Head Loss Calculations from Modified Hazen-Williams Formula

$$H_F = .2083 \left(\frac{100}{C}\right)^{1.85} \times \frac{q^{1.852}}{d^{4.8655}}$$

$$V = .3208 \frac{q}{A}$$

$$A = \frac{d^2\pi}{4}$$ = cross-sectional flow area, sq. in.

C = 150

q = flow in gallons per minute

d = I.D. of pipe in inches = [average O.D. - (2 x min. wall thickness)]

TABLE-B

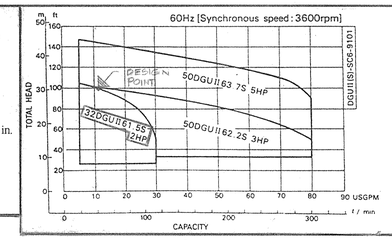


TABLE-A

L.P.S. MAIN TRUNK PIPE SIZING SCHEDULE

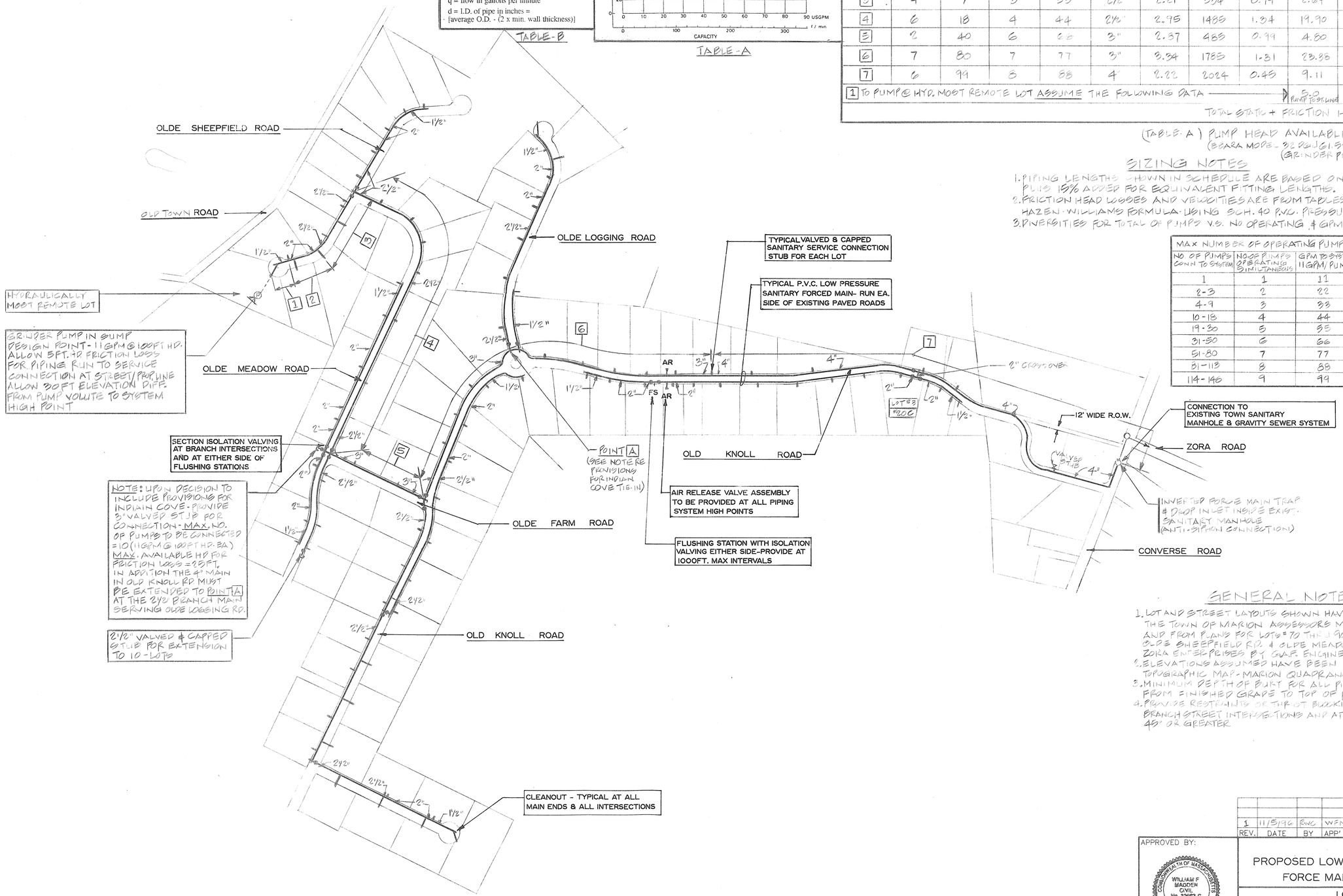
SECTION NO.	NO. OF PUMPS ON SECT.	ACCUM. TOTAL OF PUMPS	MAX. NO. OPERATING PUMPS	MAX. FLOW (GPM)	PIPE SIZE (IN.)	MAX. VELOCITY (FT/SEC)	LENGTH (FT)	FRICTION LOSS (FT/100FT)	SECTION FRICTION LOSS (FT)	ACCUM. FRICTION LOSS (FT)	ELEV. DIFF. (FT.)	TOTAL ACCUM. HD. FRICT+STATIC (FT)
1	1	1	1	11	1½"	1.73	115	0.82	0.94	0.94	30.0 TOTAL	30.94
2	2	3	2	22	2"	2.10	150	0.88	1.32	2.26		37.26
3	4	7	3	33	2½"	2.21	334	0.79	2.64	4.90		39.90
4	6	18	4	44	2½"	2.95	1485	1.34	19.90	24.80		59.80
5	8	40	6	66	3"	2.37	485	0.99	4.80	29.60		64.60
6	7	80	7	77	3"	3.34	1785	1.31	23.38	52.98		87.98
7	6	99	8	88	4"	2.22	2024	0.45	9.11	62.09		92.09
1 TO PUMP @ HYD. MOST REMOTE LOT ASSUME THE FOLLOWING DATA →									5.0 PUMP TO STUBS	67.09	30.0 TO SYSTEM HIGH PT	97.09
TOTAL STATIC + FRICTION HEAD LOSSES →												97.09 FT.

