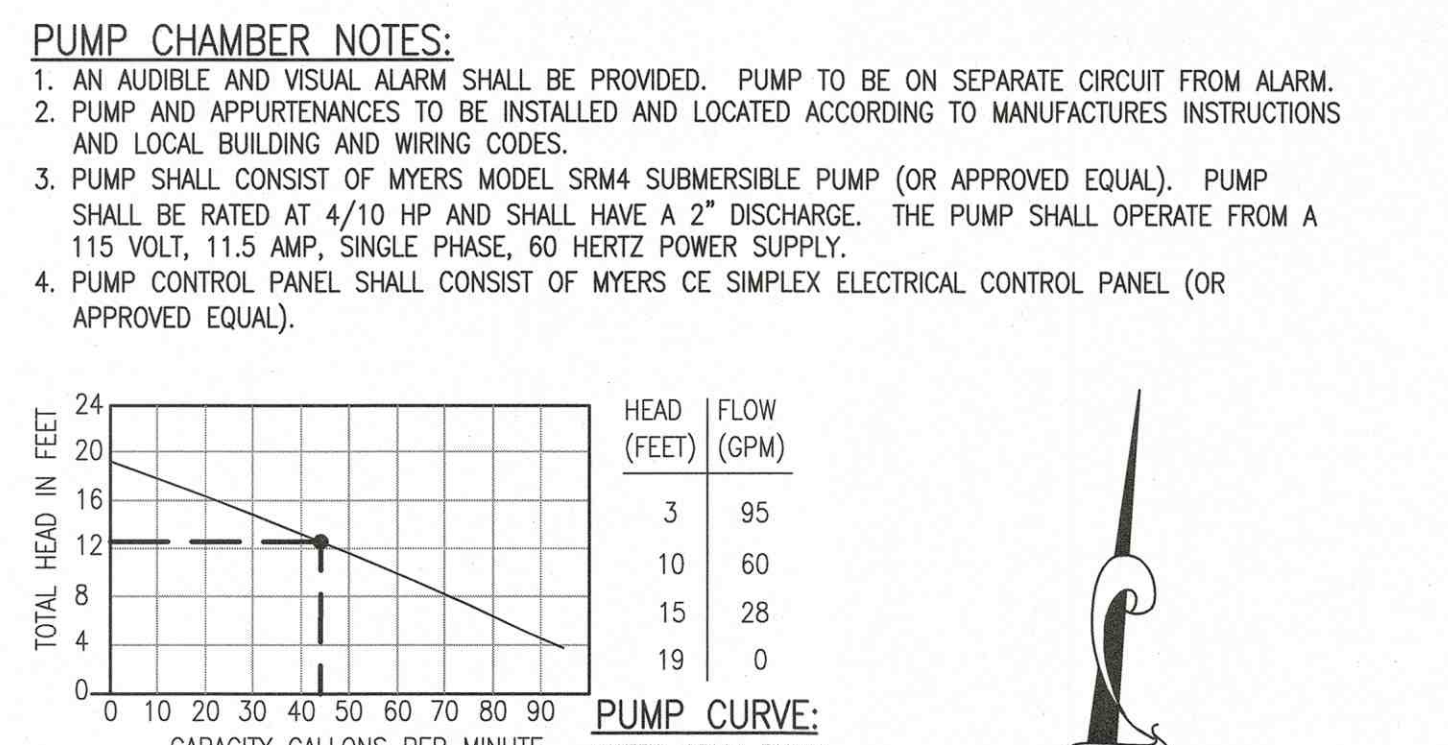
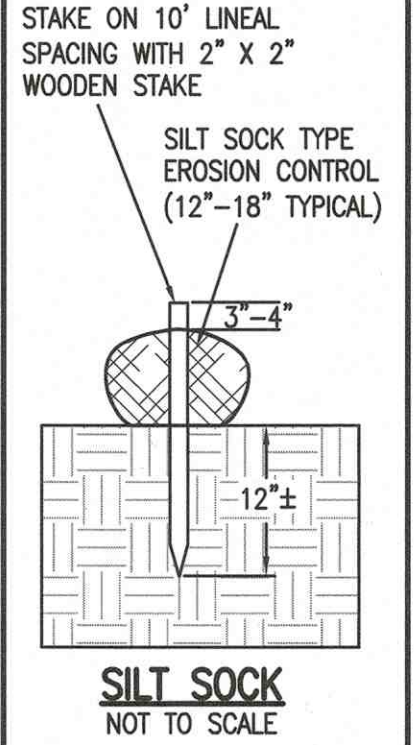
