



Zoning Board of Appeals

Town of Truro

24 Town Hall Road
Truro, MA 02666
(508) 349-7004

Staff Report

Public Hearing

Cloverleaf Truro Rental Housing Comprehensive Permit

March 12, 2020 at 5:30pm, Select Board Meeting Room

Overview

The public hearing for the Project began November 21, 2019. The March 12, 2020 hearing will be the fifth substantive hearing. The four initial hearings were used to provide a comprehensive overview of the project for the Board and the public.

At the last substantive public hearing on December 19th the Board voted to contract with an independent engineering/consulting firm to perform a “peer review” of the engineering included with the application. The primary reason for this review is to examine the adequacy of the proposed wastewater treatment system in mitigating potential impacts to groundwater, private wells, and other downgradient resources. The consultant was also tasked with reviewing the stormwater management systems and the site grading/erosion control measures. The Town selected the Horsley Witten Group out of Sandwich, MA. The firm has extensive experience in groundwater and wastewater engineering and planning both on- and off-cape.

Town staff continued to work with the applicant while the review was underway, most significantly to refine the site drive configuration to meet fire standards. This review was conducted in consultation with the Fire Chief and state fire officials and necessitated changes to the site drive configuration, which in turn required minor changes to grading and changes to the buildings proposed for the south of the site. The changes also resulted in the loss of one one-bedroom unit.

The applicant chose to fully redesign the site plans modifying the drive, grading, and building configuration prior to issuance of the peer review report. The applicant also decided to design an Innovative/Alternative (I/A) septic system known as a FAST system. I/A is a broad term for any de-nitrifying septic system and encompasses many

different proprietary systems that are rated for various levels of nitrogen removal by the state Department of Environmental Protection.

It was decided by staff that these adjusted plans should be reviewed by the Town's consultant, which resulted in delays to the report. While awaiting the report the hearing was twice continued procedurally on January 16th and February 24th.

Peer Review Report

Town staff has reviewed the report and it has also been discussed with the applicant. The applicant will address the report at the hearing, but substantive responses and any necessary adjustments to the project by the applicant will take time and will be reviewed at a subsequent hearing.

Staff suggests that the primary takeaway is that the project can be modified and constructed to mitigate potential impacts to downgradient groundwater resources. The peer review consultant will present the findings in detail at the hearing.

One concern of the report is the meaning of the language of the state's Title V septic regulations shown here in bold:

310 CMR 15.214

(2) No system serving new construction in areas where the use of both on-site systems and drinking water supply wells is proposed to serve the facility shall be designed to receive or shall receive more than 440 gallons of design flow per day per acre from residential uses except as set forth at 310 CMR 15.216 (aggregate flows) or 15.217 (enhanced nitrogen removal).

The primary question of interpretation here is whether "the use of both on-site systems and drinking water supply wells" applies to "areas" or "the facility." Staff sees the merit of both interpretations of the regulations, but the Town's consultant has stated that the regulation should be read to include all facilities in the areas without public water service.

This is also the same section of the state regulations that is the source for the Board of Health's one bedroom per 10,000 SF of lot area regulation. Thus, meeting this standard would meet the intent of the Town's regulation, although through alternative means as the full state regulation is not included in the Town regulation.

Staff feels that based on the peer review report, the Board should require that the project meet the requirements of 310 CMR 15.214(2).

Imposing this requirement is a prudent step to ensure that the project does not create long-term negative impacts to the community.

The report also includes many other recommendations that will be presented and can be discussed by the Board at the hearing.

Staff Hearing Overview

Staff suggests that today's hearing should focus on getting a detailed understanding of:

- 1) What changes the applicant has made to the site plan;
- 2) The conclusions of the peer review;
- 3) What further changes may be required; and
- 4) When the applicant can respond with a modified proposal.

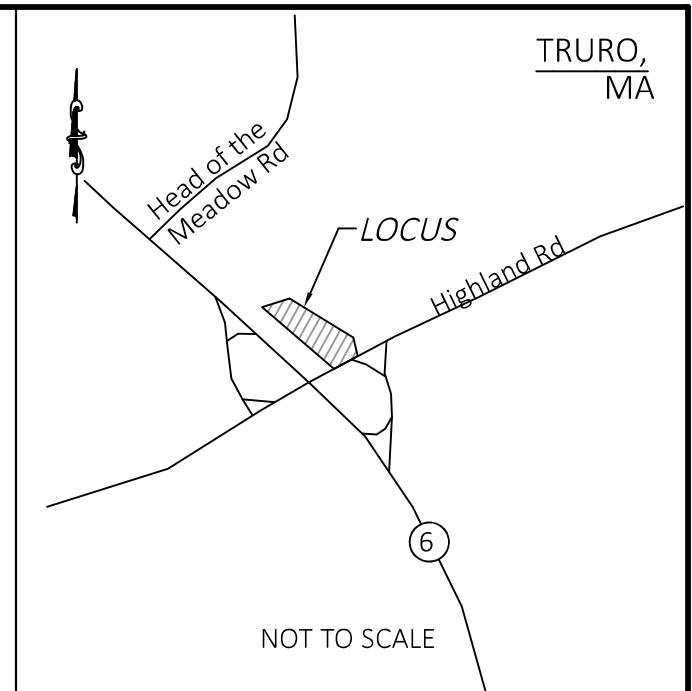
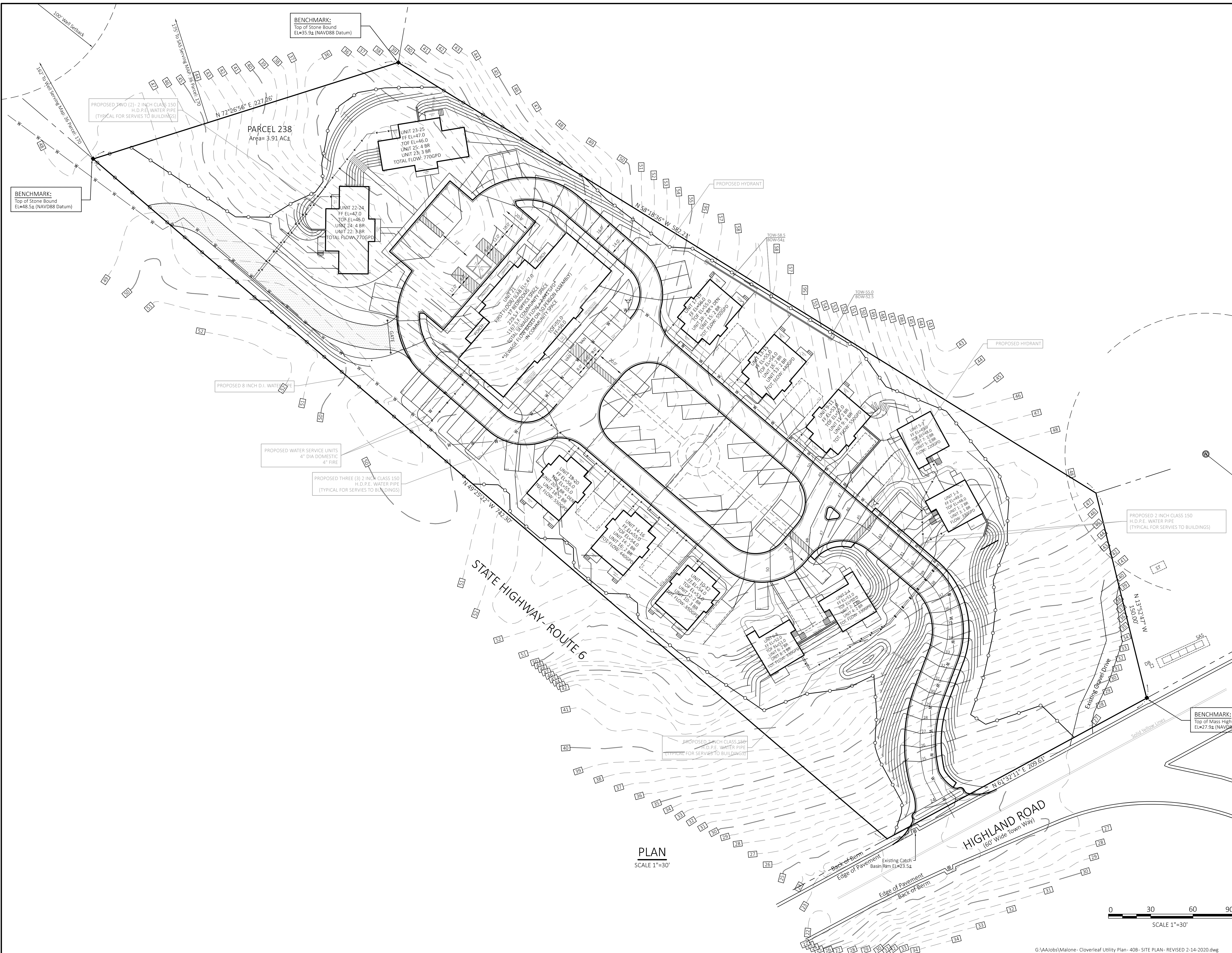
Further, staff suggests that discussion of site details such as architectural, landscaping, etc. should be put off until a final site plan addressing the above comments has been developed in case additional changes to drives, building configurations, or planted areas are required.

Any other issues of interest can be discussed. These are merely some suggestions.

Actions

Staff suggests that prior to the continuance of this public hearing, the Board should discuss:

- 1) A list of the significant questions that must be answered and additional materials that may be required for the applicant to address those questions.
- 2) The date and time of the next continued public hearing and potential site visit.
- 3) Preliminary date for subsequent public hearing.



PLAN BOOK 672
ASSESSORS' MAP 36

PAGE 34
PARCEL 238

LEGEND

— 22	EXISTING CONTOUR
— 32	PROPOSED CONTOUR
x12.34	EXISTING SPOT GRADE
24x5	PROPOSED SPOT GRADE
— W	WATER SERVICE LINE
— O	OVERHEAD UTILITY SERVICE
— U	UNDERGROUND UTILITY SERVICE
— G	GAS SERVICE LINE
— T	TEST HOLE / BORING LOCATION
— ST	SEPTIC TANK
— DB	DISTRIBUTION BOX
— SAS	SOIL ABSORPTION SYSTEM
— Reserve	RESERVED FOR FUTURE
— U.P.	UTILITY POLE
— CB	CATCH BASIN
— FH	FIRE HYDRANT
— W	WELL
— DM	DRAINAGE MANHOLE
— CB	CONCRETE BOUND, FOUND
— T	TOP OF BANK
— L	LIMIT OF WORK
— F	FENCE
— E	EDGE OF CLEARING

SCALE 1"=30'

PLAN
SCALE 1"=30'

BENCHMARK:
Top of Mass Highway Sound
EL=27.9z (NAVD88 Datum)



SHEET 1 OF 4
PERMIT SET - NOT FOR CONSTRUCTION

REVISED 2-14-2020: UPDATED BUILDING LAYOUT; ADJUSTED ENTRANCE; UPDATED SEWAGE SYSTEM COLLECTION AND ADDED I.A. TREATMENT TECHNOLOGY; UPDATED WATER SERVICE LAYOUT AND DRAINAGE ACCORDINGLY

