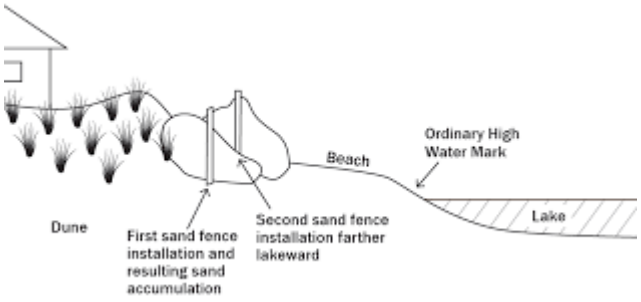
Appendix 3
Detail of Sand Dune Training Scheme; Principles.

The dunes accrete where the sand dries enough between hightides and is mobilised by the prevailing wind to move up the beach until it reaches the slope where saltation of the sand grains is less than the slope or height gain of the face permits. Obstructions such as natural material on the strandline or vegetation in embryo dunes such as marram grass hold the sand due to a lowering of the wind velocity therefore causing accretion and therefore dune development. Artificial stimulus and holding dunes in position has been traditionally done with Dune fencing, typically chestnut fencing, where the velocity of the wind drops because of the fence and the sand accretes.

This process means that dunes always build on the seaward face and extend seawards, with sand blowing over the top when the conditions allow.



Dune training uses this principle of adjusting the location of the start of the accretion provided it is still viable and not within the intertidal area.

If it is assumed that dune accretion occurs along the beach, albeit at slightly different rates (often due to different wetness of the sand between tides), fencing at or slightly above the highwater Spring tide level will build up the beach and initiate dune formation. Because the requirement is to build the dune further down the shore line, the fence should be moved in stages down the shore to the point where the dunes will have enough space to accrete to the critical height and not overspill frequently on to the road.
Fencing would not be the traditional chestnut paling style, but using plain wire and geotextile membrane that will biodegrade. Accretion can also be accelerated by putting brushwood in the new dune area.

The newly accreted dunes should be supported with assisted vegetation cover (marram planting) periodically to hold the sand. (see figures below). This will help to stop the dune migrating landward and causing the same problem.

As well as the fence being shifted down the beach in stages, it could be done in stages along the beach starting in the northern half where sand blow is at its worst.

Challenges:

Access to the beach: The Swansea scheme allowed breaks through new dune for access. The images show that these, where the sand has not accreted will work as blow outs and pass sand onto the road. Various track mechanisms can be sued to traverse the dunes.

At the mid-point of the beach the meander of the Torridge comes closest to the highwater mark at Marine Parade. This may not be a long enough foreshore to allow stable dune accretion. Since sand is accreting in this location, it can be assumed that the slope (and length) are not yet at the maximum for their location. However, it must be acknowledged that the meander location and the length of shore will alter as sea level rise and increased riverine inputs change with the climate.

Wave run up and the wave return wall at Marine Court. The building at the south end of the beach has a wave return wall. There are concerns that the accretion permits wave run up and therefore over-topping of the wave return wall. The risk is certainly true whilst the sand approaches the height of the wall. Once the dune exceeds the wall height, the wave run up issue will not be such a problem. The rate of dune building will need to be determined if the length of risk exposure is acceptable.

Lane End
The underground channel at Lane End will probably remain permanently blocked at its exit.

Surface water drainage
Keeping the gap and path in the beach between the dunes and the wall should provide space for the water and percolate into the sand.

Maintaining dune integrity:
The dunes should be managed to remain vegetated as much as possible to prevent blow out and dune migration.

Phasing the project
The dunes will grow from north to south and therefore the training can be done in phases. The caution to this approach is about storms outflanking the dunes and causing flooding behind the dune for a longer period.

Ongoing Sand overspill removal costs;
Until the system stabilises along the entire beach, there will be some sand incursion on to the Highway. There sand has been treated as contaminated and therefore sent to landfill in the recent past. It should be contested about the contamination and the suitable location for disposal to reduce the costs of the ongoing maintenance.

Costs: NB These are ball park figures only

Total Beach scheme

Beach length is 580m approximately
2 lengths of fencing @£12/m £13920
Sand movement in Phase 1 £4000

Annual sand movement from road until stable; £5000 per annum for 5 years= £25000
Additional stage fence movement: 4 stages; £6960 per stage carried out each year or 2 years pending accretion rate.

