



# TRACER STUDY BURIAL DEPTH DETECTION RANGE

DETECTION RANGE TRIAL AT LEE ON SOLENT  
– FEB 2013

## Introduction

The Eastern Solent Coastal Partnership has been awarded a £4,000 contribution from the SCOPAC Minor Projects fund to develop the techniques used for tracing gravel sized beach material implanted with unique RFID tags. Part of this funding was allocated to examine within the field, the likely range of the detection equipment within different beach sediments.

A series of simple tests were carried out to assess the detection range of the various sizes of RFID tag, at different orientations to the reading antennas and varying depths within the sediment. The results are reported for dissemination across the wider SCOPAC readership.

## Test Location

A test study site at Lee On Solent was chosen due to the mix of different sediment types available, with a predominately gravel upper beach and a mixed gravel/sand foreshore. Lee On Solent is also a designated deployment site for 500 tracer pebbles as part of the River Hamble to Portchester Coastal Strategy (RHPS). The location of the test site is shown in Figure 1.



**Figure 1 - Test study site at Lee On Solent**

Pebbles were tested for depth range both within the upper gravel beach and on the upper foreshore area which was predominately a mixed sandy gravel.

## Test Method

Test pebbles were used containing both the 23mm and the newer 12mm RFID tags. Only smaller pebbles containing the 12mm RFID tags will be deployed as part of the RHPS as these are more representative of the sediment distribution along this frontage. However the 23mm RFID tags have previously been deployed at Portsmouth and Hayling Island where the beach material is larger.



Holes were dug in the beach and pebbles were buried at set measured depths of between 50-100mm intervals, until they were no longer detectable by the RFID handheld antenna. Once no longer detectable, the pebbles were retrieved after one experiment to ensure that the equipment could still locate them at a lesser depth (Figure 2).



Figure 2. Burial of pebbles at Lee On Solent

All pebbles were detected with previous knowledge of their burial position marked. This was to ensure the test pebbles could be retrieved from the field and did not remain within the deployment site for the River Hamble to Portchester Strategy study.

The quad bike antenna array previously developed was not used for this testing due to complications experienced following field trials and potential concerns over the effectiveness of the array at accurately recording tracer pebbles.

## Results

Beach Sediment	Burial Depth (m)	Horizontal RFID Detected		Vertical RFID Detected	
		12mm	23mm	12mm	23mm
Sand & Gravel	0.10	Y	Y	Y	Y
	0.15	Y	Y	Y	Y
	0.20	Y	Y	Y	Y
	0.25	Y	Y	Y	Y
	0.30	Y	Y	Y	Y
	0.35	N	Y	N	Y
	0.40	N	Y	N	Y
	0.50	N	Y	N	Y
	0.60	N	N	N	Y
	0.70	N	N	N	N
	0.80	N	N	N	N
Gravel	0.10	Y	Y	Y	Y
	0.15	Y	Y	Y	Y
	0.20	Y	Y	Y	Y
	0.25	Y	Y	Y	Y
	0.30	Y	Y	Y	Y
	0.35	Y	Y	Y	Y
	0.40	Y	Y	N	Y
	0.50	N	Y	N	Y
	0.60	N	N	N	Y
	0.70	N	N	N	Y
	0.80	N	N	N	Y

Results suggest that the larger RFID tag (23mm) has a greater detection range than the smaller 12mm tag. The detection range is greatest in the gravel for both pebble sizes, although the smaller tags are unlikely to be detected in sediment depths of greater than 30-35cm. Orientation seems to be less important in the smaller pebbles, whilst a vertical orientation of the 23mm tag improves the detection range.

## **Limitations**

Whilst it appears that RFID size, orientation and sediment type effect the detection range there may be further limitations to the range such as battery power of kit, speed of operators sweep, air temperature and water content of sediment.

Due to the bespoke nature of the detection kit, at present the exact limitations are currently unknown and largely based on anecdotal evidence collected from previous use during surveys.



