Technical soil challenges for trees in urban environments

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Introduction

- Compaction
- Drainage
- Geotextiles
- Land remediation

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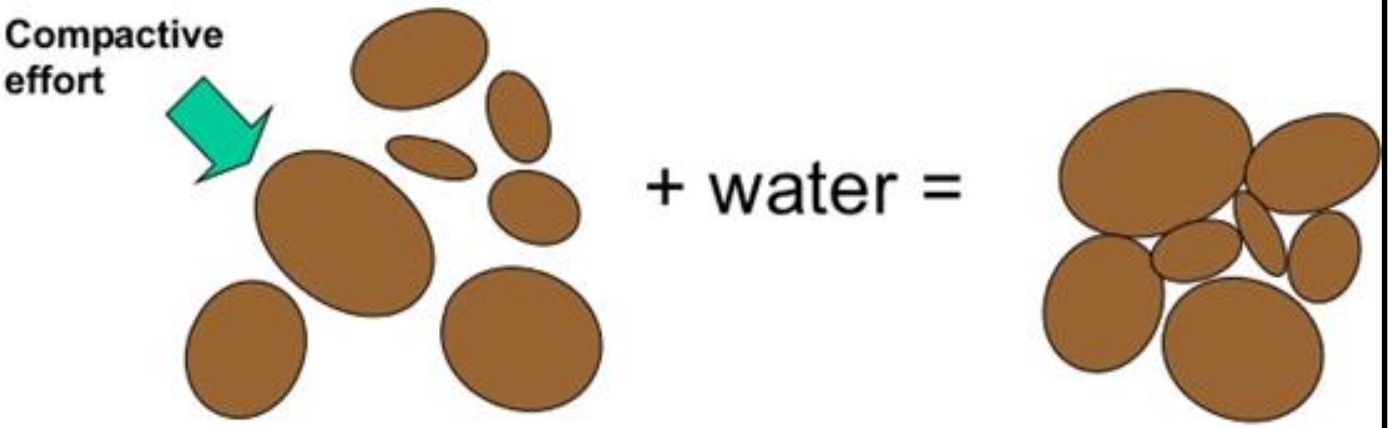
A civil engineering definition

What is compaction?

A simple ground improvement technique, where the soil is densified through external compactive effort.

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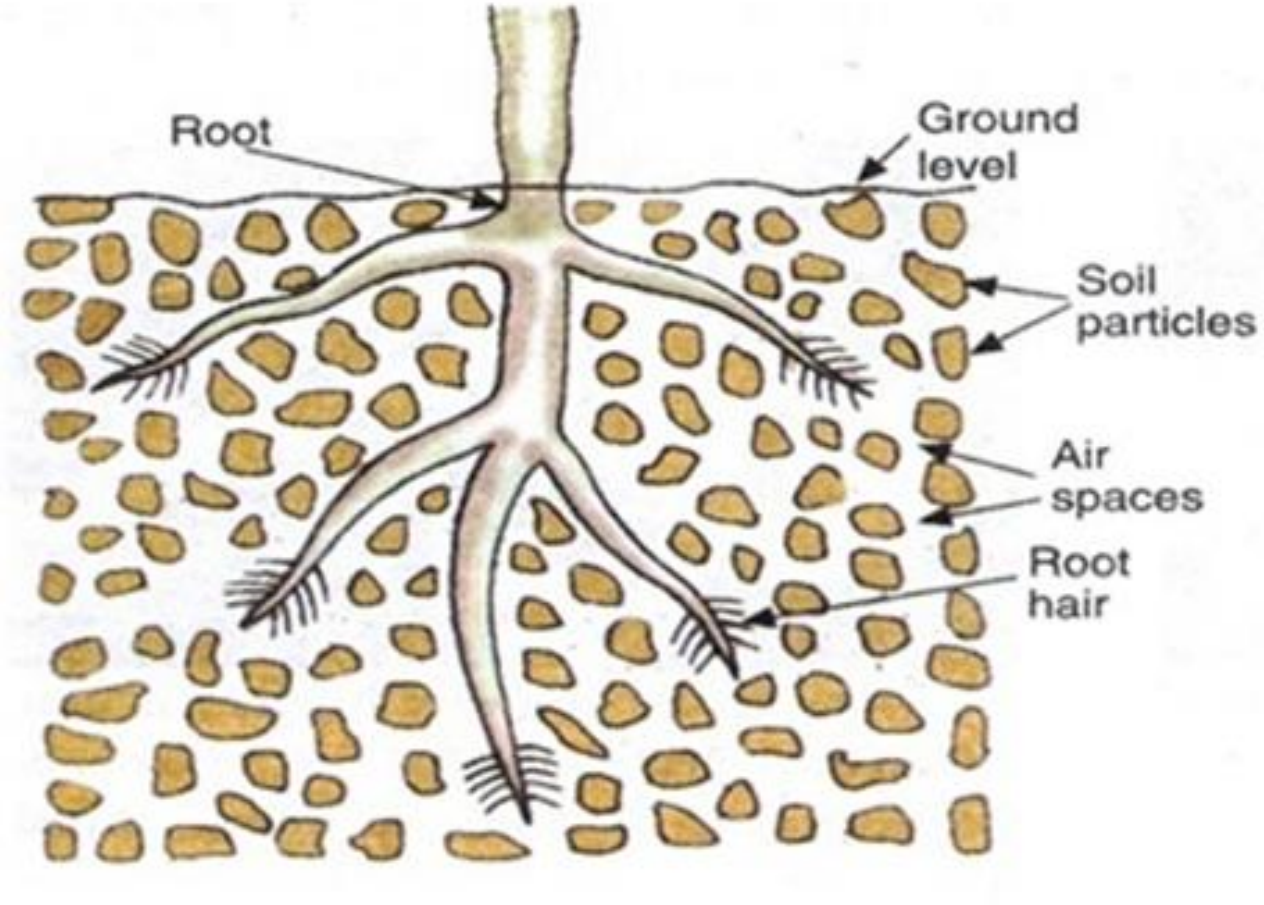
Soil requirements for root function

