LOW PRESSURE T&J PANEL SYSTEM

FOR

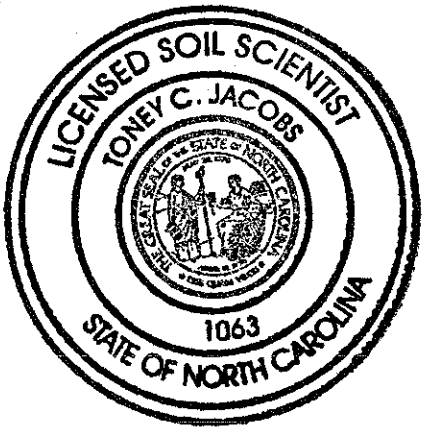
LOT 445 GRASSHOPPER ROAD, SECTION 8

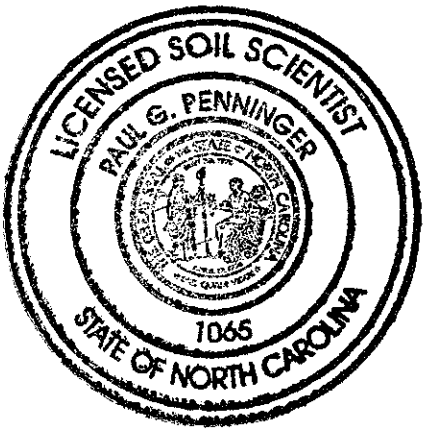
IREDELL COUNTY, NORTH CAROLINA

by

Toney C. Jacobs & Associates, Inc.
Consulting Soil Scientists
168 Broadbill Drive
Mooresville, N. C. 28115

April 10, 1997
Revised: April 17, 1997





Submitted to: Mr. Ron McCaulley
111 Tweed Place
Mooresville, N. C. 28115

Mr. David Hinson, R.S.
Iredell County Health Dept.
Mooresville, N. C. 28115

Paul G. Penninger

Toney C. Jacobs, CPSS

Lot 445 - Grasshopper Rd. Court

PRESSURE DISTRIBUTION T & J PANEL SYSTEM

This evaluation and plan were made in multiple site visits to advise the client and the Iredell County Health department of the feasibility of an on-site septic system, loading rate for such a system, and soil or site specifics to consider in system design. The proposed system is for a new 3-bedroom home in an area of older waterfront lots on Lake Norman. There is presently a 3-bedroom mobile home on the lot being served by an old septic system. The county has no record of type system or the age of the system. The proposed system would be located directly upslope and downslope of the old septic tank.

Prior to the evaluation for this report Mr. David Hinson of the Iredell County Health Department had approved an LPP system area near the Grasshopper Rd. side of the lot, but due to building setbacks this interfered with the house plans of Mr. McCaulley. The soil evaluation for this report was a three-step process. First there was an on-site meeting with Mr. Hinson and Mr. McCaulley to discuss prior evaluations and possible system options. Second, auger holes were placed in the proposed area followed by backhoe pits for the saprolite evaluation. Mr. Hinson was present during the pit evaluations. In addition to the soil profile descriptions, soil particle size and hydraulic conductivities (Ksat) were measured.

Due to space limitations, partially influenced by an adjacent property owner's well, the panel block system best suits the lot. The recommendation for an on-site septic system is based on 1) topography and landscape position, 2) soil characteristics, 3) soil wetness, 4) soil depth, 5) restrictive horizons, and 6) available space.

Soils

Three backhoe pits were described in or near the proposed system. In these pits, there was a friable to firm sandy loam saprolite at 15 to 36" deep. Above the saprolite was a weakly structured sandy clay loam B horizon. Particle size analysis by the hydrometer method on samples taken from ≈ 30-50" deep confirmed that the saprolite texture was provisionally suitable. Ksat measurements made at pits 2 and 3 at 30" - 40" showed water moved through the saprolite at 22"/d and 18"/d, respectively. Five percent of average Ksat translates into a LTAR of 0.6 gal/ft^2/d. The proposed LTAR is 0.3 gal/ft^2/d.

Design Considerations

The profile descriptions, particle size analysis, and Ksats show that the soil/saprolite is provisionally suitable. There were inclusions of hard floating rock in each pit. There was soil beneath and around the rock, as each pit was dug to 50+ inches deep. Of concern is the difficulty in digging the proposed trenches. If it is necessary to dig the trenches greater than 2' wide to remove rocks, the widened area should be carefully backfilled with sandy loam saprolite from the site (basement excavation) or imported material. There is also a well close to the proposed septic and pump tank locations to be property abandoned prior to system installation.

