Safe Drinking Water Quality Management, Inc.

1513 N. Line St., Lansdale, PA 19446, 215-361-1488

Project Narrative for 384 Evansville Road On-Site Sewage Plant and Discharge

(Address: 384 (formerly 2149) Evansville Road, Fleetwood, PA 19522, Maidencreek Twp. Berks County)

Summary:

An on-site sewage treatment and on-site discharge is proposed for the property at 384 Evansville Road with a building large enough for a 23-bed personal care home. The building is also adequate, and can instead, be converted to a total of 4, 3-bedroom residential apartment units (Currently, the building is partially occupied by a single 4-member family and uses an old and inadequate septic tank and on-site discharge field for its wastewater). For the proposed project, the following two specific points of, design flow and structure of absorption bed must be taken into specific consideration:

1. Discharge Flow: Six years and 3 quarters of water consumption data from a similar retirement home in the area, show an average water use of 36.78 gpd per bed (see attached data). Based on that, a maximum flow of 74 gpd per bed is proposed to be used (There is a meter on the water source and will be read/recorded monthly for verification of the discharge flow).

2. Absorption Field: Since the wastewater from the building will be treated using a complete activated sludge process, the At-Grade/subsurface discharge method is proposed to be used for the absorption field.

Water Source:

The water source of the property is an on-site well, located about 60 ft outside the building.

Well Specifications: Total Depth: 120 ft Depth of Casing: 65 ft Water level Depth: 52 ft Discharge yield: 15 gpm Well Pump: 4-inch, 1 HP.

The well water has been tested for the following parameters and showed to be well suitable, and meets all EPA Safe Drinking Water Standards, as a potable water for human consumption without a need for any treatment:

Bacteriological Parameters:	Total Coliform: 0 per 100 ml,	E. Coli: 0 per 100 ml,	HPC: 3 per 100 ml	
Wet Chemistry Parameters:	Alkalinity:	230 mg/l (as CaCO3)	Nitrates:	4.3 mg/l
	pH:	7.8 pu	Iron:	0.05 mg/l
	Total Harness:	320 mg/l (as CaCO3)	Manganese:	0.04 mg/l
	Calcium Hardness:	284 mg/l (as CaCO3)	Chloride:	43 mg/l
	Non-carbonate Harness:	96 mg/l (as CaCO3)	Sulfate:	38 mg/l
	Total Dissolved Solids:	388 mg/l		
Volatile Organic Carbon:	None detected (None of the 21 regulated VOC's were detected).			

Sewage Flow Magnitude:

The hydrogeology nitrate plume study concluded that the proposed absorption field can take a maximum flow of, 2,313 gpd, or 8,753 L/day (see the report in the attached). However, 6 years and 3 quarters of water consumption data obtained from a similar personal care/retirement home institution (17 to 52 residents) in the same area (Grand View Manor at 129 Houck Rd. Fleetwood, PA 19522) show an average water consumption of 36.78 gal/day per resident/bed (See the attached data). Therefore, the actual proposed flow will be 850 gpd (23 x 36.78 gpd/bed = 851). However, a flow of 850 x 2 = 1,700 gpd, is proposed to be used as the flow that the absorption field is designed for (the treatment plant is designed for a flow of 3,400 gpd).

Sewage Treatment Plant:

It is proposed to use an on-site custom designed activated sludge plant to include equalization tank, activated sludge/aeration tank, final clarifier tank, effluent pump pit (or dosing tank), and aerated sludge storage tank. The proposed treatment plant will be an activated sludge plant and will use a complete conventional activated sludge treatment processes with the design flow of 3,400 gpd. The effluent of this plant will be discharged, onto a 2,550 sqft rectangular (102' x 25') At-Grade absorption bed.

On-Site Discharge Absorption Field:

The soil profile and percolation tests were conducted for the primary absorption field. Also, soil profiles were tested at the proposed alternative site. There were a total of 8 soil probes in the proposed primary and alternative absorption bed sites (4 in the primary site and 4 in the alternative site). The limiting zones at the proposed primary bed are at the depth 24 - 29 inches (see the attached soil profile and percolation test report). Twelve percolation tests were conducted at the primary absorption bed. The test results showed an average percolation rate of 9.47 min/in. A schematics of the soil profile and percolation test locations is attached.