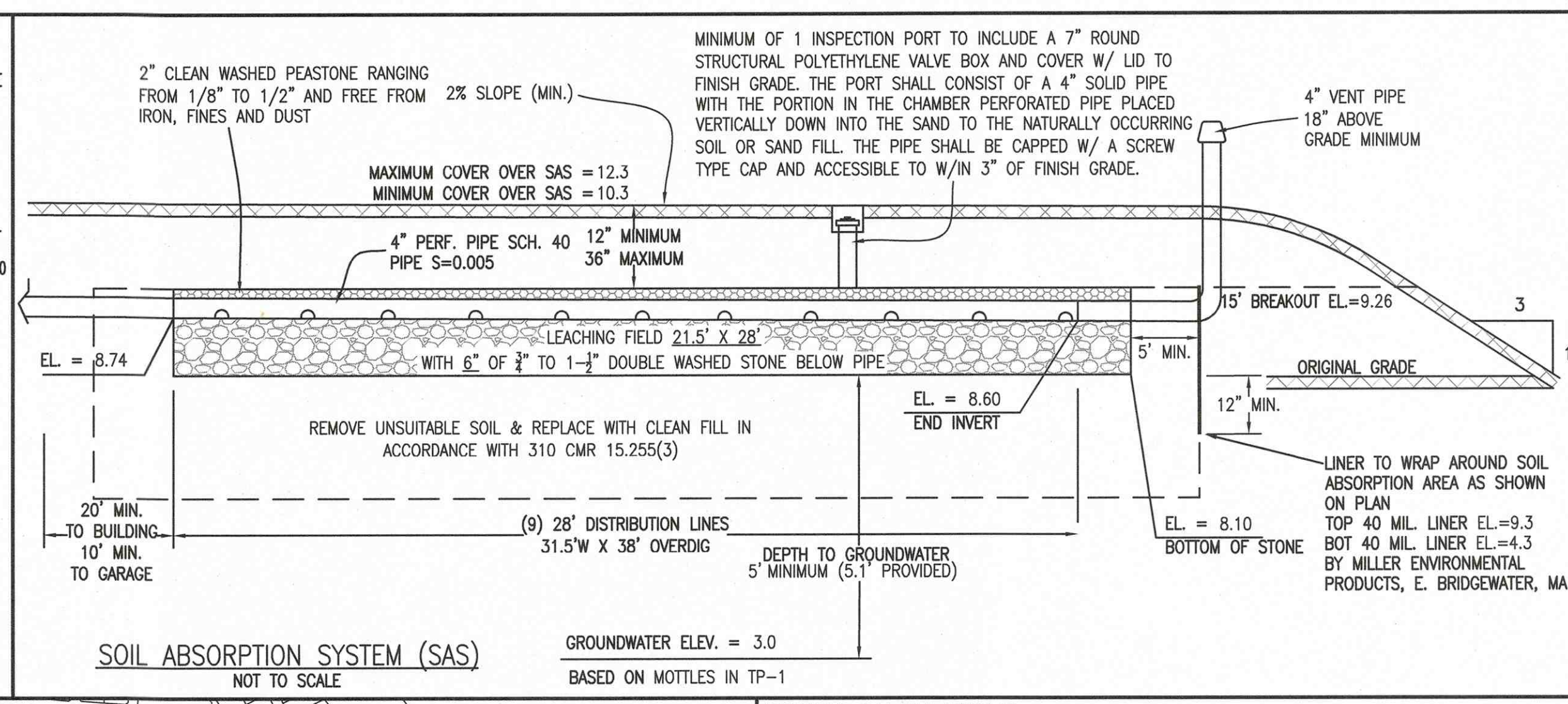
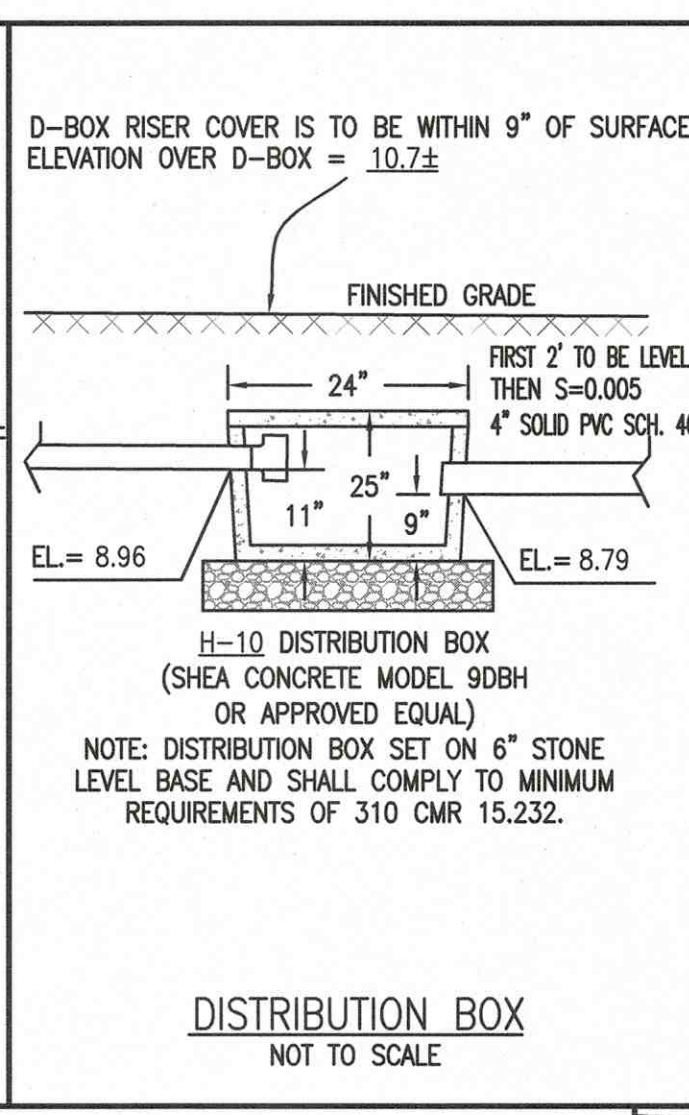
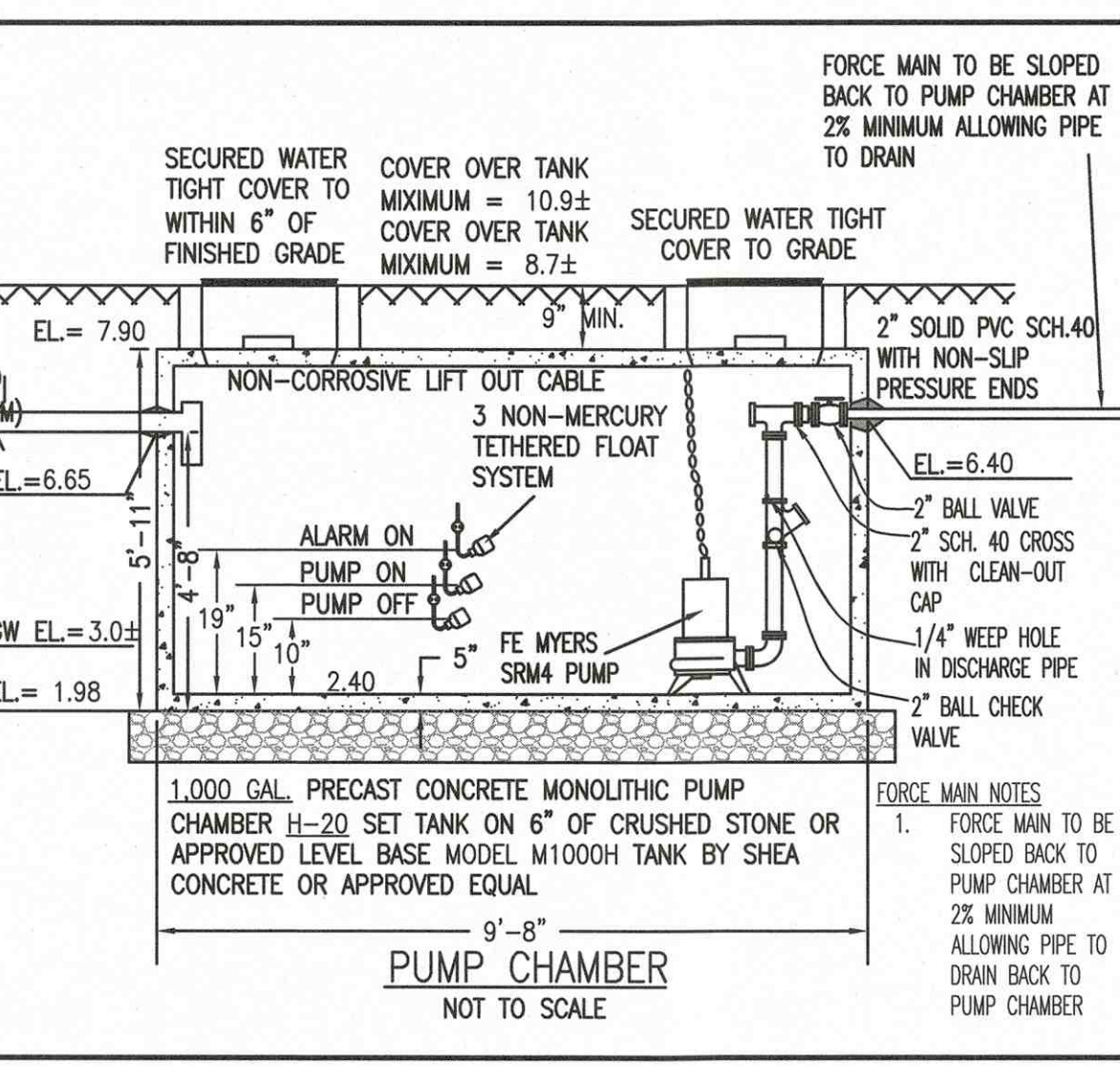