The proposed panel system should be a great improvement over the old system Mr. McCaulley has been allowed to use for the past months. If he were building a two-bedroom home he could continue to use this system. The fact the old system has been disposing of the waste is justification that 200' of panel should give good results for the new 3-bedroom house. It will be necessary to remove the old septic tank prior to installation of the proposed panel system. The tank should be pumped, removed, and the area backfilled prior to system installation. It is recommended that flow to this old system be stopped 1 month prior to system installation to allow the soil to dry before driving equipment over the proposed system area.

While designing the system it was noticed that the 760' elevation had been manipulated by the installation of the sea wall. The yellow 50' line was ≈ 3' within the 50' setback from the lake. Due to the uncertainty of lot boundaries and exact location of the proposed septic lines and the adjacent well, a new lot survey was necessary to locate the flagged septic lines, the well, and the new 760' contour. The result is the attached site plan. The proposed septic lines were shifted up the slope ≈ 8' from the flagged lines so all lines were out of the 50' setback from the lake. With the well across the street, minimum repair will be left on the lot. If repair is needed in the future, possible options include: (1) moving the neighbor's well, (2) use of an ATU to reduce setback requirements, (3) possibly purchasing a septic area off of Grasshopper Rd., and (4) DWQ discharge permit as a last resort.

Location

The lot is at the intersection of Grasshopper Rd. and Tweed Place.

Reference

(1) *Design and Installation of Low Pressure Wastewater Treatment Systems,* by Craig Cogger, Bobby L. Carlisle, Dennis Osborne, and Ed Holland. UNC Sea Grant UNC-SC-82-03, May 1982.

(2) *Laws and Rules for Ground Absorption Sewage Disposal Systems 15A NCAC 18A. 1900,* NCDEHNR-DEH.

(3) *Design, Installation and Maintenance of the T & J Panel Wastewater treatment System for Sanitarians and Septic Tank Installers,* 1988.

Recommendation

Two Hundred (200) lineal feet of pressure T & J lines.

Ownership Responsibility for a LPP Distribution System

Conservation measures should be undertaken in plumbing fixture specifications to minimize the volume of wastewater entering the disposal system, including, but not limited to the following precautions:

(a) Provide water conserving plumbing fixtures within the facility. Waterclosets must be 1.6 gal. flush (per code). Shower head should also have restrictions or be of low volume design.

(b) Develop conservative water use habits.

(c) Monitor and maintain the system as necessary for proper operation. An Operation Permit will require a maintenance contract to be filed with the Iredell County Health Department. It is recommended that the owner aggressively utilize this requirement because of its importance to system longevity. The management entity (certified operator) should be a part of installation process. If installed by other, it would be best if operator was consulted for a preclosure inspection.

System must be properly installed by a *qualified* and *competent* contractor following the requirements of the Iredell County Department of Environmental Health, DEH, the N.C. Building Code, Plumbing Code, and the Electrical Code. This plan, as any, is a guide to a minimum standard, but cannot take the place of experience and common sense. County inspector should allow additional inspection time because of complexity of system and need for exacting levels.

Components of System

1. Two compartment septic tank - 1000 gal.
2. Pumping tank - 1000 gal.
3. Submersible effluent pump and level controls - SSOMA certified

4. High water alarm signals which are UL approved
5. Supply pipe
6. Gate valves
7. Laterals with LPP distribution and T & J Panels in ground absorption trenches, 2 feet wide, level end to end. If the installer does not understand this or its importance, he should not begin construction until certain of all requirements.

Construction Sequence

1. Lines have been flagged as noted on drawing and in specifications.
2. Clear the area of all organic material with minimum soil disturbance (DO NOT GRADE).
3. Install trenches per cited reference material and this plan. There should be one hole near the center of each panel, pointed up. Top grade on pipes to be "level" from end to end and vertically from manifold and checked by sanitarian. (Note: This is a three valve designed system and uses one size hole). Sanitarian must check that correct drill bit is on site.
4. All joints in lateral manifold piping shall be watertight connections to insure that the only source of water seepage from the system is through the orifices as designed. Carefully install manifold and lateral network according to the attached design layout. Protect valves with valve box. A larger diameter protective sleeve with cap or approved box with lid shall be placed over the turned up lateral and positioned level with the ground surface (so as not to be damaged by mowing machine). Turn-up with two 45 degree elbows, not one 90. Area around pipe should be stabilized with crushed stone, both inside and outside of riser. Stone allows for infiltration of waste and wash water when system is maintained.
5. Carefully backfill manifold trenches to grade with clean clay or clay loam which is carefully placed and compacted.
6. The installation contractor shall stabilize the area of construction by planting with Kentucky 31 tall Fescue and mulching. Area to be limed and fertilized with 0.5 tons lime, 75 units of N, 150 units P, and 100 units of K per disturbed acre.
7. The septic tank shall consist of an approved 1000 gallon capacity reinforced, precast watertight, concrete tank with full baffle and shall have easy access to each chamber from ground level for inspection. The first chamber of the septic tank shall consist of 2/3 to 3/4 of the volume of the total tank and the baffle shall contain a

horizontal opening across the tank at about midway . Locate the septic tank at such height as to provide approximately 8" of cover soil over top of the tank.

