

APPENDIX 3 SATURATED HYDRAULIC CONDUCTIVITY - DOUBLE-RING INFILTRATION METHOD

Site Selection

Because of the considerable time and effort that is required to obtain meaningful Ksat values, it is imperative that sites are chosen carefully and chosen prior to the day of measurement. For LIA/LCA studied the sites should have nil or at least, minimal disturbance.

Procedure

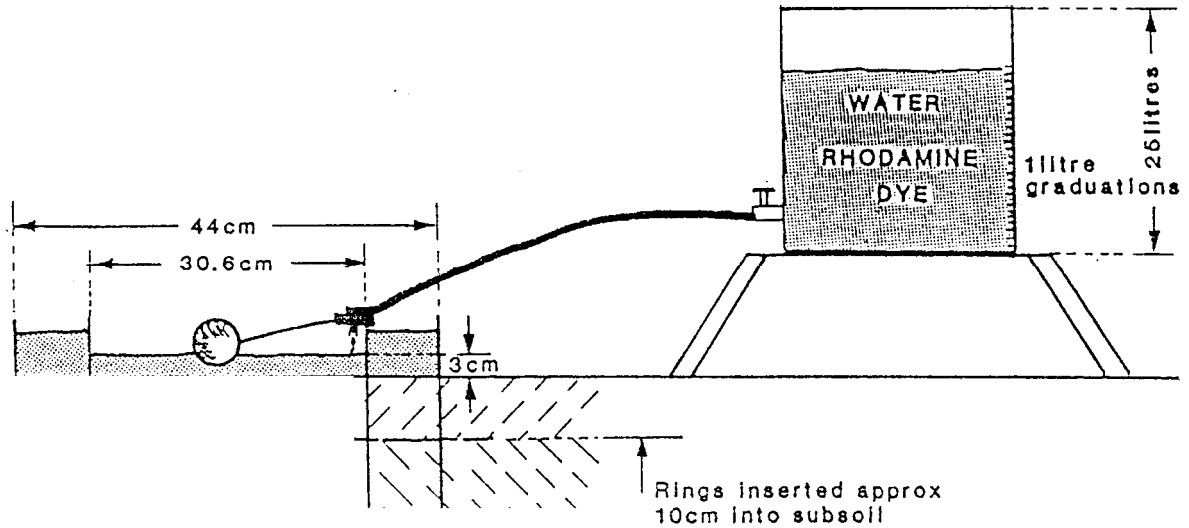
- 1) Record date, site number and details on land use, disturbance, representativeness and location of the site.
- 2) Insert five (5) small infiltration rings. The small rings are placed inside the large rings. Rings need to be 100mm into the main clay horizon. Use the Gouge auger to identify horizon depths. Remove some topsoil if necessary. On some gradational soils the removal of surface vegetation may be all that is required. Using the 'Wacker' and special steel plates insert the rings. If a sledge hammer is to be used care should be taken to cause minimal soil disturbance.
- 3) Rings need to be at least two metres apart and located at random. Relocate ring if obstacles such as stones or roots prevent an even downward movement of the ring into the soils.
- 4) Fill both rings with water and set up the calibrated reservoir tank and float valves so that water is added when the level in the ring drops below about 3cm. The calibrated water containers should be kept as level as possible.
- 5) Place lids on rings to minimise evaporation and interference by birds and stock. Ensure the ball floats move freely.
- 6) Check that all containers are full and will last overnight. If the chosen site has a high infiltration rate then the addition of extra containers and float valves may be needed to prevent them from emptying overnight. It is important for calculating Ksat values that levels can be recorded over a 24 hour period without any interruptions to the flow.
- 7) Record the water level from the left hand side of the scale on the calibrated containers hourly or more frequently depending on rate.

Record time as well as water level and always record the time and water level prior to and after topping up the containers.

- 8) Remove water from internal and external rings using a siphon hose or scoop. Dig out each ring, taking care not to disturb the soil contained within. Up-end the ring and record the proportion of soil area that has been transmitting water for each ring and record if water movement has been evenly disturbed or confined to root/worm holes or structural cracks.

Record the details of any feature that may inhibit or enhance the rate of flow (See attached recording sheet).

Diagram of Equipment



Calculations

Volume of water in the inner ring

$$\begin{aligned}
 &= \pi^2 h \\
 &= \pi \times 153 \times 153 \times h && (h = \text{height of water in inner ring}) \\
 &= 735 \times h && (\text{Radius of inner ring} = 153 \text{ mm})
 \end{aligned}$$

.. Height of 1 litre of water in the inner ring

$$\begin{aligned}
 h &= \frac{1000}{735} \\
 &= 13.6 \text{ mm}
 \end{aligned}$$

Each one litre drop in the calibrated container is equivalent to a drop of 13.6mm in the inner infiltration ring.

Example of Calculation Sheet

SITE NO

A Time	B Time cliff. (minutes)	C Equivalent 24 hour period ($\times \frac{1440}{B}$)	D Level (litres)	E Water level Diff (litres)	F Drop in Ring (E x 13.6)	G Daily Rate (mm/day) (F x C)
12.01			0.1			
1.01	60	24	2	0.1	1.36	36.64
2.13	72	20	0.25	0.05	0.68	13.6
3.30	77	18.70	0.4	0.15	2.04	38.14

Equipment

- Data sheets
- Water proof pen and pencils
- 25 litre Calibrated water containers (5 per site plus spares)
- Float valves, tops and tubing
- Stands for containers
- 5 small, 5 large steel infiltration rings per site (30 cm, 45 cm diam)
- Lids for steel rings Rhodamine B dye for water
- Rain gauge
- Water supply* and pump. Regional pig units used successfully
- Tandem trailer 10' x 4' needed to transport equipment
- Bendigo L.I.A vehicle needed to transport equipment
- Soil auger
- Crow bar
- Pick
- Mattock
- Sledge hammer
- Shovel
- Clock
- 'Wacker Packer' (motorised) for pushing steel infiltration rings into soil.
- Steel end for Wacker
- Steel tops for both small and large infiltration rings
- Fuel for Wacker (50:1 fuel : oil mix)
- Spare fuel and oil for pig unit

* Water for calibrated containers should be filtered as valves are easily blocked.

Hydraulic Conductivity Data Sheet

Site Number: **Area/Property:**

Date:

Ring 1		Ring 2		Ring 3		Ring 4		Ring 5	
Time	Level	Time	Level	Time	Level	Time	Level	Time	Level
Percentage of wet soil at base of ring									
Wetness distribution (uniform, uneven, localised)									
Description of base ring									