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INSTALLATION OF EVAPOTRANSPIRATION SYSTEMS AT IRRUNDGADGI COMMUNITY, NULLAGINE

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Introduction

Irrungadgi community is a small fringedweller settlement situated on the outskirts of Nullagine, some 200km north of Newman. The community is comprised of nine houses with separate ablution facilities. As part of an upgrading programme for the community, a wet area was added on to each of the houses, comprising a shower, flushing toilet and laundry area. Wastewater from the houses was disposed of in leach drains for seven of the houses. Two houses were installed with Evapotranspiration (ET) systems to dispose of household effluent. The ET systems were installed in May 1991 and planting took place in July 1991.

This report briefly outlines the installation of and planting of the ET systems at Irrungadgi, the problems encountered and those likely to be encountered in system functioning and monitoring.

System Design

Each ET system was initially designed to service a household of 15 people and was $45m^2$ in area and with a depth of 1m. The trench was filled with 50cm of graded gravel above which a 50cm layer of river sand was placed (Figure 1).

Upon arriving at Irrungadgi however, it was observed that the leach drains being installed were comprised of two 11m long drains with a width of 1.3m. This factor, coupled with the observation that people did not appear to be using as much water as was previously estimated in calculating ET system sizing, resulted in decreasing the area of one of the trenches to correspond to the surface area of the leach drains (22m long and 1.3m wide). In this way a more direct comparison could be made between the effectiveness of ET systems and leach drains in disposing of wastewater.

In both of the systems installed, three standpipes were positioned at intervals along the trench to allow water levels to be monitored in the disposal field.

System 1

System 1 was excavated as a trench 22m long and 1.3m wide and for the most part, 1m deep. A fall of 100 mm had been provided in digging the trench to allow gravity movement of wastewater towards the end of the trench to occur. The concrete soakwell used was considerably larger than anticipated, being 1.5m in height. The first couple of metres of trench was hence dug to a depth of 1.6m to allow soakwell installation. The soakwell was placed directly onto the base of the trench without a layer of gravel being added first. The area directly around the soakwell however, was filled in with rocks and gravel as was directed by the original design.

The base of the trench was filled with a 20cm layer of crushed rock above which the distribution pipe was placed. The pipe had been slotted to allow wastewater distribution to occur in the gravel layer. A further 30cm of graded gravel was then laid in the trench. Two standpipes had been inserted into the distribution pipe to provide an opportunity to take wastewater samples from the system if needed (figure 1a). A third standpipe was positioned some two metres from the end of the trench to provide an opportunity to measure water levels in the system.

System 2

System 2 was constructed as detailed in Figure 1b. A layer of gravel however, was not laid beneath the soakwell as initially planned; river sand was used instead. This was because the builders needed a firm foundation to build the soakwell on which would not have been provided if gravel had been used. The brick soakwell was constructed to the dimensions detailed, with gaps of 1-3cm being provided between each brick. The bricks used were roughly 30x6x5cm in size and did not have any holes. Each brick was cemented into position. A concrete lid was cast and placed on top of the soakwell which was then covered with a 10cm layer of sand.

Fill Material

Three sizes of crushed rock was used in the trench. The rock was appropriated from piles of tailings from mining operations. The bottom 20cm of trench was filled with rocks ranging in size from 4-15cm above which a 10cm layer of rock of 2-6cm in diameter was placed. Another 10cm layer of smaller gravel (roughly 1-3cm in diameter) was laid on top of this. River sand taken from a nearby creek bed was placed above the gravel layers. The sand was a mixture of silty sand and small pea gravel with some larger stones occasionally interspersed.

Piping

PVC piping was used to connect the septic tank wastewater outlet to the soakwell in each trench. In both systems the soakwell was positioned 1.8m from the second septic tank, leaving a gap between the well and the start of the trench of some 80cm. The short length of pipe between the trench and the septic tank ensures that any blockages that occur can be easily cleaned.

Piping from the ablutions block to the first septic tank, between the two septic tanks and from the second septic tank to the soakwell were all sealed and made watertight using concrete. Because this prevented leakages it was unlikely that any plants grown on the systems would damage these structures due to roots seeking water and growing into cracks.