8. The dosing tank shall consist of an approved 1000 gallon capacity, reinforced, precast, watertight concrete tank without baffle and shall have a concrete mounting pad (concrete blocks) for accommodating the pump. Test for leakage per regulations. Provide access for entry into the tank directly over the pump location, and extending 6" above final grade. Use a 30" diameter concrete well casing or equivalent and concrete well cap or other approved type cover. There must be a seal (masonry or seal rope) between well tile and top of tank.

9. All piping and fitting shall be SCH 40 PVC. Glue for all PVC pipe joints shall be as recommended by the pipe manufacturer. Note: On the distal end of each lateral turn-up should be 2 each, 45 degree elbows, rather than one 90 to facilitate maintenance.

10. Pump: The submerged pump shall be Model ME 50 manufactured by Myers or equal, 115 or 230 v/l phase; capable of pumping 22.5 gallons per minute at 35' of head.

11. Pump controls and alarm to meet specifications of .1952, all being compatible.

12. A "Warning Sign" shall be located within the house to inform the occupants of action to take in case the "High Water Alarm" is activated. This sign shall contain the name, address, telephone number, and emergency telephone number of the person to contact upon malfunction of the system. This should be "management entity".

13. Pump and Controls: Details of pump installation are shown in the plan. The pump must be placed on concrete blocks on the bottom of the tank. This prevents the pumping of any solid particles which can clog the pipe system. A piece of nylon rope or other non-corrodible material should be attached to the pump and the outlet pipe for lifting the pump in and out of the chamber. Controls shall be fastened to a telescoping tree with clamps or brackets supplied by the manufacturer. The lower level control or "pump-off" must be positioned above the pump, so that the pump remains submerged at all times. The level control "pump-on" is positioned to pump a specified volume of effluent. The high water control float is then mounted about 3" above the upper pump-on control. (Note: Care must be taken to insure that floats do not become fouled by other components in the tank, such as the electric power cord or the lifting rope. The pump outlet pipe should be connected to the supply manifold with a threaded PVC union (or dresser coupling) to allow quick removal.

14. Electrical Connections: The pump and high water alarm must be placed on separate electrical circuits. (If the pump circuit fails, the alarm must still be able to operate). Follow the manufacturers recommendations for the proper fuses or circuit breakers. All electrical connections must be made outside the pumping chamber. Power cords from the pumps and controls should be plugged into a NEMA 4X approved outdoor receptacle. This must not be located inside the pumping chamber due to the corrosive and explosive gasses that may form from the sewage. This box must be a minimum of 1' above finished grade. Some level control switches have a box built into the housing, but are more expensive than the plug-in devices. Wiring between the pumping chamber and the station should meet State and local code requirements. A lightning arrester is recommended to protect the pump and controls from electrical surges.

15. Proper Operation Check: After all components have been installed and connected, the system should be checked for proper operation. With electrical power turned off, fill the pumping chamber with water from garden hose until the liquid rises to the level of the high-water alarm float. Turn on the electrical power. The alarm light should go on in the house, and the pump should start operating. The alarm light should go off when the liquid reaches the lowest float control. Be sure the pump is still completely submerged.

16. Pressure Head Adjustment: The pressure head must be adjusted to match that specified in the design. The pressure head is measured as the height liquid will rise above the turn-up elbow when the pump is running. To adjust the head:

(a) Glue a 4' length of pipe (preferably clear) to a threaded adapter that will screw onto the turn-up adapters. (Call this the "test tube".)

(b) Replace the turn-up cap with the "test tube".

(c) Adjust the gate valves until the effluent reaches the desired height in the "test tube". This may also be done with a weep hole in solid pipe at the desired height. Strive to be within 1/8" accuracy. Remember to include the distance below the ground surface to the lateral line when measuring the height. The pressure head should be as specified for each line. This is the height above the lateral where the liquid should be in the temporary "test tube".

17. Final Landscaping: After the system is installed, the absorption field should be reshaped to shed rainwater and be free of low areas to insure that the system will not be overloaded with excess rainwater and run-on.

Concluding Note:

This plan was done to facilitate permitting by the Iredell County Health Department by an agent of the owner. Any additions, or additional requirement(s), or deletions to enhance design or workability which will facilitate a permit are welcomed and may be made by note on this plan without returning entire design. The designer realizes that a plan with as many details as this can be changed and/or improved upon. The installer must realize that this is an exact plan and must be installed with exacting measurements. Should the installer desire a change, it must be approved by the health department in writing. Final inspection will also require more time and detail than a conventional system. If there are questions, please give me a call.