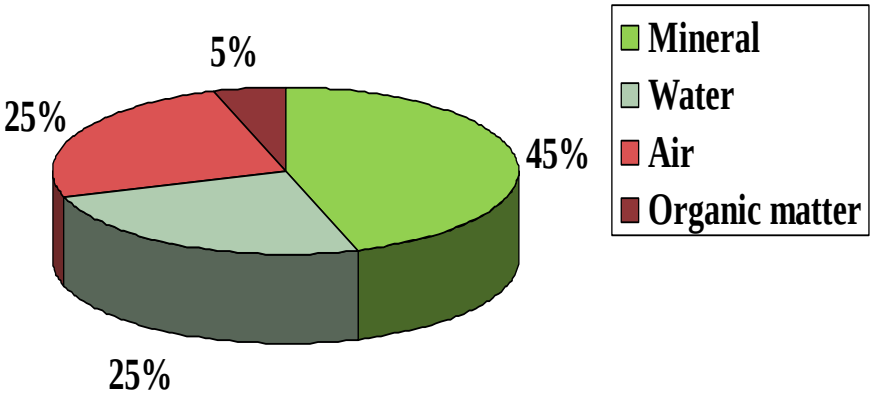


Essential Soil Properties

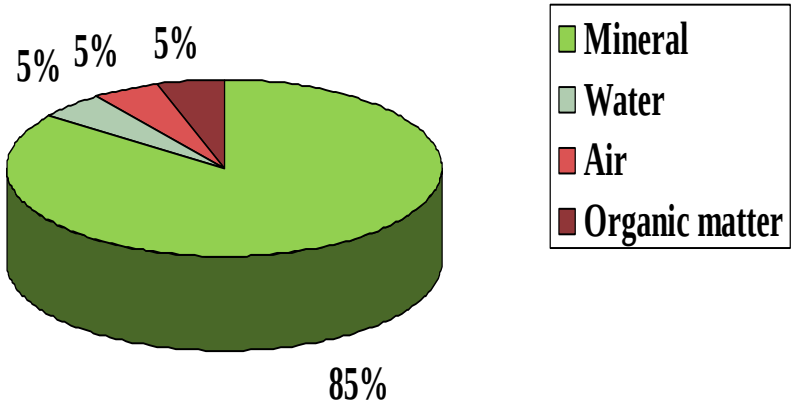
- **Aeration**
- **Drainage**
- **Support**
- **Water storage**
- Plant nutrients
- **Soil fauna (macro & micro)**

