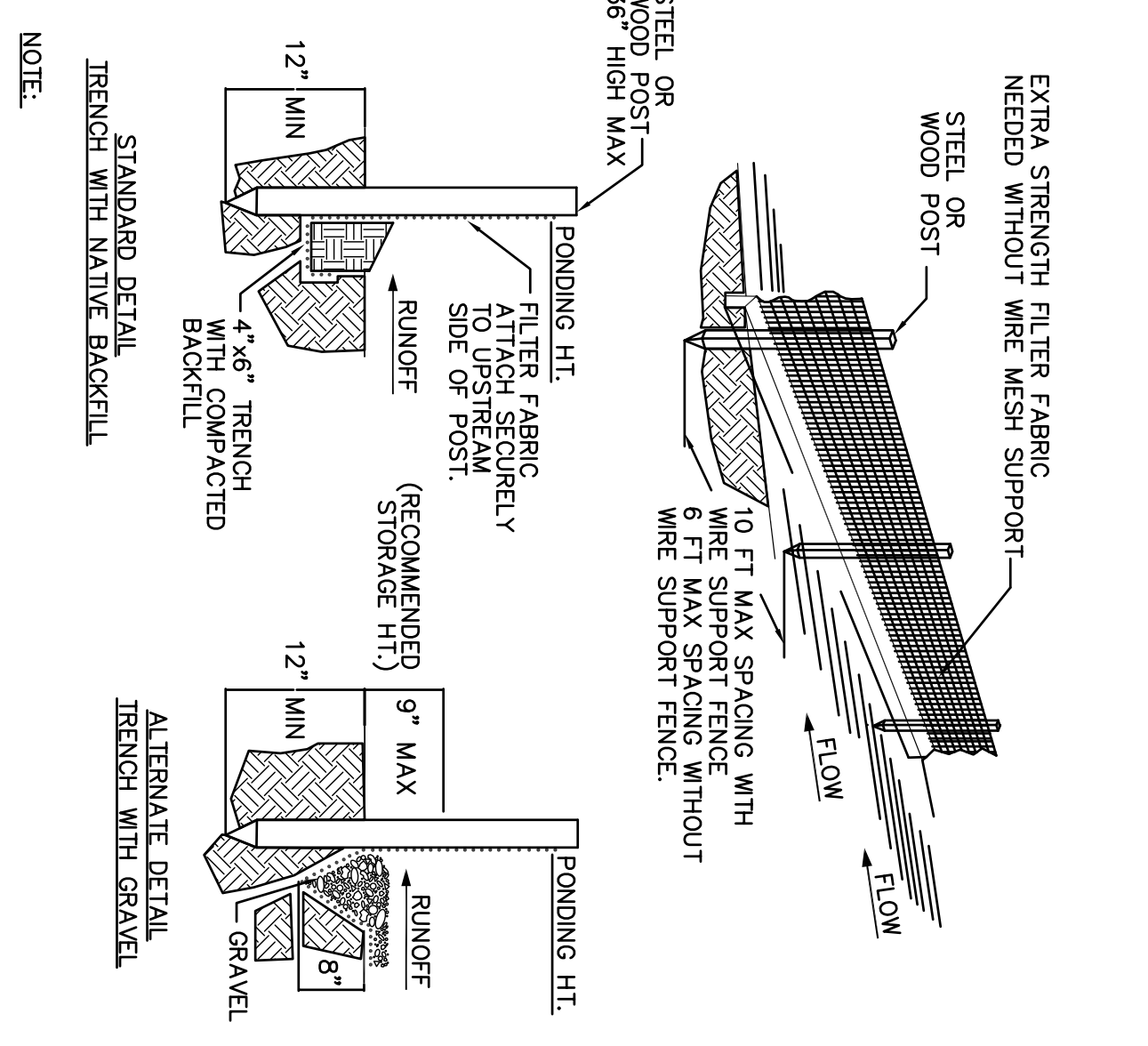


4 LANDSCAPE WALL SECTION NTS



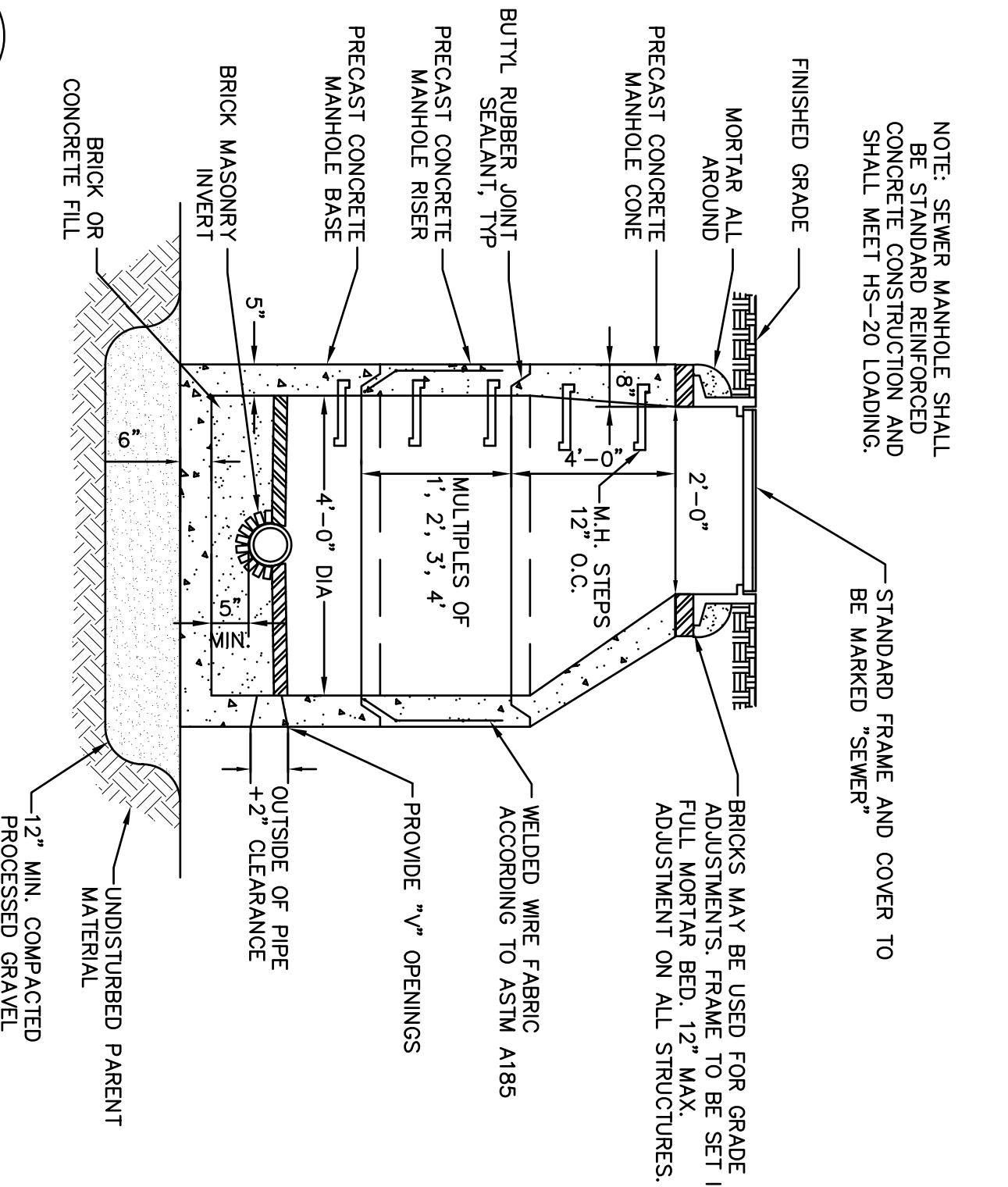
- NOTES:**
1. THE STRAW BALES SHALL BE PLACED ON SLOPE CONTOUR.
  2. BALES TO BE PLACED IN A ROW WITH THE ENDS TIGHTLY ABUTTING. USE STRAW, ROCKS OR FILTER FABRIC TO FILL GAPS BETWEEN THE BALES AND TAP THE BACKFILL MATERIAL TO PREVENT EROSION OR FLOW AROUND BALES.

5 EROSION CONTROL NTS

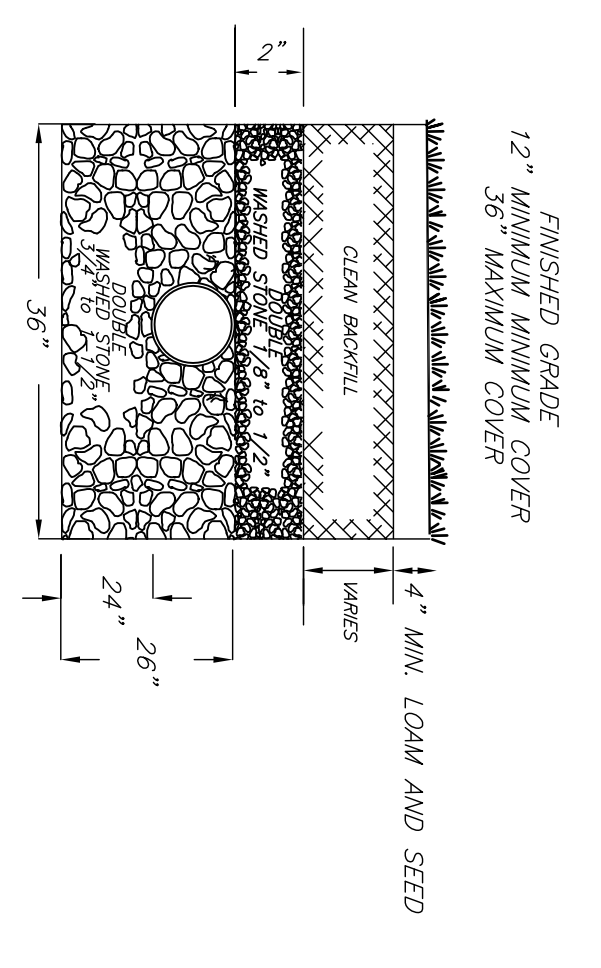
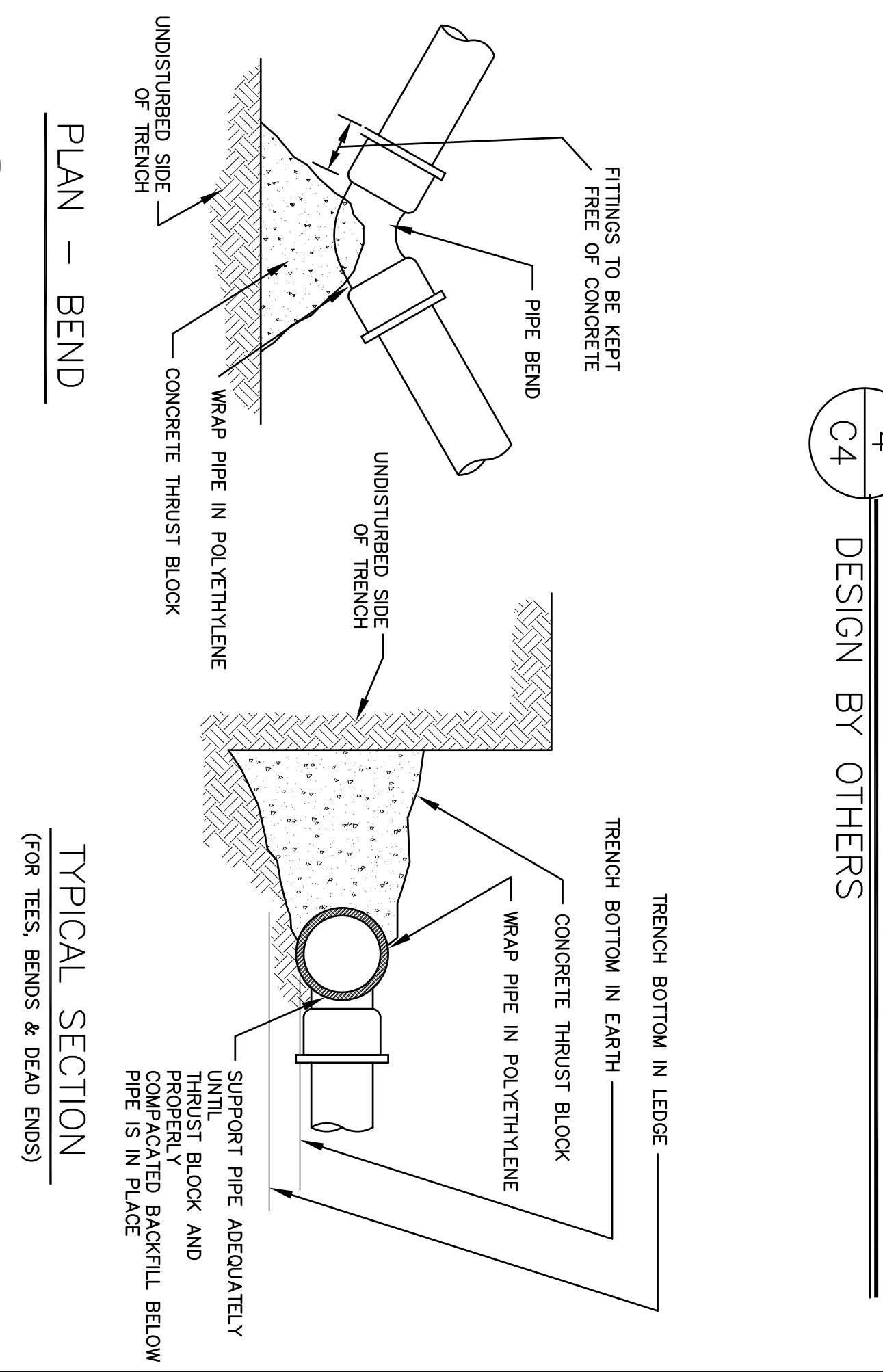


SILT FENCE NTS

6 SEWER MANHOLE NTS



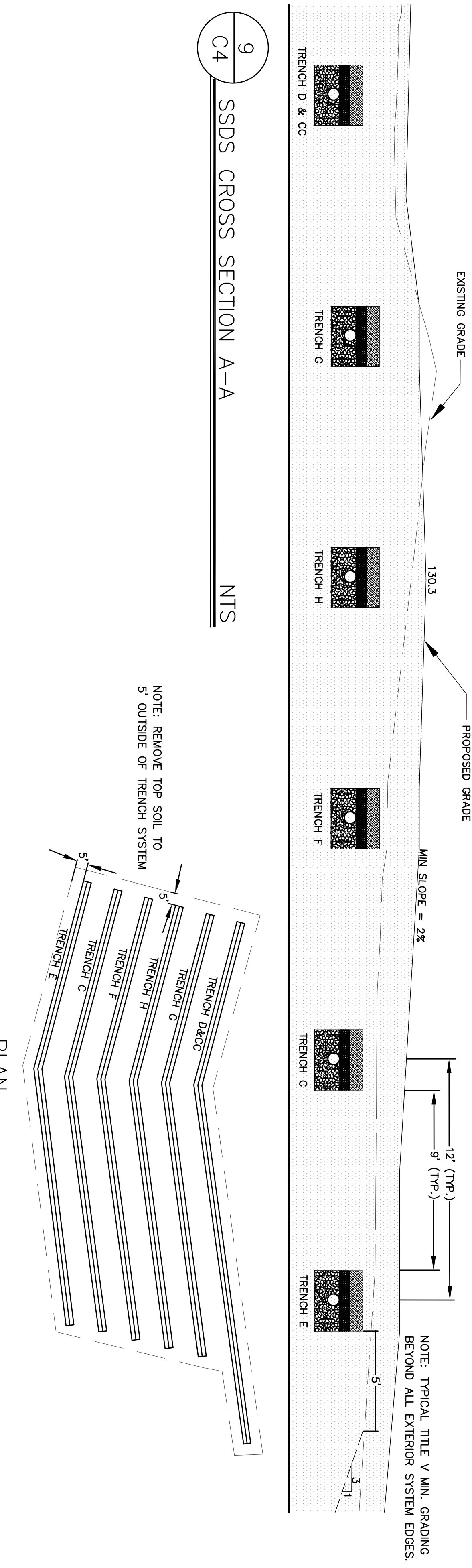
7 THRUST BLOCK DETAIL NTS



SOIL ABSORPTION TRENCH	BOTTOM ELEVATION OF TRENCH	LATERAL INVERT
C	125.40	127.40
D AND COM. CTR.	125.40	127.40
E	125.40	127.40
F	126.40	128.40
G	126.40	128.40
H	126.40	128.40