Design Specifications

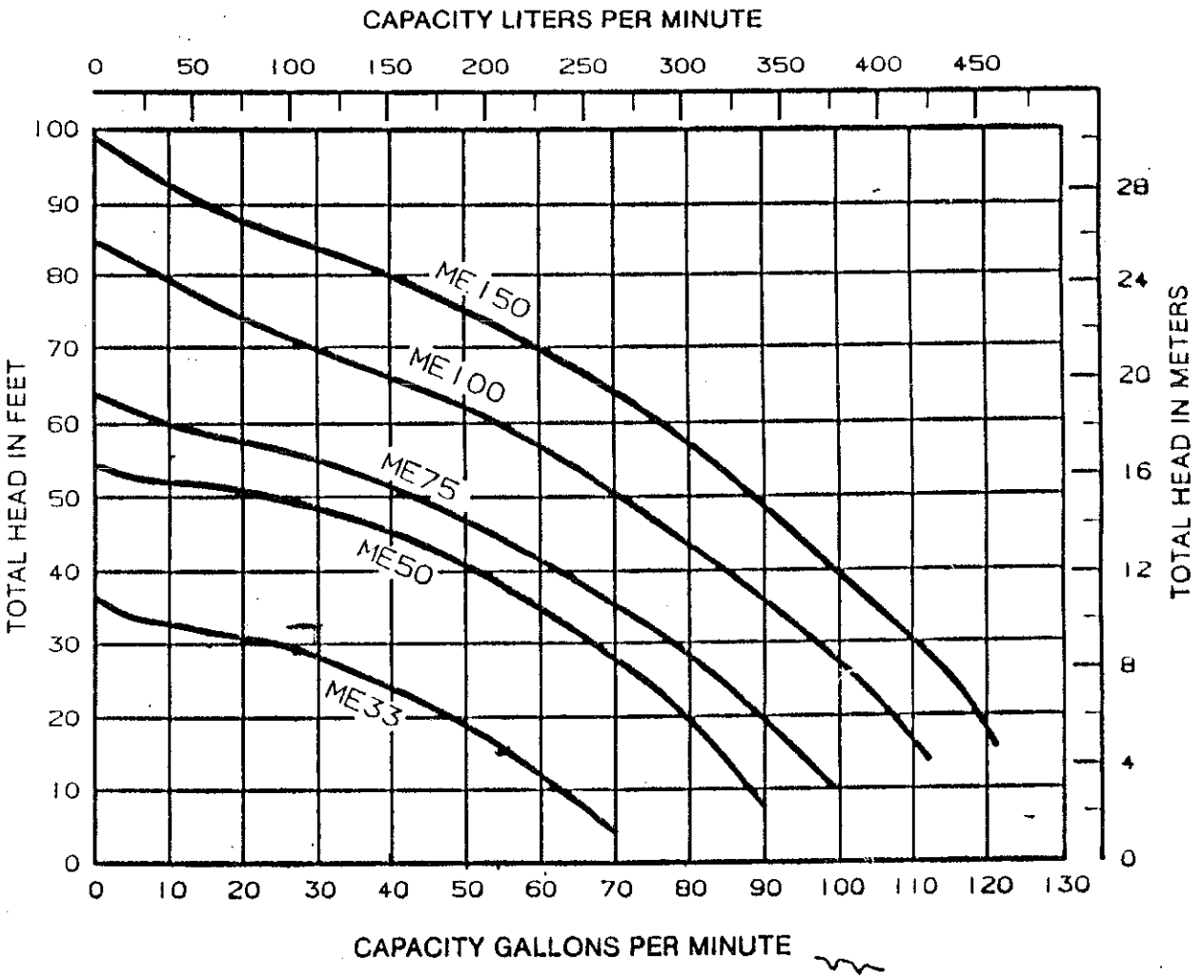
Lot 445 - Grasshopper Road

Daily design flow:	360 gpd. - 3-bedroom house
Septic tank size:	1000 gal. (2 compartments)
Pumping tank size:	1000 gal.
Effluent loading rate:	0.3 gpd/sf
Total length and diameter of supply manifold:	app. 15' lf 2" sch 40 PVC
Number and length of laterals:	2 @ 75', 1 @ 50', ¼" sch 40 PVC.
Hole size:	5/32"
Hole spacing:	1 per panel
Total number of holes:	17 per 75' line, 11 per 50' line (one in each T & Panel near the center with the hole turned up)
Flow rate through the system:	22.5 gpm
Elevation head:	25 *
Pressure head:	3.0'
Friction head:	approx. 1'
20% contingency	5.8'
Total head:	35'
Pump requirements:	22.5 gpm at 35' of head; use Myers "ME 50" pump or equivalent with compatible electrical
Dosing volume:	162 gal. - 2.2 doses/day at design flow* *
Depth of water pumped per dose:	calculated to specific tank by measure or dealer engineering specifications(1 cubic ft. of water equals 7.48 gals.)
Pump run per dose:	approx. 7.2 min.
Check valve:	No
Siphon break hole:	No

* To be verified by installer

* * Before placement of cap block, one panel on each line near the center of the field should be observed filling to make certain that it does not overflow top chamber into air chambers of panel. If overflow occurs, reduce floats by 25 gallons and reset until no overflow is observed.