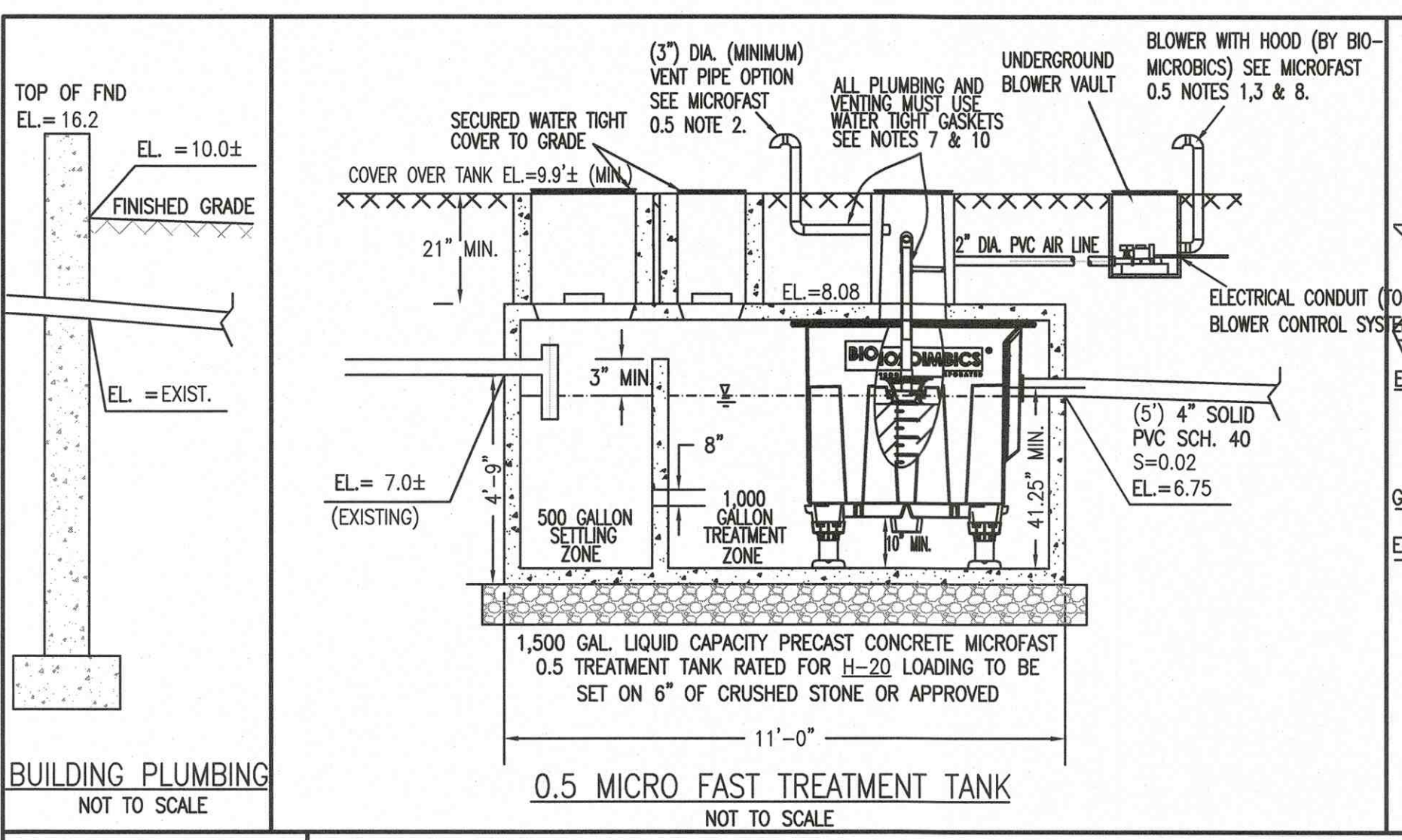
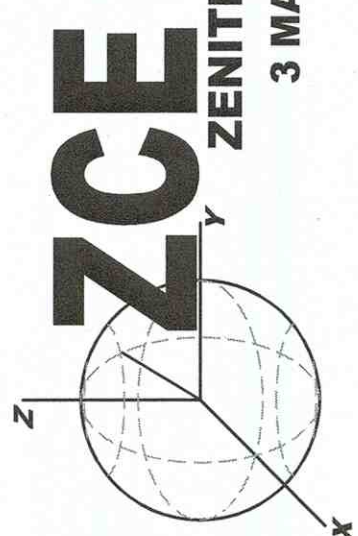