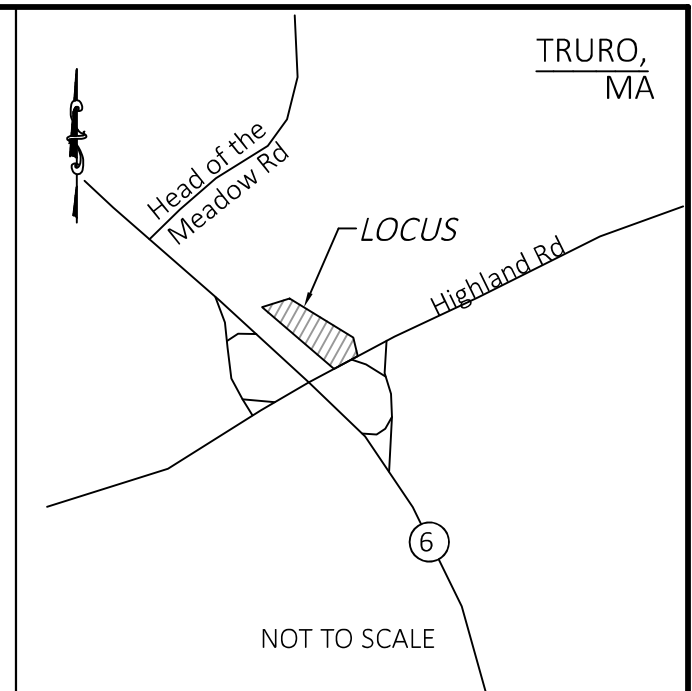
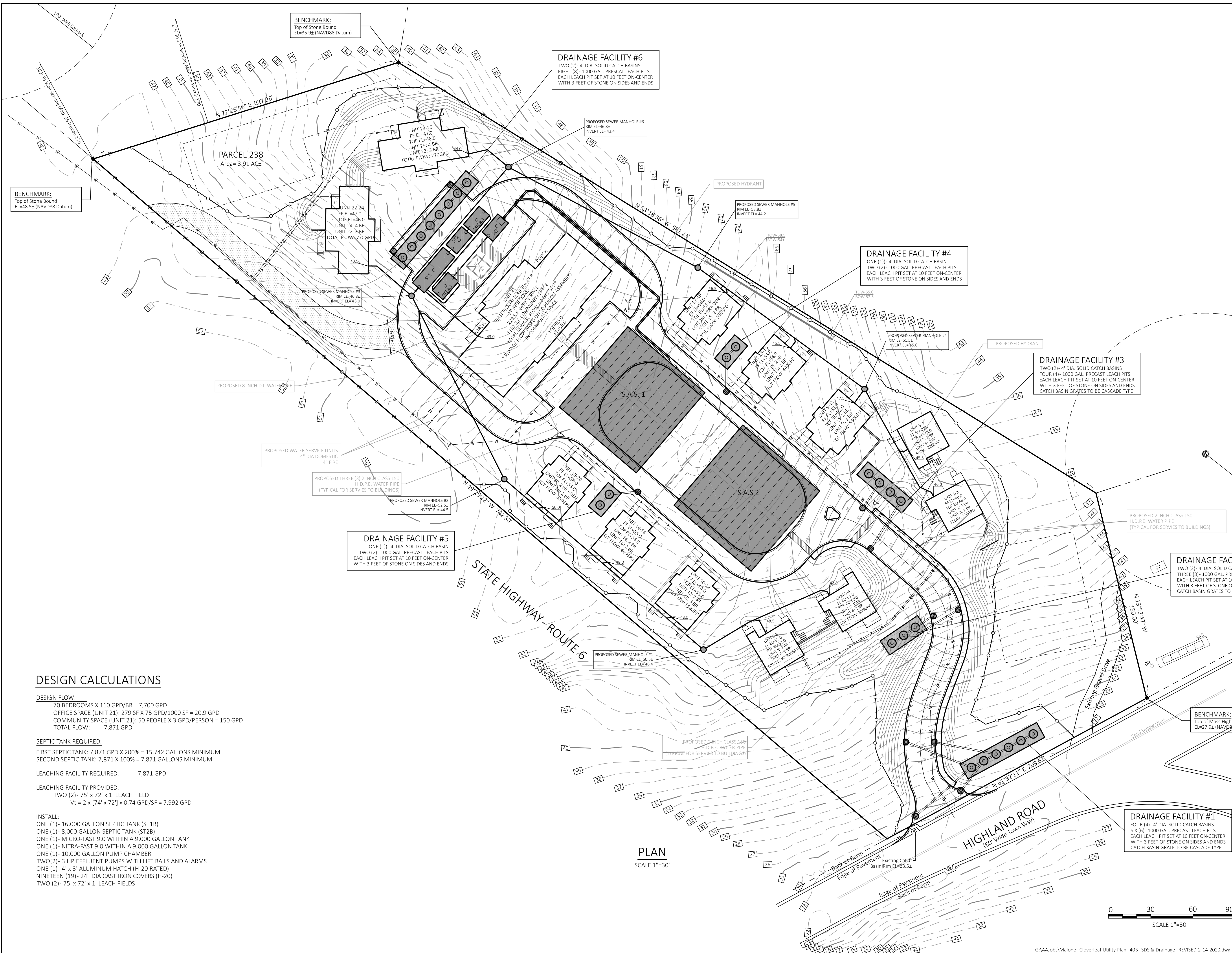
Community Housing Resource, Inc.
P.O. Box 1015, Provincetown, MA 02657

SITE PLAN
CLOVER LEAF DRIVE, OFF HIGHLAND ROAD, TRURO, MA

J.M. O'REILLY & ASSOCIATES, INC.
Professional Engineering & Land Surveying Services

1573 Main Street - Route 6A
P.O. Box 1773
Brewster, MA 02631 (508)896-6601 Fax

DATE:	SCALE:	BY:	CHECK:	JOB NUMBER:
11-1-2019	As Noted	RRR	JMO	JMO-8446A



PLAN BOOK 672 PAGE 34
 ASSESSORS' MAP 36 PARCEL 238

LEGEND

— 22	EXISTING CONTOUR
— 32	PROPOSED CONTOUR
x12.34	EXISTING SPOT GRADE
24x5	PROPOSED SPOT GRADE
— W	WATER SERVICE LINE
— O	OVERHEAD UTILITY SERVICE
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— DM	DRAINAGE MANHOLE
— CB	CONCRETE BOUND, FOUND
— T	TOP OF BANK
— L	LIMIT OF WORK
— F	FENCE
— E	EDGE OF CLEARING

SCALE 1"=30'

DESIGN CALCULATIONS

DESIGN FLOW:
 70 BEDROOMS X 110 GPD/BR = 7,700 GPD
 OFFICE SPACE (UNIT 21): 279 SF X 75 GPD/1000 SF = 20.9 GPD
 COMMUNITY SPACE (UNIT 21): 50 PEOPLE X 3 GPD/PERSON = 150 GPD
 TOTAL FLOW: 7,871 GPD

SEPTIC TANK REQUIRED:
 FIRST SEPTIC TANK: 7,871 GPD X 200% = 15,742 GALLONS MINIMUM
 SECOND SEPTIC TANK: 7,871 X 100% = 7,871 GALLONS MINIMUM

LEACHING FACILITY REQUIRED: 7,871 GPD

LEACHING FACILITY PROVIDED:
 TWO (2)- 75' x 72' x 1' LEACH FIELD
 Vt = 2 x [74' x 72'] x 0.74 GPD/SF = 7,992 GPD

INSTALL:
 ONE (1)- 16,000 GALLON SEPTIC TANK (ST1B)
 ONE (1)- 8,000 GALLON SEPTIC TANK (ST2B)
 ONE (1)- MICRO-FAST 9.0 WITHIN A 9,000 GALLON TANK
 ONE (1)- NITRA-FAST 9.0 WITHIN A 9,000 GALLON TANK
 ONE (1)- 10,000 GALLON PUMP CHAMBER
 TWO (2)- 3 HP EFFLUENT PUMPS WITH LIFT RAILS AND ALARMS
 ONE (1)- 4' x 3' ALUMINUM HATCH (H-20 RATED)
 NINETEEN (19)- 24" DIA CAST IRON COVERS (H-20)
 TWO (2)- 75' x 72' x 1' LEACH FIELDS

PLAN
 SCALE 1"=30'

SHEET 2 OF 4
 PERMIT SET - NOT FOR CONSTRUCTION

REVISED 2-14-2020: UPDATED BUILDING LAYOUT, ADJUSTED ENTRANCE, UPDATED SEWAGE SYSTEM COLLECTION AND ADDED I.A. TREATMENT TECHNOLOGY, UPDATED WATER SERVICE LAYOUT AND DRAINAGE ACCORDINGLY

Community Housing Resource, Inc.
 P.O. Box 1015, Provincetown, MA 02657

SEWAGE-DRAINAGE SITE PLAN- 40B PERMIT SET
 CLOVER LEAF DRIVE, OFF HIGHLAND ROAD, TRURO, MA

J.M. O'REILLY & ASSOCIATES, INC.
 Professional Engineering & Land Surveying Services

1573 Main Street - Route 6A
 P.O. Box 1773
 Brewster, MA 02631 (508)896-6602 Fax
 (508)896-6601
 DATE: 11-1-2019 SCALE: As Noted BY: RFR CHECK: JMO JOB NUMBER: JMO-8446A



GENERAL NOTES:

- A.) NEITHER DRIVEWAYS NOR PARKING AREAS ARE ALLOWED OVER SEPTIC SYSTEM UNLESS H-20 COMPONENTS ARE USED
- B.) THE DESIGNER WILL NOT BE RESPONSIBLE FOR THE SYSTEM AS DESIGNED UNLESS CONSTRUCTED AS SHOWN. ANY CHANGES SHALL BE APPROVED IN WRITING.
- C.) CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL UNDERGROUND AND OVERHEAD UTILITIES PRIOR TO COMMENCEMENT OF WORK.

CONSTRUCTION NOTES:

- 1.) ALL CONSTRUCTION SHALL CONFORM TO THE STATE ENVIRONMENTAL CODE, TITLE 5, AND THE REQUIREMENTS OF THE LOCAL BOARD OF HEALTH.
- 2.) SEPTIC TANK(S), GREASE TRAP(S), DOSING CHAMBER(S) AND DISTRIBUTION BOX(ES) SHALL BE SET ON A LEVEL STABLE BASE WHICH HAS BEEN MECHANICALLY COMPACTED, OR ON A 6 INCH CRUSHED STONE BASE.
- 3.) SEPTIC TANK(S) SHALL MEET ASTM STANDARD C1127-93 AND SHALL HAVE AT LEAST THREE 20" DIAMETER MANHOLES. THE MINIMUM DEPTH FROM THE BOTTOM OF THE SEPTIC TANK TO THE FLOW LINE SHALL BE 48".
- 4.) SCHEDULE 40 PVC INLET AND OUTLET TEES SHALL EXTEND A MINIMUM OF 6" ABOVE THE FLOW LINE OF THE SEPTIC TANK AND SHALL BE INSTALLED ON THE CENTERLINE OF THE TANK DIRECTLY UNDER THE CLEANOUT MANHOLE.
- 5.) RAISE COVERS OF THE SEPTIC TANK AND DISTRIBUTION BOX WITH PRECAST CONCRETE WATER TIGHT RISERS OVER INLET AND OUTLET TEES TO WITHIN 6" OF FINISH GRADE, OR AS APPROVED BY THE LOCAL BOARD OF HEALTH AGENT.
- 6.) PIPING SHALL CONSIST OF 4" SCHEDULE 40 PVC OR EQUIVALENT. PIPE SHALL BE LAID ON A MINIMUM CONTINUOUS GRADE OF NOT LESS THAN 1%.
- 7.) DISTRIBUTION LINES FOR SOIL ABSORPTION SYSTEM (AS REQUIRED) SHALL BE 4" DIAMETER SCHEDULE 40 PVC LAID AT 0.005 FT/FT. LINE SHALL BE CAPPED AT END OR AS NOTED.
- 8.) OUTLET PIPES FROM DISTRIBUTION BOX SHALL REMAIN LEVEL FOR AT LEAST 2' BEFORE PITCHING TO SOIL ABSORPTION SYSTEM. WATER TEST DISTRIBUTION BOX TO ASSURE EVEN DISTRIBUTION.
- 9.) DISTRIBUTION BOX SHALL HAVE A MINIMUM SUMP OF 6" MEASURED BELOW THE OUTLET INVERT.
- 10.) BASE AGGREGATE FOR THE LEACHING FACILITY SHALL CONSIST OF 3/4" TO 1-1/2" DOUBLE WASHED STONE FREE OF IRON, FINES AND DUST AND SHALL BE INSTALLED BELOW THE CROWN OF THE DISTRIBUTION LINE TO THE BOTTOM OF THE SOIL ABSORPTION SYSTEM. BASE AGGREGATE SHALL BE COVERED WITH A 2" LAYER OF 1/8" TO 1/2" DOUBLE WASHED STONE FREE OF IRON, FINES AND DUST.
- 11.) VENT SOIL ABSORPTION SYSTEM WHEN DISTRIBUTION LINES EXCEED 50 FEET; WHEN LOCATED EITHER IN WHOLE OR IN PART UNDER DRIVEWAYS, PARKING AREAS, TURNING AREAS OR OTHER IMPERVIOUS MATERIAL; OR WHEN PRESSURE DOSED.
- 12.) SOIL ABSORPTION SYSTEM SHALL BE COVERED WITH A MINIMUM OF 9" OF CLEAN MEDIUM SAND (EXCLUDING TOPSOIL).
- 13.) FINISH GRADE SHALL BE A MAXIMUM OF 36" OVER THE TOP OF ALL SYSTEM COMPONENTS, INCLUDING THE SEPTIC TANK, DISTRIBUTION BOX, DOSING CHAMBER AND SOIL ABSORPTION SYSTEM. SEPTIC TANKS SHALL HAVE A MINIMUM COVER OF 9".
- 14.) FROM THE DATE OF INSTALLATION OF THE SOIL ABSORPTION SYSTEM UNTIL RECEIPT OF A CERTIFICATE OF COMPLIANCE, THE PERIMETER OF THE SOIL ABSORPTION SYSTEM SHALL BE STAKED AND FLAGGED TO PREVENT THE USE OF SUCH AREA FOR ALL ACTIVITIES THAT MIGHT DAMAGE THE SYSTEM.
- 15.) THE BOARD OF HEALTH SHALL REQUIRE INSPECTION OF ALL CONSTRUCTION BY AN AGENT OF THE BOARD OF HEALTH (OR THE DESIGNER IF THIS SYSTEM REQUIRES A VARIANCE) AND MAY REQUIRE SUCH PERSON TO CERTIFY IN WRITING THAT ALL WORK HAS BEEN COMPLETED IN ACCORDANCE WITH THE TERMS OF THE PERMIT AND APPROVED PLANS. 48 HOURS ADVANCE NOTICE IS REQUESTED.
- 16.) ONE (1) 4" PVC INSPECTION PORT TO BE RAISED TO WITHIN 3" OF FINISH GRADE FOR EACH LEACHING FIELD. BOTH INSPECTION PORTS TO BE PROVIDED WITH CAST IRON CLEANOUT COVERS AT FINISH GRADE.
- 17.) INSTALLER TO CONFIRM LOCATION OF ALL UNDERGROUND AND OVERHEAD UTILITIES PRIOR TO START OF CONSTRUCTION.
- 18.) WATER/SEWER CROSSING: WASTELINE SHALL BE A 20" SECTION OF PVC PIPE CENTERED OVER THE WATER LINE TO MAXIMIZE DISTANCE TO JOINTS.