ME Series
1/3 through 1-1/2 HP
Effluent Pumps
Performance Curve

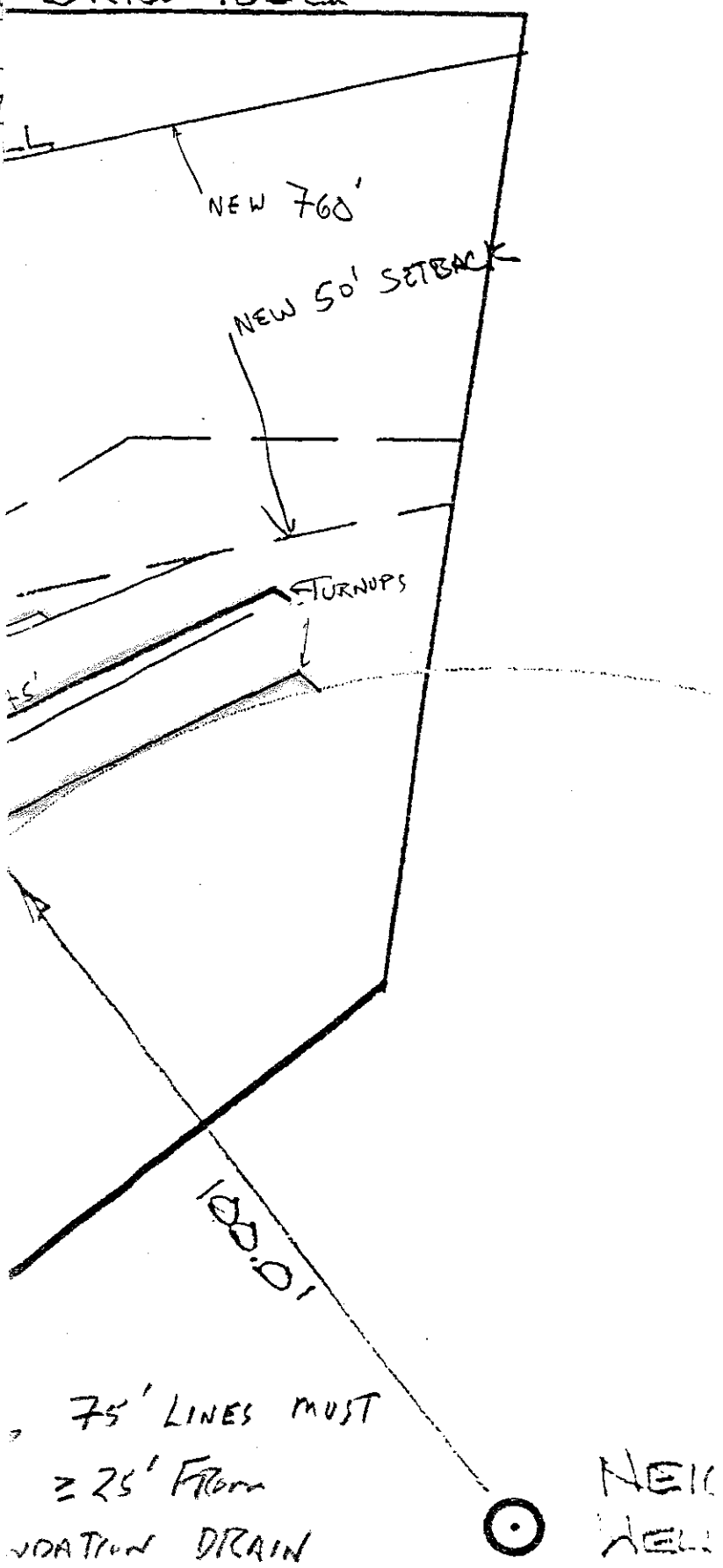


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K3327 7/91

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SYSTEM SCHEMATIC SHOWING ORIG. 760 el.
LOCATION OF SEPTIC LINES
AND AFTER NEW BOUNDARY
REVISED 4-17-97