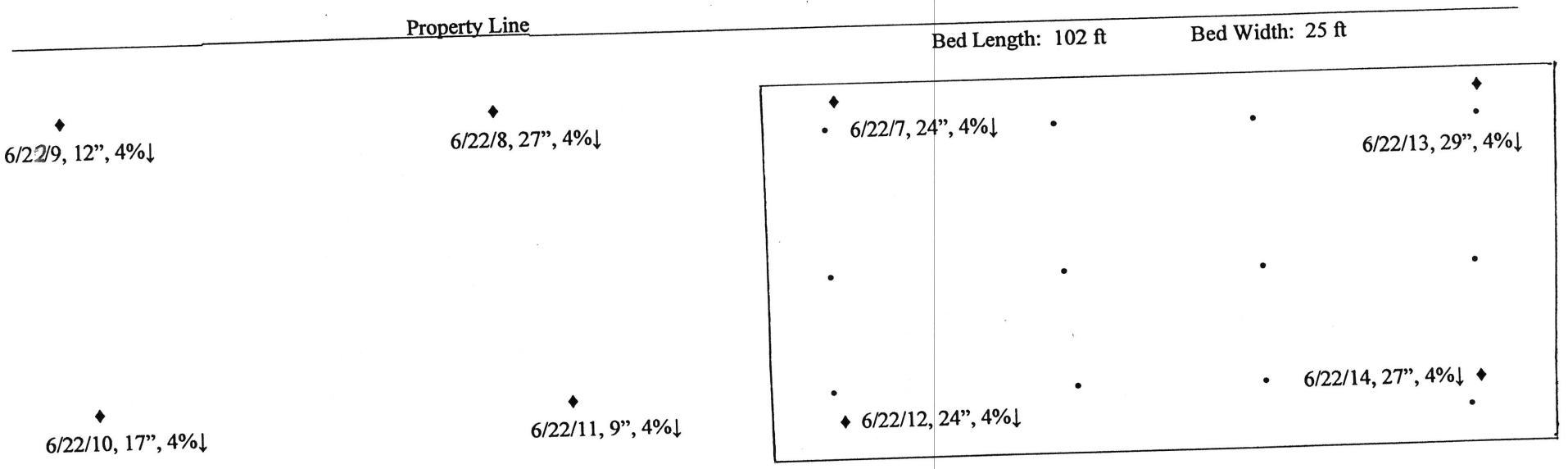
Required Absorption Bed Area:

The required area was calculated based on Chapter 73.16, Table A. Minimum Aggregate Absorption Area Requirements for Treatment Tank Effluent. Based on the formula (required area for subsurface sand = 1.5 sqft/gal/d), the total required area was calculated to be 2,550 sqft. A rectangular bed of 102 ft by 25 ft is proposed to be used.

Absorption Bed Structure:

a. Underneath bed layer will consist of 10 inches deep aggregate gravel.
b. Flow distribution system above the bed aggregate will consist of the following PVC pipes and fittings:
   - 2-in supply line from the treatment plant, connected to the middle of the manifold pipe.
   - 21 ft of 3-in manifold pipe across the middle width of the bed.
   - Five, 49-ft, 1.5-in perforated lateral sections on each side of the manifold (total 10 lateral sections for the bed).
   - Nine, 0.5-in holes on each lateral section (1 hole, 3-ft from manifold, then 7, 6-ft-apart, & last hole in 4 ft, at the end, total 90 for the bed).
   - One, 1.5-in screw-capped clean out at the end of each lateral section (total 10 for the bed).
c. Upper layer aggregate: 6 in. gravel aggregate above the distribution pipes (total 8 inches from the bottom of the lateral pipes).
d. Protective cloth over the gravel aggregates (overlapped by 4 inches) to prevent penetration of the top soil into the aggregate.
e. Top layer will consist of 6 inches top soil and grass (total bed depth including top soil will be 24 inches).
f. The bed edges will be tapered down with top soil to slope 1 to 3, and will be seeded for grass.

The effluent of the treatment plant will be pumped from the dosing tank to the distribution pipes on the bed by two 1-HP centrifugal pumps working with two floats, set at different water depths. The lead pump will normally operate. The second pump will operate in case the lead pump malfunctioned, or the water level in the dosing tank raised too high by any other reason. The pump discharge line will be emptied using a solenoid valve to open and allow the line to drain back into the dosing tank after the pump stopped.



Soil Profile and Percolation Test Locations at Primary Absorption Bed

♦ Soil Probe Locations
• Percolation Test Locations

North
↑
South

Schematics of Primary Discharge Absorption Sites with Soil Probes and Percolation Test Locations at 384 Evansville Rd. Fleetwood, PA.

Engineering Specifications of Proposed On-site Swage Plant and On-Site Discharge

(Address: 384 (formerly 2149) Evansville Road, Fleetwood, PA 19522, Maidencreek Township, Berks County, PA)

Raw Sewage Collection Line

A 4-inch PVC, Schedule 40 main collection line will come from the building and is immediately converted to a 6-inch PVC just outside the building. The raw sewage runs through this 6-inch main about 300 feet to discharge into the surge/equalization tank of the treatment plant. There are 4, 6-inch screw capped clean out openings along the line, (60-80 feet apart). See the property plot plan in the attached.

Influent and Effluent Expected Characteristics

Parameters	Plant Influent	Plant Effluent
Flow, gpd	1,700	1,700
Plant Maximum Hourly Flow, gpd	3,400	3,400
Plant Max Instantaneous Flow, gpd	5,760	5,760
CBOD, Maximum Daily, mg/l	250	<10
TSS, Maximum Daily, mg/l	250	< 8
Ammonia-N, mg/l	35	< 3
Total Phosphorus, mg/l	8	< 3
Organic Nitrogen, mg/l	25	< 3
Total Nitrogen, mg/l	30	< 10

Treatment Plant

An extended aeration activated sludge plant comprised of Surge/Equalization Tank, Activated Sludge/Aeration Tank, Final Clarifier, Sludge Storage Tank and Dosing Tank. The plant will be inside a building. It will have a high capacity to remove most of the nitrogen (or at least 60%) through the natural process of nitrification - de-nitrification in the aeration and final clarifier tanks. This is supported by these three important parameters:

a. High Detention time (4.8 days for aeration tank and final clarifier combined), b. High water alkalinity (alkalinity: 230 mg/l, pH: 7.8) and,
c. The plant is located inside a building and is protected from the winter cold temperature that reduces nitrification-de-nitrification.

