



D.C. MacRitchie, LLC
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- ABBREVIATIONS:**
- BM BENCH MARK
 - BOW BOTTOM OF WALL
 - BWV BORDERING VEGETATED WETLAND
 - CB CATCH BASIN
 - DEMO DEMOLITION OR DEMOLISH
 - DIA DIAMETER
 - DMH STORM DRAIN MANHOLE
 - DPW DEPARTMENT OF PUBLIC WORKS
 - DS DOWNSPOUT
 - DW DRY WELL
 - EG EXISTING GRADE
 - EOP EDGE OF PAVEMENT
 - EX EXISTING
 - FTE FINISH FLOOR ELEVATION
 - FG FINISH GRADE
 - FIN FINISH
 - HDPE HIGH DENSITY POLYETHYLENE
 - INV INVERT
 - LS LEVEL SPREADER
 - LSCSF LAND SUBJECT TO COASTAL STORM FLOWAGE
 - MH MANHOLE
 - MHW MEAN HIGH WATER
 - NTS NOT TO SCALE
 - OC ON CENTER
 - PVC POLYVINYL CHLORIDE
 - SCHED SCHEDULE
 - SDR STANDARD DIMENSION RATIO
 - SMH SEWER MANHOLE
 - TBA TO BE ABANDONED
 - TBM TEMPORARY BENCH MARK
 - TBR TO BE REMOVED
 - TD TRENCH DRAIN
 - TOW TOP OF WALL
 - TYP TYPICAL
 - VGC VERTICAL GRANITE CURB

- REFERENCE DOCUMENTS:**
- DEED BOOK 30884, PAGE 189
 - PLAN BOOK 320 PLAN 50, PLAN 698 OF 1951
 - PLAN OF LAND LOCATED AT 38 BALDPATE ROAD, BOXFORD, MA., PREPARED BY AMERICAN LAND SURVEY ASSOCIATES, LLC DATED JUNE 6, 2017
 - SEWAGE DISPOSAL SYSTEM PLAN (3 SHEETS), BALDPATE ROAD, BOXFORD, MA, PREPARED BY HANCOCK ENGINEERING ASSOCIATES, DATED OCTOBER 9, 1997
 - AS-BUILT SEWAGE DISPOSAL SYSTEM PLAN, PREPARED BY HANCOCK ENGINEERING ASSOCIATES, DATED JUNE 12, 1998
- DATUM:** 1988 NAVD. REFERENCE DOCUMENT #5 ELEVATIONS HAVE BEEN ADJUSTED BY -0.79-FOOT PER NATIONAL GEODETIC SURVEY VERTCON NGVD 29 TO NAVD 88 DATUM SHIFT.

- LEGEND**
- | SYMBOL | DESCRIPTION |
|---------|-------------------|
| ---●--- | LIMIT OF WORK |
| --- | PROPERTY LINE |
| -100- | MINOR CONTOURS |
| -98- | MAJOR CONTOURS |
| -W- | WATER LINE |
| --- | WETLAND |
| --- | BUFFER ZONE |
| --- | NO DISTURB ZONE |
| --- | UNDERGROUND POWER |
| OHW | OVERHEAD POWER |
| G | GAS LINE |
| ○ | SPLIT RAIL FENCE |
| ○ | STONE WALL |
| ● | TREE - CONIFER |
| ○ | TREE - DECIDUOUS |

- CONSERVATION COMMISSION NOTES:**
- RESOURCE AREA LIMITS SHOWN HEREON LOCATED BY WETLANDS AND LAND MANAGEMENT, INC. IN JUNE OF 2017.
 - NO CANOPY REMOVAL IS PROPOSED FOR THIS PROJECT

2 SILT SOCK
NTS

- EROSION & SEDIMENT CONTROL NOTES:**
- PRIOR TO COMMENCING EARTH DISTURBING ACTIVITIES, INSTALL SEDIMENT CONTROLS IN LOCATION SHOWN ON PLAN.
 - REMOVE SEDIMENTS ALONG BASE OF SILT SOCK WHEN DEPTH OF REACHES 1/2 THE HEIGHT OF THE SOCK.
 - SEDIMENT CONTROLS SHALL REMAIN IN PLACE UNTIL ALL WORK IS COMPLETE AND SITE HAS BEEN FULLY AND PERMANENTLY STABILIZED.
 - CONTRACTOR SHALL AT ALL TIMES PROTECT THE SITE WITH EROSION AND SEDIMENT CONTROLS AS NECESSARY TO CONTROL EROSION OF SOILS AND KEEP SEDIMENTS FROM WASHING BEYOND THE LIMIT OF WORK LINE.
 - CONTRACTOR SHALL TAKE CARE TO LIMIT THE DISTURBANCE OF EXISTING STABILIZED/VEGETATED AREAS TO THE MAXIMUM EXTENT PRACTICABLE. DISTURBED AREAS SHALL BE STABILIZED WITH GROUNDCOVER VEGETATION, RIPRAP OR OTHER SUITABLE STABILIZATION MEASURES AS NECESSARY. EROSION CONTROL BLANKETS SHALL BE USED IN ALL AREAS STEEPER THAN 3:1.
 - ALL DISTURBED AREAS TO BE STABILIZED WITH LOAM AND SEED UNLESS OTHERWISE NOTED.