Notes: ① OLD PROPOSED SEPTIC LINES ARE FLAGGED IN FIELD

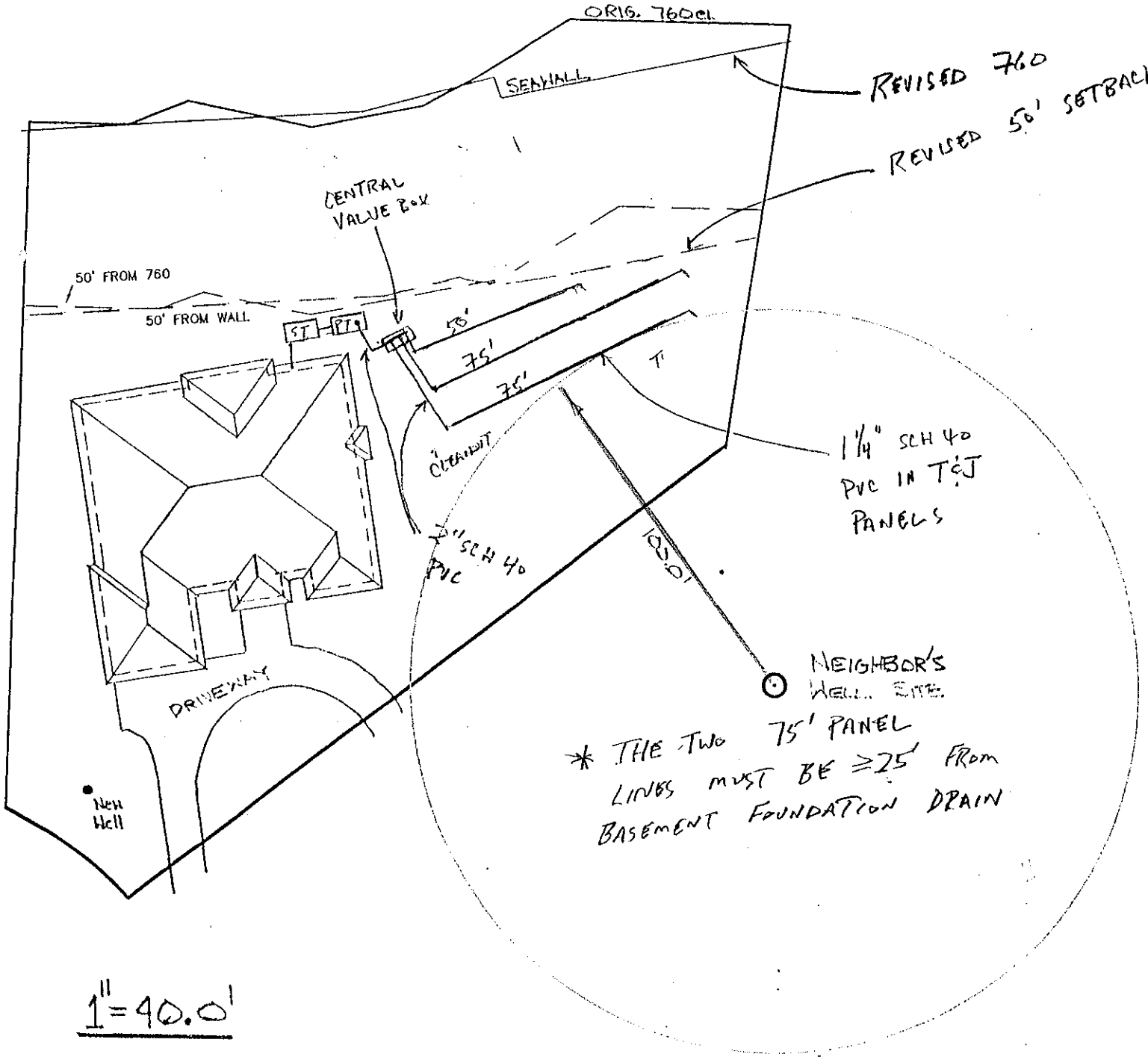
② NEW LINES SKETCHED ON NEW SURVEY SO ALL PARTS OF SEPTIC SYSTEM ARE → 50' FROM REVISED 760' CONTOUR

③ OLD PROPOSED LINES FIELD LOCATED BY SURVEYOR AND ARE SHOWN AS INFORMATION AND AS REFERENCE POINTS FOR FUTURE SITE VISITS

1" = 20'

SYSTEM SCHEMATIC

REVISED 4-4-97



1" = 40.0'

PARTICLE SIZE ANALYSIS

SERIES: Pit 2 ~~60~~ 50" LAB ID# - 0
PEDON # 0 COLLECTED
HORIZON: inches
SAMPLE SIZE IS 100 GRAMS
BY
PHOTO:

	30 sec	90 sec	3 hr	10 hr
READING	37	30	16	13
BLANK	6	6	6	6
TEMP C	18	18	18	18

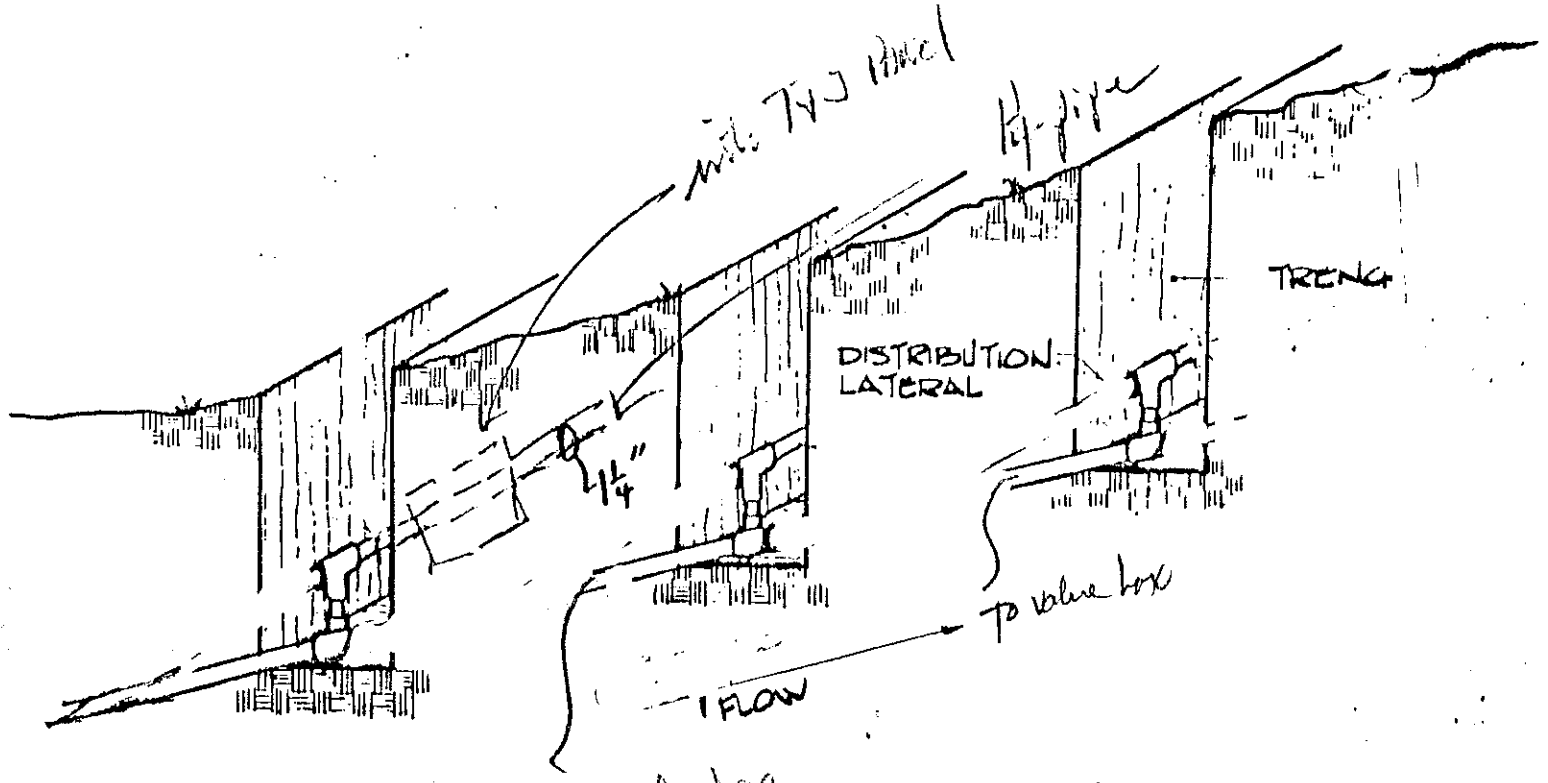
1. Concentration C=R-R1 at
   30 seconds= 31
   90 seconds= 24
   3 hours= 10
   10 hours= 7

2. P=(C/Co)*100
   30 seconds= 31
   90 seconds= 24
   3 hours= 10
   10 hours= 7

3. d=theta / t^.5 * Tcorr
   30 sec d= 63.26485
   90 sec d= 38.49782
   3 hrs d= 3.86
   10 hrs d= 2.15