8 SOIL ABSORPTION AREA PRESSURE DOSED TRENCH SECTION NTS

9 SSDS CROSS SECTION A-A NTS



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PROJECT: SEWAGE DISPOSAL SYSTEM  
FOUR MILE VILLAGE  
C/O BETHANY COMMUNITY SERVICES

CLIENT: BOXFORD FRIENDSHIP FOUNDATION  
10 PHOENIX WAY  
HAVERHILL, MA 01832

**Bergman & Associates, Inc.**  
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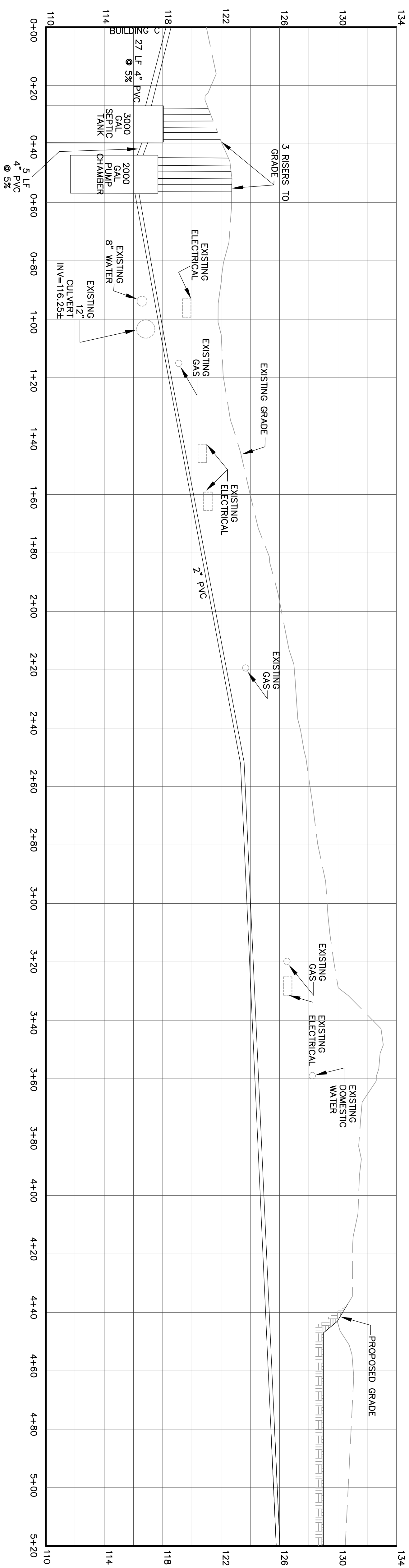
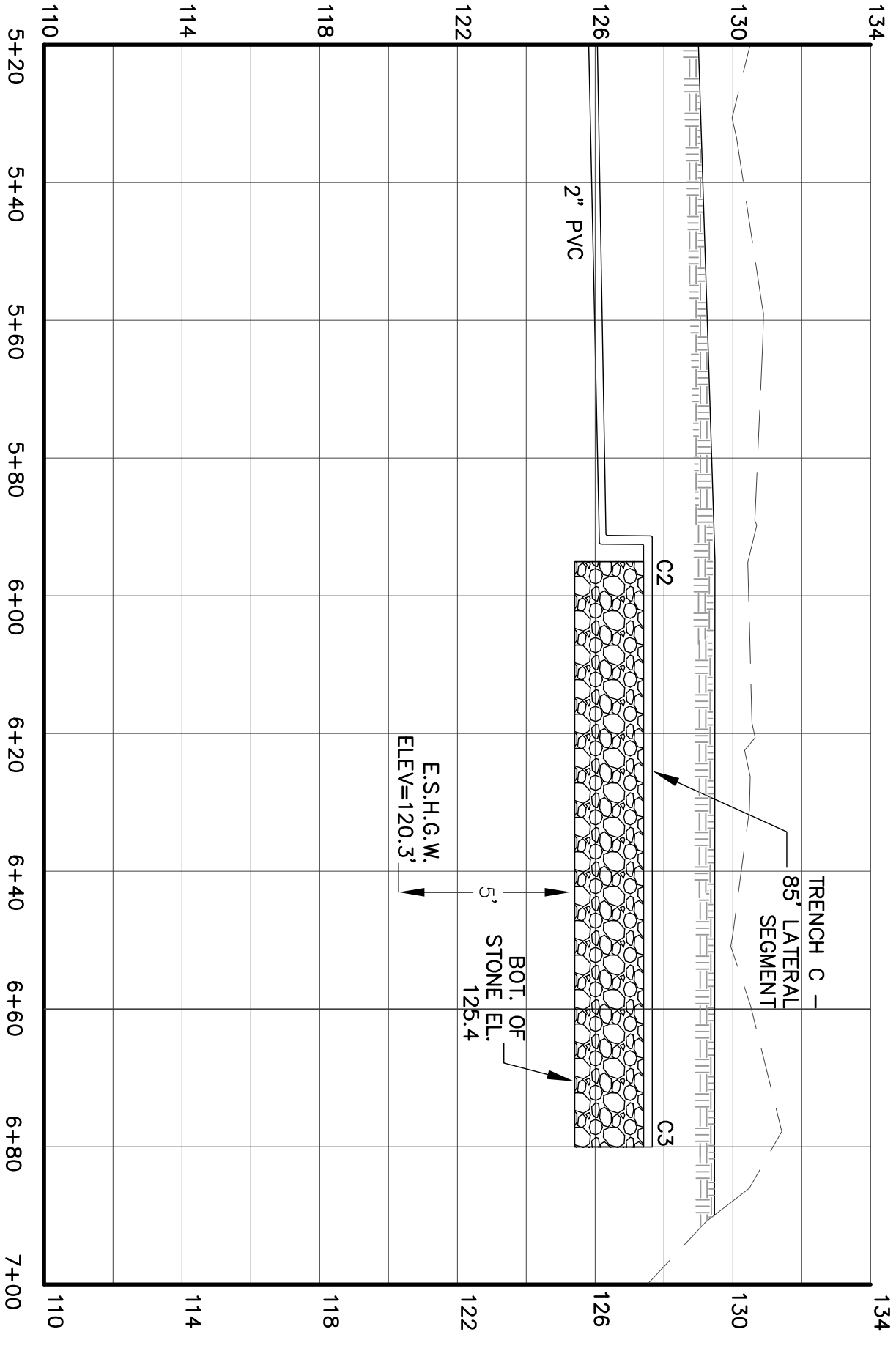
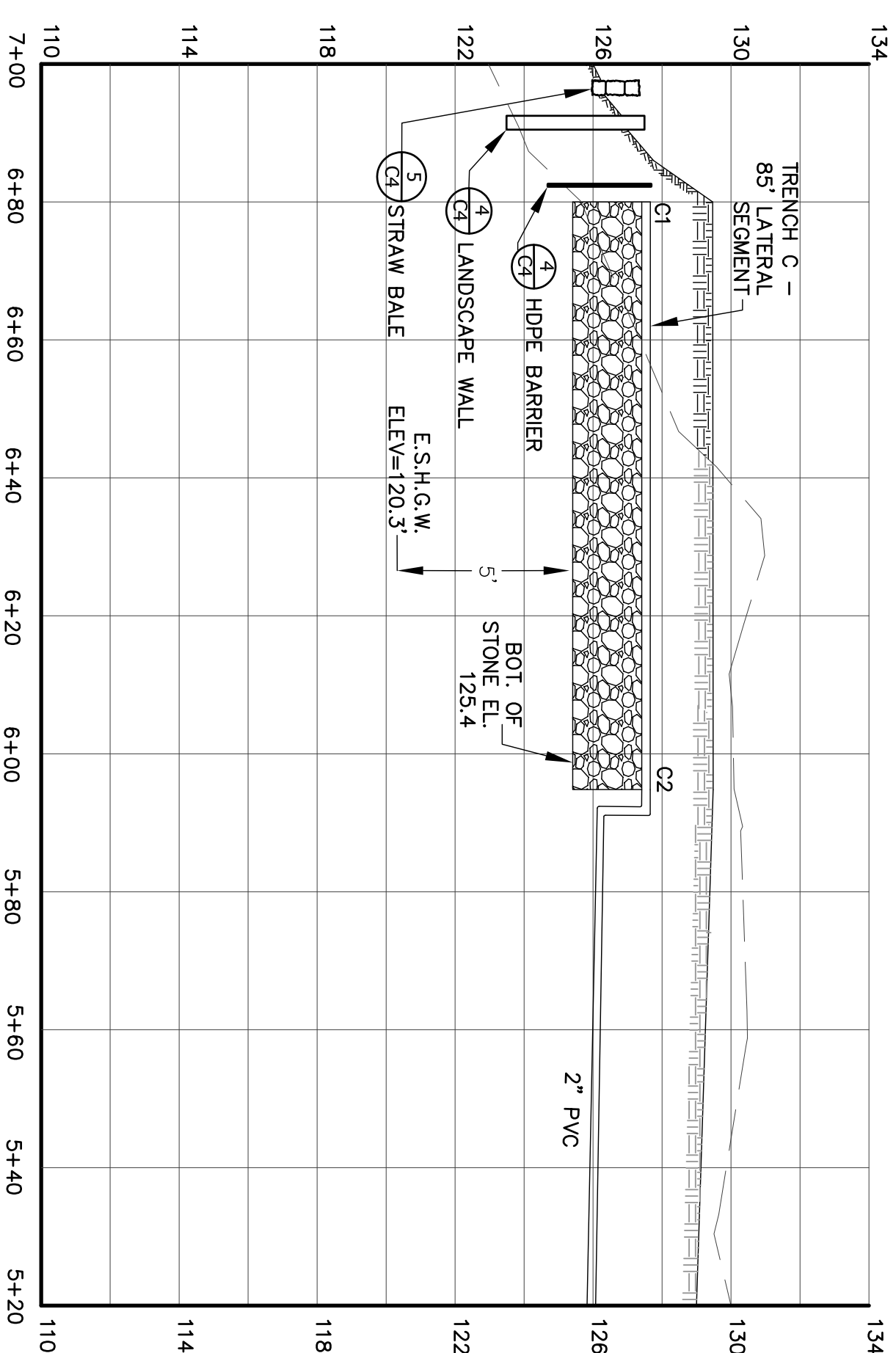


TABLE OF INVERTS

BLDG OUT	118.20
TANK IN	116.85
TANK OUT	116.60
PUMP IN	116.35
PUMP OUT	116.10



**Pump Selection for a Pressurized System - Multiple Family Residence Project**

**Parameters**

Discharge Assembly Size	2.00	inches
Transport Length	558.2	feet
Transport Pipe Class	40	inches
Transport Line Size	2.00	inches
Distributing Valve Model	None	
Max. Elevation Lift	13.9	feet
Manifold Length	3	feet
Manifold Pipe Class	40	inches
Number of Laterals per Cell	2.00	inches
Lateral Length	85	feet
Lateral Pipe Class	40	inches
Office Size	2.00	inches
Office Spacing	3/16	feet
Residual Head	4	feet
Flow Meter	3	inches
Add-on Friction Losses	0	feet

**Calculations**

Minimum Flow Rate per Office	0.76	gpm
Number of Offices per Zone	44	
Total Flow Rate per Zone	33.4	gpm
Number of Laterals per Zone	2	
% Flow Differential 1st/Last Office	2.5	%
Transport Velocity	3.2	fps

**Frictional Head Losses**

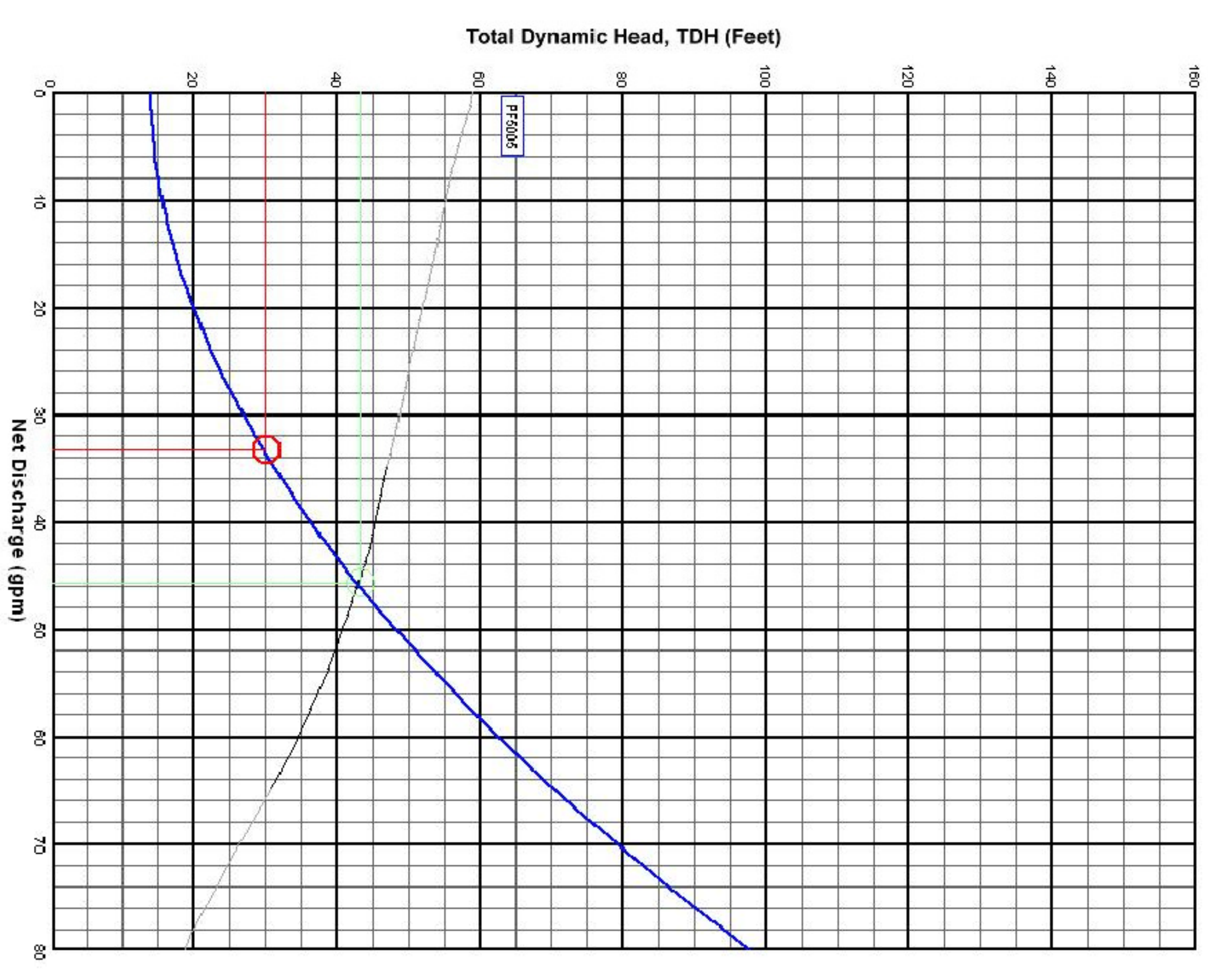
Loss through Discharge	2.2	feet
Loss in Transport	10.6	feet
Loss through Valve	0.0	feet
Loss in Manifold	0.0	feet
Loss in Laterals	0.2	feet
Loss through Flowmeter	0.0	feet
Add-on Friction Losses	0.0	feet