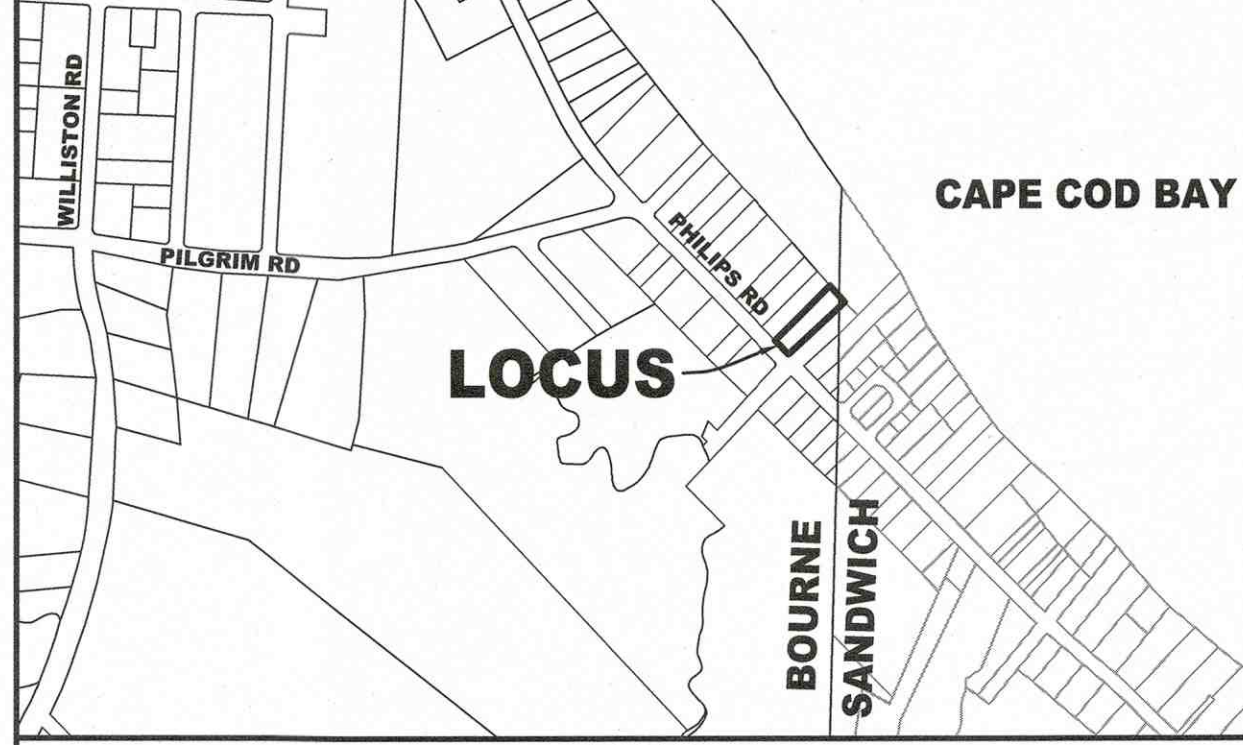
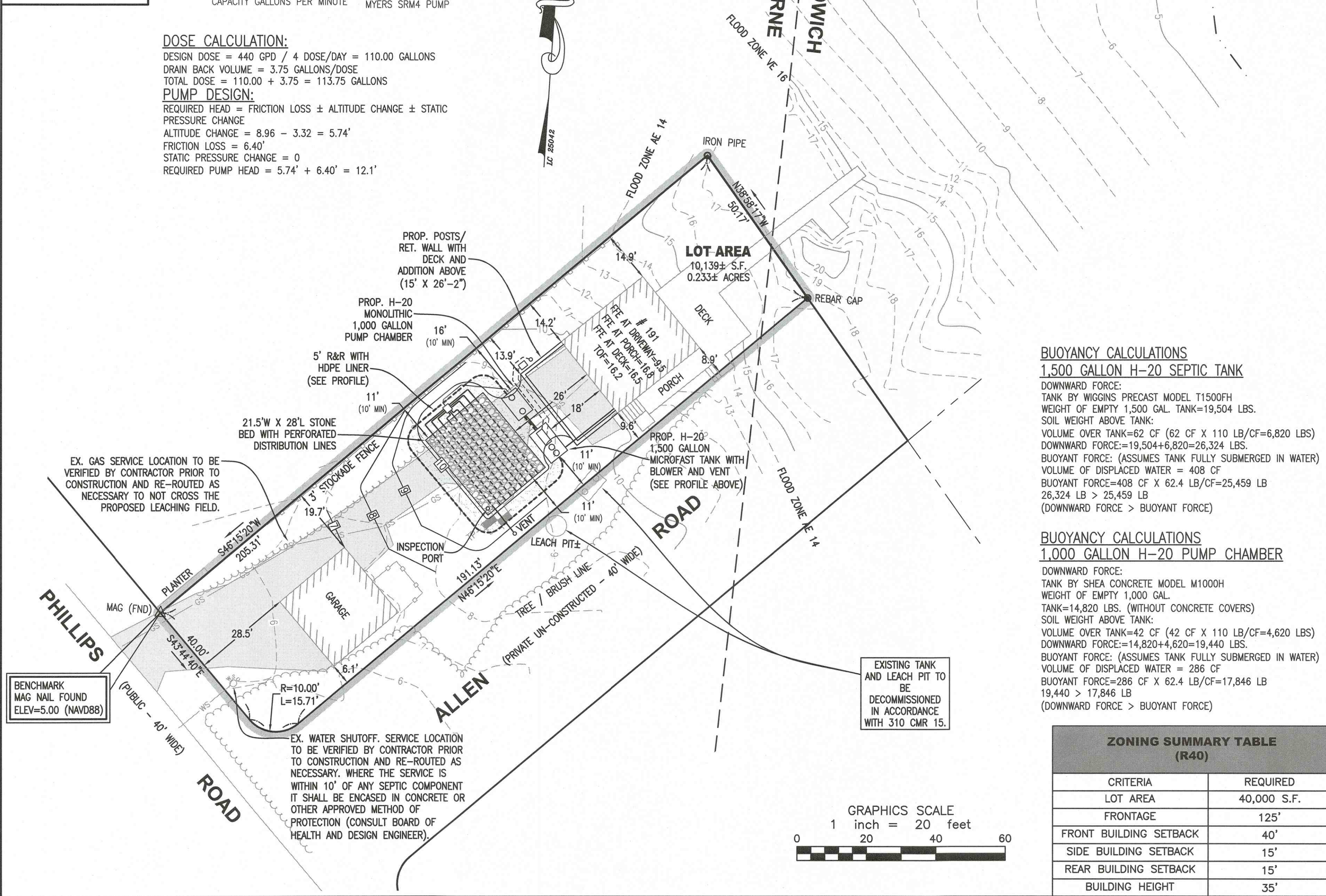