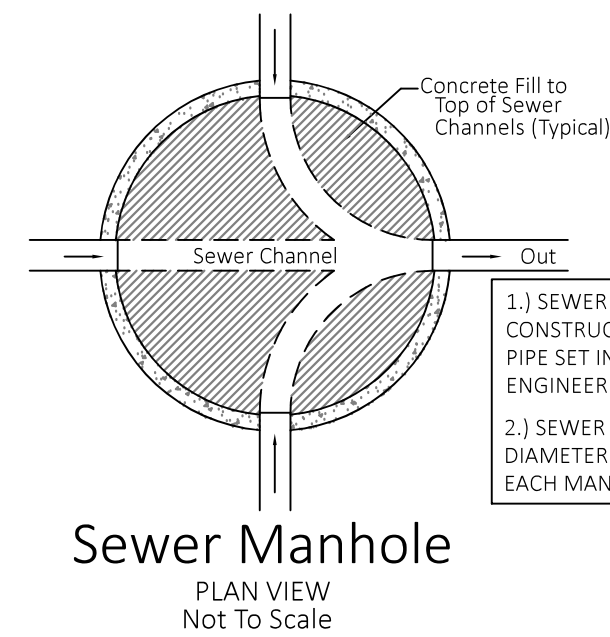
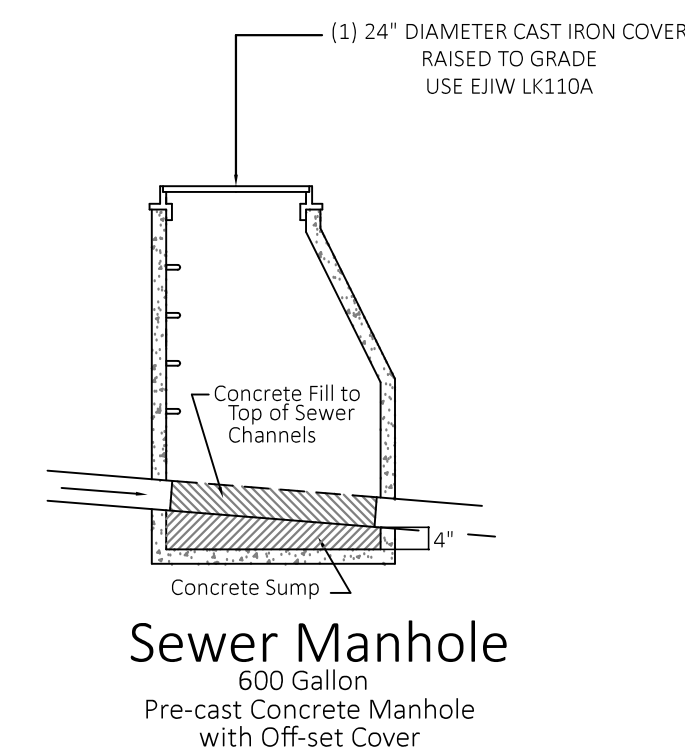
SOIL LOGS:

DEPTH FROM SURFACE (INCHES)	SOIL HORIZON	SOIL TEXTURE (USDA)	SOIL COLOR (MUNSELL)	SOIL MOTTLING	OTHER
0-6	A	FINE LOAMY SAND	10YR3/1		
6-24	C1	COARSE SAND	10YR7/8	NONE	
24-186	C2	COARSE SAND	10YR6/4		NO WATER ENCOUNTERED

DATE OF TESTING: 10-16-2019
 PERCOLATION RATE: LESS THAN 52 MIN/INCH IN C1 LAYERS (ASSUMED)
 WITNESSED BY: ROBERT REEDY, EIT, J.M. O'REILLY & ASSOCIATES, INC.
 NO GROUNDWATER WAS ENCOUNTERED
 USE A LOADING RATE OF 0.74 GPD/SF FOR SIZING OF SOIL ABSORPTION SYSTEM.

PROFILE OF SEWER MANHOLES:

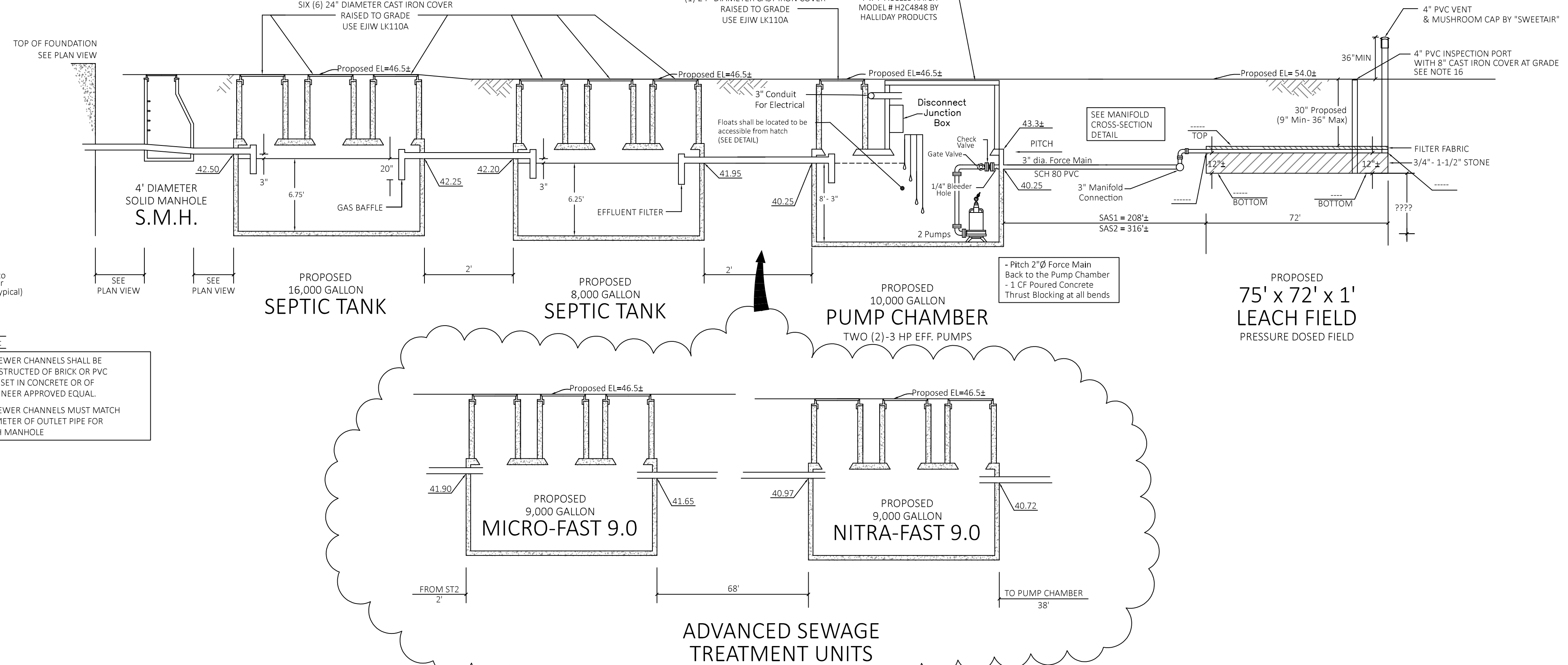
NOT TO SCALE



- 1.) SEWER CHANNELS SHALL BE CONSTRUCTED OF BRICK OR PVC PIPE SET IN CONCRETE OR OF ENGINEER APPROVED EQUAL.
- 2.) SEWER CHANNELS MUST MATCH DIAMETER OF OUTLET PIPE FOR EACH MANHOLE.

SCHEMATIC FLOW PROFILE:

NOT TO SCALE

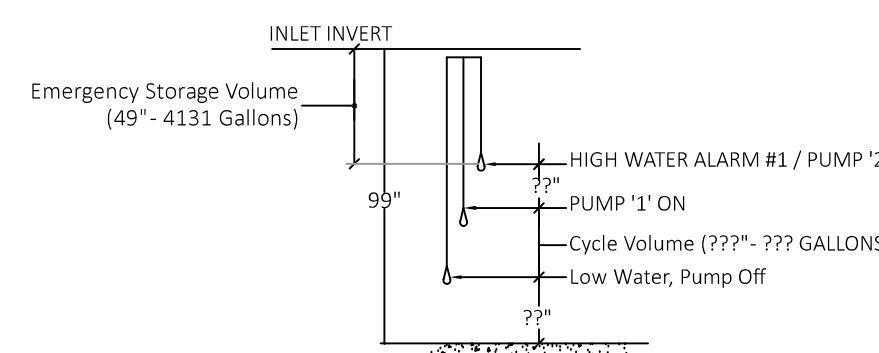


PUMP DOSING CALCULATIONS:

1. DETERMINE VOLUME OF EFFLUENT TO BE PUMPED TO LEACHING FIELD:
 DAILY FLOW = 3325 GALLONS (DESIGN FLOW)
 NUMBER OF DOSES PER DAY = 20 DOSES
 NUMBER OF GALLONS = 3325/20 = 166 GPD
2. DRAIN BACK VOLUME:
 2" FORCE MAIN = 1.6 GALLONS
 3" MANIFOLD = 10.3 GALLONS
 PUMPING VOLUME = DOSING VOLUME + DRAIN BACK VOLUME
 PUMPING VOLUME = 166 + 1.6 + 10.3 = 178 GALLONS
3. TOTAL DYNAMIC HEAD: 34'±
4. PUMP MUST BE CAPABLE OF PUMPING AT LEAST 88 GPM AGAINST A TOTAL DYNAMIC HEAD OF 34'± (USE [2] LIBERTY LE100 3 HP PUMPS OR ENGINEER APPROVED EQUIVALENT)

PUMP CHAMBER FLOAT DETAIL:

NOT TO SCALE



FLOAT DETAIL:

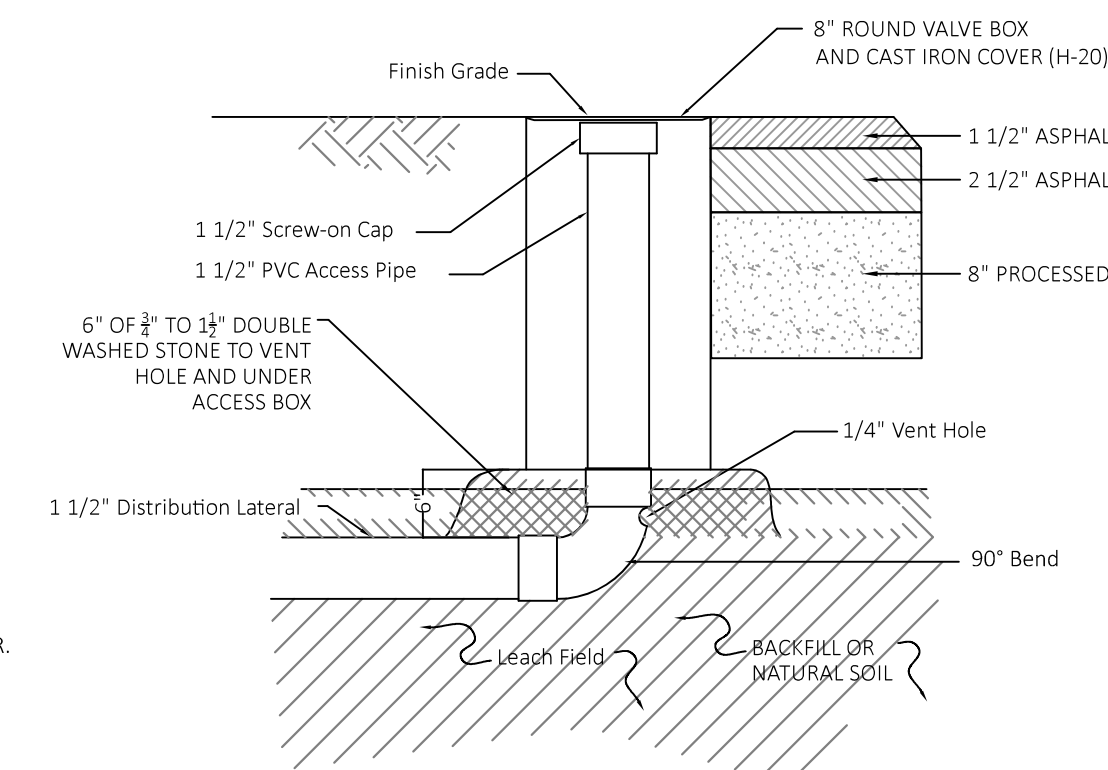
- 1.) PUMP '1' ON - PUMP DOSES CYCLE VOLUME TO FIELD. SHUTS OFF AT LOW WATER FLOAT.
 - 2.) HIGH WATER ALARM ON / PUMP '2' ON - EXCESSIVE WATER, PUMP '1' NOT OPERATING PROPERLY. RED WARNING LIGHT & ALARM BELL TO ENGAGE. PUMP '2' ON TO LOWER LIQUID LEVEL TO LOW WATER FLOAT.
- *FLOAT INSTALLATION NOTES:**
- 1.) FLOATS SHALL BE INSTALLED WITH A CABLE WEIGHT AND SHALL NOT BE TETHERED TO THE DISCHARGE LINE IN ORDER TO ALLOW FOR THEM TO BE PULLED UP TO THE TOP OF PUMP CHAMBER.
 - 2.) FLOATS SHALL BE INSTALLED SO THAT THEY CAN BE ACCESSED FROM OUTLET MANHOLE COVER.
 - 3.) FLOATS MUST BE INSTALLED SO THAT THEY ARE FREE TO MOVE THROUGHOUT ITS TRAVEL AND NOT CONTACT THE PUMP BODY, PIPING, OR OTHER OBJECTS.

PUMP NOTES & REQUIREMENTS:

- 1.) ALARM LOCATION SHALL BE APPROVED BY OWNER. ALARM SHALL BE A RED WARNING LIGHT WITH AUDIBLE ALARM.
 - 2.) THE CORDS FOR THE FLOATS SHALL BE ONE CONTINUOUS PIECE FROM THE PUMP CHAMBER TO THE DISCONNECT PULL BOX. THE CORDS SHALL BE ENCASED IN 3" ELECTRICAL CONDUIT.
 - 3.) ALARM TO BE WIRED TO DIFFERENT CIRCUIT THAN PUMPS.
 - 4.) ALL PUMP, WIRING, ALARM, AND FLOAT INSTALLATIONS SHALL CONFORM TO MASSACHUSETTS STATE PLUMBING AND MASSACHUSETTS STATE ELECTRICAL CODES AS WELL AS TO MANUFACTURER'S SPECIFICATIONS.
 - 5.) PUMPS SHALL BE LIBERTY LE100 1 HP (OR ENGINEER APPROVED EQUAL). INSTALLER SHALL VERIFY PUMPS WITH MANUFACTURER FOR FLOW AND TDH (SEE PUMP DOSING CALCS FOR DETAILS).
- 6.) PUMP SEQUENCE
- a) PUMP A DOSES TO FIELD UNTIL COMPLETE.
 - b) PUMP OFF FLOAT ENGAGED.
 - c) PUMP ON, FLOAT ENGAGED ACTIVATES PUMP B.
 - d) PUMP B DOSES TO FIELD UNTIL COMPLETE.