**Pipe Volumes**

Vol of Transport Line	97.3	gals
Vol of Manifold	0.5	gals
Vol of Laterals per Zone	29.6	gals
Total Volume	127.5	gals

**Minimum Pump Requirements**

Design Flow Rate	33.4	gpm
Total Dynamic Head	29.9	feet



System Curve: —  
 Pump Curve: —  
 Pump Optimal Range: —  
 Operating Point: ●  
 Design Point: ○

1  
C5

**PROFILE - BUILDING C**

HORIZ. SCALE: 1"=20'  
 VER. SCALE: 1"=4'

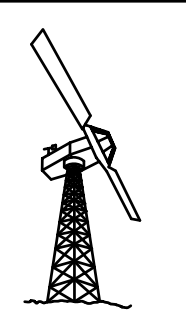
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DRAWING NO.: C5	DRAWING TITLE: PROFILES	SHEET 5 OF 11



REV. NO.	DATE	REVISION DESCRIPTION	MADE BY	CHKD BY	APVD BY
1	09JULY15	DEP & BCC COMMENTS			

PROJECT: SEWAGE DISPOSAL SYSTEM  
 FOUR MILE VILLAGE  
 C/O BETHANY COMMUNITY SERVICES

CLIENT: BOXFORD FRIENDSHIP FOUNDATION  
 10 PHOENIX WAY  
 HAVERHILL, MA 01832



**Bergman & Associates, Inc.**  
 Engineers

20 WASHINGTON STREET  
 HAVERHILL, MA 01832-5524  
 (978) 372-1125 TEL  
 (978) 372-1130 FAX

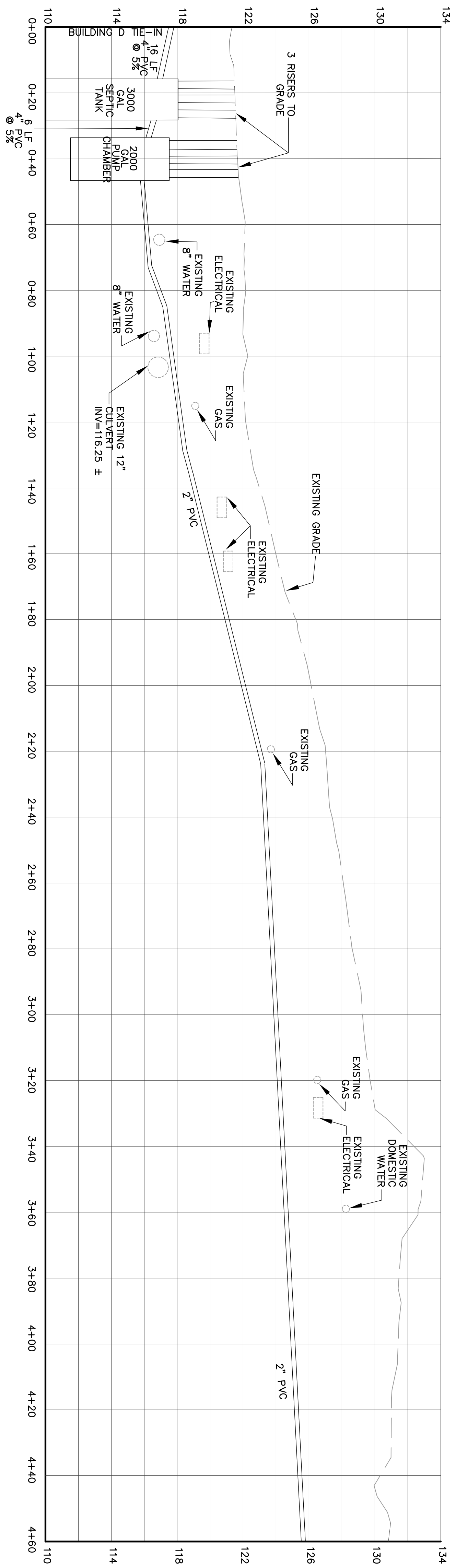
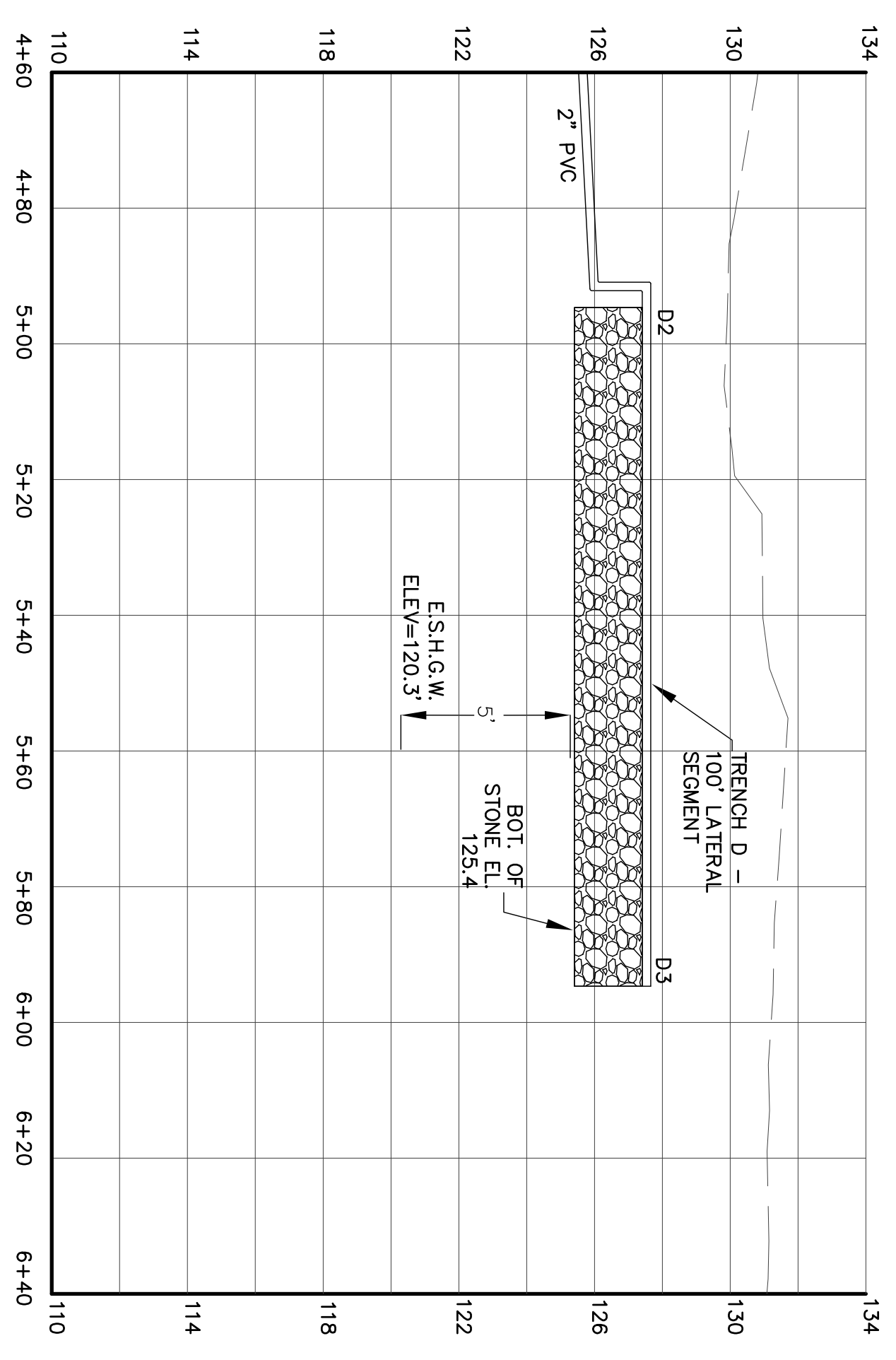
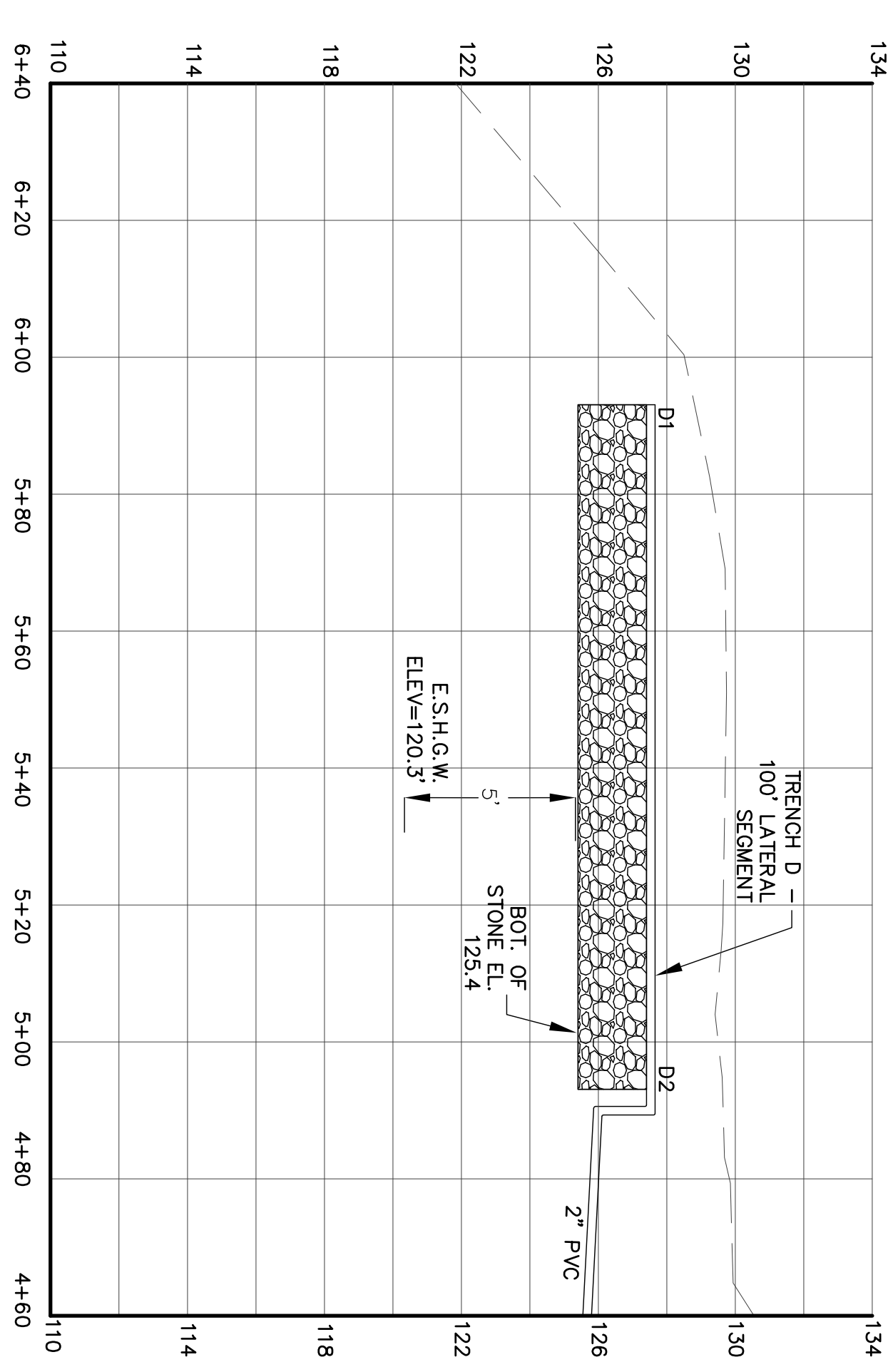


TABLE OF INVERTS

BLDG OUT	117.46
TANK IN	116.66
TANK OUT	116.41
PUMP IN	116.11
PUMP OUT	115.86



1 PROFILE - BUILDING D  
 HORZ. SCALE: 1"=20'  
 VER. SCALE: 1"=4'

Pump Selection for a Pressurized System - Multiple Family Residence Project

Parameters

Discharge Assembly Size	2.00	inches
Transport Length	442.4	feet
Transport Pipe Class	40	inches
Transport Line Size	2.00	inches
Distributing Valve Model	None	
Max. Elevation Lift	14	feet
Manifold Length	3	feet
Manifold Pipe Class	40	inches
Manifold Pipe Size	2.00	inches
Number of Laterals per Cell	2	
Lateral Length	100	feet
Lateral Pipe Class	40	inches
Lateral Pipe Size	2.00	inches
Orifice Size	3/16	inches
Orifice Spacing	4	feet
Residual Head	3	feet
Flow Meter	None	
Add-on Friction Losses	0	feet

Calculations

Minimum Flow Rate per Orifice	0.76	gpm
Number of Orifices per Zone	52	
Total Flow Rate per Zone	39.6	gpm
Number of Laterals per Zone	2	
% Flow Differential (1st Last Orifice)	4.0	%
Transport Velocity	3.8	fps

Fictional Head Losses

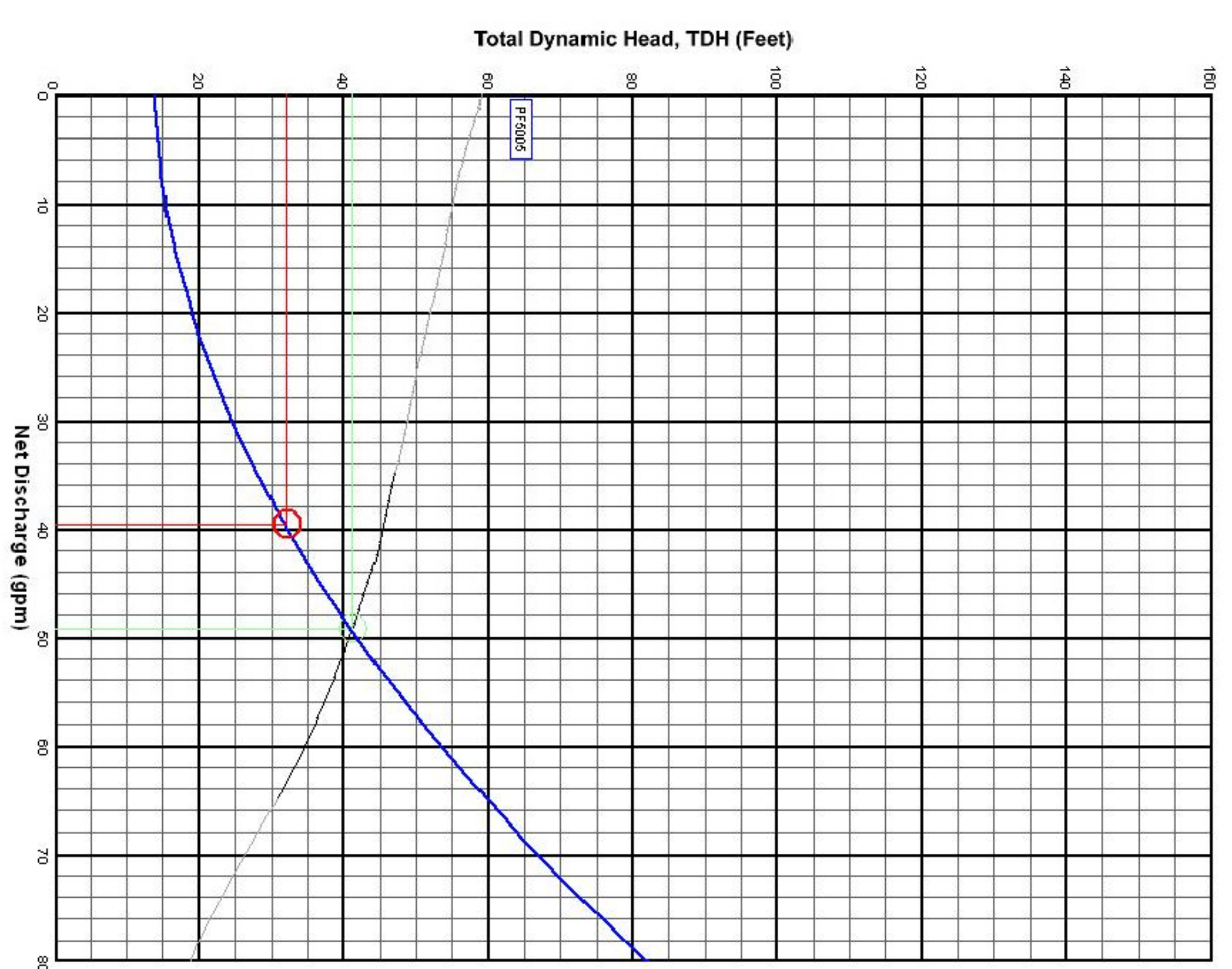
Loss through Discharge	3.1	feet
Loss in Transport	11.5	feet
Loss through Valve	0.0	feet
Loss in Manifold	0.0	feet
Loss in Laterals	0.3	feet
Loss through Flowmeter	0.0	feet
Add-on Friction Losses	0.0	feet