**ZENITH CONSULTING ENGINEERS, LLC**  
 3 MAIN STREET LAKEVILLE, MA 02347  
 PHONE: (508) 947-4208



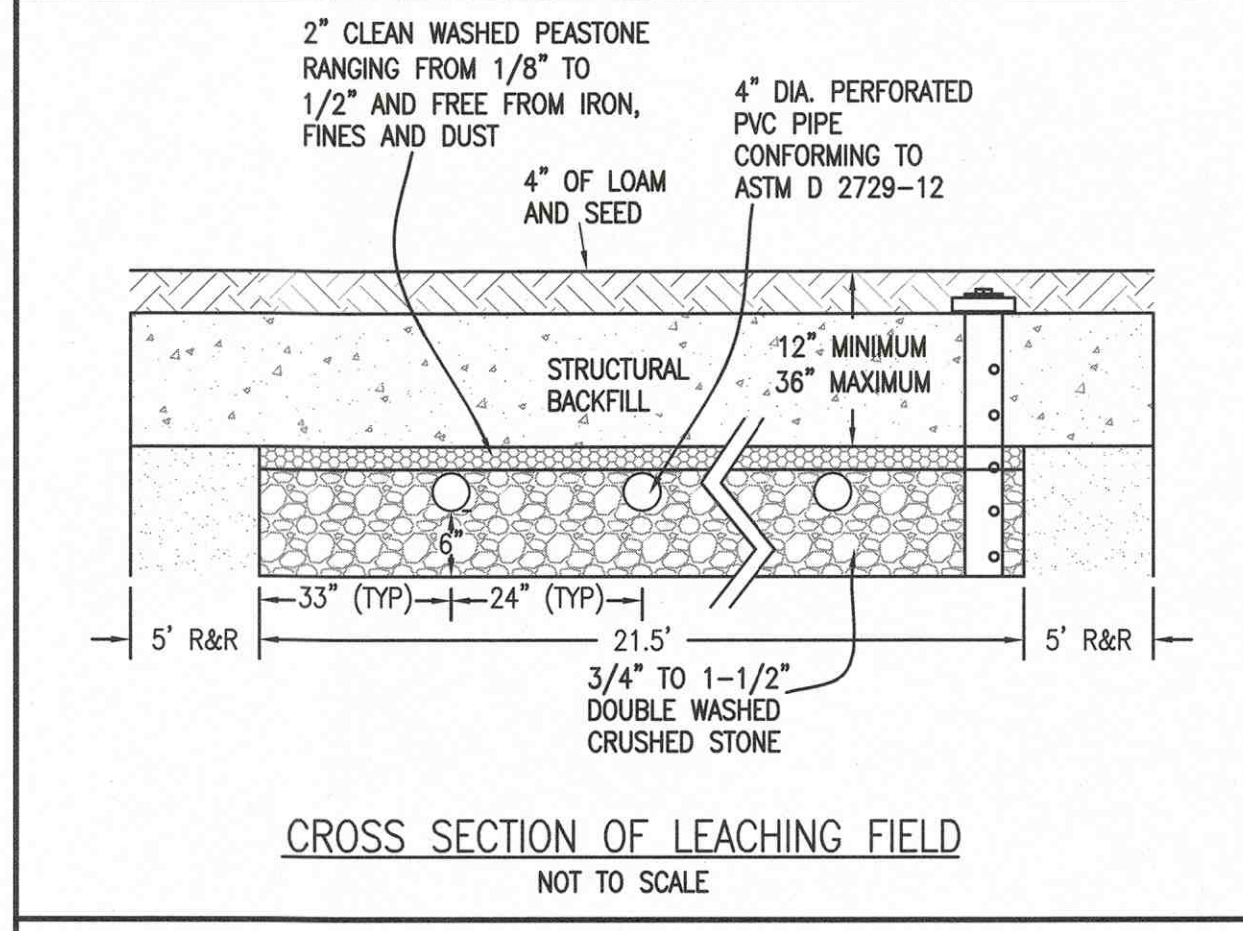
**DOSE CALCULATION:**  
 DESIGN DOSE = 440 GPD / 4 DOSE/DAY = 110.00 GALLONS  
 DRAIN BACK VOLUME = 3.75 GALLONS/DOSE  
 TOTAL DOSE = 110.00 + 3.75 = 113.75 GALLONS