Total Scheme over 10 years; £70760

Phased Option: Applied over 3 years

150 m of beach in phase 1

£3600 of front and back fencing
Y1 Sand movement £4000
Y2 Sand movement £5000
Monitoring £1000

Total Phase 1; £13600

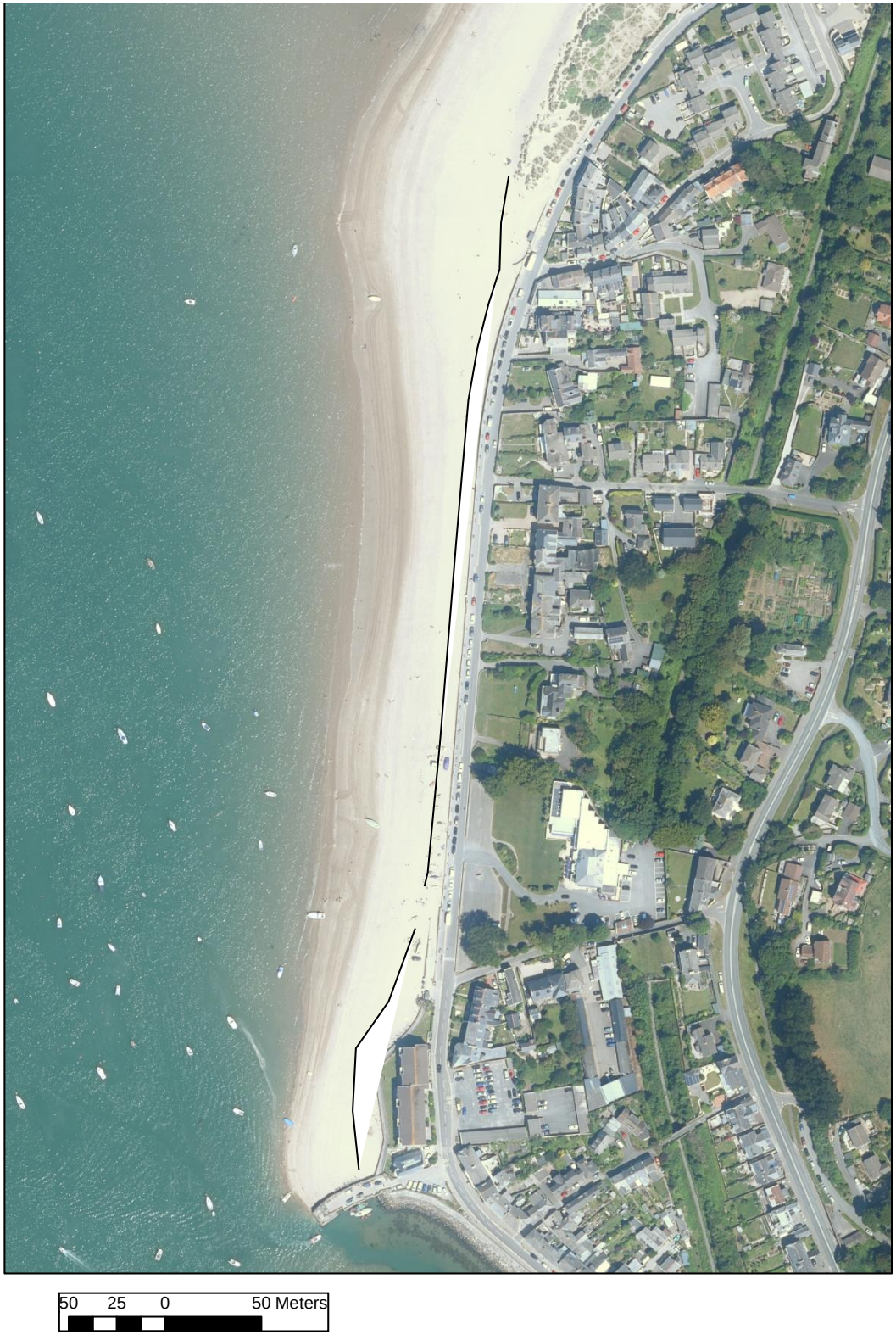


Figure 1 Location of dune training

Generalised approach to training the dunes to grow along the beach and seaward

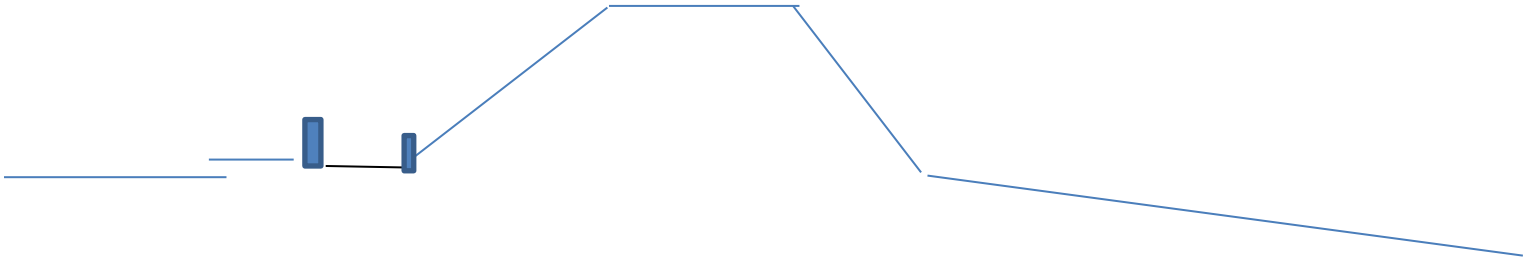


Figure End state desired

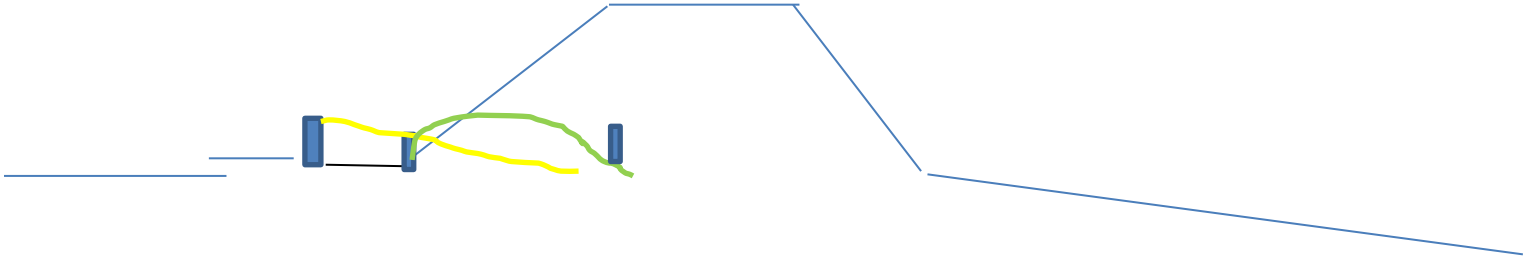


Figure Stage 1 Put in back fence and front at 1 m above MHWST. Move sand from between wall and fence to inside the back fence.