Pipe Volumes

Vol of Transport Line	77.1	gals
Vol of Manifold	0.5	gals
Vol of Laterals per Zone	34.9	gals
Total Volume	112.5	gals

Minimum Pump Requirements

Design Flow Rate	39.6	gpm
Total Dynamic Head	31.9	feet

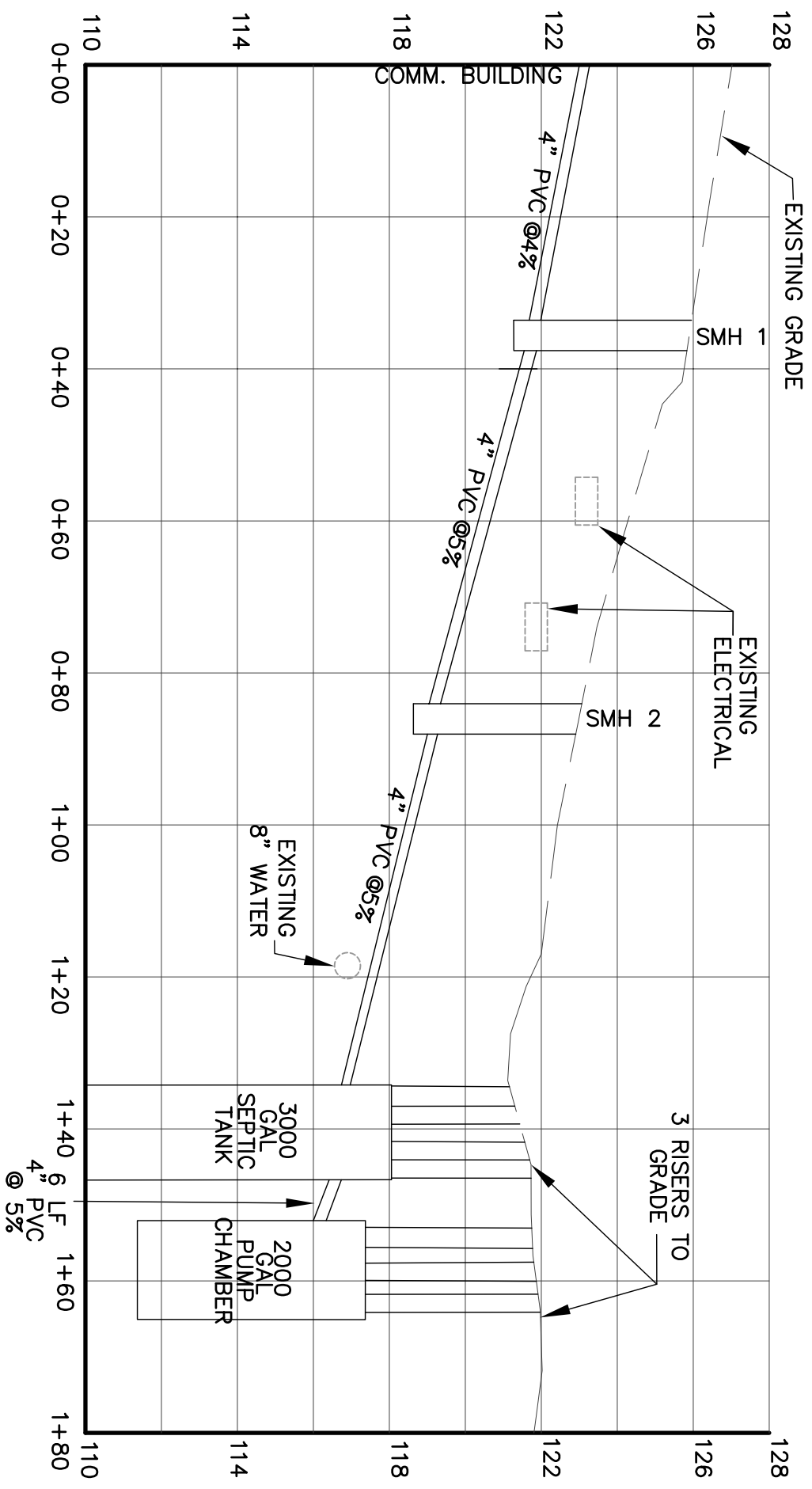


Legend

System Curve	—
Pump Curve	—
Pump Optimal Range	—
Operating Point	●
Design Point	○

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DRAWING NO.: C6	DRAWING TITLE: PROFILES	SHEET 6 OF 11		
1 C6		REV. NO. DATE REVISION DESCRIPTION MADE BY CHKD BY APVD BY		

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NOTE: SEE SHEET C7 FOR PUMP AND TRENCH PROFILE

BLDG OUT	123.00
SMH1 IN	121.64
SMH1 OUT	121.54
SMH2 IN	118.09
SMH2 OUT	118.09
TANK IN	116.89
TANK OUT	116.41

**Pump Selection for a Pressurized System - Multiple Family Residence Project**

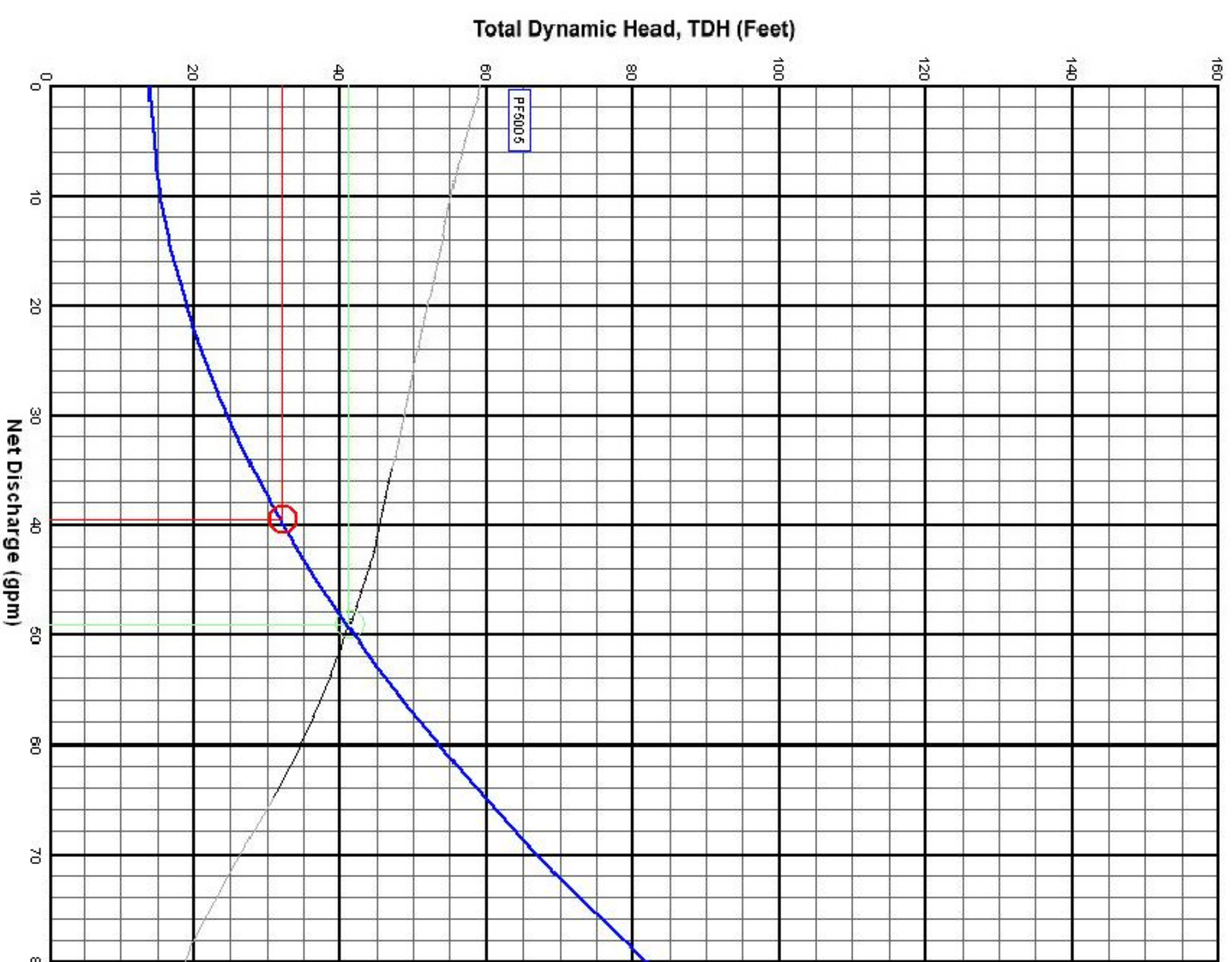
Parameters	
Discharge Assembly Size	2.00 inches
Transport Length	442.4 feet
Transport Pipe Class	40
Transport Line Size	2.00 inches
Distributing Valve Model	None
Manhole Elevation Lift	14 feet
Manhole Length	3 feet
Manhole Pipe Class	40
Manhole Pipe Size	2.00 inches
Number of Laterals per Cell	2
Lateral Length	100 feet
Lateral Pipe Class	40
Lateral Pipe Size	2.00 inches
Office Spacing	316 feet
Residual Head	4 feet
Flow Meter	3 feet
Add-on Friction Losses	None

Calculations	
Minimum Flow Rate per Office	0.76 gpm
Number of Offices per Zone	52
Total Flow Rate per Zone	39.6 gpm
Number of Laterals per Zone	2
% Flow Differential 1st Last Office	4.0 %
Transport Velocity	3.8 fps

Frictional Head Losses	
Loss through Discharge	3.1 feet
Loss in Transport	11.5 feet
Loss through Valve	0.0 feet
Loss in Manhole	0.0 feet
Loss in Laterals	0.3 feet
Loss through Flowmeter	0.0 feet
Add-on Friction Losses	0.0 feet

Pipe Volumes	
Vol of Transport Line	77.1 gals
Vol of Manhole	0.5 gals
Vol of Laterals per Zone	34.9 gals
Total Volume	112.5 gals

Minimum Pump Requirements	
Design Flow Rate	39.6 gpm
Total Dynamic Head	31.9 feet



System Curve:	—
Pump Curve:	—
Pump Operating Range:	—
Operating Point:	○
Design Point:	○

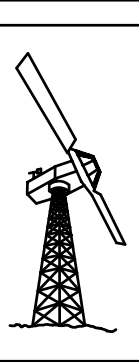


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REV. NO.	DATE	REVISION DESCRIPTION	MADE BY	CHKD BY	APVD BY
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PROJECT:	SEWAGE DISPOSAL SYSTEM FOUR MILE VILLAGE C/O BETHANY COMMUNITY SERVICES
CLIENT:	BOXFORD FRIENDSHIP FOUNDATION 10 PHOENIX WAY HAVERHILL, MA 01832