**PUMP DESIGN:**  
 REQUIRED HEAD = FRICTION LOSS ± ALTITUDE CHANGE ± STATIC PRESSURE CHANGE  
 ALTITUDE CHANGE = 8.96 - 3.32 = 5.74'  
 FRICTION LOSS = 6.40'  
 STATIC PRESSURE CHANGE = 0  
 REQUIRED PUMP HEAD = 5.74' + 6.40' = 12.1'



**REQUESTED BOURNE BOARD OF HEALTH REGULATION VARIANCES:**

- A VARIANCE FROM THE BOURNE BOARD OF HEALTH REGULATIONS THAT REQUIRES 150' FROM A LEACHING FIELD TO A WETLAND RESOURCE AREA (COASTAL DUNE/BARRIER BEACH). A REDUCTION FROM 150' TO 0' IS REQUESTED AS THE ENTIRE LOT IS LOCATED WITHIN THIS AREA.
- A VARIANCE FROM THE BOURNE BOARD OF HEALTH REGULATIONS THAT REQUIRES A HYDROGEOLOGY STUDY FOR ALL LEACHING FACILITIES WITHIN 100' OF A WETLAND (COASTAL DUNE/BARRIER BEACH).



**BUOYANCY CALCULATIONS**  
**1,500 GALLON H-20 SEPTIC TANK**

DOWNWARD FORCE:  
 TANK BY WIGGINS PRECAST MODEL T1500HF  
 WEIGHT OF EMPTY 1,500 GAL. TANK=19,504 LBS.  
 SOIL WEIGHT ABOVE TANK:  
 VOLUME OVER TANK=62 CF (62 CF X 110 LB/CF=6,820 LBS)  
 DOWNWARD FORCE=19,504+6,820=26,324 LBS.  
 BUOYANT FORCE: (ASSUMES TANK FULLY SUBMERGED IN WATER)  
 VOLUME OF DISPLACED WATER = 408 CF  
 BUOYANT FORCE=408 CF X 62.4 LB/CF=25,459 LB  
 26,324 LB > 25,459 LB  
 (DOWNWARD FORCE > BUOYANT FORCE)

**BUOYANCY CALCULATIONS**  
**1,000 GALLON H-20 PUMP CHAMBER**

DOWNWARD FORCE:  
 TANK BY SHEA CONCRETE MODEL M1000H  
 WEIGHT OF EMPTY 1,000 GAL. TANK=14,820 LBS. (WITHOUT CONCRETE COVERS)  
 SOIL WEIGHT ABOVE TANK:  
 VOLUME OVER TANK=42 CF (42 CF X 110 LB/CF=4,620 LBS)  
 DOWNWARD FORCE=14,820+4,620=19,440 LBS.  
 BUOYANT FORCE: (ASSUMES TANK FULLY SUBMERGED IN WATER)  
 VOLUME OF DISPLACED WATER = 286 CF  
 BUOYANT FORCE=286 CF X 62.4 LB/CF=17,846 LB  
 19,440 > 17,846 LB  
 (DOWNWARD FORCE > BUOYANT FORCE)

**SOIL LOGS**  
 DATE: 8-26-21  
 PERFORMED BY: TOM MORRIS, ZENITH CONSULTING ENG.  
 WITNESSED BY: TERRI GUARINO, BOURNE BOARD OF HEALTH