Planting ET Systems at Nullagine

Plants obtained from Pundulmurra nursery were planted on either side of each of the two trenches constructed at Nullagine. The species used were *Acacia ampliceps*, *A. ligulata*, *A. craspedocarpa*, *A. aneura* and *E. camaldulensis*. Other species for establishment on the trench surface are currently being grown by Pundulmurra nursery and will be planted at a later date. Approximately 50

Figure 1: Evapotranspiration Systems at Irrungadgi Community

Figure 1a: System 1

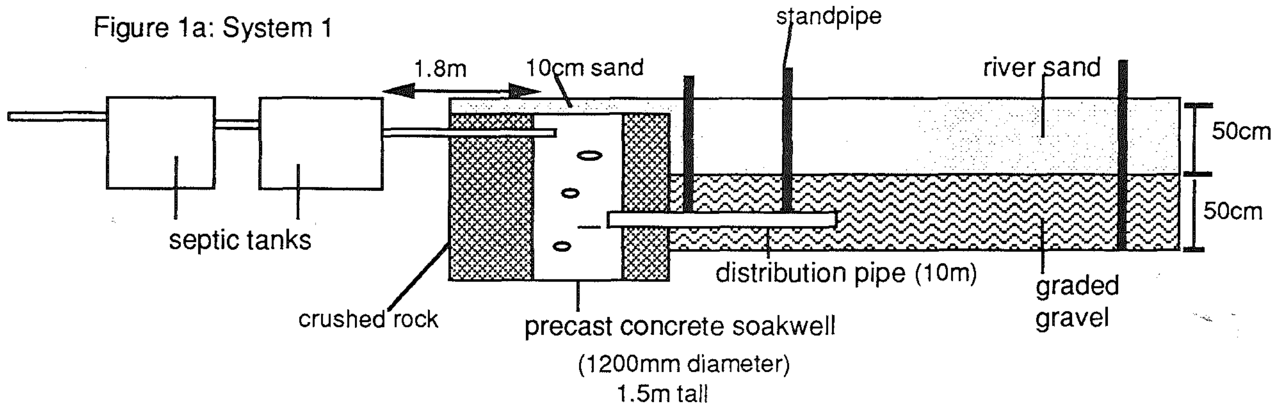
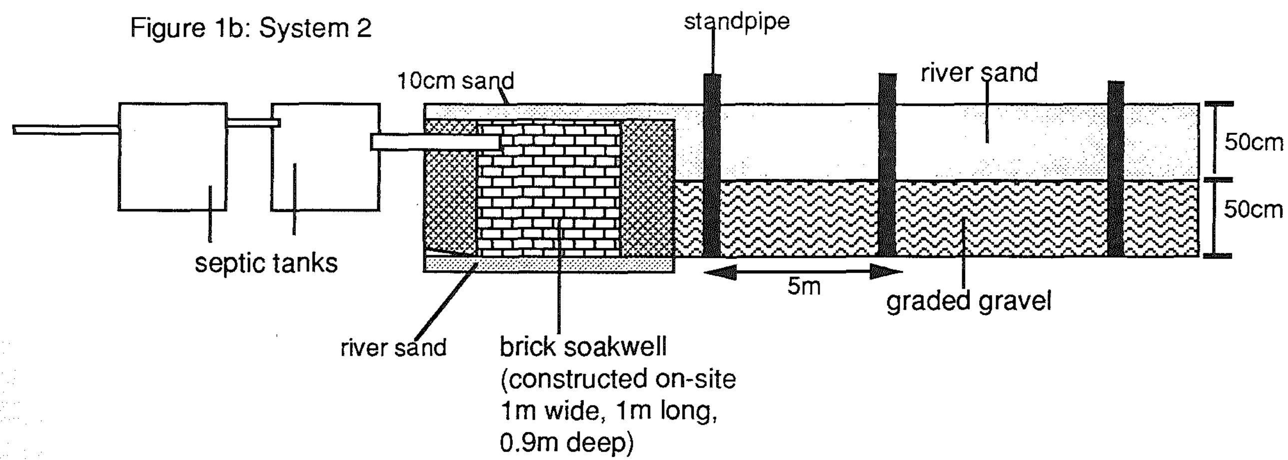


Figure 1b: System 2



plants were planted for each trench with drip feed irrigation systems also being installed.