The plans for the treatment plant are in the attached. Description of the plant specifications are given in the followings (L=Length, W=Width, V=Volume, DT=Detention Time):

1. **Flow:** Raw Sewage Flow: 1700 gpd, Maximum Hourly Flow: 3,400 gpd.

2. **Treatment Plant:** Plant Design Capacity: 3,400 gpd, Plant Maximum Capacity: 5,760 gpd

3. **Surge/Equalization Tank:**
   - **Dimension:** L: 7.0 ft W: 4.0 ft D: 6.0 ft V: 1,250 gal Liquid D: 4.5 ft Liquid V: 940 gal DT: 13 hr.
   - **Bar Screen:** A 2'x1'x1.5' plastic basket will be hung under the incoming raw sewage outfall to collect the large objects and rags. The basket will be cleaned 3 times per week.
   - **Equalization Tank Aeration:** Aeration will be done by a 3/4-in fine size air diffuser using air from the blower.
   - **Raw Sewage Lift Pumps:** Two 0.5-HP raw sewage grinder pumps to work with floats, set at 2.5 and 4 feet depth.

4. **Activated Sludge/Aeration Tank:**
   - **Dimension:** L: 8.0 ft W: 8.0 ft D: 12.0 ft V: 5,740 gal Liquid D: 10.5 ft Liquid V: 5,025 gal DT: 71 hr.
   - **Aerators:** 2, 1.25-in air lines at one side of the tank bottom, each to supply air to 2, 3/4-in air diffusers (total 4).
   - **Air Blowers:** 2, 24-CFM Rotary Lube Blowers, Model: 24URAI, 2-in inlet & outlet, with 3 HP motor, and 2 silencers for each. They will take air from a manifold which is connected to outside via a 6-in pipe with a coarse filter at its inlet. Also, a fine filter will be in the manifold for both blowers. The blowers will be alternated monthly and will operate with timers to be on for ½ hour and off for ½ hour.
   - **Effluent:** 4-in PVC to the final clarifier.

5. **Final Clarifier:**
   - **Dimension:** L: 8.0 ft W: 5.5 ft D: 12.0 ft V: 3,700 gal Liquid D: 10.5 ft Liquid V: 3,200 gal DT: 45 hr.
   - **Sludge Collection Cone:** The tank bottom will be a 4-sided cone with the slope of 65%.
   - **Sludge Return Pumps:** 2, 2-in airlift pumps with 4-inch trunks. First pump will have a T and 2 valves on the discharge line for periodical waste of the sludge into the sludge storage tank.
6. **Dosing Tank:**
   - **Dimension:** L: 3.0 ft W: 3.0 ft D: 12.0 ft V: 800 gal Liquid D: 10.5 ft Liquid V: 700 gal DT: 9.8 hr.

7. **Dosing Pumps:** 2, 1 HP centrifugal submersible pumps working with floats set at different water depths. The lead pump will normally operate. The follow pump will operate if the lead pump malfunctioned, or the water level in the dosing tank raised too high by any other reason. Each pump will have a check valve on its discharge line. There will be a T on the main discharge line (line that is connected to both pumps) with a solenoid valve to open and empty the discharge line back into the dosing tank right after the pumping stopped.

8. **Sludge Digester / Storage Tank:**
   - **Dimension:** L: 8.0 ft W: 3.0 ft D: 12.0 ft V: 2,150 gal Liquid D: 10.5 ft Liquid V: 1,880 gal.
   - **Sludge Digester Aeration:** Aeration will be done by a 3/4-in fine size air diffuser, using air from the blower.

9. **Plant Operation:** the plant will be operated by an operator who will attend the plant at least 3 time per week.

Notice; Additional tanks seen on the blue print were originally designed to be used for polishing removal of phosphorus as the effluent had been planned to be discharged into a stream. Since the effluent is proposed to discharge into an absorption bed, these tanks will not be used. They however, can be used (only if needed) as additional effluent storage capacity, additional sludge storage tank, or etc. At this point they will not be used in the operation of the treatment plant.

10. **Absorption Field:**

Required Absorption Bed Area:

The area was calculated using Chapter 73.16, Table A. "Minimum Aggregate Absorption Area Requirements for Treatment Tank Effluent". Based on the formula (Required Area for Subsurface Sand = 1.5 sqft/gal/d), the total area was calculated to be 2,550 sqft.

Required Area for subsurface sand = 1.5 sqft/gal/day (with the provisions; A & B).