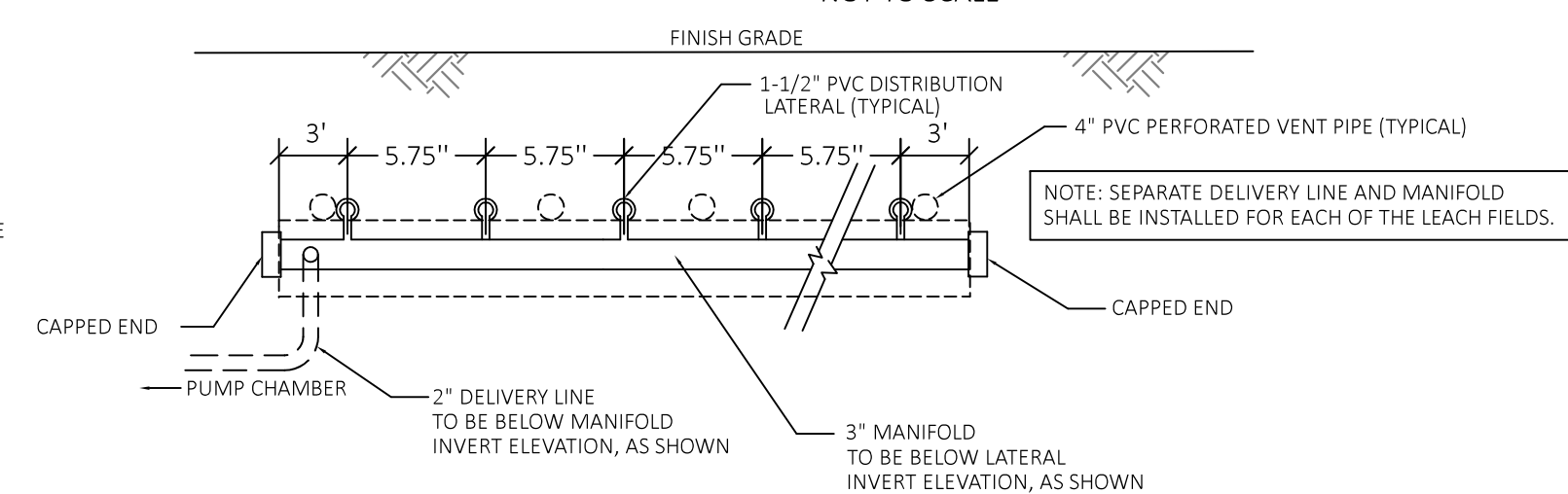
DETAIL OF LATERAL ACCESS CAP

NOT TO SCALE



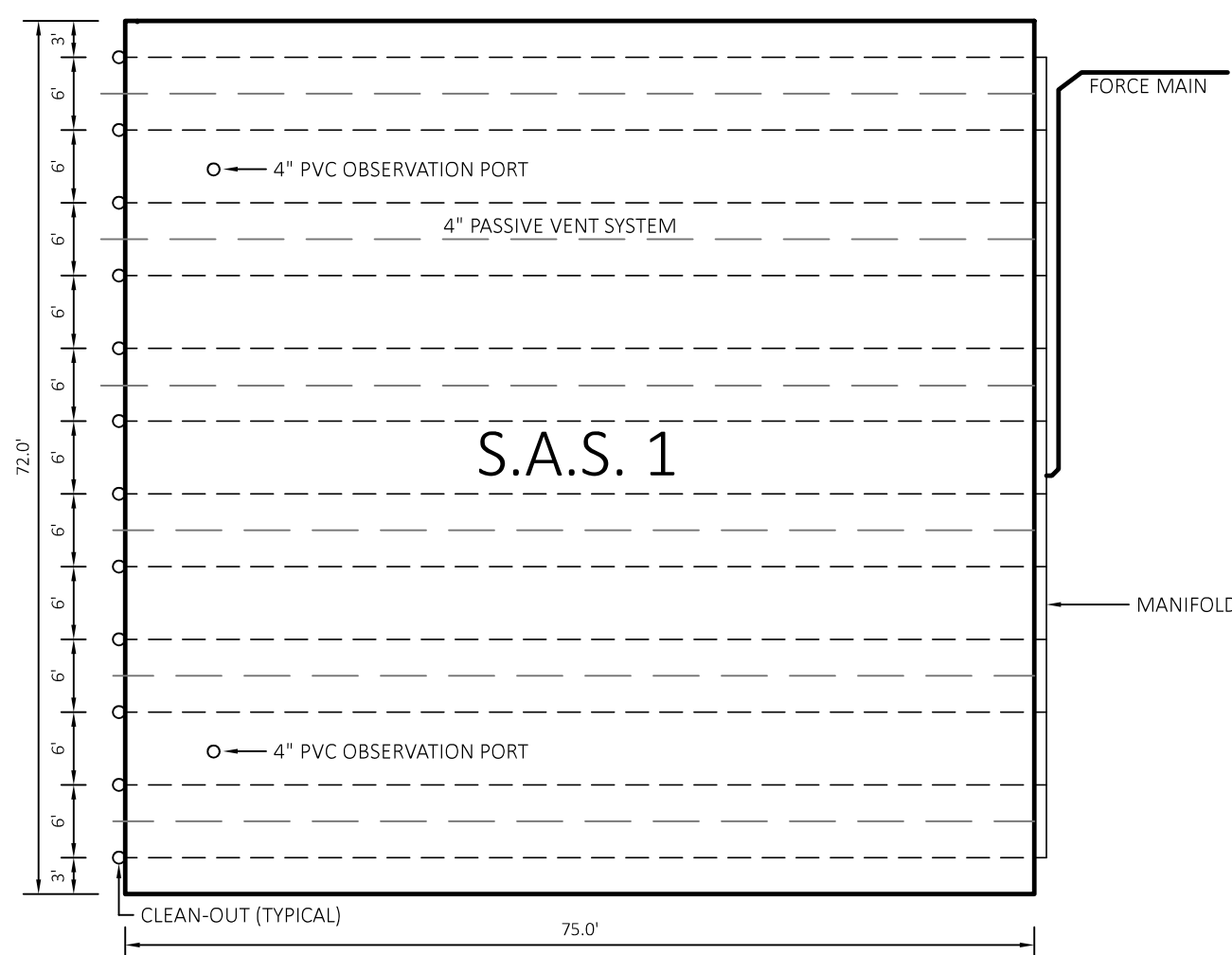
MANIFOLD CROSS-SECTION DETAIL

NOT TO SCALE



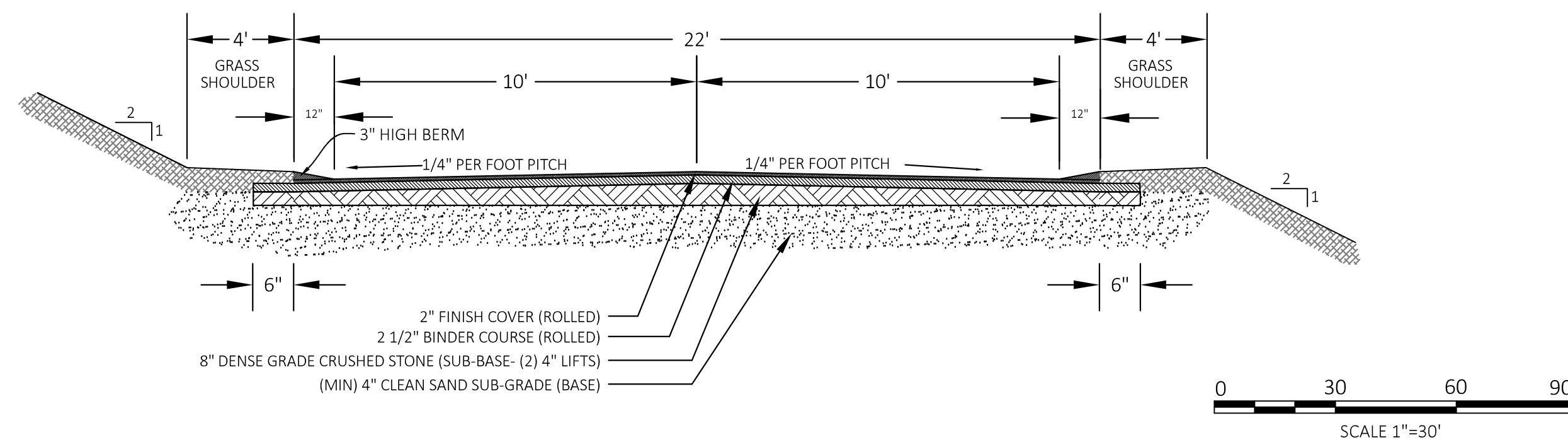
SOIL ABSORPTION SYSTEM DETAIL:

NOT TO SCALE



DRIVEWAY PAVEMENT SECTION (WITH CROWN):

NOT TO SCALE



SHEET 3 OF 4
 PERMIT SET - NOT FOR CONSTRUCTION

REVISION 2-14-2020: UPDATED BUILDING LAYOUT; ADJUSTED ENTRANCE; UPDATED SEWAGE SYSTEM COLLECTION AND ADDED I.A. TREATMENT TECHNOLOGY; UPDATED WATER SERVICE LAYOUT AND DRAINAGE ACCORDINGLY

Community Housing Resource, Inc.
 P.O. Box 1015, Provincetown, MA 02657

SEWAGE DETAILS- 40B PERMIT SET
 CLOVER LEAF DRIVE, OFF HIGHLAND ROAD, TRURO, MA

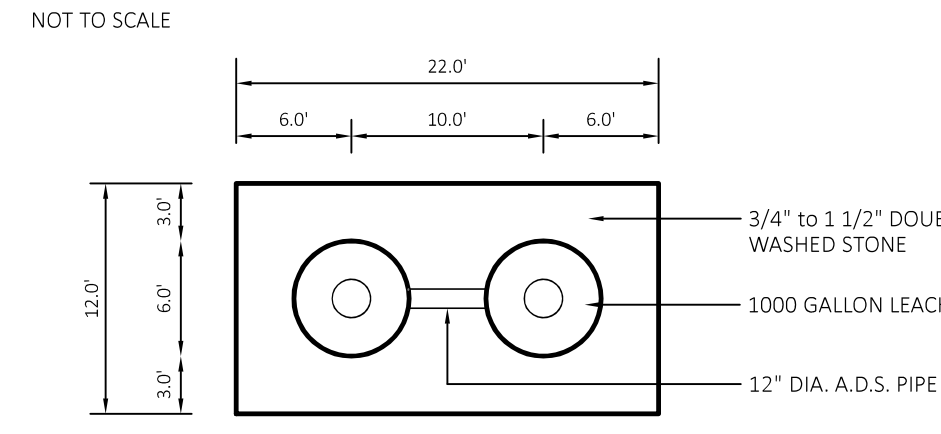
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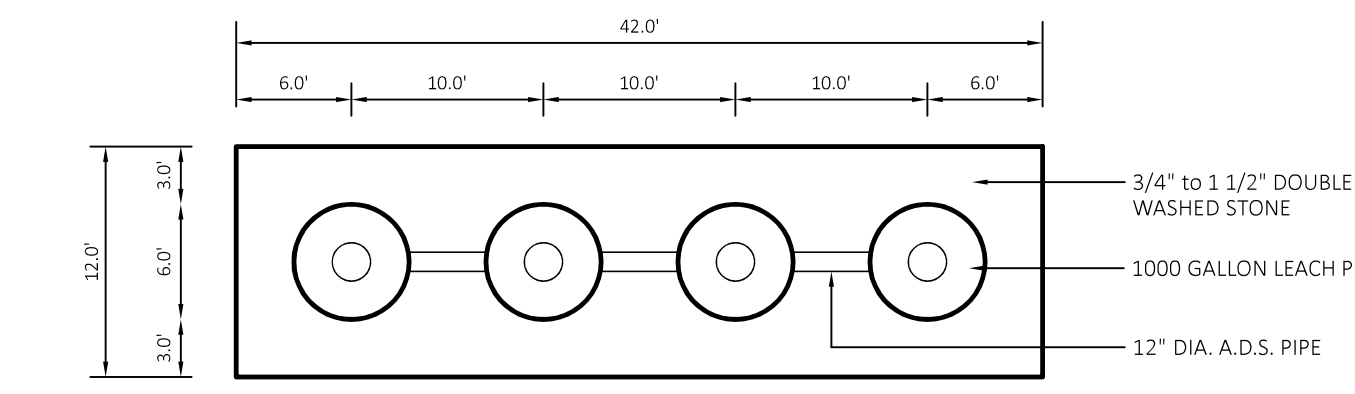
DATE: 11-1-2019	SCALE: As Noted	BY: RFR	CHECK: JMO	JOB NUMBER: JMO-8446A
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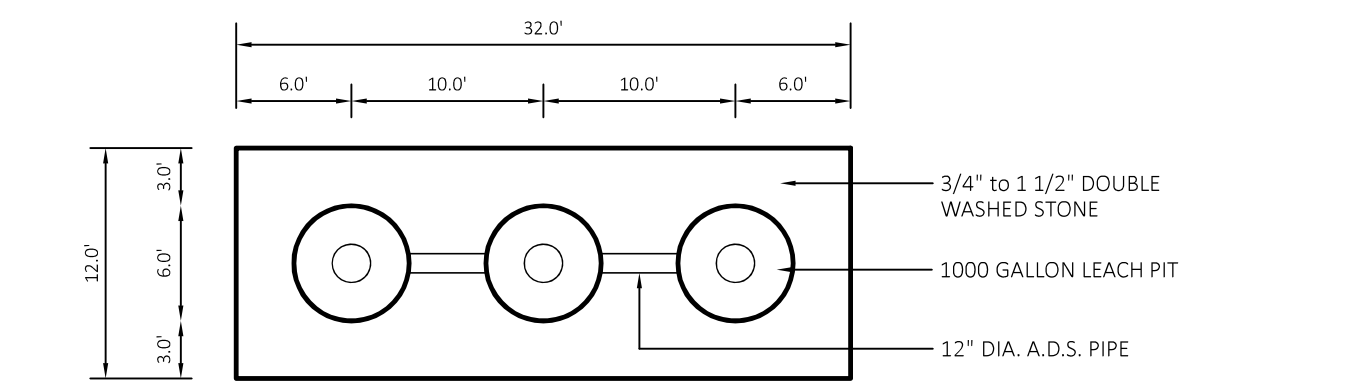
LEACHING FACILITY LAYOUT DETAIL



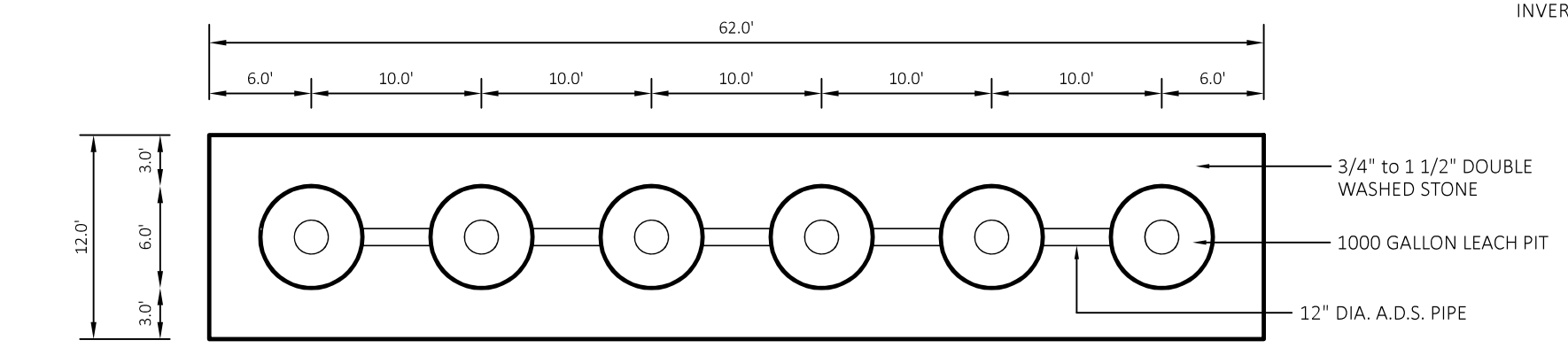
LEACHING FACILITY #4 & #5
SCALE 1" = 10'



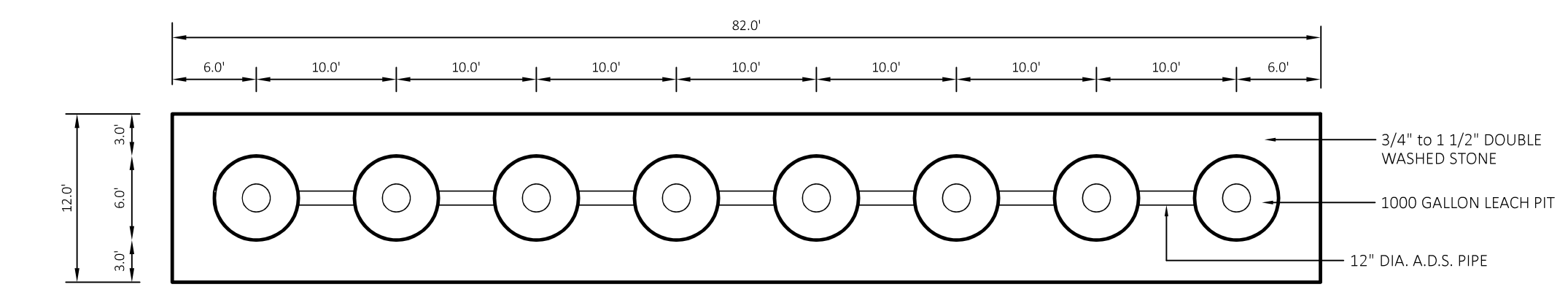
LEACHING FACILITY #3
SCALE 1" = 10'



LEACHING FACILITY #2
SCALE 1" = 10'