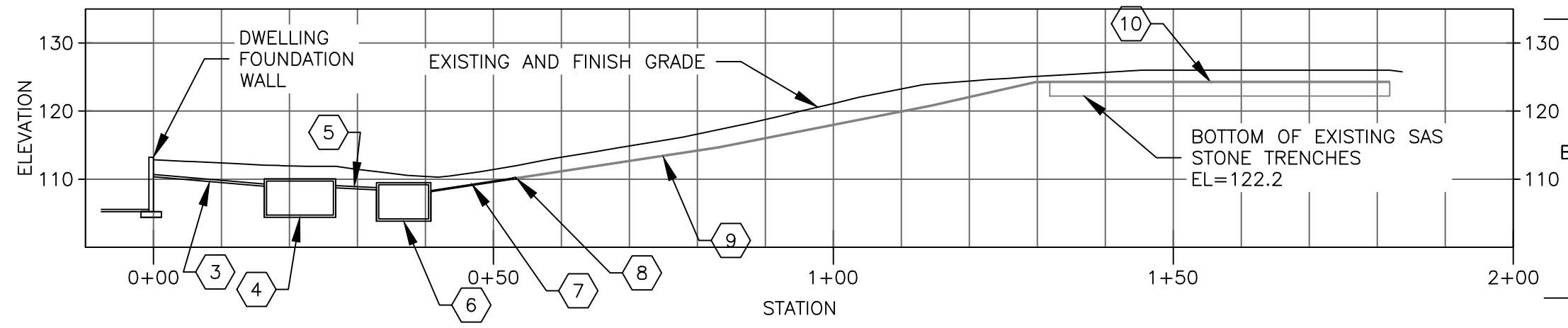
- CONSTRUCTION NOTES:**
- PORTIONS OF THE PROJECT AREA INCLUDE AREAS SUBJECT TO PROTECTION UNDER M.G.L. C.131, §40. BEFORE COMMENCING ANY ACTIVITIES AT THIS SITE, CONTRACTOR SHALL CONFIRM THAT AN ORDER OF CONDITIONS HAS BEEN ISSUED BY THE CONSERVATION COMMISSION. CONTRACTOR SHALL OBTAIN A COPY OF AND COMPLY WITH ALL APPLICABLE REQUIREMENTS INCLUDED IN THE ORDER OF CONDITIONS.
 - TANK INSTALLATION: PRIOR TO INSTALLING TANKS, CONTRACTOR SHALL VERIFY INVERT ELEVATION OF BUILDING SEWER AT HOUSE. CONTRACTOR SHALL CONTACT ENGINEER PRIOR TO INSTALLING TANKS IF MEASURED INVERT ELEVATION DIFFERS FROM INVERT ELEVATION SHOWN ON THIS PLAN.
 - SEE ARCHITECTURAL DRAWINGS FOR BUILDING LAYOUT & CONSTRUCTION DETAILS

- GENERAL NOTES:**
- DIG SAFE: CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LAWS, RULES, CODES, AND STANDARDS INCLUDING BUT NOT LIMITED TO DIG SAFE LAWS. CONTACT DIG SAFE AT: (888) DIG SAFE (344-7233) AT LEAST THREE BUSINESS-DAYS PRIOR TO PERFORMING EXCAVATIONS ON PUBLIC OR PRIVATE PROPERTY INCLUDING DIGGING, BLASTING, HAMMERING POSTS INTO THE GROUND, GRADING, LANDSCAPING, AND DRILLING. CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT UNDERGROUND UTILITIES IN THE WORK AREA.
 - EXISTING CONDITIONS: PROPERTY LINES, AND EXISTING CONDITIONS SHOWN HEREON ARE FROM MULTIPLE SOURCES INCLUDING AVAILABLE PUBLIC RECORDS AND PLANS PREPARED BY OTHERS. A SUBSURFACE SURVEY FOR UTILITIES HAS NOT BEEN CONDUCTED. THE LOCATIONS OF SUBSURFACE UTILITIES SHOWN HEREON ARE APPROXIMATE AND ARE BASED ON LIMITED VISIBLE STRUCTURES AND FEATURES. IT IS EXPECTED THAT THERE MAY BE DISCREPANCIES AND OMISSIONS IN THE LOCATION AND QUANTITIES OF EXISTING SUBSURFACE UTILITIES AND STRUCTURES SHOWN HEREON. THIS INFORMATION IS NOT GUARANTEED TO BE EITHER CORRECT OR COMPLETE AND ALL RESPONSIBILITY FOR THE ACCURACY AND COMPLETENESS THEREOF IS EXPRESSLY DISCLAIMED. PRIOR TO COMMENCING ANY WORK IN THIS AREA, CONTRACTOR SHALL PERFORM SUCH INVESTIGATIONS AS NECESSARY TO LOCATE ALL UTILITIES AND STRUCTURES IN PROXIMITY TO THE WORK AREA.