A. Pressure dosing is required (the dosing will be pressurized at minimum of 5 psi), and

B. One third reduction in the area may be permitted for use of an aerobic tank (this provision will not be used).

Required Area = 1.5 sqft/gal/day x 1,700 gal/day = 2,550 sqft

A rectangular bed of 102 ft by 25 ft is proposed to be used for the subsurface discharge.

Bed Structure:

Bed structure from bottom to the top will be according to the following specifications (see attached plan):

a. Underneath bed layer will consist of 10 inches deep gravel aggregate.

b. Flow distribution system will be of PVC Sch. 40 pipes and fittings placed above the bed aggregate:

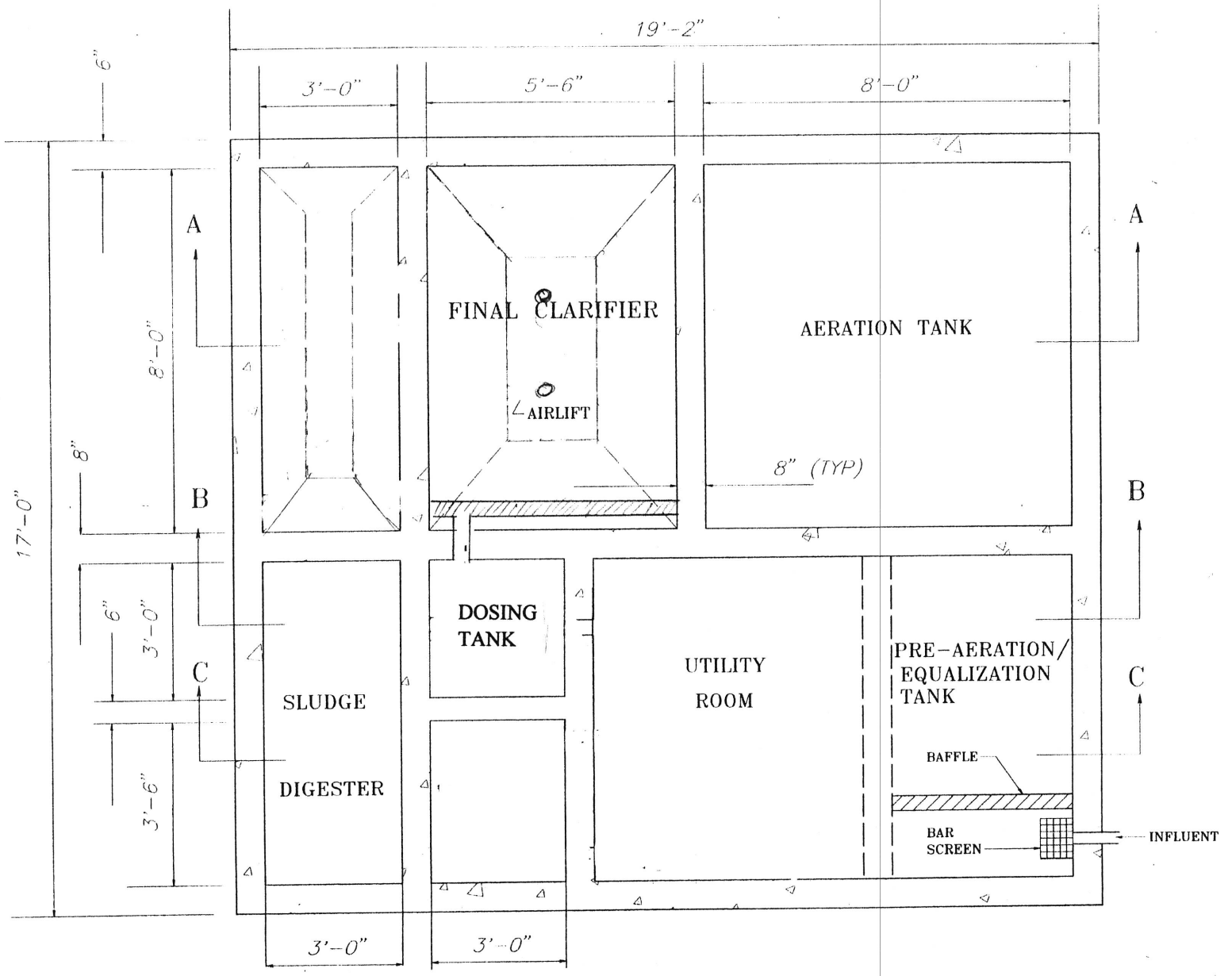
- 2-in dosing line (about 280-ft flexible polyethylene pipe from the treatment plant and is connected to the middle of the manifold pipe).
- 21 ft of 3-in manifold pipe across the width and in the middle length of the absorption bed.
- 5, 49-ft, 1.5-in perforated lateral sections on each side of the manifold (Total Length= 10 laterals x 49 = 490 for the bed).
- 9, 0.5-in orifices on each lateral section (1 at 3-ft from manifold, then 7, 6-ft-apart , & last orifice in 4 ft, at the end, total 90 orifices).
- 1, 1.5-in screw-capped clean out at the end of each lateral sections (total 10 clean out openings for the bed).

c. Upper layer gravel aggregate: 6 inches above the distribution pipes (total 8 inches from the bottom of the lateral pipes).

d. Protective cloth over the gravel aggregates and tapered edges (overlapped by 4 in) to stop penetration of the top soil.

e. Top layer, will consist of 6-inches top soil and grass (Total bed depth including top soil will be 24 inches).