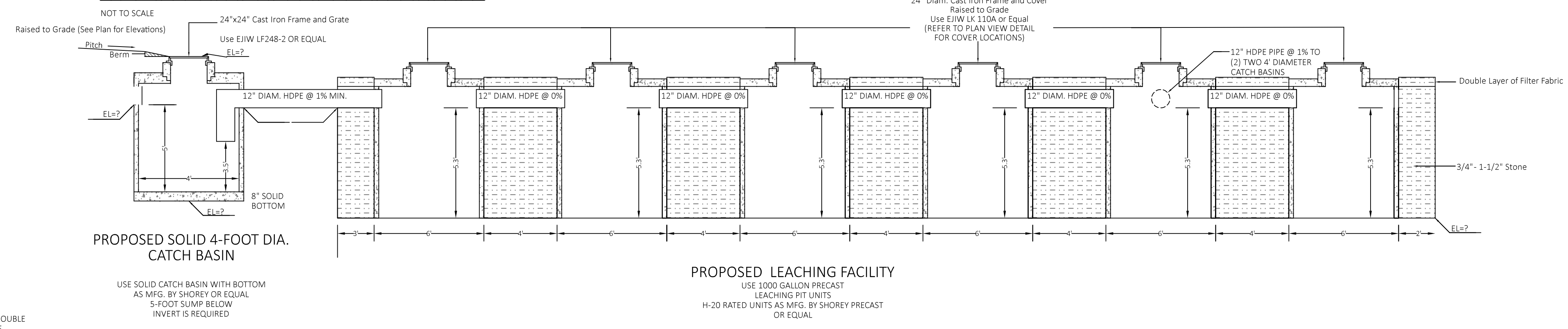


LEACHING FACILITY #1
SCALE 1" = 10'

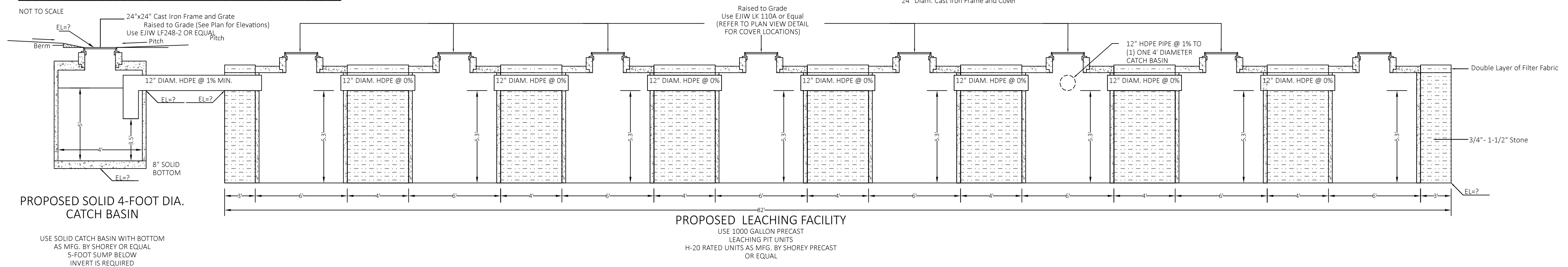


LEACHING FACILITY #6
SCALE 1" = 10'

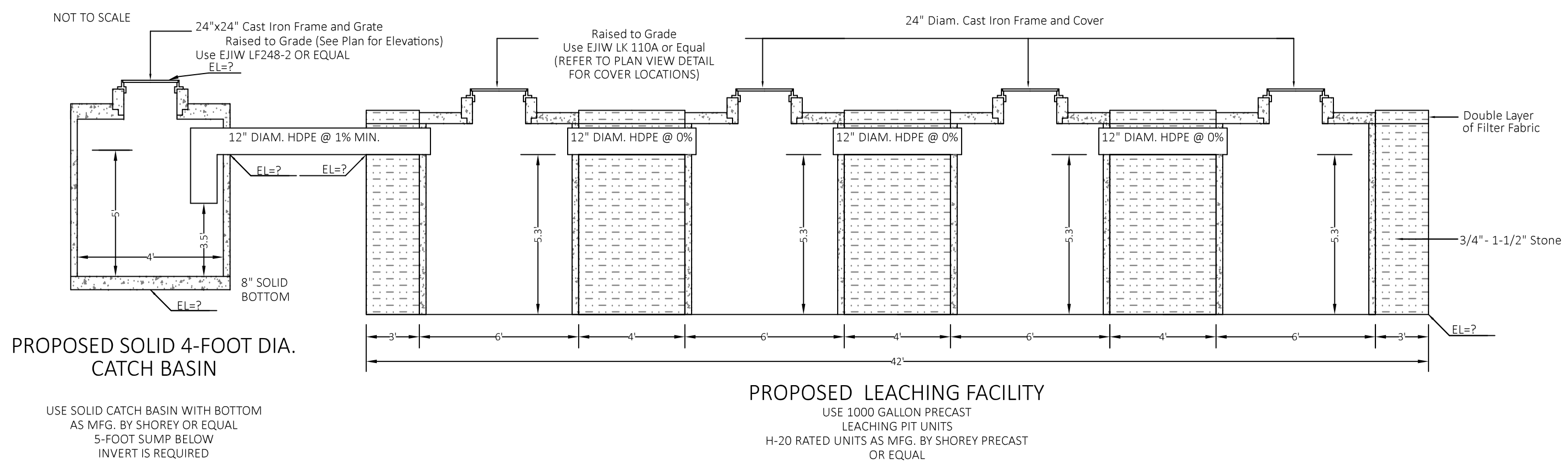
FLOW PROFILE OF DRAINAGE FACILITY #1



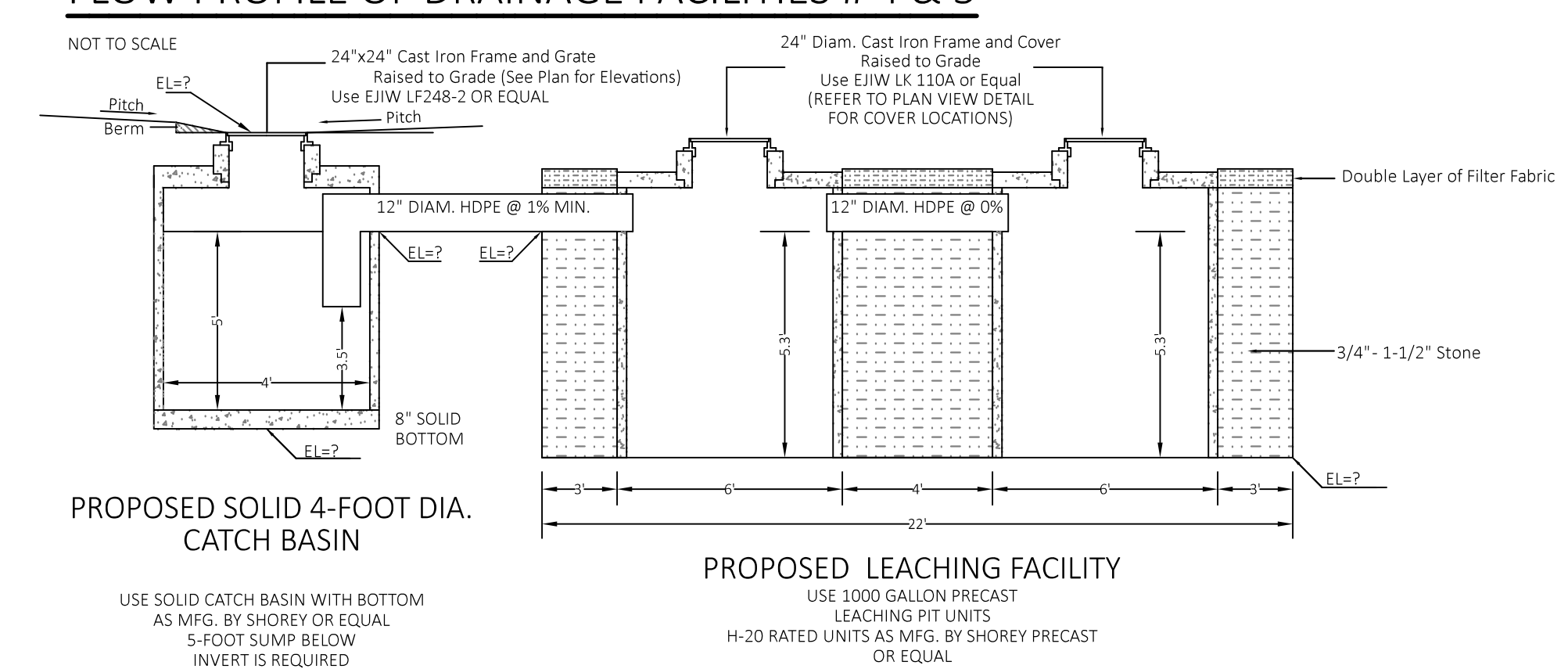
FLOW PROFILE OF DRAINAGE FACILITY #6



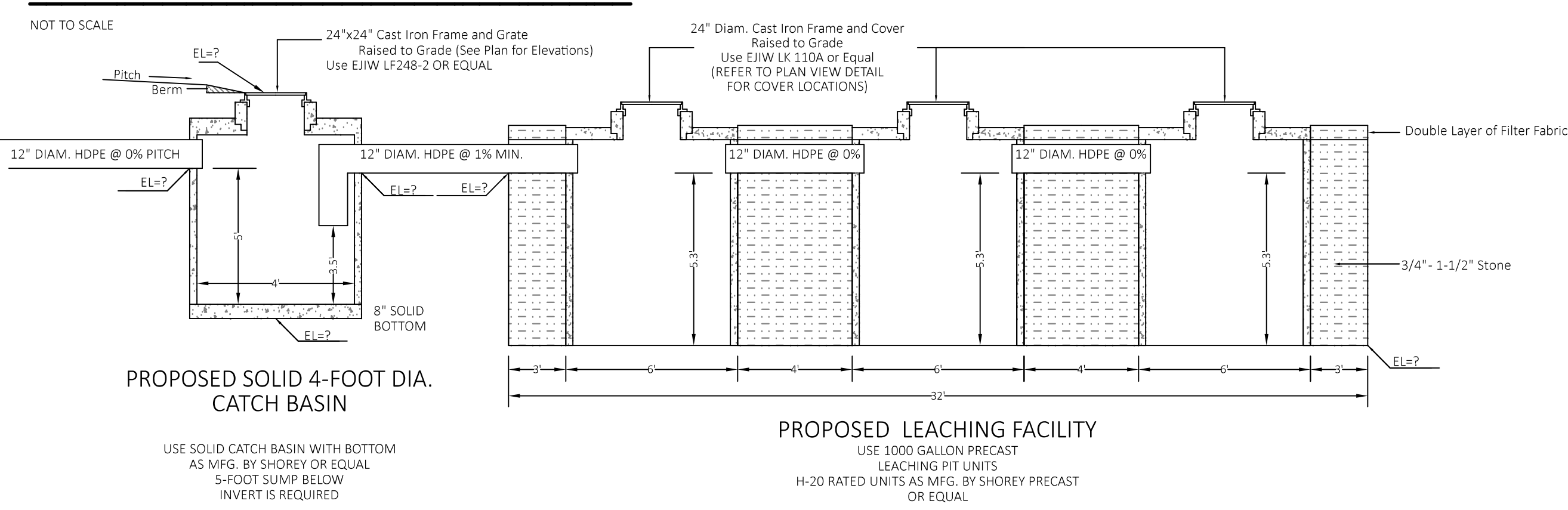
FLOW PROFILE OF DRAINAGE FACILITY #3



FLOW PROFILE OF DRAINAGE FACILITIES #4 & 5



FLOW PROFILE OF DRAINAGE FACILITY #2



GENERAL NOTES:

- CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING, LOCATING AND PROTECTING ALL ABOVE GROUND AND UNDERGROUND UTILITIES PRIOR TO AND DURING CONSTRUCTION. CONTRACTOR SHALL CONTACT DIG-SAFE, ON TARGET LOCATING AND TRURO/PROVINCETOWN WATER DEPARTMENT, AS APPLICABLE, FOR MARKING OF ALL PUBLIC AND PRIVATE UTILITIES.
- ALL COMPONENTS USED SHALL BE RATED FOR H-20 WHEEL LOADS.
- ALL WORKMANSHIP PROVIDED SHALL BE IN CONFORMANCE WITH THE TOWN OF TRURO'S D.P.W. SPECIFICATIONS.

DRAINAGE:

- ALL PROPOSED DRAINAGE SHALL BE INSTALLED AS SHOWN ON THE PLAN VIEW.
- ALL COMPONENTS OF THE DRAINAGE SHALL BE CAPABLE OF HANDLING H-20 WHEEL LOADS AND ALL CAST IRON FRAMES AND ACCESS COVERS SHALL BE BROUGHT TO FINISH GRADE.

