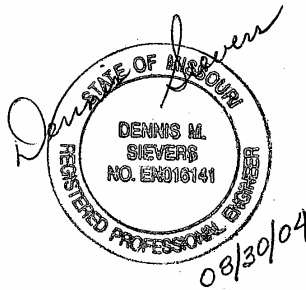


EXHIBIT A  
AT-GRADE ABSORPTION TRENCH  
ONSITE TREATMENT SYSTEM

FOR

Boone County Sheriff's Satellite Office  
Property Near Hwy 63 N & Hwy 124  
Boone County, MO



Marshall Engineering and Surveying, Inc.  
300 St. James Street  
Columbia, MO 65201  
Phone: (573) 875-8832  
Fax: (573) 875-1039

August 04

### Site and Soil Description

This will be new construction (Mobile Office with two offices). The soil consists of 8" of Class IIIa underlain by 41" of Class IVb and a seasonal water table at 8". A Wisconsin At-Grade absorption system is being proposed to take advantage of the uniform slope conditions and small daily flow. Soil loading for the At-Grade unit is 0.1 gpd/ft<sup>2</sup>.

### Peak Design Flow

Peak design flow was calculated as 2 office workers x 25 gpd/worker = 50 gpd.

### Septic Tank

The septic tank will be a 1000 gallon concrete tank with a 24" PVC riser over the effluent pipe and with a safety lid. The tank shall meet all requirements of 19 CSR 20-3.060 *Minimum Construction Standards for On-Site Sewage Disposal Systems* and Boone County regulations. The tank shall have a Zabel A1800 effluent filter or approved equal in the effluent pipe. All sewer pipe shall be 4" SDR35.

### Wisconsin At-Grade Absorption Trench

The At-Grade trench was designed from information from the State of Wisconsin. Based on soil types similar to those at this site, a linear loading rate (LLR) of 1.0 gpd/ft was assumed. This rate is recommended for sloping terrain and clay soil. From this LLR-value the following calculations were made.

Absorption Area Width, W (rock area) =  $LLR(1.0 \text{ gpd/ft}) \div 0.1 \text{ gpd/ft}^2 = 10.0 \text{ ft}$ .

Total Absorption Area =  $50 \text{ gpd} \div 0.1 \text{ gpd/ft}^2 = 500 \text{ ft}^2$ .

Absorption Area Length, L =  $500 \text{ ft}^2 \div 10 \text{ ft} = 50 \text{ ft}$ .

The Absorption Area will be 50 ft long x 10 ft wide x 1 ft deep and on the contour.

A buffer of soil shall extend in all directions beyond the rock absorption area (see details for distances).

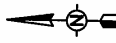
Effluent shall be divided equally (50/50) at the At-Grade unit by a Zabel GDS Z300 Flow Divider.

The following guidelines should be followed in construction of the at-grade absorption trench.

1. Minimize all compaction of the area under the absorption area, particularly the area under the rock and down slope of the rock. Avoid traffic on the tilled area especially beneath the rock area and down slope. Construct only when soil moisture is appropriate. Soil that is too wet will easily compact.