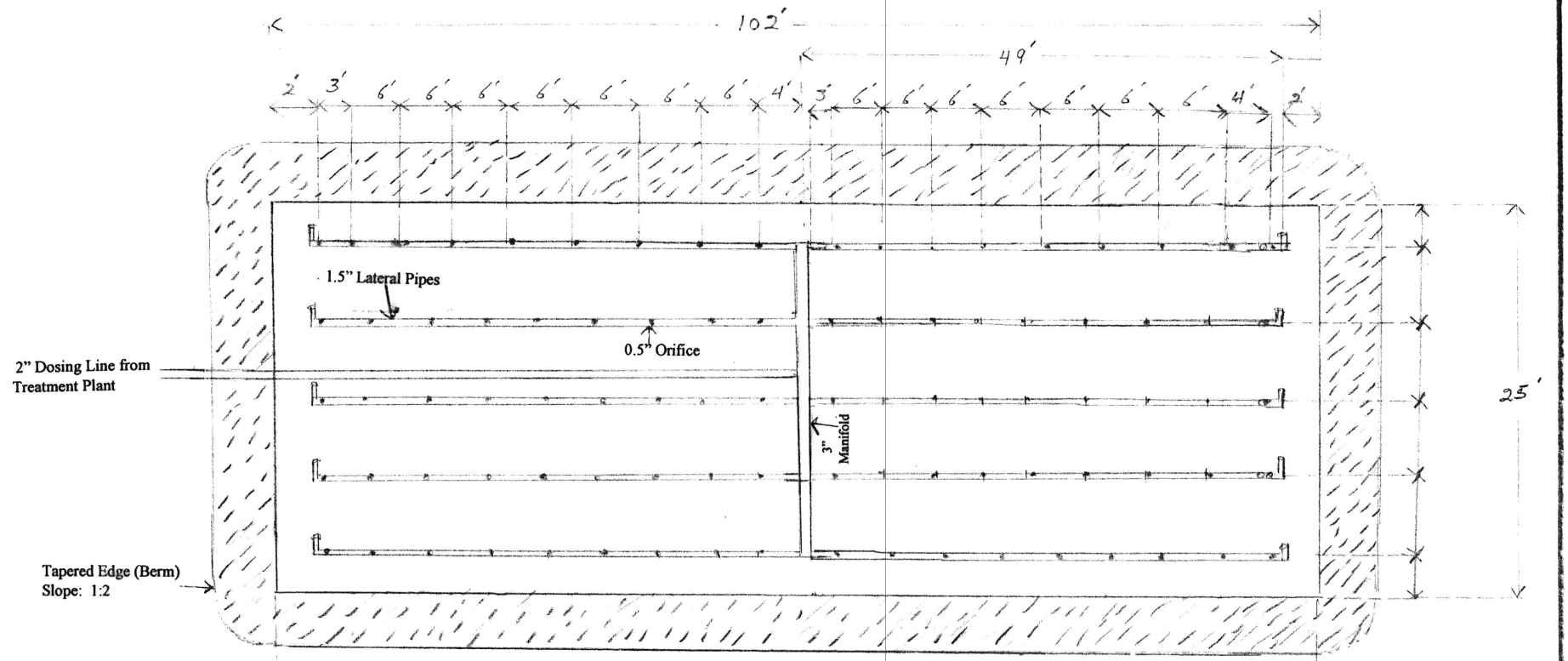
f. Absorption bed edges (berms) will be tapered down (slope: 1 : 2 or, 50%), with top soil and seeded for grass.



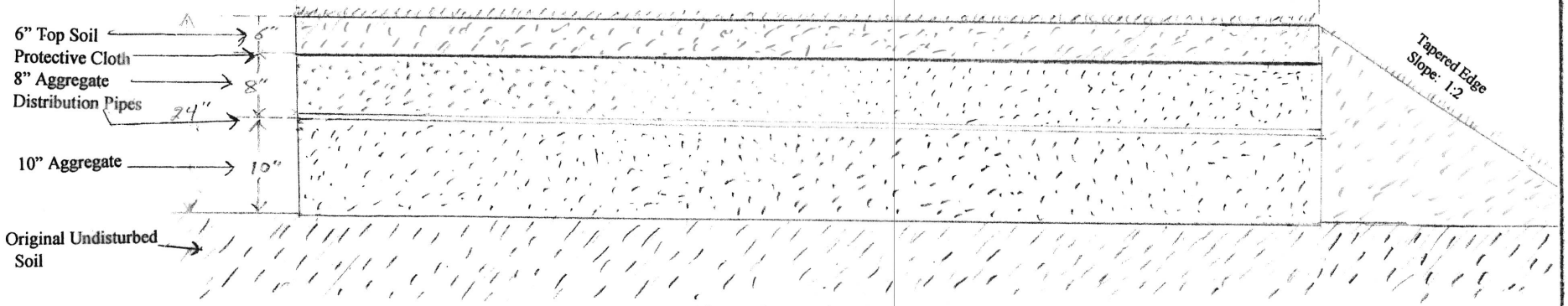
PLAN VIEW

SEWAGE TREATMENT PLAN
384 EVANSVILLE ROAD
FLEETWOOD, PA

SCALE: N.T.S.	DATE:	DWG.NO.