PAVEMENT:

- THE NEW PAVEMENT SHALL BE PLACED ON 8 INCHES OF PROCESSED STONE OR APPROVED EQUAL. PROCESSED STONE SHALL BE PLACED IN TWO 4 INCH LIFTS AND COMPACTED TO 95% STANDARD PROCTOR.

SHEET 4 OF 4
PERMIT SET - NOT FOR CONSTRUCTION

REVISED 2-14-2020: UPDATED BUILDING LAYOUT, ADJUSTED ENTRANCE; UPDATED SEWAGE SYSTEM COLLECTION AND ADDED I.A. TREATMENT TECHNOLOGY, UPDATED WATER SERVICE LAYOUT AND DRAINAGE ACCORDINGLY

Community Housing Resource, Inc.
P.O. Box 1015, Provincetown, MA 02657

SITE DETAILS- 40B PERMIT SET
CLOVER LEAF DRIVE, OFF HIGHLAND ROAD, TRURO, MA

J.M. O'REILLY & ASSOCIATES, INC.
Professional Engineering & Land Surveying Services

1573 Main Street - Route 6A
P.O. Box 1773
Brewster, MA 02631 (508)896-6602 Fax

DATE:	SCALE:	BY:	CHECK:	JOB NUMBER:
11-1-2019	As Noted	RRR	JMO	JMO-8446A





March 3, 2020

Truro Zoning Board of Appeals
c/o Ms. Barbara Carboni, Esq., KP Law, P.C.
101 Arch Street, 12th Floor
Boston, MA 02110

Re: Peer Review
Cloverleaf Parcel
Highland Road
Truro, Massachusetts

Dear Ms. Carboni and Board Members:

The Horsley Witten Group, Inc. (HW) has reviewed the application for a Comprehensive Permit submitted by Community Housing Resource, Inc. The proposed project, totaling approximately 3.91 acres, includes an affordable and mixed-income rental housing development including 70 bedrooms spread across thirteen buildings.

HW reviewed the following documents and plans prepared by J.M. O'Reilly & Associates, Inc.:

- Cloverleaf Truro Rental Housing 22 Highland Road, Truro Application for a Comprehensive Permit, dated November 6, 2019;
- Proposed Planting Plan, dated October 21, 2019; and
- Community Housing Resource, Inc., Permit Set, dated November 1, 2019, revised February 14, 2020, which includes:
 - Site Plan Sheet 1 of 4
 - Sewage-Drainage Site Plan-40B Permit Set Sheet 2 of 4
 - Sewage Details – 40B Permit Set Sheet 3 of 4
 - Site Details – 40B Permit Set Sheet 4 of 4
- HydroCAD Report, printed February 25, 2020

HW's review included the installation of three monitoring wells to map the direction of groundwater flow in the vicinity of the proposed project. We evaluated the impact to downgradient water resources from the septic system and stormwater management practices proposed for the site. We also reviewed the engineering design plans and provided comments and questions on the septic system design, the stormwater management design and the overall layout of the property, including erosion and sedimentation control practices. The comments below start with our evaluation of the water quality issues identified with the project and are followed with specific comments and questions on the design plans.

Water Quality Considerations for the Proposed Project

On January 27 and 28, 2020, HW installed 3 groundwater monitoring wells (B1, B2 and B3) off-site and downgradient of the proposed housing development. On February 4, 2020, depth to water measurements were collected at the three groundwater monitoring wells as well as the culvert outfall off of Shore Road and Village Pond. These sample locations and groundwater contours can be found as Figure 1. Groundwater in the vicinity of the site flows to generally to the south, across Route 6 and eventually flows into Pilgrim Pond or the surrounding wetland resources.

It is HW's understanding that public water is available to many of the homes and businesses located directly on Route 6A. The remainder of the properties downgradient of the proposed development rely on private wells. As such, they could potentially be impacted by wastewater and stormwater discharges from the proposed project.

The applicant's revised plans include the use of a Micro-Fast system to treat wastewater effluent prior to discharge to help reduce nitrogen in the effluent. A primary component of HW's review is whether or not this system will be protective of downgradient wells as well as Village Pond. The wells are sensitive to increased levels of nitrogen. The state has a 10 mg/L drinking water standard for nitrogen, and uses a 5 mg/L planning standard to ensure that potential variations in the nitrogen concentration do not exceed 10 mg/L.

The State Environmental Code, Title 5, and the Truro Board of Health Regulations both limit the volume of sewage that can be discharged on a property served by a private well and septic system. Title 5 (310 CMR 15.214(2) states that "no system serving new construction in areas where the use of both on-site systems and drinking water supply wells is proposed to serve the facility shall be designed to receive or shall receive more than 440 gallons of design flow per day per acre from residential uses except as sept forth at 310 15.216 (aggregate flows) or 15.271 (enhanced nitrogen removal)". This provision relates to properties and neighborhoods served by onsite wells and septic systems. The proposed project will be served by municipal water, but the neighboring properties are served by private wells and septic systems.

The Town's Board of Health Regulations require that the design flow for septic system be limited to 440 gallons per day per acre across the Town, the same flow rate limitation applied in Title 5 for areas served by private wells and septic systems. The applicant has requested a waiver to this requirement which is discussed further below. If this is granted, the project still has to meet the requirements of Title 5.

The flow restrictions imposed by Title 5 and the Board of Health regulations limit the design flow to the site to approximately 1,900 gallons per day and the applicant has proposed a design flow of 7,871 gallons per day. Under Title 5, to get approval for the higher flow rate, the applicant must document that it can meet the requirements for aggregate flows mentioned above. Specifically, for systems with a design flow of 2,000 gallons per day or greater, the requirements of the Department of Environmental Protection's (DEP) "Guidelines for Title 5 Aggregation of Flows and Nitrogen Loading", must be met. The guidelines require a calculation of the nitrogen concentration at the property boundary downgradient of the septic system. The calculations assume that a plume leaves the septic leaching facility and is diluted by precipitation recharges as it flows the property boundary.

HW developed the calculation of the plume concentration both at the property boundary, and at the southern boundary of the state-owned land on which Route 6 is located. Both calculations were developed to show compliance with Title 5 at the property boundary and recognizing that there are no wells on the Route 6 property that would be impacted by the wastewater effluent discharge. The calculations were conducted assuming a 20 mg/L effluent concentration for wastewater treated using the FAST system. They were also conducting using a 35 mg/L nitrogen concentration, because the FAST system is not approved by DEP for flows greater than 2,000 gallons per day. Table 1 shows the results of this analysis, and the full calculations are also attached for review.

TABLE 1: Results of Title 5 Nitrogen Aggregation Calculations

	At Property Boundary (mg)	At State-Owned Route 6 Land (mg)
Nitrogen Concentration of 20 mg/L (FAST System)	18.3	14.3
Nitrogen Concentration of 35 mg/L	32.0	24.9

In each scenario, the nitrogen concentration at the downgradient property boundary, and downgradient of the state-owned Route 6 land is above the 10 mg/L drinking water standard that must be met according to DEP guidelines. This indicates a potential threat to the downgradient drinking water wells.

To meet the Title 5 requirements, HW recommends that the applicant incorporate a higher level of wastewater treatment to meet the 10 mg/L concentration at the property boundary and therefore be more protective of the downgradient private wells. Treatment systems like Nitrex, and possibly the SanTOE system, a larger version of the NiTROE system could potentially provide nitrogen concentrations in the effluent at or below 10 mg/L. A Title 5 Nitrex system was installed as part of the Brackett Landing affordable housing project in Eastham for this same reason and has been performing well. A similar Title 5 system could be incorporated into this project. Alternatively, the applicant could apply for a groundwater discharge permit according to 314 CMR 5.00 for approval of a system that meets a 10 mg/L nitrogen standard.

As mentioned above, the applicant will need a waiver from the Board of Health Regulation that limits the amount of effluent that can be discharged on the site. It is HW's opinion that the proposed FAST system does not provide enough nitrogen removal to meet the Title 5 requirements, and therefore doesn't justify the granting of the waiver. However, if the applicant agreed to using an advanced treatment system that meets a 10 mg/L standard (either under Title 5 or through the Groundwater Discharge Program), then the waiver might be more appropriate. If the Board agrees to the waiver with the use of an appropriate treatment system, then it should be conditioned on requirements for regular monitoring of the treated effluent, monitoring of groundwater on the southeastern property boundary, and the development of a

contingency plan that describes how the property owner will address issues with the performance of the system if effluent standards aren't met in the future.

In addition to the septic water quality questions, HW understand that the proposed project will use infiltration chambers to discharge untreated stormwater into the ground. This raises the potential for fuel spills and other discharges to enter groundwater and flow towards downgradient wells. As discussed further below, HW recommends that the application work to improve the treatment of stormwater prior to discharge using bioretention facilities, grass swales or other techniques to further protect neighboring wells. Enhanced stormwater treatment, like the enhanced septic system recommendation, will protect groundwater quality and downgradient wells, and could be a condition required by the Board to grant the waiver to the Board of Health regulation.

Phosphorus is the nutrient of concern for Village Pond. The project's stormwater and wastewater discharges are a source of phosphorus. Some phosphorus will be captured by the subsurface sediments below the leaching fields and infiltration chambers. But with a larger leaching facility, there is the potential for a phosphorus plume to migrate towards Village Pond. This issue should be evaluated by the applicant and further information on how they will manage this issue should be provided.

Specific Comments on the Septic System Design

1. The applicant appears to have included reserve areas for the septic leaching facilities on the north and south ends of the property, but these are not labeled on the plans. The existing and proposed topography on the site would likely require any reserve area to be constructed in fill and/or have a significant amount of grading. The applicant should provide additional design information to confirm that these locations can function as reserve areas and meet all the Title 5 requirements for construction of a leaching facility in an area that has a significant change in topography. The applicant should also document that the proposed effluent pumps will function properly in the event the reserve areas must be utilized.
2. Test pits do not appear to have been performed in the areas of the proposed leaching facilities. The plans note that one boring was dug using a hand auger, but the location is not indicated on the plans. Title 5 requires a minimum of two deep hole test pits in the primary leaching areas and two in the reserve areas along with percolation tests.
3. Elevations should be provided on the top of tanks and leach field to ensure the minimum/maximum cover over the entire system meets Title 5 and/or H-20 loading as required.
4. Pipe sizes/slopes are not labeled. HW recommend 6" minimum and cleanouts at bends where no manholes are proposed. Additionally, it appears that portions of the septic system piping will be located underneath "landings" with steps on some of the buildings including units 17-18, 13-15, 10-12, 14-16, and 18-20. HW recommends locating sewer lines away structures or footings.
5. Final plans should demonstrate that setbacks are being met (leach field to drainage system), particularly in the areas of Drainage Facilities #4 and #5. This also applies to any roof drainage facilities that are currently not shown.

6. The leach field detail should clearly label the 5-foot minimum estimated seasonal high groundwater (ESHGW) separation, along with an explanation of how the ESHGW was determined. The applicant will also need to document that groundwater mounding will not impact the minimum separation between the bottom of the leaching field and groundwater. Given the dept to water, this should not be a problem in the primary leaching areas but might be an issue in the reserve areas.
7. HW recommends allowing for more than one day of storage in the pump chamber as a safety factor to account for potential power outages. Alternatively, backup power could be provided.
8. HW recommends that the Applicant provide information on the operation and maintenance (O&M) for the septic system components.

Specific Comments on Stormwater Management Facilities

1. The Applicant has proposed catch basins discharging to leaching pits as the stormwater management system. HW recommends better treatment such as vegetated bioretention areas to further treat stormwater and protect downgradient private wells.
2. The Applicant has delineated the subcatchment areas to include only the proposed developed driveway pavement, however there are additional areas within the property boundary but outside of the driveway that will contribute to the proposed drainage system. It is unclear how runoff from the lawn areas outside of the pavement and in backyards will be managed. These areas are currently wooded and will be cleared, increasing runoff. Additionally, the secondary access to Route 6 has not been included. It appears this will be gravel (compacted dirt roads are considered impervious) and is not included in any drainage areas. HW recommends including all of these areas in the drainage calculations and adjusting the proposed design as required.
3. HW recommends that the Applicant also clarify if any off-site areas will be draining onto the site and captured within the drainage system proposed.
4. The drainage calculations do not include roof runoff and there does not appear to be any proposed drainage systems for the roofs. HW recommends including this in the calculations and showing locations for roof drainage.
5. The Applicant has provided proposed HydroCAD modeling calculations for the 50-year design storm, HW recommends that the Applicant provide documentation for the 50-year rainfall amount chosen along with the reasoning for only including this storm.
6. HW recommends limiting the sheet flow to a maximum of 50' and should be less if slope differs for the first 50 feet for the time of concentration (Tc) calculations in HydroCAD.
7. It appears that in at least one area (CB3A) the peak elevation is located above the invert out of the structure, meaning that stormwater will back up into the catch basin and the structure will be full of water during the modeled storm event.
8. HW recommends soil borings should be taken for each infiltration area. HW recommends that the Applicant provide soil borings to verify that the soil type, infiltration rate, and depth to groundwater assumed is realistic.