- KEYNOTES:**
- EX SEPTIC TANK (TBR)
 - EX DOSING CHAMBER (TBR)
 - BUILDING SEWER
 - 1,500 GAL TWO COMPARTMENT SEPTIC TANK
 - EFFLUENT PIPE
 - 1,000 GAL PUMP CHAMBER
 - PRESSURE PIPE
 - NEW TO EX PRESSURE PIPE COUPLING
 - EX PRESSURE PIPE
 - EX PRESSURE DOSED SOIL ABSORPTION SYSTEM
 - PUMP CONTROL PANEL/ALARM
 - PUMP ELEC CONDUIT
 - ELEC JUNCTION BOX
 - PROPOSED ADDITIONAL 506 SF LIVING SPACE
 - PROPOSED 448 SF DECK (280SF IN BUFFER ZONE)
 - EX 380 SF DECK TO BE REBUILT IN PLACE (245 SF IN BUFFER ZONE)
 - 250 SF EX DECK (TBR)
 - PROPOSED 37 SF PORTICO
 - SILTATION BARRIER

ELEVATIONS

POINT	ELEVATION
A	TOP OF FOUNDATION 113.23
B	SEWER INVERT AT HOUSE 110.36
C	SEPTIC TANK INVERT IN 108.96
D	SEPTIC TANK INVERT OUT 108.71
E	DOSING CHAMBER INVERT IN 108.41
F	BOTTOM OF SEPTIC TANK 104.38
G	TOP OF SEPTIC TANK 110.05
H	BOTTOM OF DOSING CHAMBER 103.83
I	TOP OF DOSING CHAMBER 109.50
J	DOSING CHAMBER FLOOR 104.16
K	MINIMUM DOSING CHAMBER LIQUID LEVEL (9" ABOVE FLOOR) 104.91
L	SAS DISTRIBUTION PIPE INVERT 124.23



PIPE SCHEDULE

DIA	PIPE	L (FT)	S (FT/FT)
4"	PVC SCHED 40 PIPE FROM HOUSE TO SEPTIC TANK	16	0.07
4"	PVC SCHED 40 PIPE FROM SEPTIC TANK TO DOSING CHAMBER	6	0.02
2"	PVC SCHED 40 PRESSURE PIPE FROM DOSING TANK TO SAS	92 (15' NEW+77' EX)	



NO	DESCRIPTION	DATE

DESIGNED BY: DCM
 DATE: 9/17/2019
 PLOT SCALE: AS NOTED
 PLOT DATE: 9/17/2019
 FILE REF: 34218-122

PREPARED FOR:
 CARPENTER & MACNEILLE
 106 WESTERN AVE
 ESSEX, MA 01929

PROJECT:
HOUGH/ERICKSON RESIDENCE
 TAX MAP 19 LOT 3
 38 BALDPATE ROAD
 BOXFORD, MASSACHUSETTS

OWNED BY:
 MICHAEL HOUGH & BRIANA ERICKSON

SHEET TITLE:



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SEPTIC SYSTEM DESIGN & CALCULATIONS:

- THIS DESIGN IS FOR THE RELOCATION OF THE EXISTING SEPTIC TANK AND PUMP CHAMBER TO ACHIEVE THE REQUIRED SETBACKS FROM THE PROPOSED FOUNDATION SHOWN HEREON.
- SYSTEM COMPONENTS ARE DESIGNED FOR GARBAGE GRINDERS PER LOCAL BYLAW §201-10
- NO INCREASE IN DESIGN FLOW IS PROPOSED.
- BEDROOM COUNT = 4
- DESIGN FLOW = 440 GPD

SEPTIC TANK:

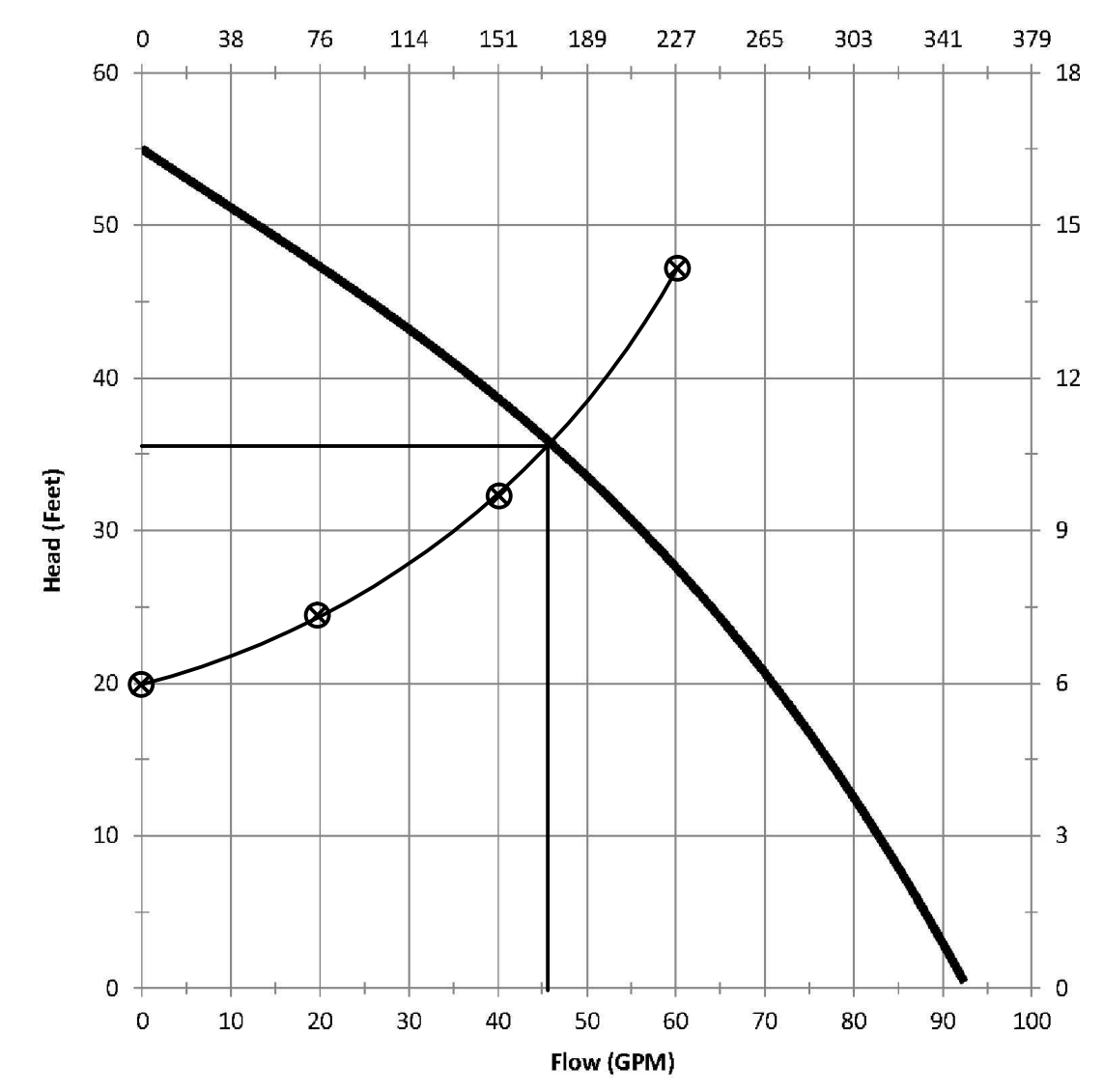
- TWO COMPARTMENT TANK REQUIRED FOR SYSTEMS WITH GARBAGE GRINDERS PER 310CMR15.223
- MINIMUM REQUIRED HYDRAULIC DETENTION TIME BASED ON DESIGN FLOW PER 310CMR15.224:
 COMPARTMENT 1 (48 HOURS): 880 GAL
 COMPARTMENT 2 (24 HOURS): 440 GAL
- PROPOSED SEPTIC TANK:
 1,500 GAL TWO COMPARTMENT TANK (1,000GAL+500GAL) SHEA MODEL #15002C
- AN EFFLUENT TEE FILTER IS PROPOSED PER 310CMR231(10)
- AN OUTLET COVER AT GRADE OVER THE EFFLUENT TEE FILTER IS PROPOSED PER 310CMR15.227(7)