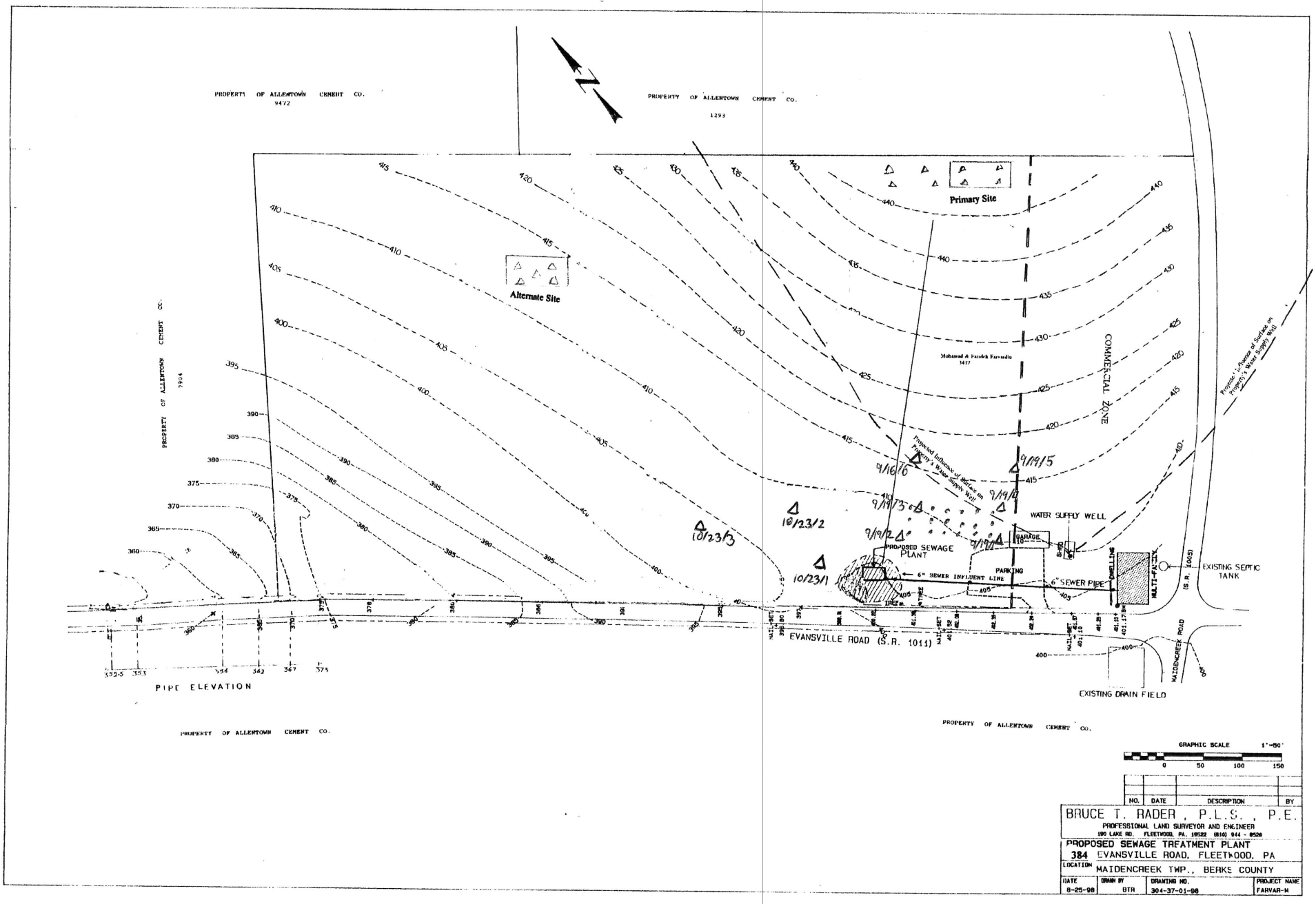


Absorption Bed Pipe Distribution system



Absorption Bed Cross Section

Schematics of Absorption Bed Distribution System and Cross Section.