Comments on Other Utilities

1. The applicant should provide data on hydrant flow tests to confirm the water supplied to the property will meet design requirements for fire protection.
2. Information on transformers and site lighting are not shown. HW recommends locating these on the plan to avoid conflicts with parking, landscape and other utilities (water, sewer, gas, septic) conflicts.
3. Other utilities (gas, electric, CATV, telephone) that will be located within driveway layout should be shown on the cross section.

Other Site Design Comments

1. HW recommends a phasing plan be provided for construction.
2. No erosion and sedimentation control (ESC) measures are currently shown. These are particularly important during construction, on steep slopes (2:1 in many areas), and for the protection of leaching areas (septic and stormwater) from compaction during construction. HW recommends that the Applicant provide ESC for both during construction as well as post-construction site stabilization.
3. Cut and fill calculations were provided. These are difficult to follow as the grading plan does not show adequate detail. HW recommends that this calculation be revised once the plans are further developed.
4. The Applicant states that salvaged ground cover will be reused onsite. HW recommends a stockpile location be indicated on the plans with information on how the area will be protected from erosion during construction. Additional areas for topsoil and other materials to be stockpiled should be indicated.
5. The buffer to the Route 6 property appears to only be 10-feet in certain areas. HW recommends a larger buffer be provided.
6. It appears that trees/shrubs are proposed over septic leach field, and possibly over the stormwater infiltration systems. HW recommends a landscape plan that overlays utilities so that there are no conflicts.
7. The detail for the driveway pavement cross section shows a crown but some areas of the driveway seem to be not crowned.
8. The driveway has a fairly steep slope and narrow width, HW recommends that the Applicant confirm that they have received input/approval from the Fire Department about their revised site access road design.
9. It appears that not all parking spaces have been graded and there are dashed lines that indicate double-stacked spaces. HW recommends that the Applicant verify that all parking spaces are feasible and meet the minimum requirements (handicapped spaces as well).
10. One dumpster has been shown near the large building. HW requests that the Applicant confirm this is adequate (in size, distance from all units, and location for pickup by trucks) and that additional locations are not required.
11. HW recommends that areas for snow removal be shown on the plan. The driveway is fairly narrow and there is not a lot of area outside of the driveway and parking spaces that is not occupied by stormwater or wastewater systems.

12. HW recommends showing a playground area, bus stop, or mailbox location if proposed.
13. No sidewalk is shown, HW defers to the Board should a connection to offsite areas be requested.
14. It was noted in the Application that the area may be mapped by as an area containing endangered species by the Natural Heritage and Endangered Species Program. HW recommends that the applicant provide further information on how they plan to address this issue.
15. Invasive species may be present onsite. HW recommends the preparation of a management plan as part of the landscape improvements.

Sincerely,

Horsley Witten Group, Inc.

A handwritten signature in blue ink, appearing to read "Mark Nelson".

Mark Nelson, P.G.
Principal

TITLE 5 AGGREGATION OF FLOWS AND NITROGEN LOADING

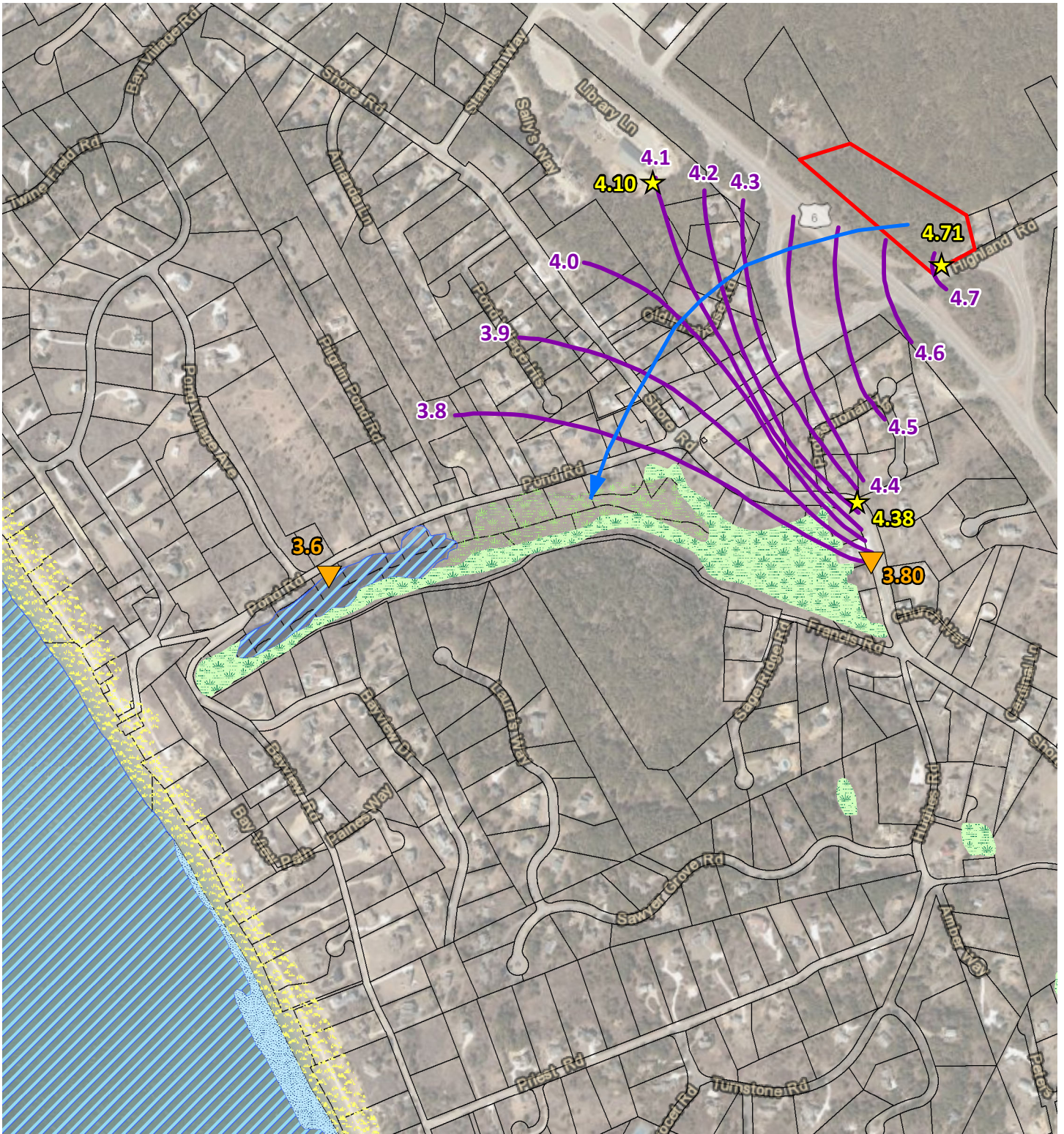
Clover Leaf Drive, Off Highland Road, Truro, MA

<u>From Leachate Field to Property Line</u>		
Area of Impact (AOI)	Width:	180 feet
	Length:	156 feet
	AOI	28080 ft ²
		0.645 acres
<u>Nitrogen Load for AOI</u>		
Proposed Leaching Facility Design Flow		7,871 gpd
Using FAST system assumed Nitrate content		20 mg/L
	= 7,871 gpd x 20 mg/L x (1 L / 0.264 gal)	596,288 mg
<u>Volume of Water from Discharge and Recharge</u>		
Discharge Volume of Wastewater (gpd to lpd conversion)		
	= 7,871 gpd x 3.78 L/gal	29,752 Liters
Recharge Volume from Natural Surfaces		
Assume: 16 in/yr of recharge per 1 acre of land in Truro		
	=AOI (0.645 acres) @ 16 in/yr (4,500 L/day)	2902.5 Liters
Result:	<u>Load</u>	<u>596,288 mg</u>
	Volume	(29,752L + 2902.5L)
		18.3 mg

<u>From Leachate Field to Property Line</u>		
Area of Impact (AOI)	Width:	180 feet
	Length:	156 feet
	AOI	28080 ft ²
		0.645 acres
<u>Nitrogen Load for AOI</u>		
Recommended FAST Leaching Facility Design Flow		7,871 gpd
Traditional System		35 mg/L
	= 3,500 gpd x 20 mg/L x (1 L / 0.264 gal)	1,043,504 mg
<u>Volume of Water from Discharge and Recharge</u>		
Discharge Volume of Wastewater (gpd to lpd conversion)		
	= 3,500 gpd x 3.78 L/gal	29,752 Liters
Recharge Volume from Natural Surfaces		
Assume: 16 in/yr of recharge per 1 acre of land in Truro		
	=AOI (0.645 acres) @ 16 in/yr (4,500 L/day)	2,902.5 Liters
Result:	<u>Load</u>	<u>265,152 mg</u>
	Volume	(13,230L + 2902.5L)
		32.0 mg

<u>From Leachate Field to Downgradient Residential Homes</u>		
Area of Impact (AOI)	Width:	180 feet
	Length:	650 feet
	AOI	117,000 ft ²
		2.686 acres
<u>Nitrogen Load for AOI</u>		
Proposed Leaching Facility Design Flow		7,871 gpd
Using FAST system assumed Nitrate content		20 mg/L
	= 7,871 gpd x 20 mg/L x (1 L / 0.264 gal)	596,288 mg
<u>Volume of Water from Discharge and Recharge</u>		
Discharge Volume of Wastewater (gpd to lpd conversion)		
	= 7,871 gpd x 3.78 L/gal	29,752 Liters
Recharge Volume from Natural Surfaces		
Assume: 16 in/yr of recharge per 1 acre of land in Truro		
	=AOI (2.686 acres) @ 16 in/yr (4,500 L/day)	12,087 Liters
Result:	<u>Load</u>	<u>596,288 mg</u>
	Volume	(29,752L + 12,087L)
		14.3 mg

<u>From Leachate Field to Downgradient Residential Homes</u>		
Area of Impact (AOI)	Width:	180 feet
	Length:	650 feet
	AOI	117,000 ft ²
		2.686 acres
<u>Nitrogen Load for AOI</u>		
Recommended FAST Leaching Facility Design Flow		7,871 gpd
Traditional System		35 mg/L
	= 3,500 gpd x 20 mg/L x (1 L / 0.264 gal)	1,043,504 mg
<u>Volume of Water from Discharge and Recharge</u>		
Discharge Volume of Wastewater (gpd to lpd conversion)		
	= 3,500 gpd x 3.78 L/gal	29,752 Liters
Recharge Volume from Natural Surfaces		
Assume: 16 in/yr of recharge per 1 acre of land in Truro		
	=AOI (2.686 acres) @ 16 in/yr (4,500 L/day)	12,086.8 Liters
Result:	<u>Load</u>	<u>265,152 mg</u>
	Volume	(13,230L + 12086.8L)
		24.9 mg



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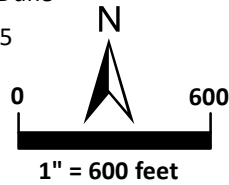
Legend

*USGS Color Ortho Imagery (2019) - MassGIS

- Site
- Potential Wells
- Water Depth
- Groundwater Contours
- Parcels

- DEP Wetlands**
- Marsh/Bog
 - Wooded marsh
 - Cranberry Bog
 - Salt Marsh
 - Open Water

- Tidal Flats
 - Beach/Dune
- $i = 0.005$



Horsley Witten Group
 Sustainable Environmental Solutions
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**Groundwater Contours
 Truro, MA**

Date: 3/2/2020

Figure 1