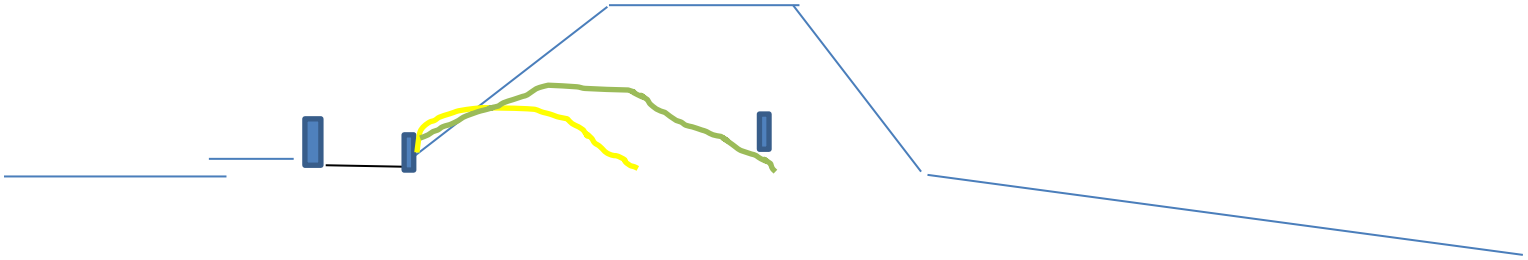


Figure Stage 2 Move the fence out as the dune and foreshore accrete. Staying at 1 m above MHWST

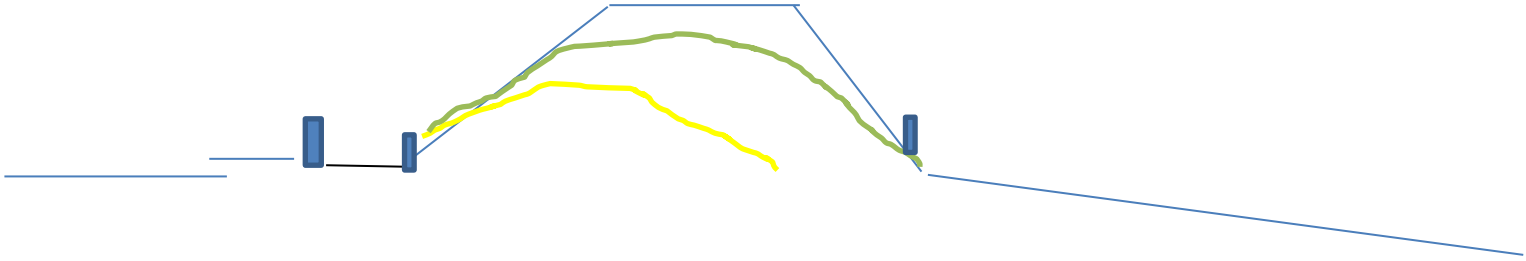


Figure Stage 3 Continue to move the fence out as the dune and foreshore accrete. Staying at 1 m above MHWST until dune critical height is reached. Max height will be no higher than the current dunes to the north (c 10 m).

Figure: Primary Channel (blue) and secondary flood channel (green) locations in relation to beach. Maintaining a critical foreshore length will be important