GRAPHIC SCALE 1"=50'
0 50 100 150

NO.	DATE	DESCRIPTION	BY

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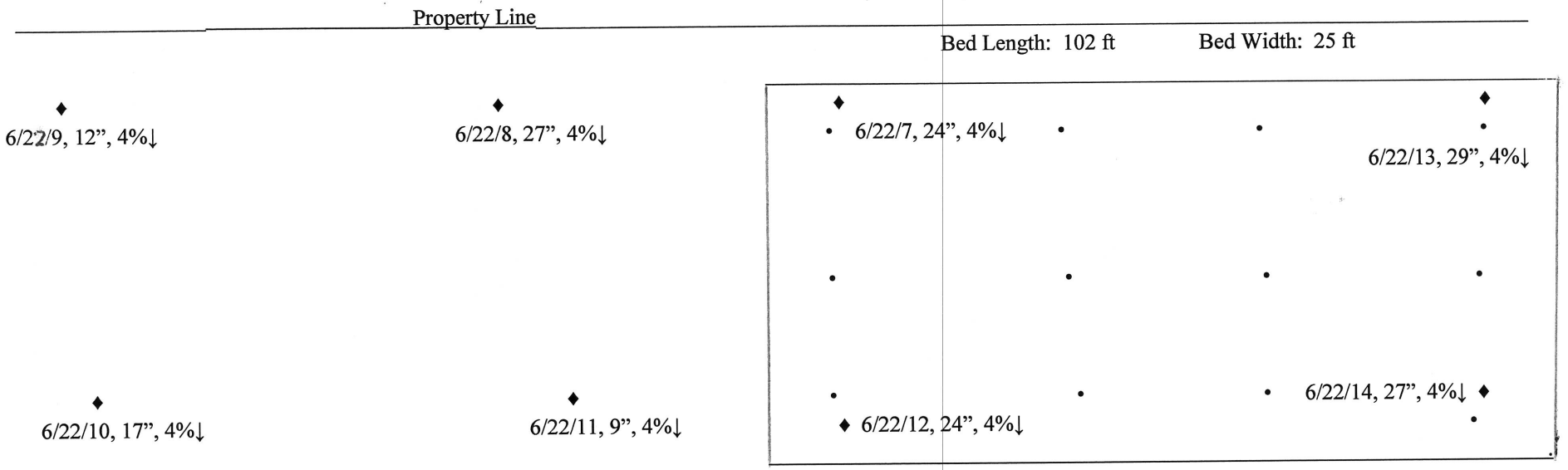
PROFESSIONAL LAND SURVEYOR AND ENGINEER
190 LAKE RD. FLEETWOOD, PA. 19522 (610) 944 - 9520