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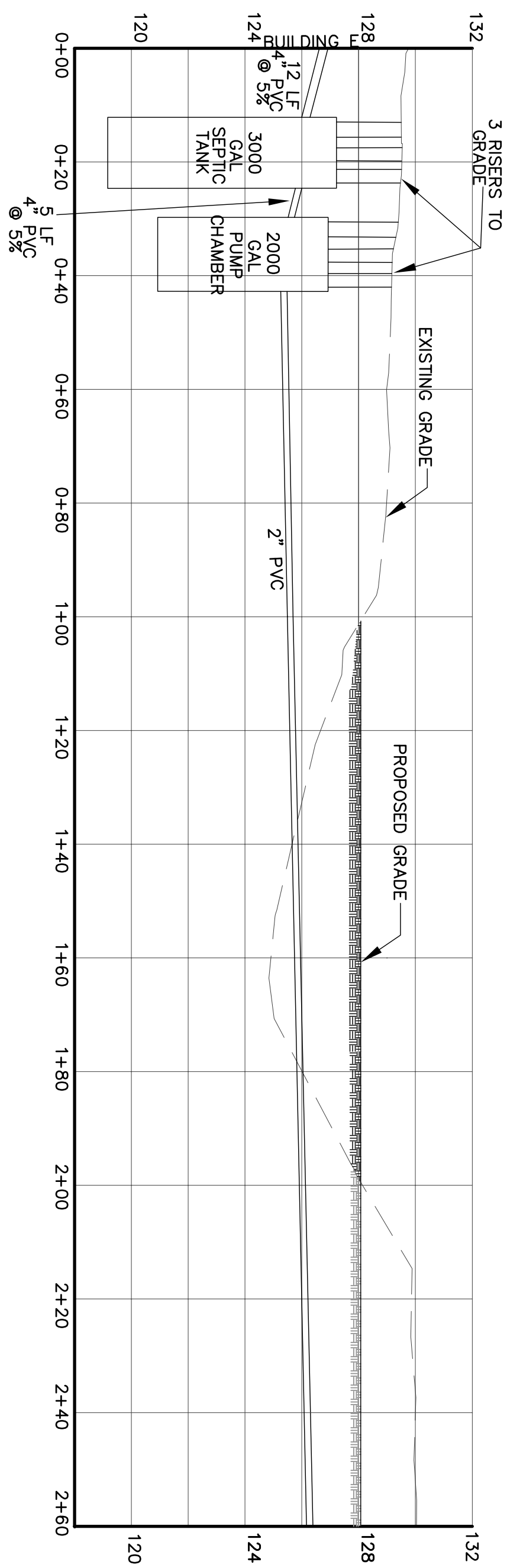
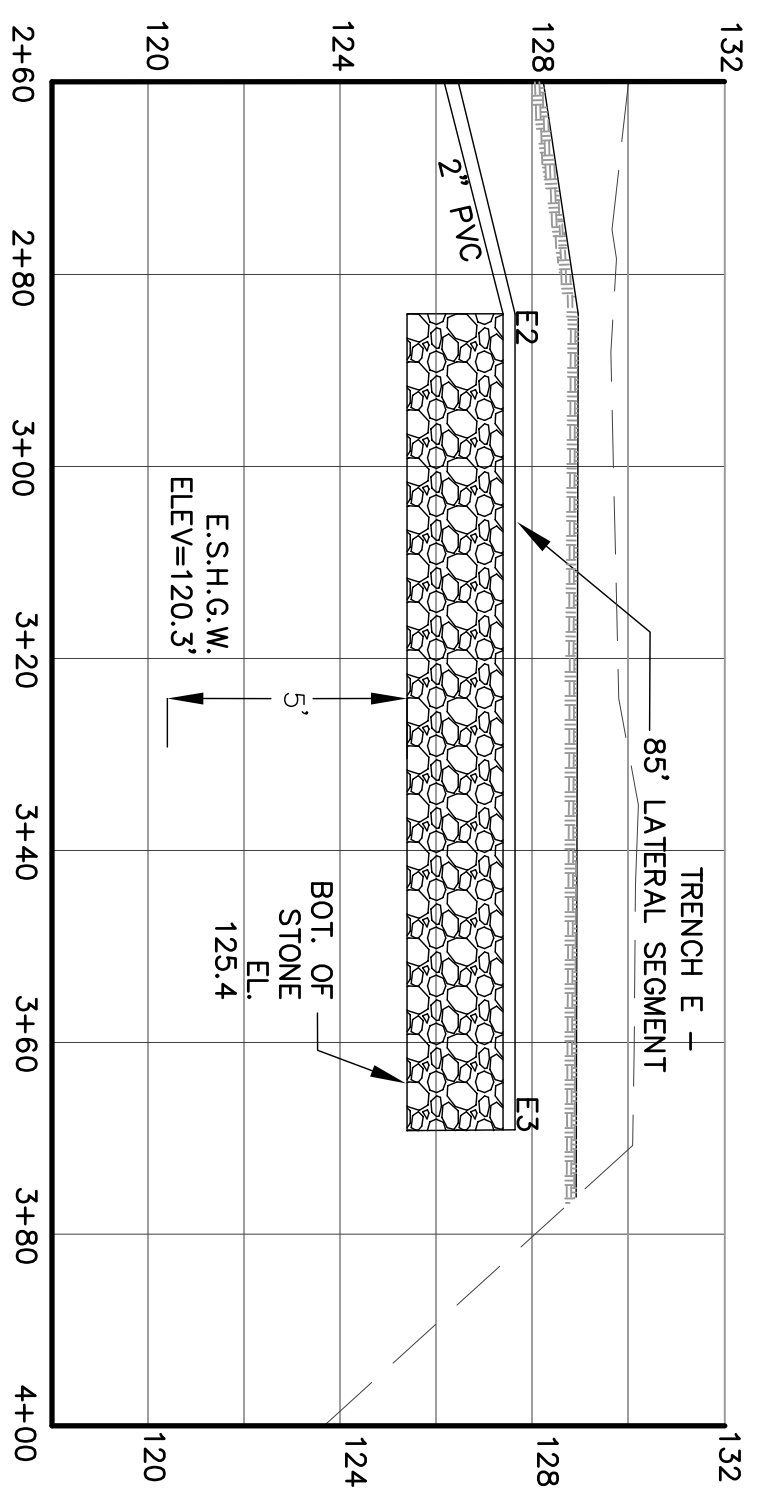
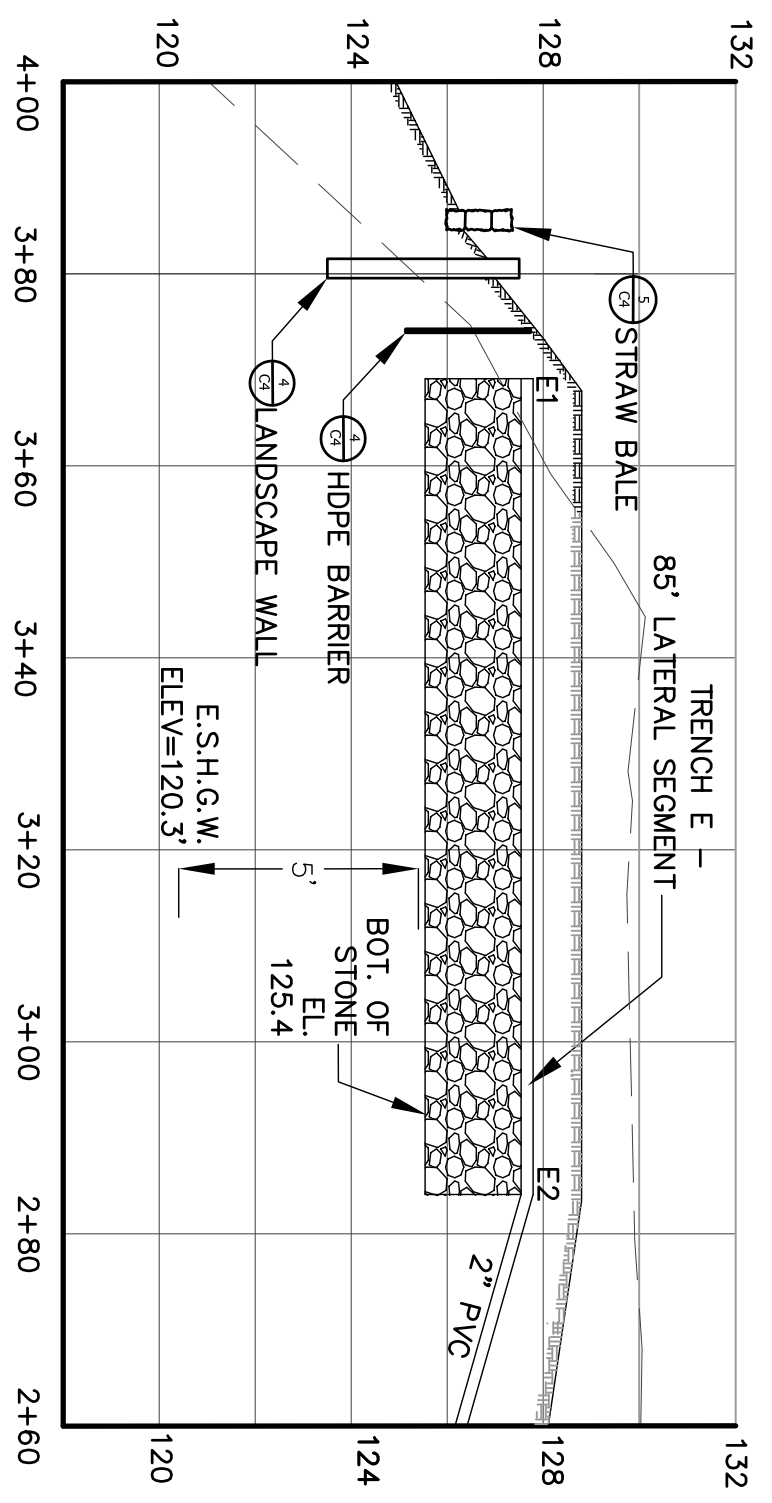


TABLE OF INVERTS

BUILDING	128.62
TANK IN	128.02
TANK OUT	128.07
PUMP IN	128.57
PUMP OUT	128.27



**Pump Selection for a Pressurized System - Multiple Family Residence Project**

**Parameters**

Discharge Assembly Size	2.00	inches
Transport Length	244	feet
Transport Pipe Class	4.0	inches
Transport Line Size	2.00	inches
Distributing Valve Model	None	
Max. Elevation Lift	4.78	feet
Manifold Length	3	feet
Manifold Pipe Class	4.0	inches
Number of laterals per Cell	2	
Lateral Length	85	feet
Lateral Pipe Class	4.0	inches
Office Size	3/16	inches
Office Spacing	4	feet
Residual Head	3	feet
Flow Meter	None	inches
Add-on Friction Losses	0	feet

**Calculations**

Minimum Flow Rate per Office	0.76	gpm
Number of Offices per Zone	44	
Total Flow Rate per Zone	33.4	gpm
Number of Laterals per Zone	2	
% Flow Differential (still, sat. Office)	2.5	%
Transport Velocity	3.2	fps

**Frictional Head Losses**

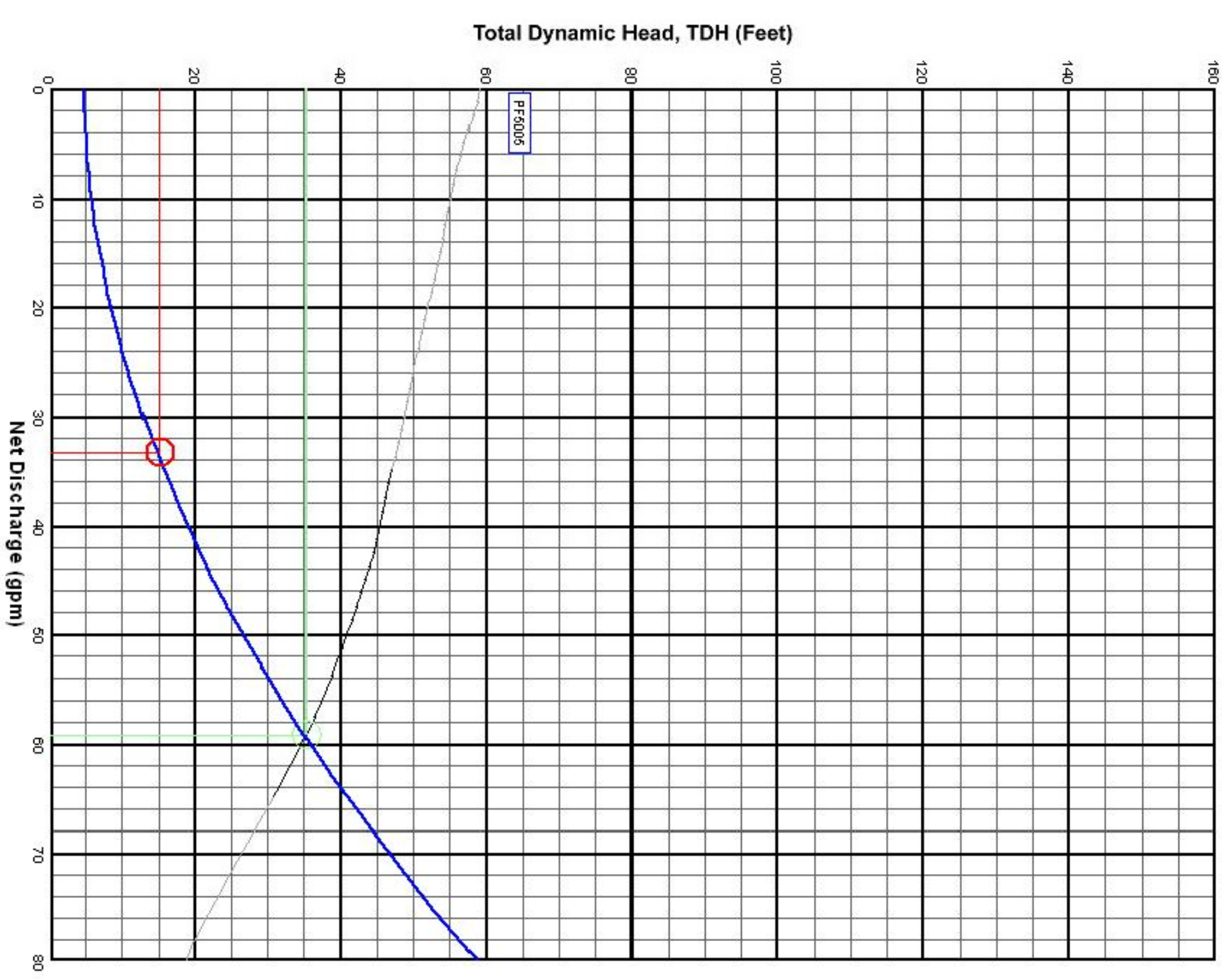
Loss Through Discharge	2.2	feet
Loss in Transport	4.6	feet
Loss through Valve	0.0	feet
Loss in Manifold	0.0	feet
Loss in Laterals	0.2	feet
Loss through Flowmeter	0.0	feet
Add-on Friction Losses	0.0	feet

**Pipe Volumes**

Vol of Transport Line	42.5	gals
Vol of Manifold	0.5	gals
Vol of laterals per Zone	29.6	gals
Total Volume	72.7	gals

**Minimum Pump Requirements**

Design Flow Rate	33.4	gpm
Total Dynamic Head	14.8	feet



System Curve: —  
 Pump Curve: —  
 Pump Optimal Range: —  
 Operating Point: ●  
 Design Point: ○



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REV. NO.	DATE	REVISION DESCRIPTION	MADE BY	CHKD BY	APVD BY
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PROJECT: SEWAGE DISPOSAL SYSTEM  
 FOUR MILE VILLAGE  
 C/O BETHANY COMMUNITY SERVICES