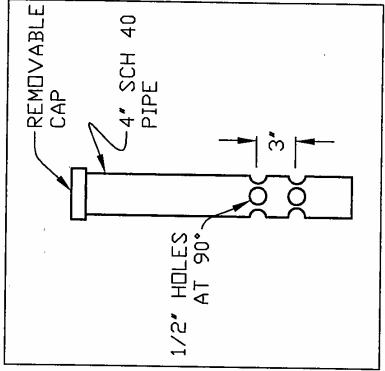
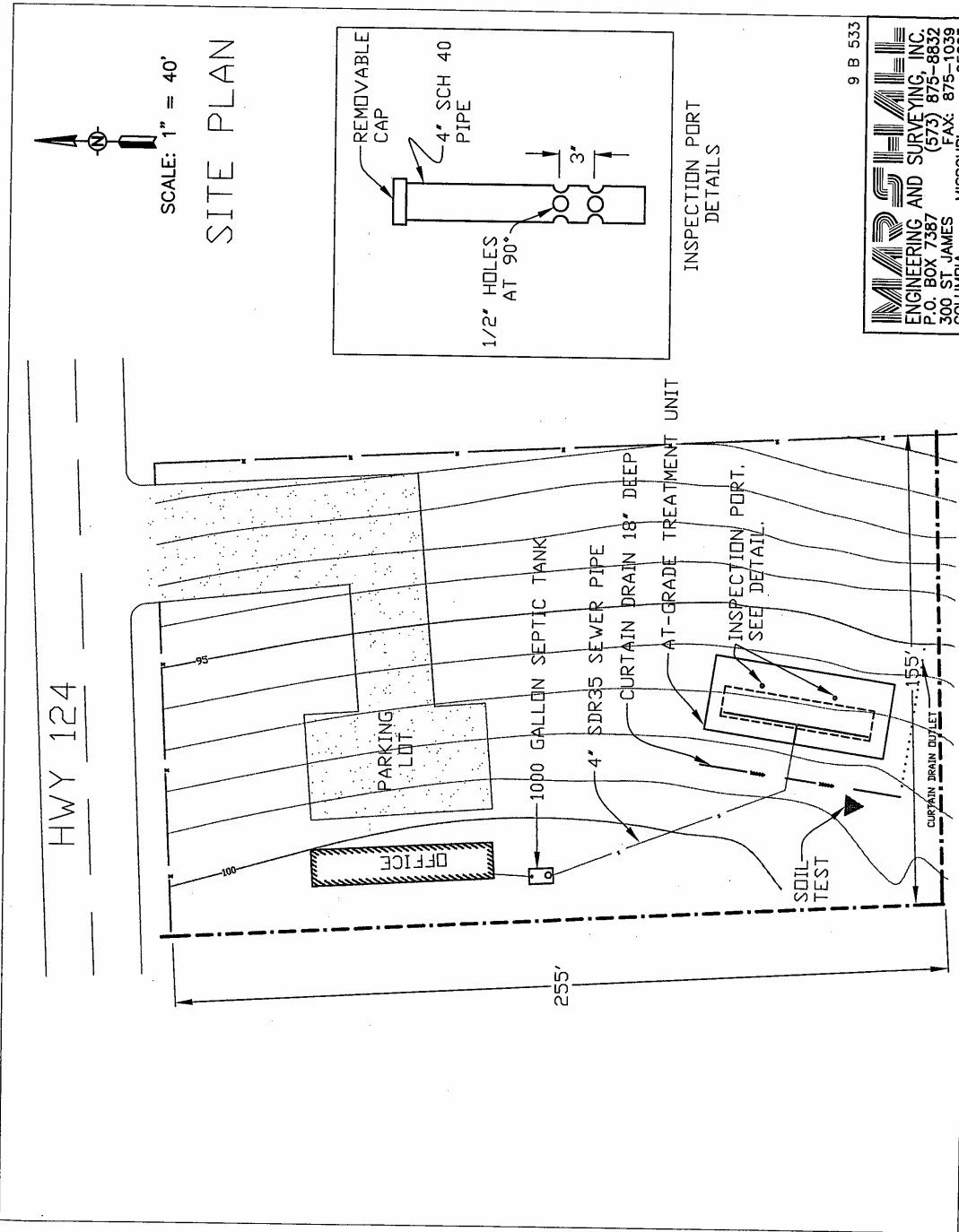
2. Remove all vegetation from the ground surface and roto-till the area under the trench before placing rock. Include the area down slope of the rock and under soil cover.
3. Place 12" of clean rock (1-2") on the tilled area. Work from the upslope edge of the system to minimize compaction. Rock is to be on the contour.
4. Place geotextile fabric over the rock. Extend the material only to the edge of the rock.
5. Place 12" of loam soil (clay content < 25%) over the rock and fabric and taper the soil to a distance of at least 5 ft in all directions from the rock.
6. A curtain drain is to be placed above the trench to divert surface water and lateral flow away from the trench.
7. All SDR35 perforated pipe must be laid level (on the contour) and capped at any open end. The pipe is to set at the upslope edge of the rock and covered with 2-3" of rock.
8. Bring each inspection tube to grade and cap.