PUMP CHAMBER:

- DISCHARGE PIPE VOLUME:
 DIA=2"; L=91'
 $V = (91' \times 3.14 \times (2''/12')^2 / 4) \times 7.48 \text{ GAL/CF} = 15 \text{ GAL}$
- DESIGN DOSES PER DAY: 4
- GALLONS PER DOSE: 440GPD/4DOSES+15GAL = 125GAL/DOSE
- INSIDE TANK DIMENSIONS:
 L=7.34'; W=4.51'
- DOSING VOLUME (6" LIQUID DEPTH DROP PER DOSE):
 $V_d = 7.34' \times 4.51' \times (6''/12') \times 7.48 \text{ GAL/CF} = 124 \text{ GAL/DOSE}$
- PROPOSED TANK
 1,000 GAL TANK SHEA MODEL #1000PC
- PUMP CHAMBER EMERGENCY STORAGE CAPACITY:
 440 GAL EMERGENCY STORAGE REQUIRED
 WORKING LEVEL (HIGH WATER ALARM FLOAT) = 24" FROM TANK FLOOR
 PIPE INVERT IN = 51" FROM TANK FLOOR
 STORAGE PROVIDED:
 $[(51'' - 24'')/12'] \times 7.34' \times 4.51' \times 7.48 \text{ GAL/CF} = 557 \text{ GAL} > 440 \text{ GAL OK}$

PUMP SYSTEM NOTES:

- CONTROL PANEL: LIBERTY MODEL SXL24=3 WITH NEMA 4X EXTERIOR GRADE ENCLOSURE & 3 PILOT DUTY FLOAT SWITCHES FOR ON, OFF AND ALARM.
- PER CMR 15.231(9) A HIGH WATER ALARM (LIBERTY MODEL ALM-2) INSIDE OF DWELLING WHICH IS POWERED BY A SEPARATE CIRCUIT FROM THE CIRCUIT TO THE PUMP IS REQUIRED.
- PUMP: LIBERTY PUMP MODEL FL51 CAPABLE OF 36 GPM PUMP RATE AT 46' HEAD



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SYSTEM HEAD DATA		
STATIC		
FLOW (GPM)	HEAD (FT)	TDH (FT)
0	20	20.0
20	20	23.5
40	20	32.7
46	20	36.0
60	20	47.0

TITLE 5 310CMR 15.000 NOTES:

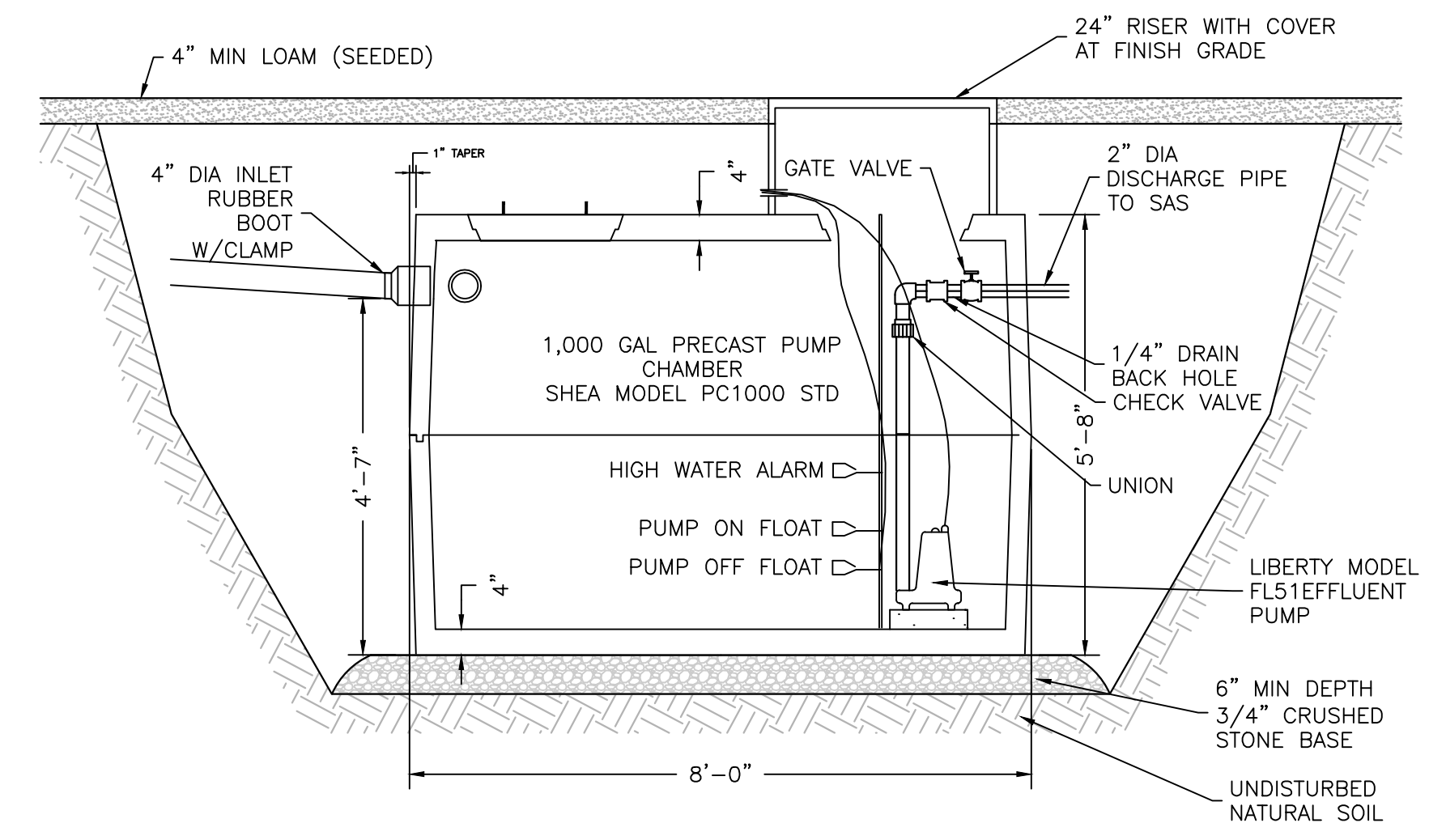
- THE EXISTING DOSING TANK, PUMP AND CONTROL PANEL SHALL BE REPLACED WITH A NEW DOSING TANK, PUMP AND CONTROL PANEL. EXISTING COMPONENTS THAT MEET THE SPECIFICATIONS OF THE NEW COMPONENTS MAY BE REUSED.
- DECOMMISSIONING EXISTING COMPONENTS: EXISTING TANKS TO BE DECOMMISSIONED SHALL BE PUMPED BY A LICENSED SEPTAGE HAULER; AND SHALL BE EXCAVATED AND REMOVED FROM THE SITE, OR THE BOTTOM OF THE TANK SHALL BE OPENED OR RUPTURED AFTER BEING PUMPED SO AS TO PREVENT RETAINAGE OF WATER AND THE TANK SHALL BE COMPLETELY FILLED WITH CLEAN SAND OR OTHER SUITABLE MATERIAL APPROVED IN WRITING BY THE APPROVING AUTHORITY.
- ALL SYSTEM COMPONENTS SHALL BE MARKED WITH MAGNETIC MARKING TAPE OR A COMPARABLE MEANS IN ORDER TO LOCATE THEM ONCE BURIED. (CMR 15.221(12))

DESIGN NOTES:

- UNLESS OTHERWISE SHOWN THERE ARE NO KNOWN:
 - SURFACE WATER SUPPLIES OR GRAVEL PACKED PUBLIC WATER SUPPLY WELLS LOCATED WITHIN 400 FEET OF THE PROPOSED SYSTEM
 - TUBULAR PUBLIC WATER SUPPLIES WITHIN 250 FEET OF PROPOSED SYSTEM, OR, PRIVATE WATER SUPPLY WELLS WITHIN 150 FEET OF PROPOSED SYSTEM.
- UNLESS OTHERWISE SHOWN OR NOTED THERE ARE NO KNOWN SURFACE WATERS OF THE COMMONWEALTH, ZONE A'S, RIVERS, BORDERING VEGETATED WETLANDS, SALT MARSHES, INLAND OR COASTAL BANKS, REGULATORY FLOODWAYS, VELOCITY ZONES, SURFACE WATER SUPPLIES, TRIBUTARIES TO SURFACE WATER SUPPLIES, CERTIFIED VERNAL POOLS, PRIVATE WATER SUPPLIES OR SUCTION LINES, GRAVEL PACKED OR TUBULAR PUBLIC WATER SUPPLY WELLS, OR SUBSURFACE DRAINS LOCATED WITHIN 100 FEET OF THE SETBACK DISTANCES IN 310 CMR 15.211 AND THERE ARE NO KNOWN LEACHING CATCH BASINS OR DRY WELLS LOCATED WITHIN 25 FEET OF THE SETBACK DISTANCES IN 310 CMR 15.211.