CLIENT: BOXFORD FRIENDSHIP FOUNDATION  
 10 PHOENIX WAY  
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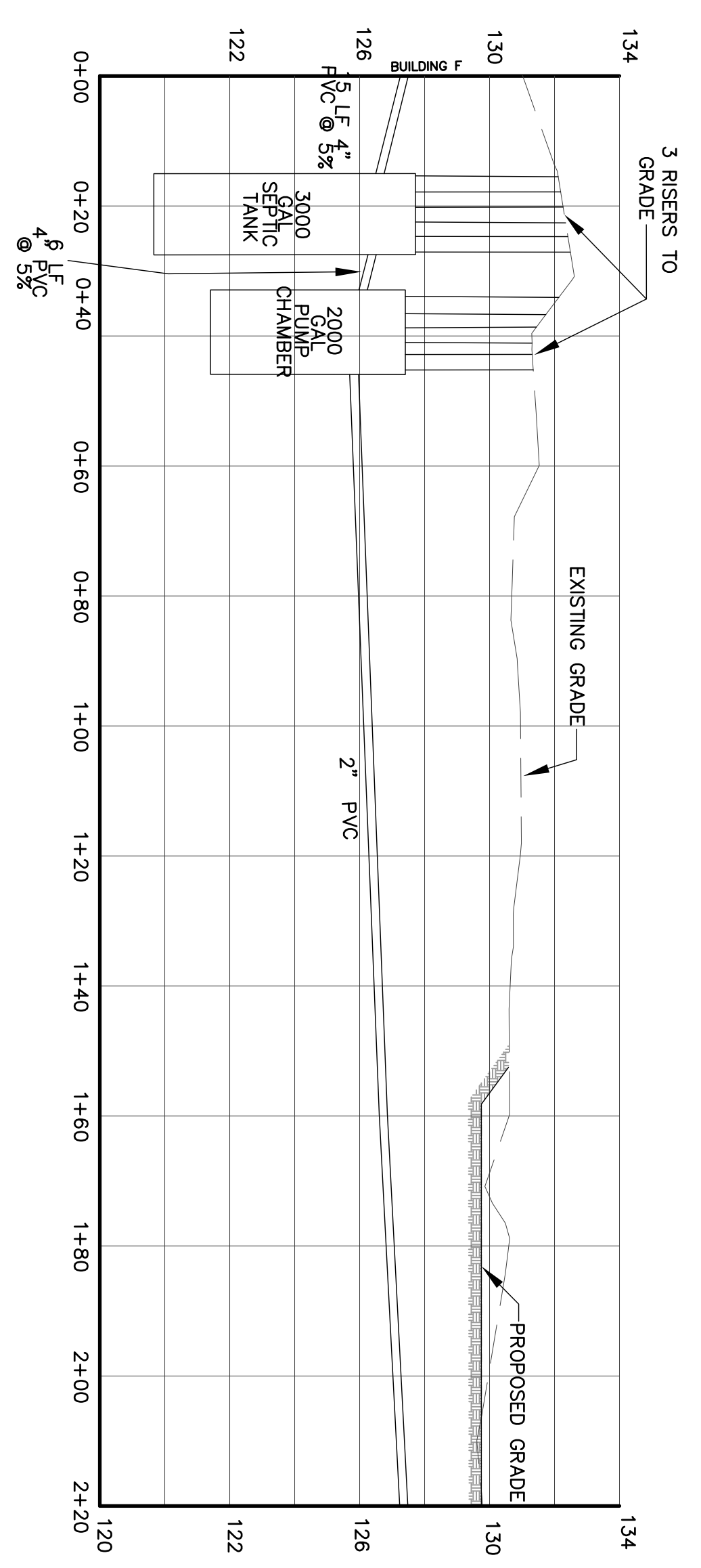
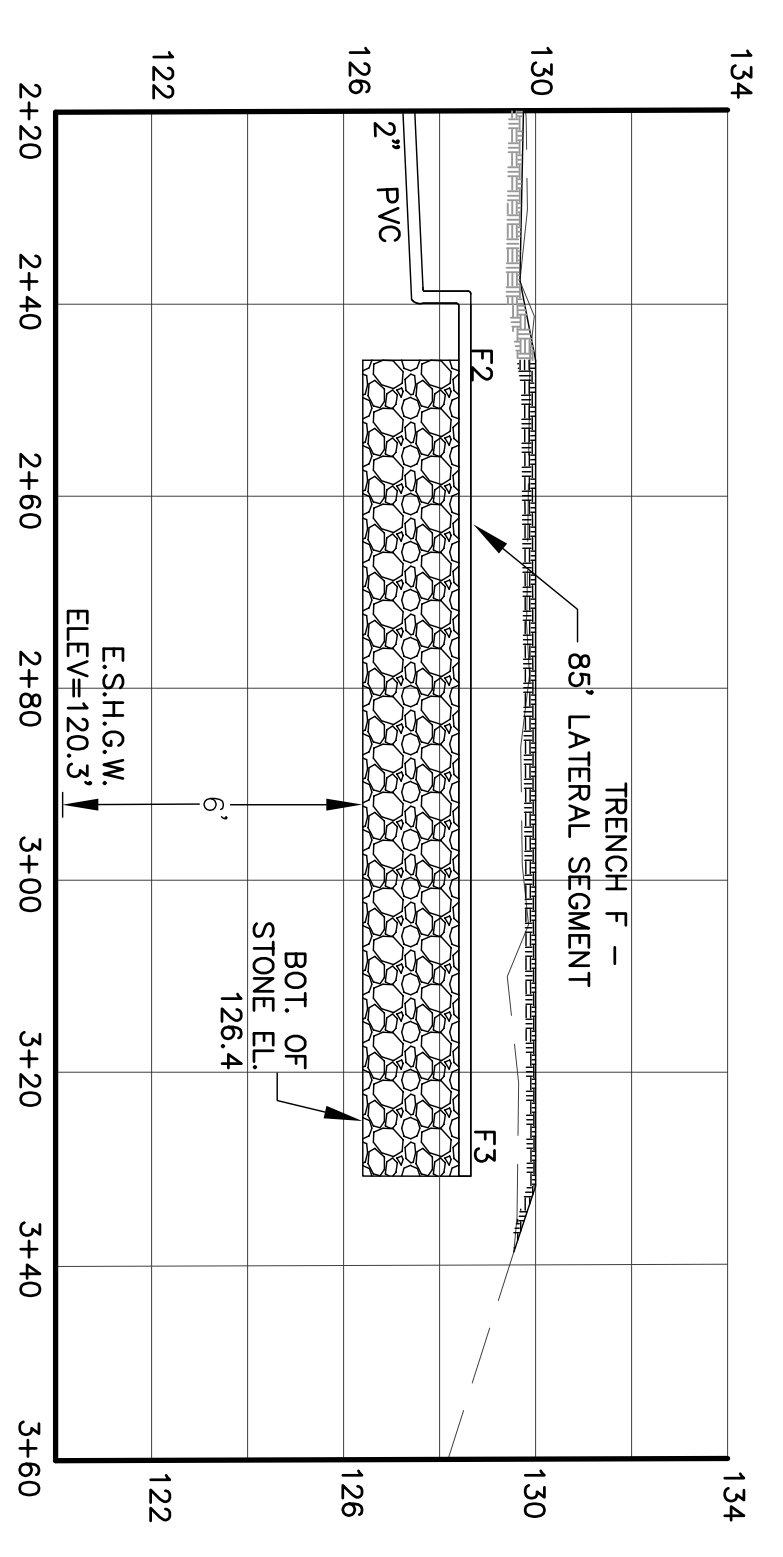
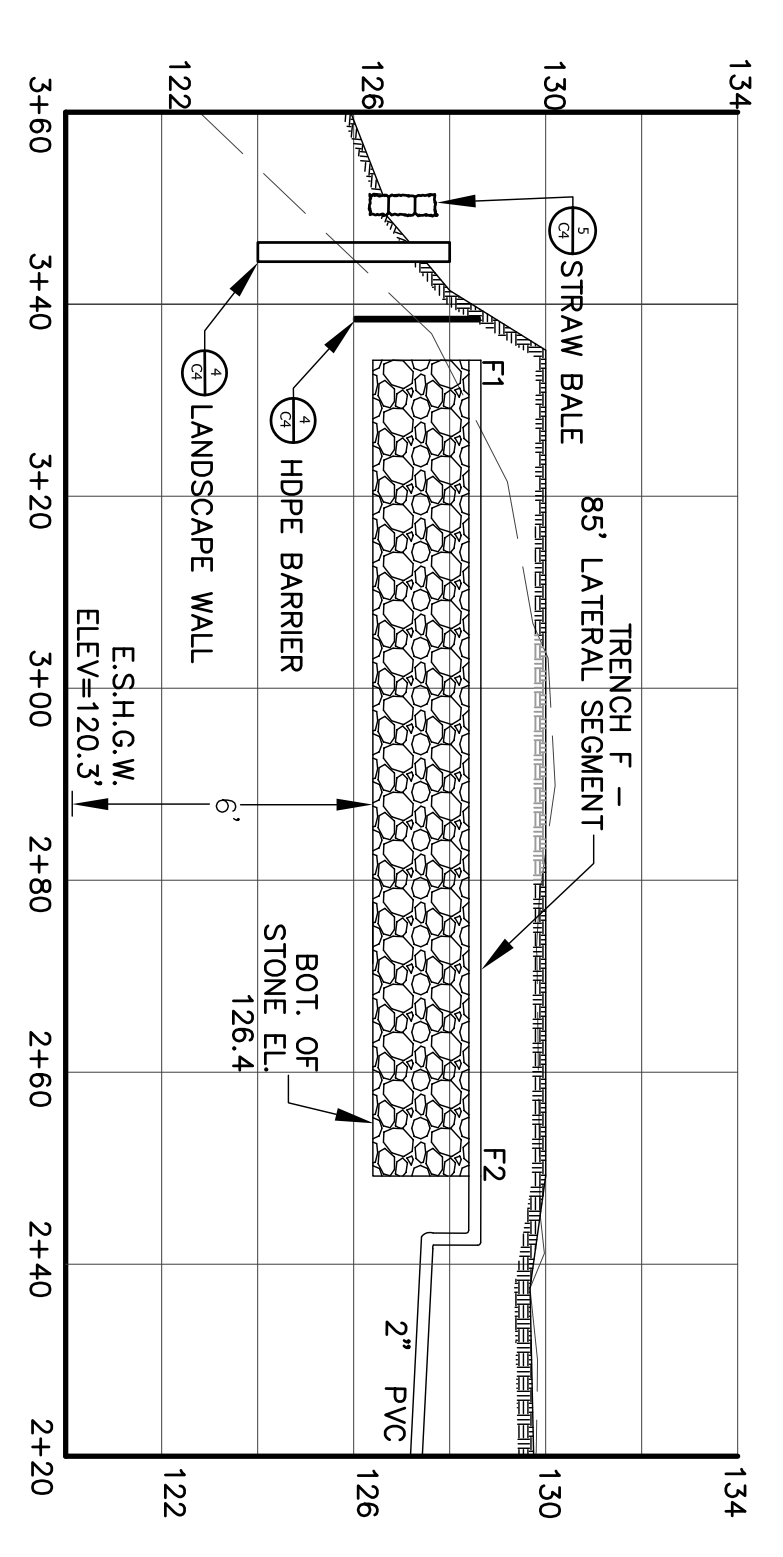


TABLE OF INVERTS

BLOS OUT	127.24
TANK IN	126.49
TANK OUT	126.24
PUMP IN	125.94
PUMP OUT	125.69



Pump Selection for a Pressurized System - Multiple Family Residence Project

**Parameters**

Discharge Assembly Size	2.00	inches
Transport Length	225	feet
Transport Pipe Class	40	
Transport Line Size	2.00	inches
Distributing Valve Model	None	
Max Elevation Lift	5.16	feet
Manifold Length	3	feet
Manifold Pipe Class	40	
Manifold Pipe Size	2.00	inches
Number of Laterals per Cell	2	
Lateral Length	85	feet
Lateral Pipe Class	40	
Lateral Pipe Size	2.00	inches
Office Spacing	316	inches
Residual Head	4	feet
Flow Meter	3	feet
Flow Meter	None	inches
Add-on Friction Losses	0	feet

**Calculations**

Minimum Flow Rate per Office	0.76	gpm
Number of Offices per Zone	44	
Total Flow Rate per Zone	33.4	gpm
Number of Laterals per Zone	2	
% Flow Differential (1st/Last Office)	2.5	%
Transport Velocity	3.2	fps

**Frictional Head Losses**

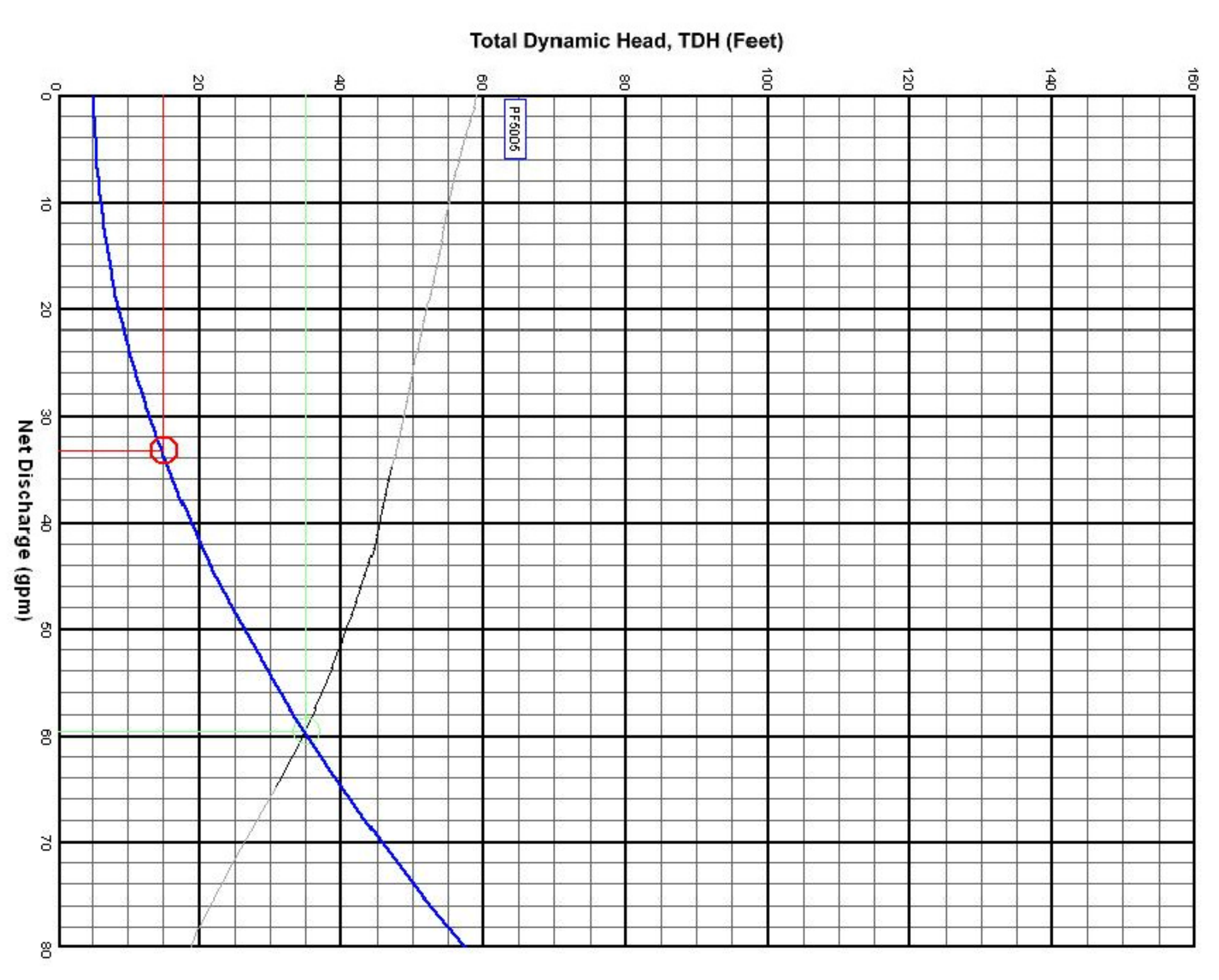
Loss through Discharge	2.2	feet
Loss in Transport	4.3	feet
Loss through Valve	0.0	feet
Loss in Manifold	0.0	feet
Loss in Laterals	0.2	feet
Loss through Flowmeter	0.0	feet
Add-on Friction Losses	0.0	feet

**Pipe Volumes**

Vol of Transport Line	39.2	gals
Vol of Manifold	0.5	gals
Vol of Laterals per Zone	29.6	gals
Total Volume	69.4	gals

**Minimum Pump Requirements**

Design Flow Rate	33.4	gpm
Total Dynamic Head	14.8	feet



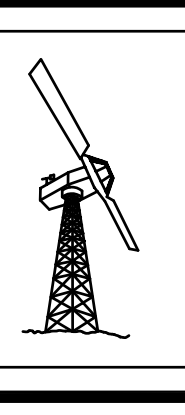
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DRAWING NO.: 9	DRAWING TITLE: PROFILES	SHEET 9 OF 11