Irrigation Systems

The irrigation system was comprised of a 44 gallon drum to which was connected a 20m length of 13mm polyethylene piping.. Ten drip outlets were spaced out at regular intervals along the piping, each outlet consisting of a 20cm length of 5mm polyethylene piping upon which was attached a dripper (4L/hr). Previous testing of the equipment at Murdoch University showed that when on a slight slope, the volume of water coming from each outlet was similar with no significant drop in volume output at the furthest outlet. This equipment (drum + piping) was installed on both sides of each trench (Figure 2).

To allow root watering of the plants, a 50cm long slotted PVC pipe was positioned in the ground at each outlet. The dripper was inserted into the pipe which was then filled up with gravel. Two to three plants were then planted around each PVC pipe. All irrigation piping was buried 5-10cm beneath the ground (Figure 3).

To get community participation in this project the Nullagine school was approached. It was thought that if the children were given some part in the exercise and felt responsible for the welfare of the plants the vegetation may have a chance of becoming established. Children from Nullagine Primary School hence came and helped in planting on one of the trenches. The young people that participated were among those that lived at the community. Some showed considerable interest in what was being done.

ET System Maintenance

The only maintenance that should be required on the ET systems in the first year or so is watering of plants. Providing they are not pulled out or otherwise interfered with, watering would be needed for at least six months. A member of the local council responded positively to the suggestion of filling the drums with water at weekly intervals. This would ensure that each plant was receiving about 10L of water each week, which should be sufficient for survival.

Monitoring of ET Systems

Bob Newman, the Health Surveyor for the East Pilbara, has indicated his willingness to take water level readings from the trenches at monthly intervals. The water usage of individual households and the community in general would also be recorded so that an estimate can be made of the water entering the ET systems. A week or so may be spent at the community at a later date to get other data such as soil moisture, water usage, temperature, humidity and so on. Once the plants are established, water usage measurements will also be taken using the heat balance method, the equipment for which will be borrowed from Horticultural science at Murdoch University.