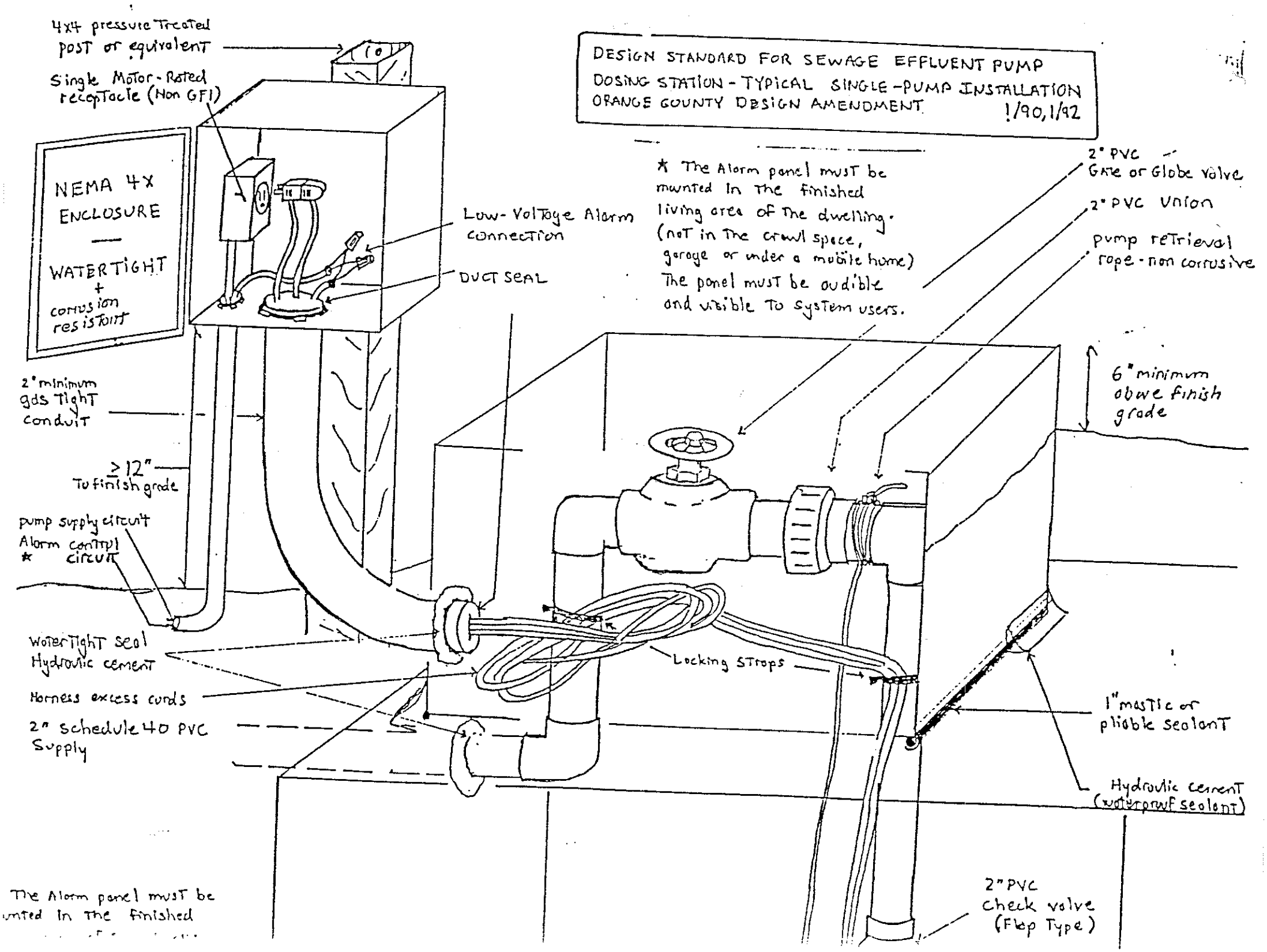
% sand = 72.32
% silt = 21.07
% clay = 6.62

Textural Class =SANDY LOAM



A PUMPING UPHILL

from Cooper et. al, 1982)
Modified


4x4 pressure Treated post or equivalent
Single Motor-Rated receptacle (Non GFI)
NEMA 4X ENCLOSURE — WATERTIGHT + corrosion resistant
Low-Voltage Alarm connection
DUCT SEAL
DESIGN STANDARD FOR SEWAGE EFFLUENT PUMP
DOSING STATION - TYPICAL SINGLE-PUMP INSTALLATION
ORANGE COUNTY DESIGN AMENDMENT 1/90, 1/92
* The Alarm panel must be mounted in the finished living area of the dwelling. (not in the crawl space, garage or under a mobile home) The panel must be audible and visible to system users.
2" PVC Gate or Globe valve
2" PVC Union
pump retrieval rope - non corrosive
6" minimum above finish grade
2" minimum gas Tight conduit
≥ 12" To finish grade
pump supply circuit
Alarm control * circuit
Watertight seal Hydraulic cement
Harness excess cords
2" schedule 40 PVC Supply
Locking Straps
1" mastic or pliable sealant
Hydraulic cement (waterproof sealant)
2" PVC Check valve (Flap Type)
The Alarm panel must be
unted in the finished