The enclosed design follows current state-of-the-art understanding and State of Missouri Department of Health and Senior Services Guidelines. We do not warrant the installation, operation or functioning of this system for any period of time.



SCALE: 1" = 40'

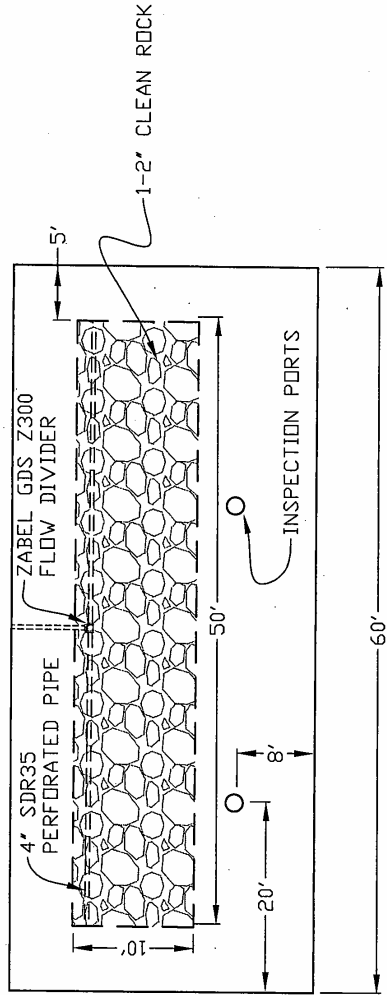
# SITE PLAN



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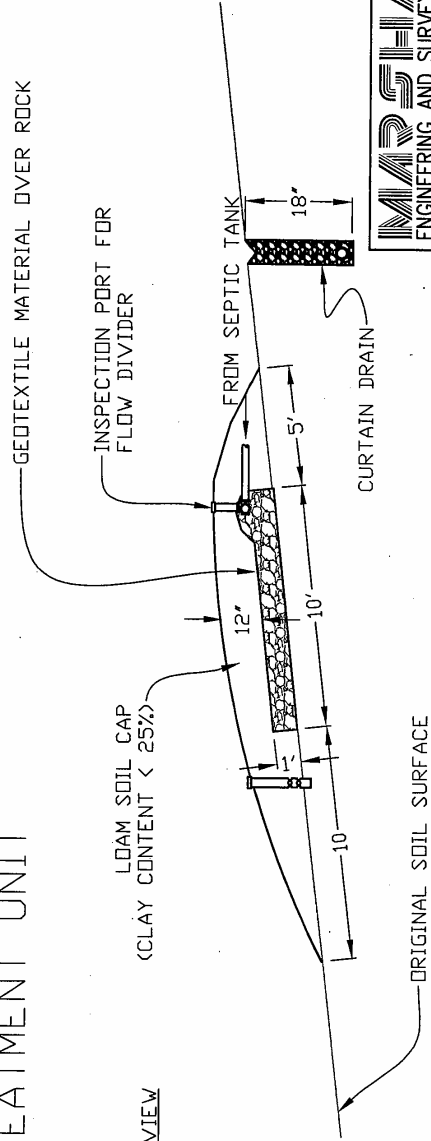
**MARSHALL**  
 ENGINEERING AND SURVEYING, INC.  
 P.O. BOX 7387  
 300 ST. JAMES  
 COLUMBIA, MISSOURI 65205

TEL: (573) 875-8832  
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TOP VIEW