PROPOSED SEWAGE TREATMENT PLANT
384 EVANSVILLE ROAD, FLEETWOOD, PA
LOCATION MAIDENCREEK TWP., BERKS COUNTY

DATE	DRAWN BY	DRAWING NO.	PROJECT NAME
8-25-98	BTR	304-37-01-98	FARVAR-M

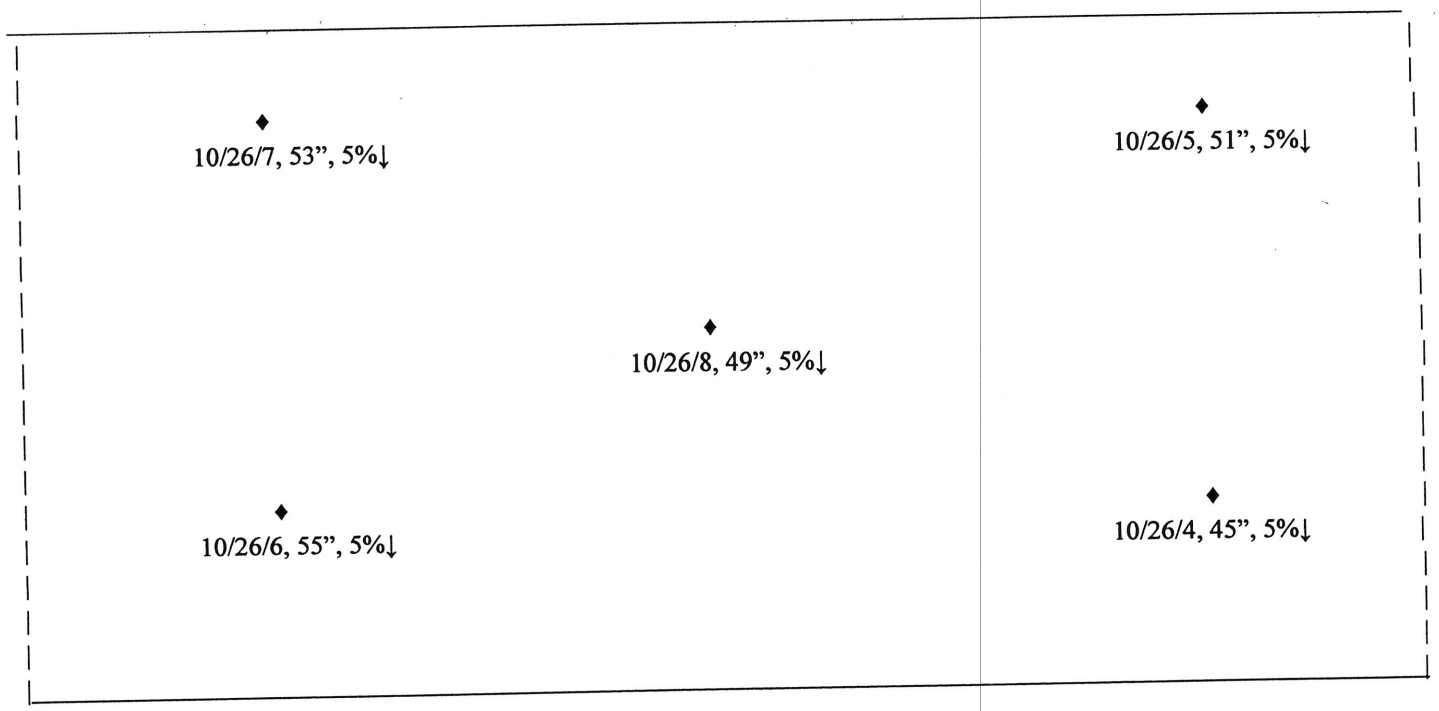


Soil Profile and Percolation Test Locations at Primary Absorption Bed

♦ Soil Probe Locations
• Percolation Test Locations

North
|
|
|
South

Schematics of Primary Discharge Absorption Sites with Soil Probes and Percolation Test Locations at 384 Evansville Rd. Fleetwood, PA.



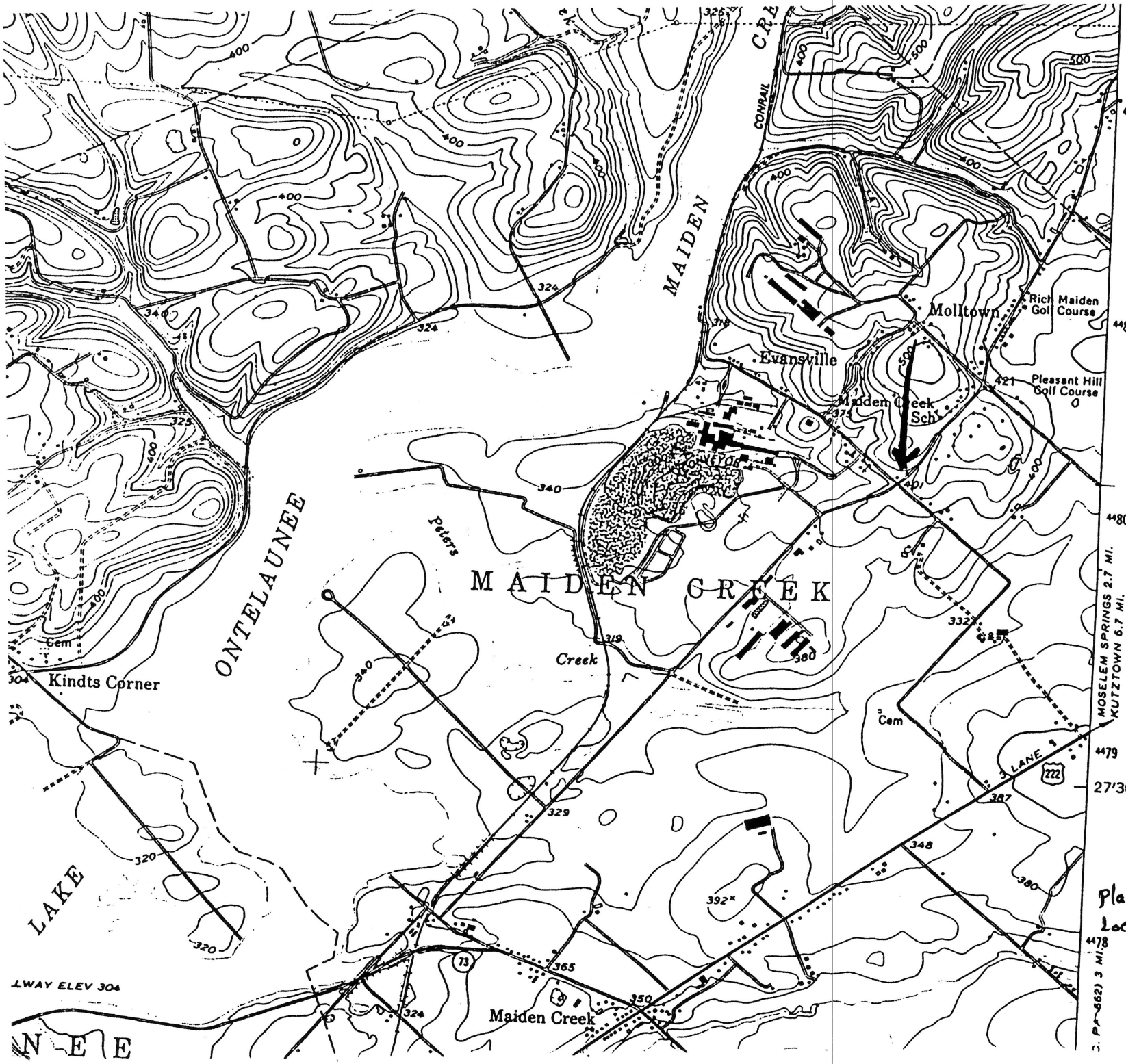
Soil Profile Locations at Alternative Absorption Site

♦ Soil Probe Locations

North

South

Schematics of Alternative Discharge Absorption Site with Soil Probes Location at 384 Evansville Rd. Fleetwood, PA



Map Name:

Temple Quadrangle

Plant Location { LA = 40° 28' 18.3"
LO = 75° 53' 9.4"