REV. NO.	DATE	REVISION DESCRIPTION	MADE BY	CHKD BY	APVD BY
1	09JULY15	DEP & BCC COMMENTS			

PROJECT: SEWAGE DISPOSAL SYSTEM  
FOUR MILE VILLAGE  
C/O BETHANY COMMUNITY SERVICES

CLIENT: BOXFORD FRIENDSHIP FOUNDATION  
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HAVERHILL, MA 01832



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Engineers

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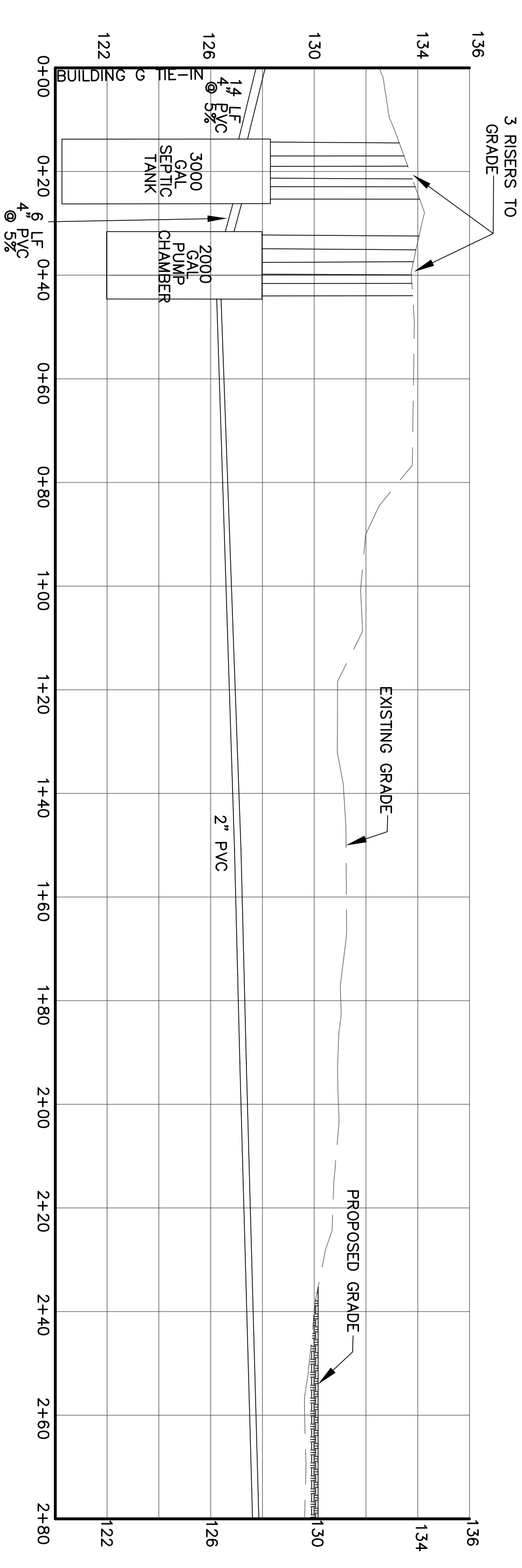
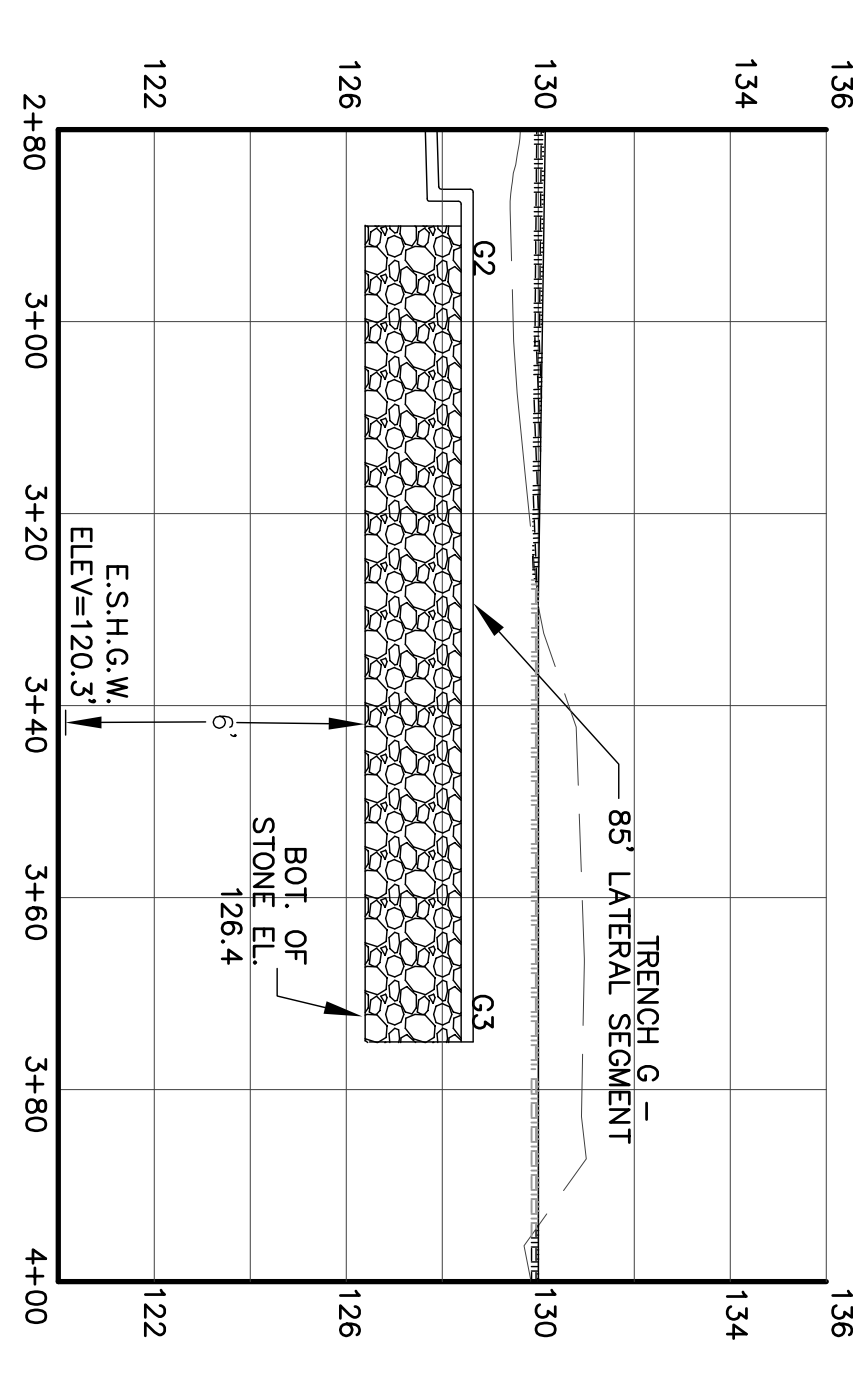
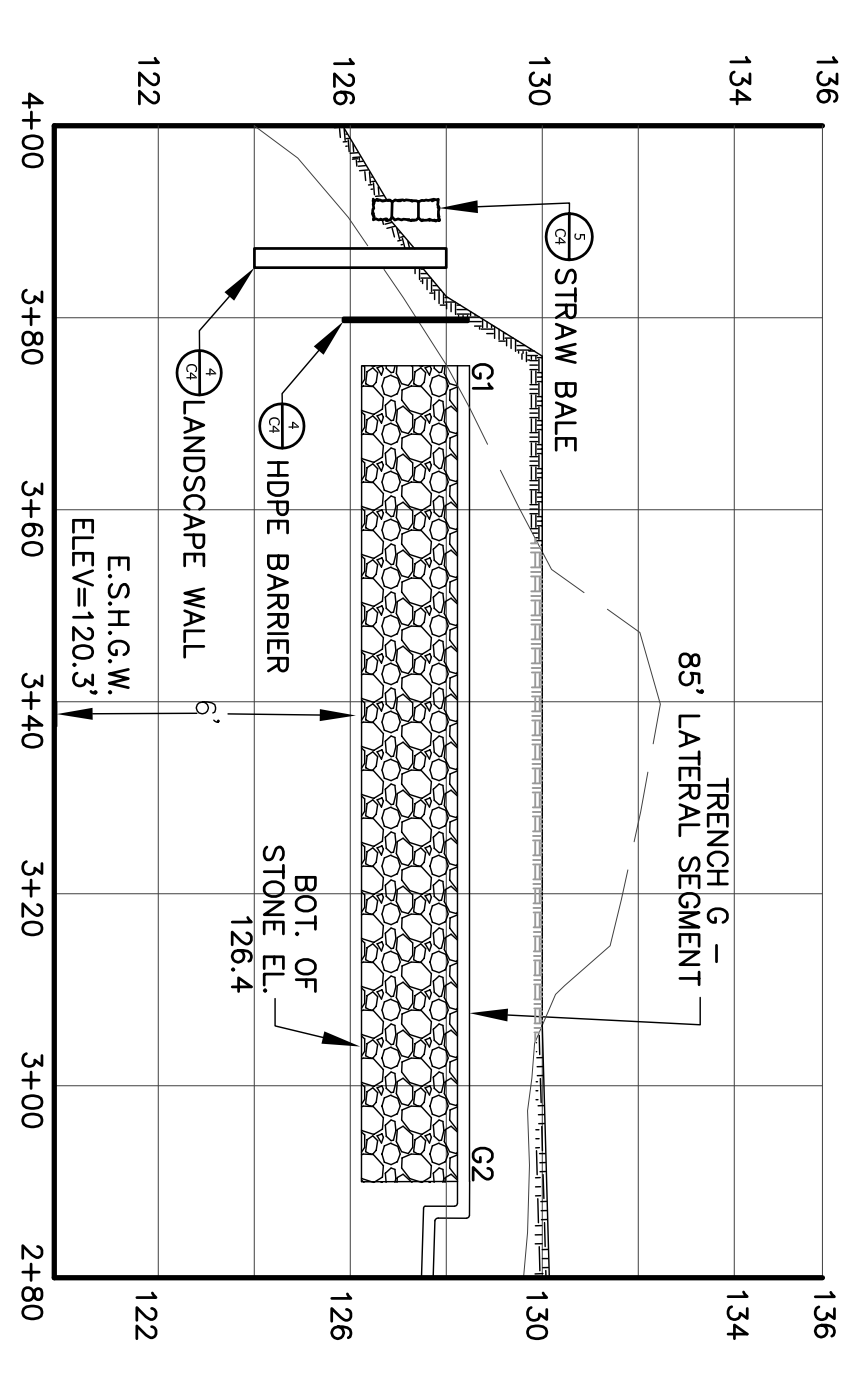


TABLE OF INVERTS

BLOG OUT	127.80
TANK IN	127.10
TANK OUT	126.85
PUMP IN	126.55
PUMP OUT	126.30



**Pump Selection for a Pressurized System - Multiple Family Residence Project**

**Parameters**

Discharge Assembly Size	2.00	inches
Transport Length	295	feet
Transport Pipe Class	4.0	inches
Transport Line Size	2.00	inches
Distributing Valve Model	None	
Max. Elevation Lift	4.58	feet
Manning Length	3	feet
Manning Pipe Class	4.0	inches
Manning Pipe Size	2.00	inches
Number of Laterals per Cell	2	
Lateral Length	85	feet
Lateral Pipe Class	4.0	inches
Lateral Pipe Size	2.00	inches
Office Spacing	316	inches
Residual Head	4	feet
Flow Meter	3	feet
Add-on Friction Losses	None	inches
Flow Meter	0	feet

**Calculations**

Minimum Flow Rate per Office	0.76	gpm
Number of Offices per Zone	44	
Total Flow Rate per Zone	33.4	gpm
Number of Laterals per Zone	2	
% Flow Differential (Steepest Office)	2.5	%
Transport Velocity	3.2	fps

**Frictional Head Losses**

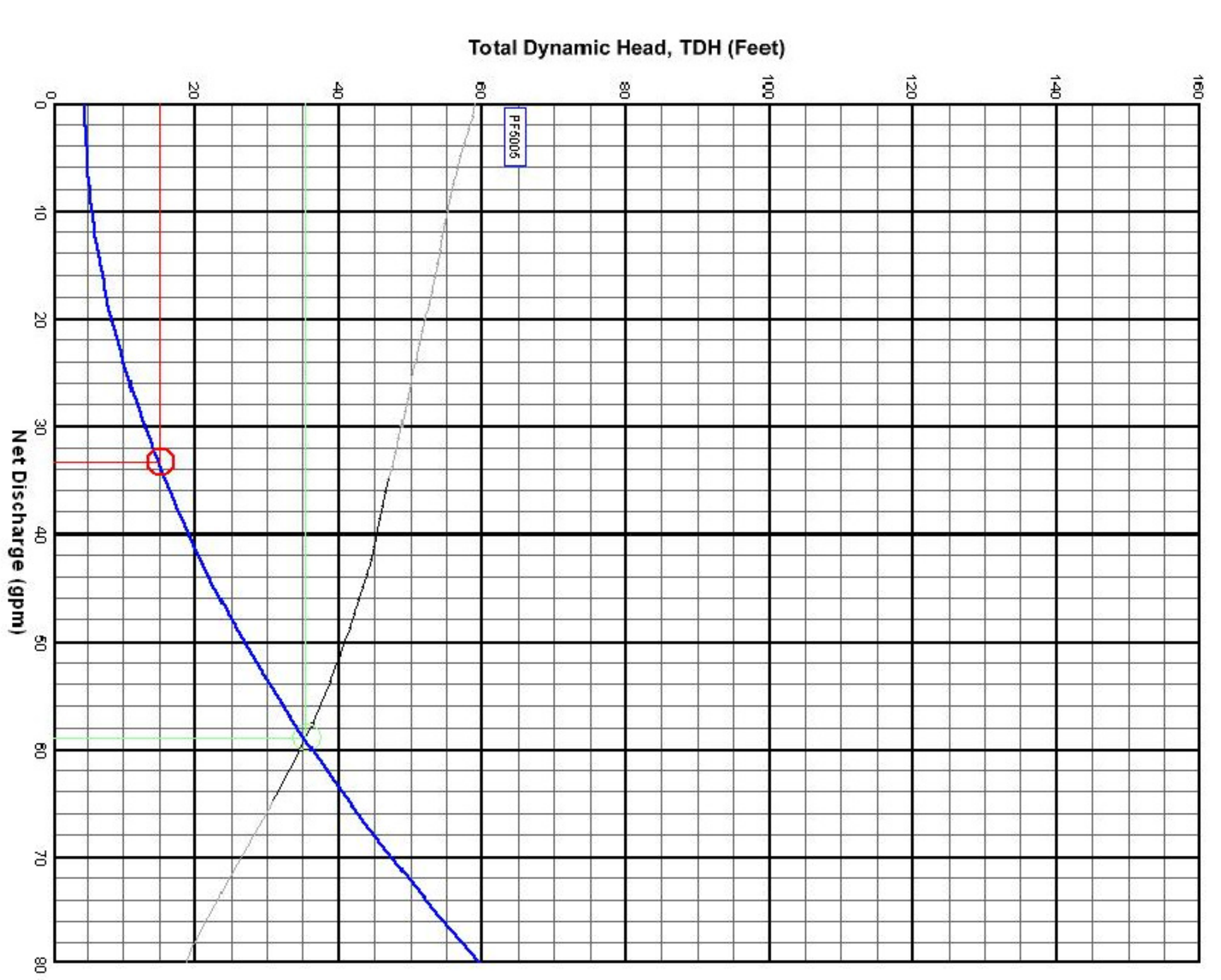
Loss through Discharge	2.2	feet
Loss in Transport	4.8	feet
Loss through Valve	0.0	feet
Loss in Manifold	0.0	feet
Loss in Laterals	0.2	feet
Loss through Flowmeter	0.0	feet
Add-on Friction Losses	0.0	feet

**Pipe Volumes**

Vol of Transport Line	44.4	gals
Vol of Manifold	0.5	gals
Vol of Laterals per Zone	29.6	gals
Total Volume	74.6	gals

**Minimum Pump Requirements**

Design Flow Rate	33.4	gpm
Total Dynamic Head	14.8	feet



Legend for graph:

- System Curve: Solid blue line
- Pump Curve: Dashed blue line
- Pump Operating Range: Shaded area
- Operating Point: Red circle
- Design Point: Red square



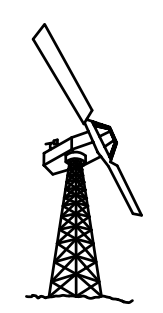
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REV. NO.	DATE	REVISION DESCRIPTION	MADE BY	CHKD BY	APVD BY
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PROJECT: SEWAGE DISPOSAL SYSTEM  
FOUR MILE VILLAGE  
C/O BETHANY COMMUNITY SERVICES