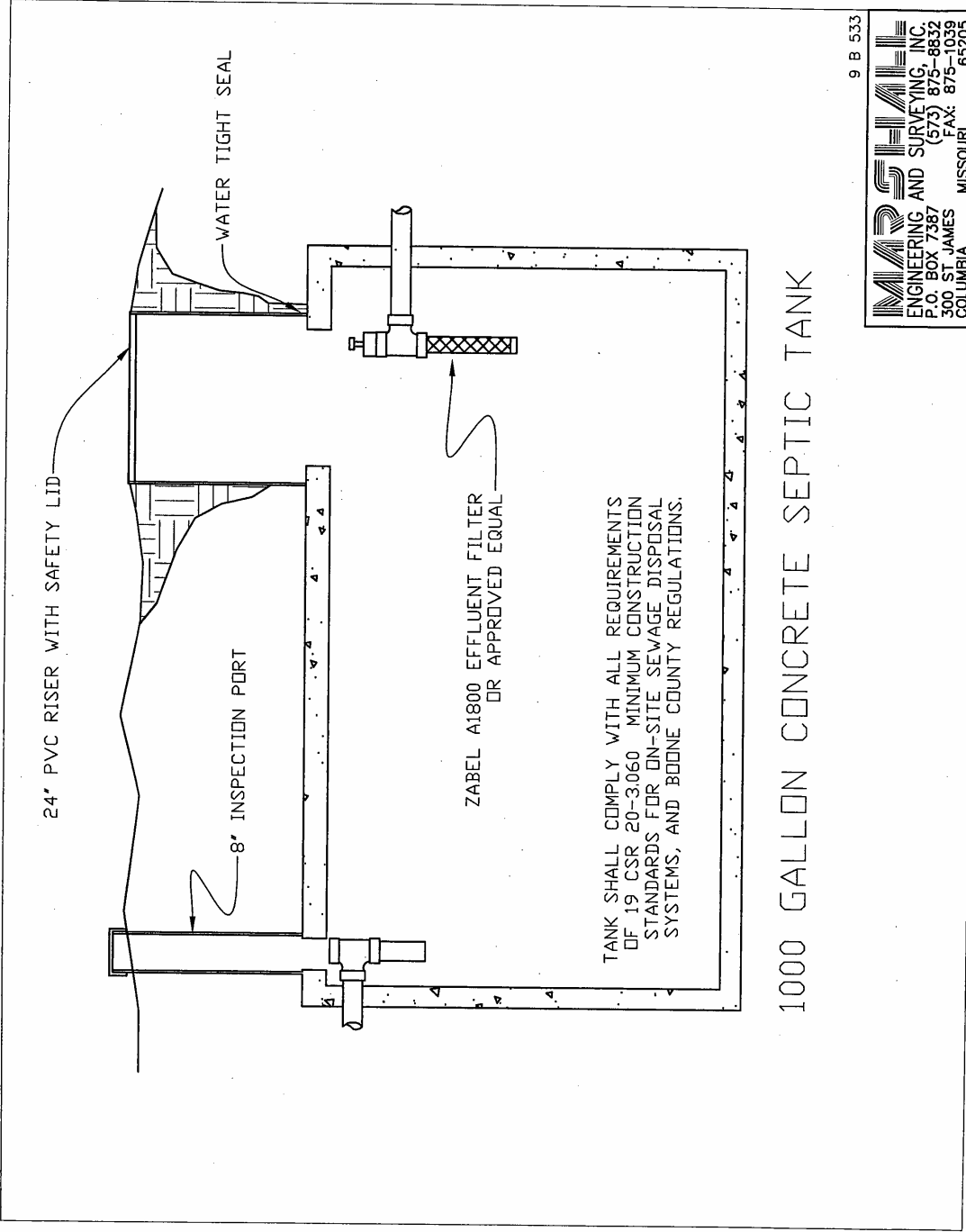
### AT-GRADE TREATMENT UNIT



SIDE VIEW

9 B 533

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24" PVC RISER WITH SAFETY LID

WATER TIGHT SEAL

8" INSPECTION PORT

ZABEL A1800 EFFLUENT FILTER  
OR APPROVED EQUAL

TANK SHALL COMPLY WITH ALL REQUIREMENTS  
OF 19 CSR 20-3.060 MINIMUM CONSTRUCTION  
STANDARDS FOR ON-SITE SEWAGE DISPOSAL  
SYSTEMS, AND BOONE COUNTY REGULATIONS.

1000 GALLON CONCRETE SEPTIC TANK

9 B 533

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