(TABLE-A) PUMP HEAD AVAILABLE @ 11 G.P.M. → 100.0 FT.
(BEARA MODEL - 32 DGU 1.5S - 2 HP. 220V, 1φ)
(GRINDER PUMP)

SIZING NOTES

1. PIPING LENGTHS SHOWN IN SCHEDULE ARE BASED ON SCALED LENGTHS PLUS 15% ADDED FOR EQUIVALENT FITTING LENGTHS.
2. FRICTION HEAD LOSSES AND VELOCITIES ARE FROM TABLES CALCULATED FROM HAZEN-WILLIAMS FORMULA USING SCH. 40 P.V.C. PRESSURE PIPING - C=150 (TABLE B)
3. DIVERSITIES FOR TOTAL OF PUMPS V.S. NO OPERATING & GPM BASED ON THE FOLLOWING:

MAX NUMBER OF OPERATING PUMPS		
NO OF PUMPS CONN TO SYSTEM	NO. OF PUMPS OPERATING SIMULTANEOUS	GPM TO SYSTEM 11 GPM/PUMP
1	1	11
2-3	2	22
4-9	3	33
10-18	4	44
19-30	5	55
31-50	6	66
51-80	7	77
81-113	8	88
114-148	9	99



GENERAL NOTES

1. LOT AND STREET LAYOUTS SHOWN HAVE BEEN TRACED FROM THE TOWN OF MARION ASSESSORS MAPS #17 & #18 (REVISED 12/87) AND FROM PLANS FOR LOTS #7 TO THRU 90 ON OLDE LOGGING RD, OLDE SHEEFFIELD RD. & OLDE MEADOW RD PREPARED FOR ZORA ENTERPRISES BY G.A.F. ENGINEERING DATED 11/20/1990
2. ELEVATIONS ASSUMED HAVE BEEN ESTIMATED FROM USGS. TOPOGRAPHIC MAP - MARION QUADRANGLE
3. MINIMUM DEPTH OF BURY FOR ALL PIPING SHALL BE 4'-0" FROM FINISHED GRADE TO TOP OF PIPE
4. PROVIDE RESTRAINTS OR THRUST BLOCKING ON MAINS AT ALL BRANCH STREET INTERSECTIONS AND AT ALL CHANGES IN DIRECTION 45° OR GREATER.

REV.	DATE	BY	APP'D	DESCRIPTION
1	11/5/96	RWC	WFM	ISSUED FOR PIPE SIZING REVIEW & CONNECTION REVIEW 10/10/96

APPROVED BY:

COMMONWEALTH OF MASSACHUSETTS
WILLIAM F. MADDEN
CIVIL
No. 32653-C
REGISTERED PROFESSIONAL ENGINEER
11-5-96
William F. Madden

APPROVED BY:

PROPOSED LOW PRESSURE SANITARY FORCE MAIN SEWER SYSTEM

LOCATION
OLD KNOLL RD. AREA - MARION, MA.
PREPARED FOR
ZORA ENTERPRISES INC.

SCALE: 1"=200'± DATE: SEPT. 30, 1996

G.A.F. ENGINEERING, INC.
PROFESSIONAL ENGINEERS & LAND SURVEYORS
454 WAREHAM STREET, PO BOX 953, MARION, MA 02738
(508)-748-0252

DRN BY: RWC | CHK BY: WFM | DWG NO.: C-1 | JOB NO. 96-M020