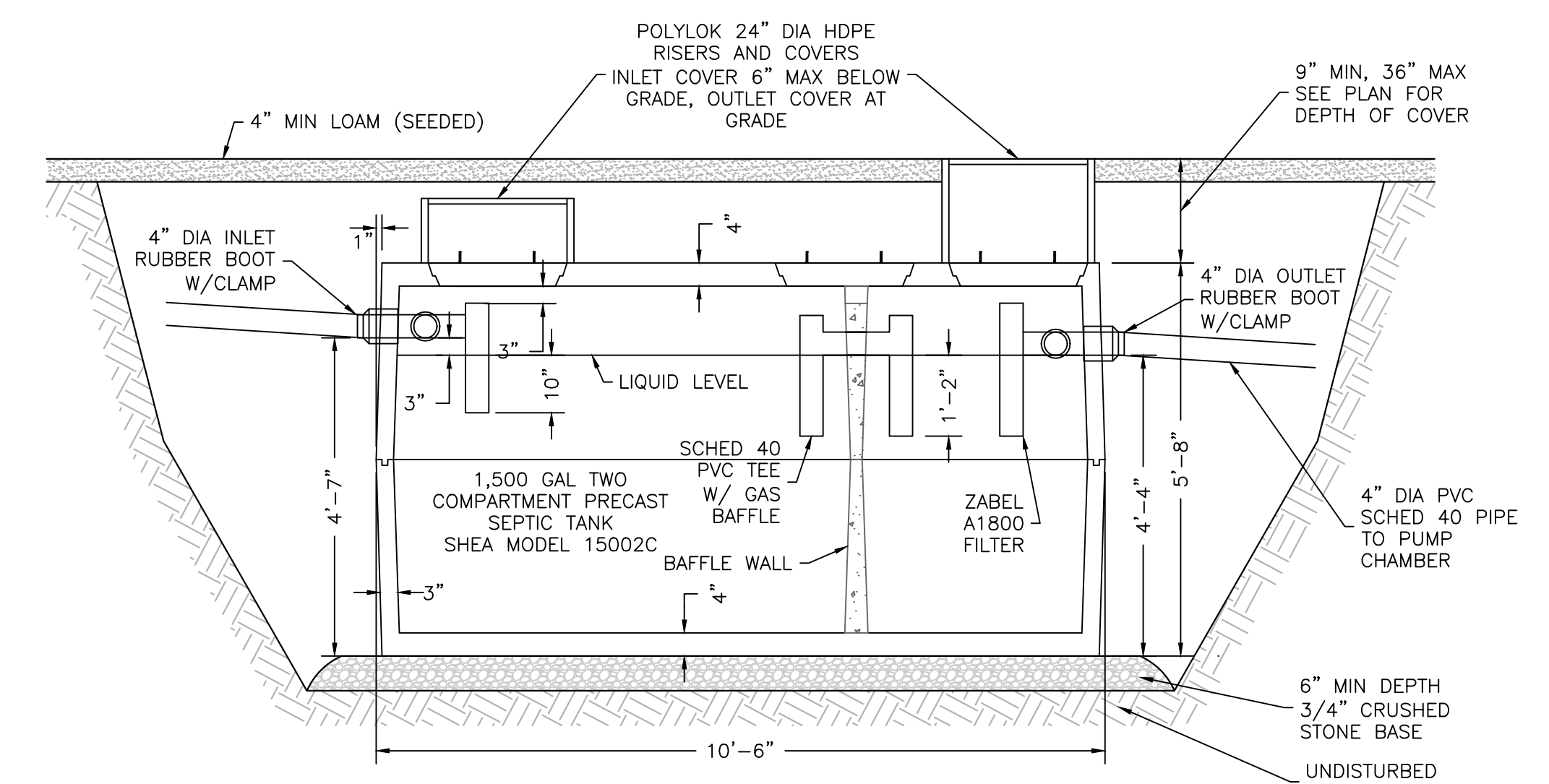
PRECAST CONCRETE STRUCTURE INSTALLATION:

- STRUCTURES SHALL BE INSTALLED LEVEL AND TRUE TO GRADE ON A LEVEL STABLE BASE THAT HAS BEEN MECHANICALLY COMPACTED AND ON TO WHICH SIX INCHES OF CRUSHED STONE HAS BEEN PLACED TO MINIMIZE UNEVEN SETTLING. IF THE SEPTIC TANK IS PLACED IN FILL, PROPER COMPACTION IS REQUIRED TO ENSURE STABILITY AND TO PREVENT SETTLING.
- STRUCTURES SHALL BE WATERTIGHT IN ACCORDANCE WITH 310 CMR 15.221(1)
- JOINTS MUST BE KEPT CLEAN OF FOREIGN MATERIAL WHILE SEALANT IS PLACED AND THE SECTIONS ARE BEING SET. JOINT SEALANTS MUST BE PLACED PER MANUFACTURERS SPECIFICATIONS. CONCRETE SEALANT IS PLACED ON THE UPPER AND LOWER SHIP LAP JOINT. WHEN JOINING SEALANT MOLD TOGETHER AT ENDS, REMOVE ALL PAPER AND BACKING WHEN APPLYING SEALANT. SEALANT MUST COMPRESS A MINIMUM OF 50% BEFORE BACKFILLING. SECTIONS MUST NOT BE REMOVED AFTER SEALANT IS COMPRESSED WITHOUT ADDING ADDITIONAL SEALANT.
- BACKFILL MUST BE PLACED EVENLY ON ALL FOUR SIDES IN 12" MAXIMUM LIFTS WITHIN ONE FOOT OF TANK WALL.
- TANK RISERS AND COVERS SHALL BE WATERTIGHT. INSTALL RISERS IN ACCORDANCE WITH MANUFACTURER INSTRUCTIONS. COVERS INSTALLED AT GRADE SHALL BE SECURED TO PREVENT UNAUTHORIZED ACCESS.



4 PUMP CHAMBER (1,000 GAL)
 SCALE: NTS

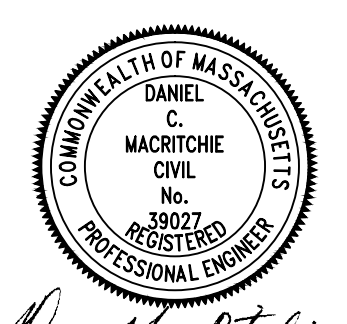
PUMP FLOAT SETTINGS		
FLOAT	DIST. FROM FLOOR (IN)	ELEVATION (FT)
TANK FLOOR	--	104.16
PUMP OFF FLOAT	9	104.91
PUMP ON FLOAT	15	105.41
HIGH WATER ALARM	24	106.16



3 SEPTIC TANK (1,500 GAL)
 SCALE: NTS

DOSING CHAMBER BUOYANCY CALCULATIONS	
TANK: SHEA MODEL PC1000	
TANK OUTSIDE DIMS:	
LENGTH (L)	8.00
WIDTH (W)	5.17
HEIGHT	5.67
BOTT OF TANK EL	103.83
TOP OF TANK EL	109.50
FINISH GRADE OVER TANK	110.5
DEPTH OF COVER MAT'L (C=FG-TOP EL)	1.0
DEPTH TO ESHWT (IN)	36
ESHWT EL	107.5
DISPLACED WATER DEPTH (FT):	
D=ESHWT-TANK BOTT EL =	3.67
DISPLACED WATER MASS (LBS):	
M = L X W X D X 62.4LBS/CF =	9,472
TANK MASS (LBS)	8,765
PUMP COMPONENTS (LBS)	200
COVER MATERIAL: L X W X C X 62.4LBS/CF	2,581
TOTAL MASS (LBS)	11,546 > 9,472 OK

SEPTIC TANK BUOYANCY CALCULATIONS	
TANK: SHEA MODEL 15002C STD	
TANK OUTSIDE DIMS:	
LENGTH (L)	10.50
WIDTH (W)	5.67
HEIGHT	5.67
BOTT OF TANK EL	104.38
TOP OF TANK EL	110.05
FINISH GRADE OVER TANK	112.0
DEPTH OF COVER MAT'L (C=FG-TOP EL)	2.0
DEPTH TO ESHWT (IN)	36
ESHWT EL	109.0
DISPLACED WATER DEPTH (FT):	
D=ESHWT-TANK BOTT EL =	4.62
DISPLACED WATER MASS (LBS):	
M = L X W X D X 62.4LBS/CF =	17,163
TANK MASS (LBS)	12,930
COVER MATERIAL: L X W X C X 62.4LBS/CF	7,244
TOTAL MASS (LBS)	20,174 > 17,163 OK



Daniel C. MacRitchie

NO.	DESCRIPTION	DATE
----	SCHEMATIC/CONCEPT	10/24/14

DESIGNED BY: DCM
 DATE: 9/17/2019
 PLOT SCALE: AS NOTED
 PLOT DATE: 9/17/2019

FILE REF: 2 DETAILS.DWG

PREPARED FOR: CARPENTER & MACNEILLE
 106 WESTERN AVE
 ESSEX, MA 01929

PROJECT: HOUGH/ERICKSON RESIDENCE
 TAX MAP 19 LOT 3
 38 BALDPATE ROAD
 BOXFORD, MASSACHUSETTS

OWNED BY: MICHAEL HOUGH & BRIANA SHEKOFF

DETAILS

C-2
 SHEET 2 OF 2