DEPTH (INCHES)	SOIL TYPE	ELEV. (FEET)
0	A SANDY LOAM	8.3
6	10YR 3/2	7.8
90	M-C SAND	0.8

**MICROFAST 0.5 NOTES:**

- BLOWER PIPING TO FAST® MAY NOT EXCEED 100 FT TOTAL LENGTH AND USE A MAXIMUM OF 4 ELBOWS IN THE PIPING SYSTEM (8" 100FT). FOR DISTANCE GREATER THAN 100 FT CONSULT FACTORY. BLOWER MUST BE LOCATED ABOVE FLOOD LEVELS.
- VENT TO BE LOCATED ABOVE FINISH GRADE OR HIGHER TO AVOID INFILTRATION. CAP WITH A VENT GRATE WITH AT LEAST 7.1 SQ IN. (45.8 SQ. CM) OPEN SURFACE AREA. OR RUN VENT TO DESIRED LOCATION AND COVER OPENING WITH A VENT GRATE WITH AT LEAST 7.1 SQ IN. OPEN SURFACE AREA. SECURE WITH STAINLESS STEEL SCREWS. VENT PIPING MUST NOT ALLOW EXCESS MOISTURE BUILD UP OR BACK PRESSURE.
- ALL APPURTENANCES TO FAST® (E.G. TANK PUMP OUTS, ETC.) MUST CONFORM TO ALL APPLICABLE COUNTRY, STATE, PROVINCE, AND LOCAL PLUMBING AND ELECTRICAL CODES. BLOWER CONTROL SYSTEM BY BIO-MICROBIOBICS, INC.
- TANK VOLUME MUST BE INCREASED BY 20% IF MINIMUM OF 10 INCHES IS USED BETWEEN THE UNIT AND THE BASE OF TANK. CONSULT FACTORY FOR APPROVAL.
- THE PRIMARY COMPARTMENT MAY BE A SEPARATE TANK.
- EITHER THE INFLUENT PIPE TEE SHALL BE FITTED WITH A PIPE CAP OR THE BAFFLE SEPARATING THE TWO ZONES SHALL BE EXTENDED ALL THE WAY TO THE TOP OF THE TANK IF CHOOSING TO USE THE PIPE CAP. THEN THE BAFFLE SHALL BE AT LEAST 3" HIGHER THAN THE WATER LEVEL AS SHOWN ON THE DRAWING.
- ALL INSPECTION VIEWING AND PUMP OUT PORTS MUST BE SECURED TO PREVENT ACCIDENTAL OR UNAUTHORIZED ACCESS.
- TANK, PIPING, CONDUIT, BLOWER HOUSING PAD AND VENTS ARE PROVIDED BY OTHERS.
- ALL PIPING AND ANCILLARY EQUIPMENT INSTALLED AFTER FAST MUST NOT IMPEDE OR RESTRICT FREE FLOW OF EFFLUENT.
- THE AIR SUPPLY LINE INTO THE FAST® UNIT MUST BE SECURED TO PREVENT VIBRATION INDUCED DAMAGE. THE AIR SUPPLY LINE SHOULD BE SECURED WITH A NON-CORROSIVE CLAMP EVERY 2' MIN. FOR ALTERNATE AIR SUPPLY OPTION CONTACT MICROFAST® FOR DETAILS AND GET WRITTEN APPROVAL BY ZENITH CONSULTING ENGINEERS, LLC.
- MIN HEIGHT MAY BE REDUCED, CONSULT FACTORY AND REFERENCE "SHORT-FAST-MODULE-PROCEDURE.PDF."

**DESIGN CALCULATIONS:**  
 ESTIMATED DAILY FLOW:  
 EXISTING 4 BEDROOM HOUSE X 110 GPD/BEDROOM = 440 GPD  
 SEPTIC TANK REQUIREMENT:  
 440 GPD X 3.0 = 1,320 GALLONS  
 USE 1,500 GALLON MICROFAST 0.5 TANK (DEP TRANSMITTAL NUMBER X236074)  
 PERCOLATION RATE = 2 MIN/INCH (CLASS II SOIL)  
 ALLOWED LOADING RATE = 0.74 GPD/SF  
 LEACHING AREA REQ'D = (440 GPD) / (0.74 GPD/SF) = 595 SF  
 SOIL ABSORPTION SYSTEM PROVIDED: PIPE AND STONE FIELD  
 21.5'W X 28'L = 602 SF > 595 SF  
 DAILY FLOW PROVIDED= 602 SF X 0.74 GPD/SF = 445 GPD > 440 GPD

**NOTES:**

- THE CONTRACTOR SHALL NOTIFY THE LOCAL BOARD OF HEALTH AND ZENITH CONSULTING ENGINEERS, LLC, AT LEAST 48 HOURS PRIOR TO REQUIRED INSPECTIONS. THE REQUIRED INSPECTIONS ARE AS FOLLOWS:  
 A. AFTER LEACH FIELD EXCAVATION PRIOR TO PLACEMENT OF SAND AND OR STONE.  
 B. AFTER PLACEMENT OF TANKS, TREATMENT UNIT AND STONE & PIPE.  
 C. PRIOR TO BACKFILL. THE CONTRACTOR IS TO PROVIDE A CURRENT SIEVE ANALYSIS SHOWING THE SAND MEETS 310 CMR 15.255(3) SPECIFICATIONS IF REQUESTED BY THE DESIGN ENGINEER.  
 D. DURING BACKFILLING OF LEACHING AREA.  
 E. FINAL INSPECTION AFTER LOAM AND SEED HAVE BEEN PLACED.
- BENCHMARK MAG NAIL IN DRIVEWAY, ELEV=5.00
- PER 310 CMR 15.246(2) HEAVY EQUIPMENT SHALL NOT BE ALLOWED TO OPERATE OVER THE LIMITS OF THE SEWAGE DISPOSAL FIELD DURING THE COURSE OF CONSTRUCTION OF THE SYSTEM.
- NO FIELD MODIFICATIONS TO THE SEWAGE SYSTEM SHALL BE MADE WITHOUT PRIOR WRITTEN APPROVAL OF THE ENGINEER AND THE LOCAL BOARD OF HEALTH.
- UNLESS OTHERWISE NOTED ALL CONSTRUCTION AND SYSTEM COMPONENTS SHALL CONFORM WITH CURRENT TITLE V OF THE STATE ENVIRONMENTAL CODE AND ANY APPLICABLE LOCAL RULES.
- IN AREAS SHOWN THE PLAN, ALL TOPSOIL, SUBSOIL, AND OTHER IMPERVIOUS MATERIALS SHALL BE REMOVED AND REPLACED WITH A CLEAN GRANULAR SAND, FREE FROM ORGANIC MATTER AND OTHER DELICIOUS SUBSTANCES, GRADED AS FOLLOWS:  
 A. NO MATERIAL LARGER THAN 2 INCHES.  
 B. UP TO 65% BY WEIGHT MAY BE RETAINED ON A #4 SIEVE.  
 C. OF THE FRACTION PASSING THE #4 SIEVE, THE FOLLOWING CRITERIA APPLY:  

SIEVE	EFFECTIVE PARTICLE SIZE	% THAT MUST PASS SIEVE
#4	4.75 mm	100%
#50	0.30 mm	10% - 100%
#100	0.15 mm	0% - 20%
#200	0.075 mm	0% - 5%