Figure 2

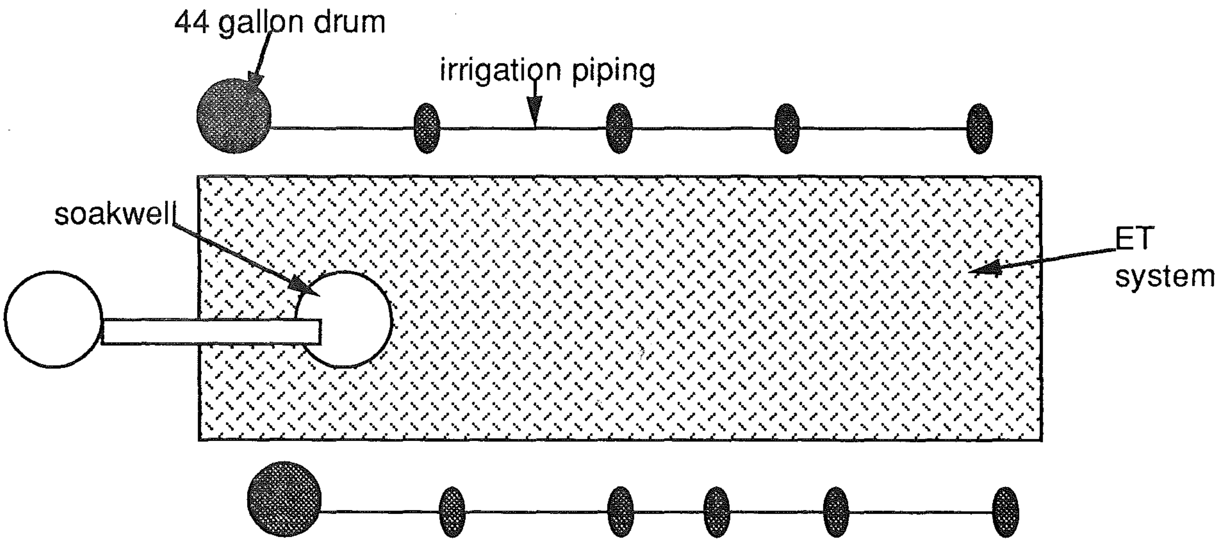
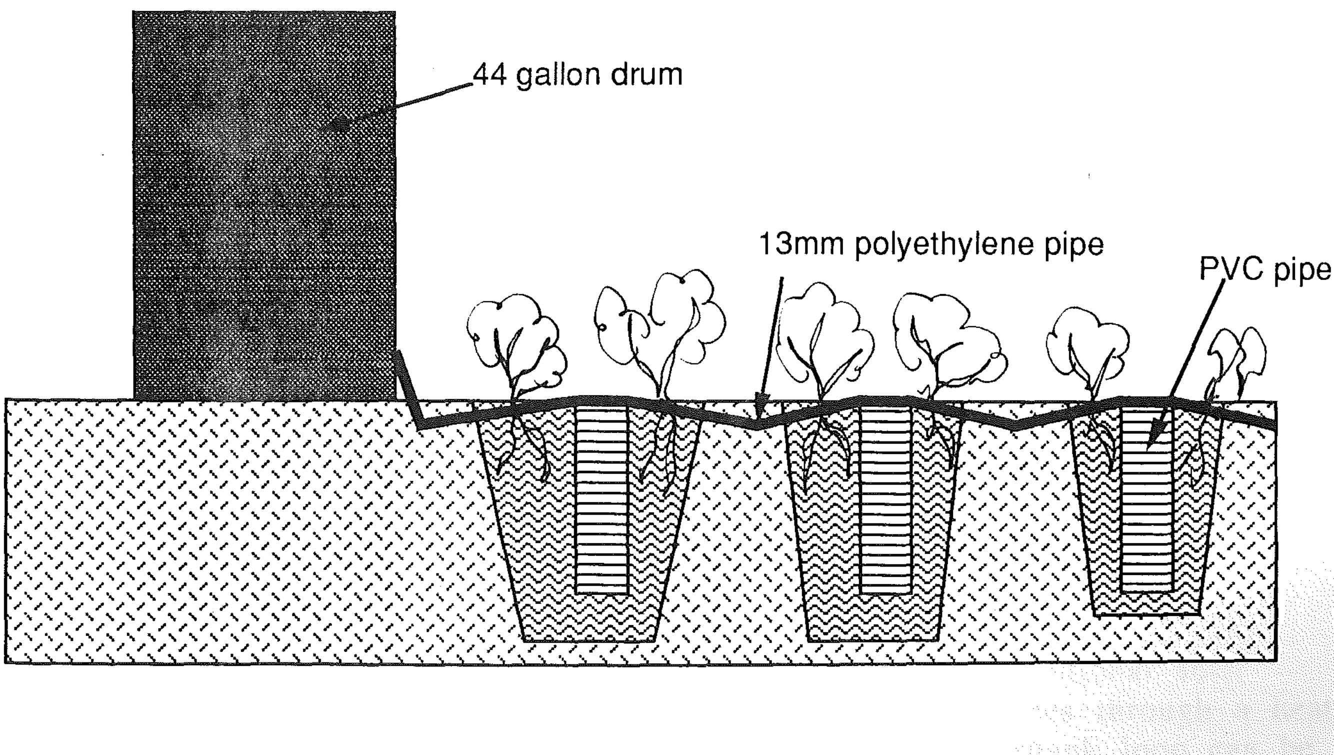


Figure 3



Potential Problems

One of the major problems in getting any results from the work at Nullagine is that there may very well not be enough wastewater generated to really test the effectiveness of the system and to water the vegetation planted on and adjacent to the disposal field. It was apparent from visits to the community that household water usage was considerably lower than anticipated. There are also some doubts as to whether these plants will survive long enough to become established. The weather was good for planting in that Nullagine had a considerable amount of rain during July (the month of planting); however the people at the community may kill the plants by driving on them, children ripping them up and so on.