CLIENT: BOXFORD FRIENDSHIP FOUNDATION  
10 PHOENIX WAY  
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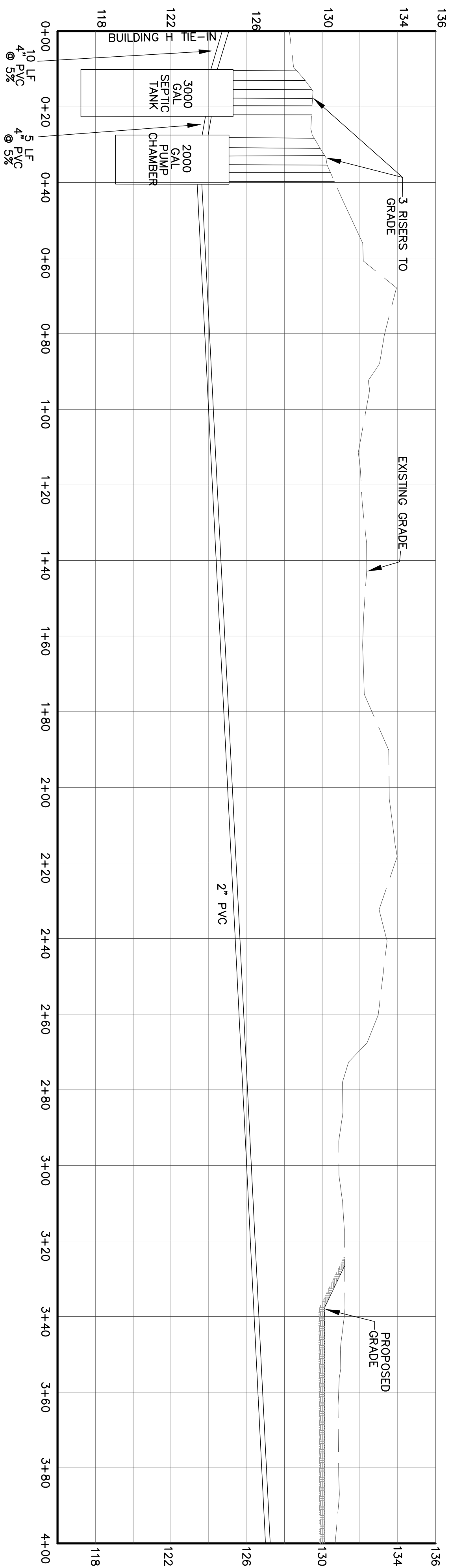
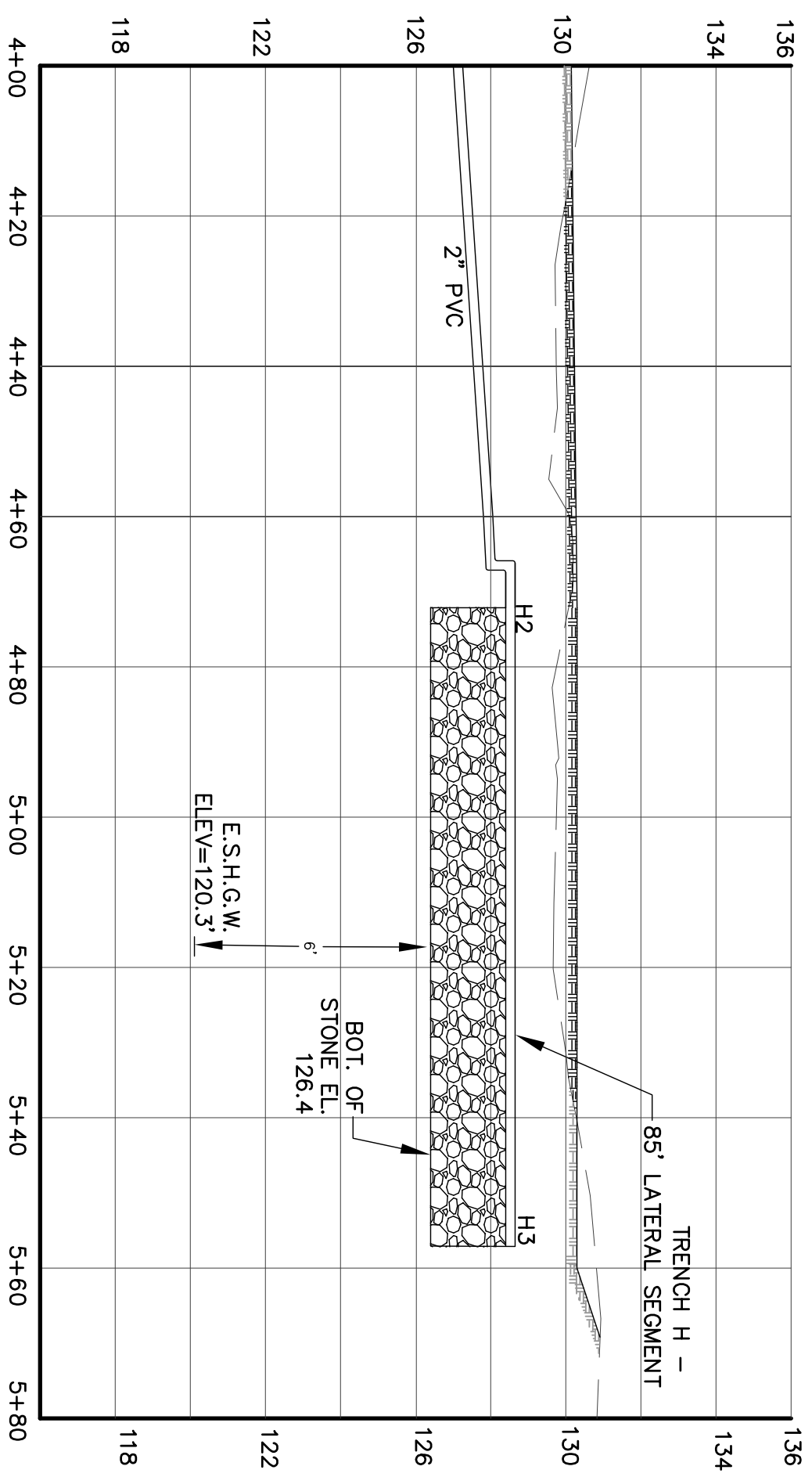
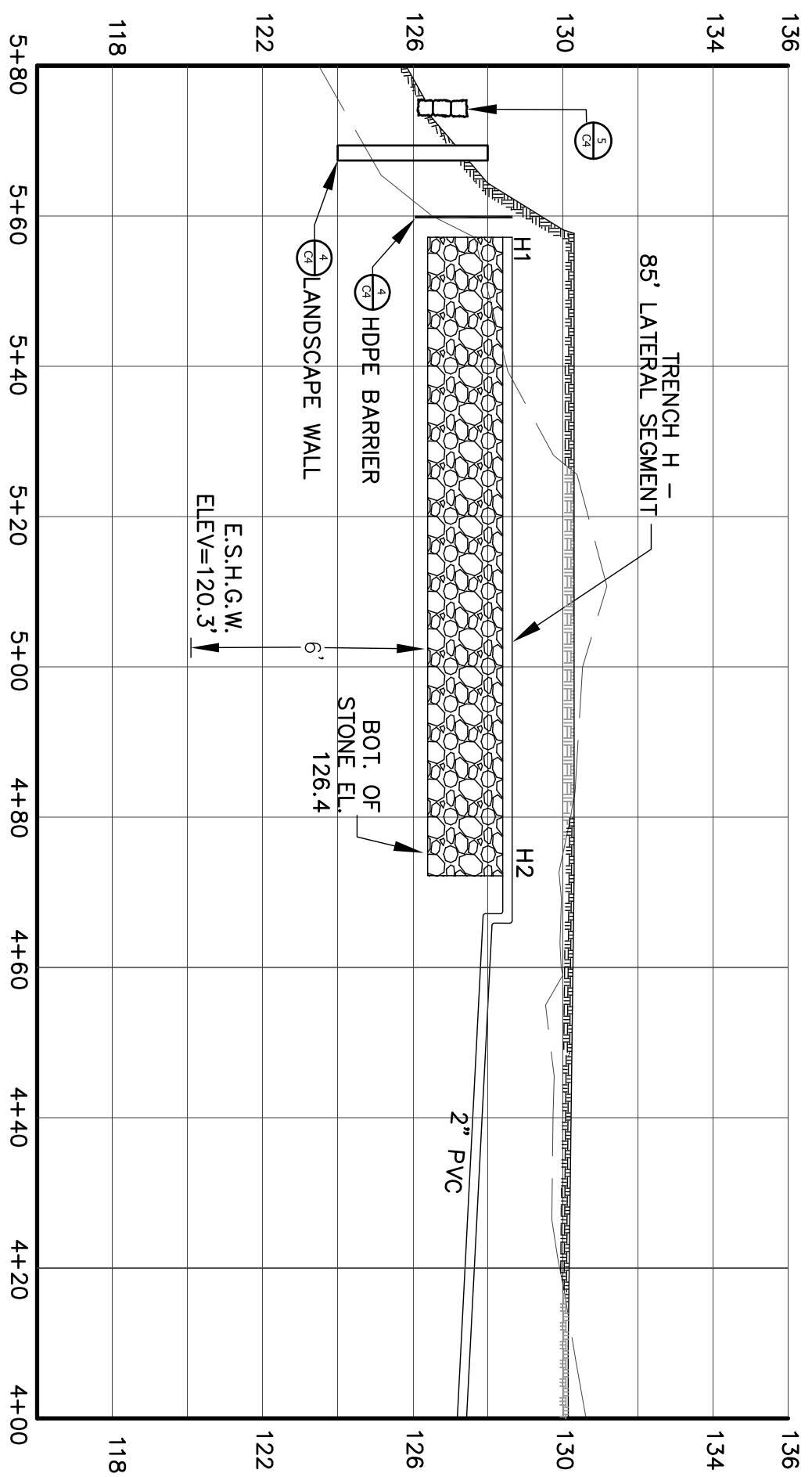


TABLE OF INVERTS

BLD OUT	124.05
TANK IN	124.10
TANK OUT	123.90
PUMP IN	123.65
PUMP OUT	123.40



**Pump Selection for a Pressurized System - Multiple Family Residence Project**

**Parameters**

Discharge Assembly Size	2.00	Inches
Transport Length	44.3	feet
Transport Pipe Class	40	feet
Transport Pipe Size	2.00	Inches
Discharge Pipe Model	None	
Discharge Valve	7.49	feet
Manifold Length	3	feet
Manifold Pipe Class	40	feet
Manifold Pipe Size	2.00	Inches
Number of Laterals per Cell	2	
Lateral Length	65	feet
Lateral Pipe Class	40	feet
Lateral Pipe Size	2.00	Inches
Office Spacing	2018	Inches
Office Spacing	4	feet
Residual Head	3	feet
Flow Meter	None	Inches
Add-on Friction Losses	0	feet

**Calculations**

Minimum Flow Rate per Office	0.76	gpm
Number of Offices per Zone	44	
Total Flow Rate per Zone	33.4	gpm
Number of Laterals per Zone	2	
% Flow Differential 1st/Last Office	2.5	%
Transport Velocity	3.2	fps

**Fictional Head Losses**

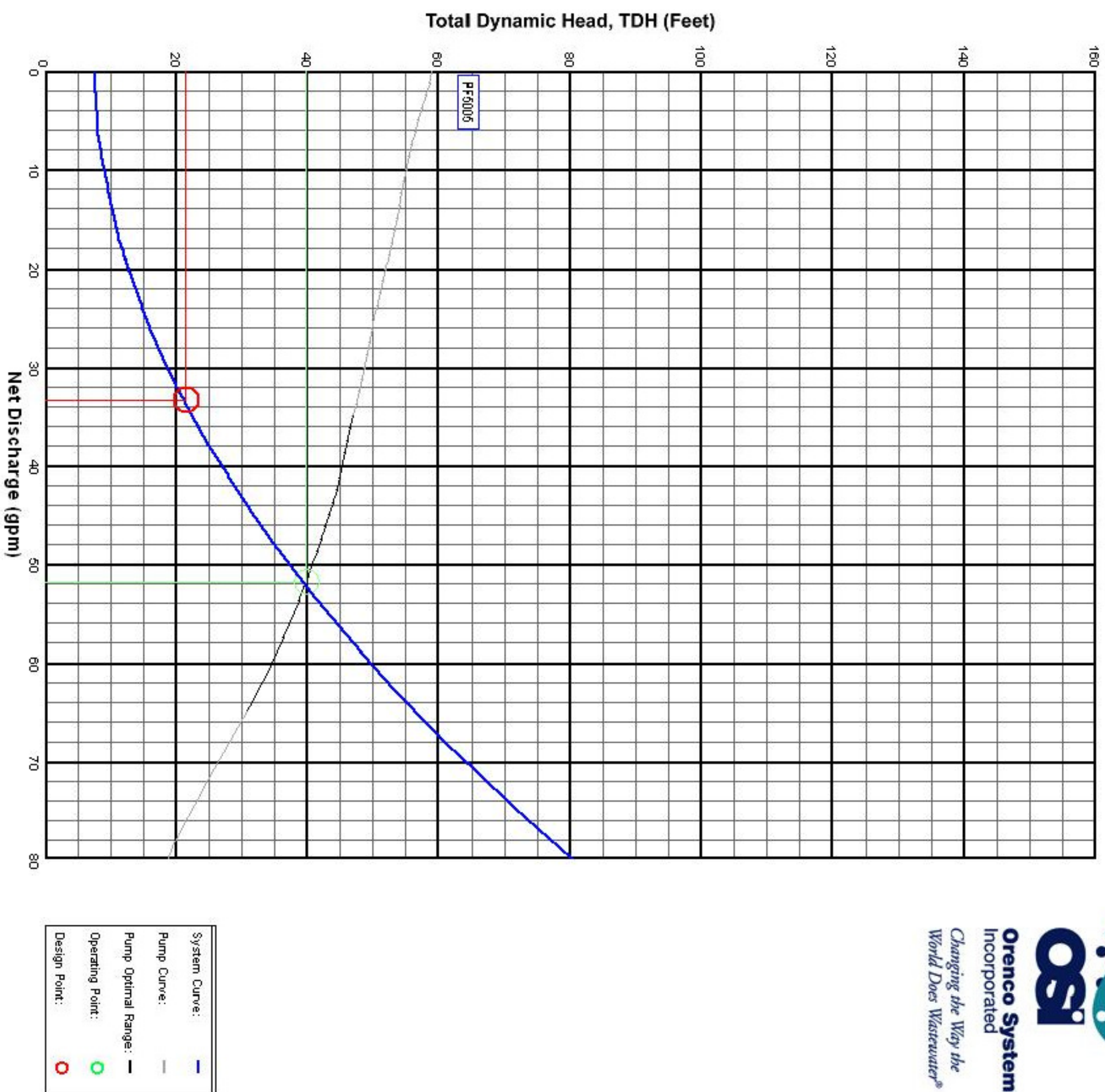
Loss through Discharge	2.2	feet
Loss in Transport	8.4	feet
Loss through Valve	0.0	feet
Loss in Manifold	0.0	feet
Loss in Laterals	0.2	feet
Loss through Flowmeter	0.0	feet
Add-on Friction Losses	0.0	feet

**Pipe Volumes**

Vol of Transport Line	77.2	gals
Vol of Manifold	0.5	gals
Vol of Laterals per Zone	29.6	gals
Total Volume	107.4	gals

**Minimum Pump Requirements**

Design Flow Rate	33.4	gpm
Total Dynamic Head	21.3	feet



**1**  
**C11**  
**PROFILE - BUILDING H**  
HORZ. SCALE: 1"=20'  
VER. SCALE: 1"=4'

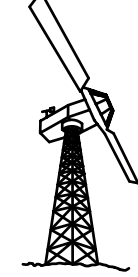
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REV. NO.	DATE	REVISION DESCRIPTION	MADE BY	CHKD BY	APVD BY
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PROJECT: SEWAGE DISPOSAL SYSTEM  
FOUR MILE VILLAGE  
C/O BETHANY COMMUNITY SERVICES

CLIENT: BOXFORD FRIENDSHIP FOUNDATION  
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