 D. A SIEVE ANALYSIS OF THE MATERIAL SHALL BE PERFORMED TO DETERMINE THAT IT MEETS THE GRADATION REQUIREMENTS NOTED ABOVE. THE INSTALLER SHALL PROVIDE A COPY OF THE SIEVE ANALYSIS RESULTS TO THE DESIGN ENGINEER.
- THE SEPTIC TANK AND D-BOX SHALL BE MANUFACTURED BY SHEA CONCRETE OR APPROVED EQUAL AND SHALL WITHSTAND H-10 LOADING CRITERIA AS NOTED ON SEPTIC SYSTEM PROFILE.
- MAGNETIC TAPE SHALL BE LAID ON TOP OF ALL SEPTIC COMPONENTS TO ALLOW FOR FUTURE DETECTION.
- GROUT IS TO BE USED AT ALL POINTS WHERE PIPES ENTER OR LEAVE ALL CONCRETE STRUCTURES IN ORDER TO PROVIDE A WATER TIGHT SEAL.
- THE FIRST TWO FEET OF EACH LINE EXITING THE DISTRIBUTION BOX SHALL BE LEVEL.
- THIS SYSTEM IS NOT DESIGNED TO ACCOMMODATE A GARBAGE GRINDER.
- OTHER THAN THOSE SHOWN, THERE ARE NO KNOWN WELLS WITHIN 200' OF THE PROPOSED SOIL ABSORPTION SYSTEM.
- IN ACCORDANCE WITH 310 CMR 15.221, ALL SYSTEM COMPONENT SHALL BE MARKED WITH MAGNETIC MARKING TAPE.
- THE CONTRACTOR SHALL RESTORE (LOAM & SEED) ALL AREAS DISTURBED DURING CONSTRUCTION.
- LOCATION OF UTILITIES ARE CONSIDERED APPROXIMATE ONLY. THE CONTRACTOR SHALL VERIFY THE ACTUAL LOCATION AND DEPTHS OF UTILITIES IN THE FIELD PRIOR TO THE START OF CONSTRUCTION.
- THE CONTRACTOR IS RESPONSIBLE UNDER MASSACHUSETTS STATE LAW TO NOTIFY DIGSAFE (1.888.DIGSAFE) TO LOCATE UTILITIES IN THE PROJECT AREA A MINIMUM OF 72 HOURS PRIOR TO THE START OF EXCAVATION.
- THE PROPERTY IS TO BE SERVICED BY A PRIVATE WATER SUPPLY WELL.
- A MINIMUM OF 12" IS TO BE MAINTAINED BETWEEN THE INVERTS ON THE SEPTIC TANK AND HIGH GROUNDWATER. THE ELEVATION FOR HIGH GROUNDWATER WAS DETERMINED BY TEST PITS.
- WATER PURIFICATION SYSTEM'S BACKWASH SHALL BE PROHIBITED FROM DISCHARGING INTO THE SEPTIC TANK AND SHALL DISCHARGE TO A DRYWELL OR TO THE GROUND IN ACCORDANCE WITH 310 CMR 15.004 (8). THE BACKWASH IS NOT TO BE DISCHARGED INTO OR IN THE DIRECTION OF THE SEPTIC SYSTEM.
- THE SEPTIC SYSTEM OWNER SHALL HAVE THE SEPTIC TANK AND OUTLET FILTER INSPECTED ANNUALLY AND CLEANED AND PUMPED AS NECESSARY.
- MICROFAST 0.5 SHALL BE INSTALLED AND MAINTAINED IN COMPLIANCE WITH THE MASSEP GENERAL USE CERTIFICATE REVISED 2-12-13 (TRANSMITTAL NUMBER X236074) AND STANDARD CONDITIONS FOR SECONDARY TREATMENT UNITS CERTIFIED FOR GENERAL USE REVISED 3-20-15.

**SITE INFORMATION:**

- THE SITE IS LISTED ON THE TOWN OF BOURNE ASSESSORS PROPERTY RECORD CARDS AS PARCEL 4.4-131-0, NUMBER 2500103174, MAP REVISED 7-16-14 (SEE PLAN VIEW).
- THE SYSTEM IS NOT LOCATED IN A PRIORITY HABITAT AND ESTIMATED HABITAT AS SHOWN ON THE MASSACHUSETTS NATURAL HERITAGE ATLAS 15TH EDITION EFFECTIVE DATE AUGUST, 2021.
- THE ENTIRE LOT IS CLASSIFIED AS A COASTAL DUNE/BARRIER BEACH.
- THE PROJECT IS NOT LOCATED WITHIN AN AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC).
- THE SITE IS LOCATED IN A WPA TO A PUBLIC WATER SUPPLY WELL.
- THE SITE IS NOT IN A ZONE A TO A SURFACE WATER SUPPLY AREA.
- THE SITE IS NOT LOCATED IN AN OUTSTANDING RESOURCE WATER AREA (ORW).

**REGISTRATION INFORMATION:**

**SUBSURFACE SEWAGE DISPOSAL SYSTEM UPGRADE**  
 PROJECT SITE: 191 PHILLIPS ROAD, BOURNE, MASSACHUSETTS  
 CLIENT INFO: TIM HASHHEM, PO BOX 265, MIDDLEBORO, MA 02346

DATE: 1-26-22  
 PROJECT NUMBER: 0230-07-01  
 SCALE: 1"=20'  
 SHEET ID: SEPTIC DESIGN

**SHEET NAME:** SUBSURFACE SEWAGE DISPOSAL SYSTEM UPGRADE  
**DESIGNED BY:** TIM MORRIS  
**CHECKED BY:** NCZ  
**APPROVED BY:** NCZ  
**DATE:** 1-26-22  
**PROJECT NUMBER:** 0230-07-01  
**SCALE:** 1"=20'  
**SHEET ID:** SEPTIC DESIGN

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