All reliant on the soil NOT being too COMPACTED

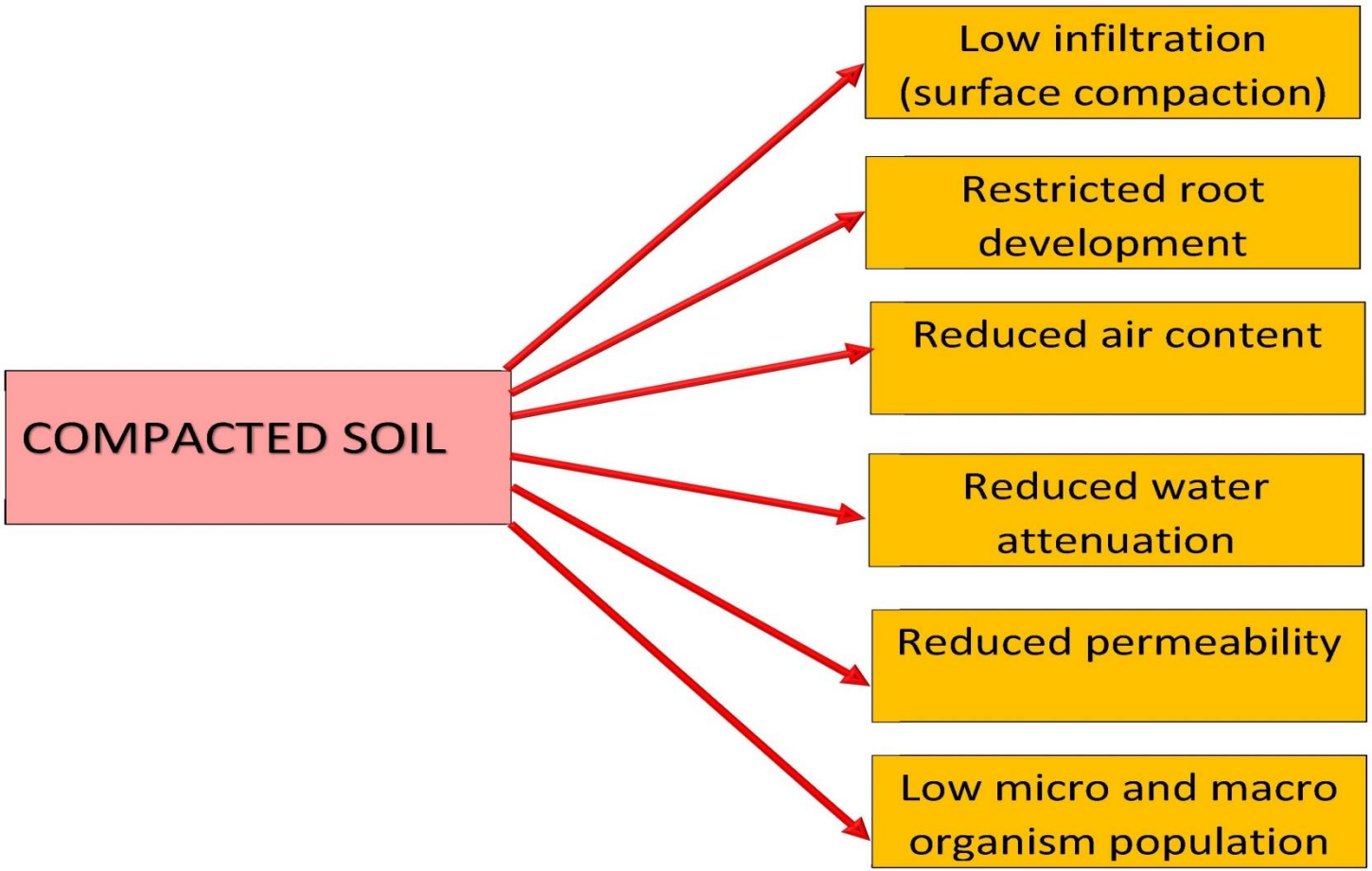
Uncompacted Soil



Compacted Soil



The consequences of soil compaction …



The causes of soil compaction

The obvious ones …….

- Soil excavation & stockpiling
- Vehicle trafficking
- Site compounds
- Storage of materials
- Piling mats

Methods for de-compacting soil

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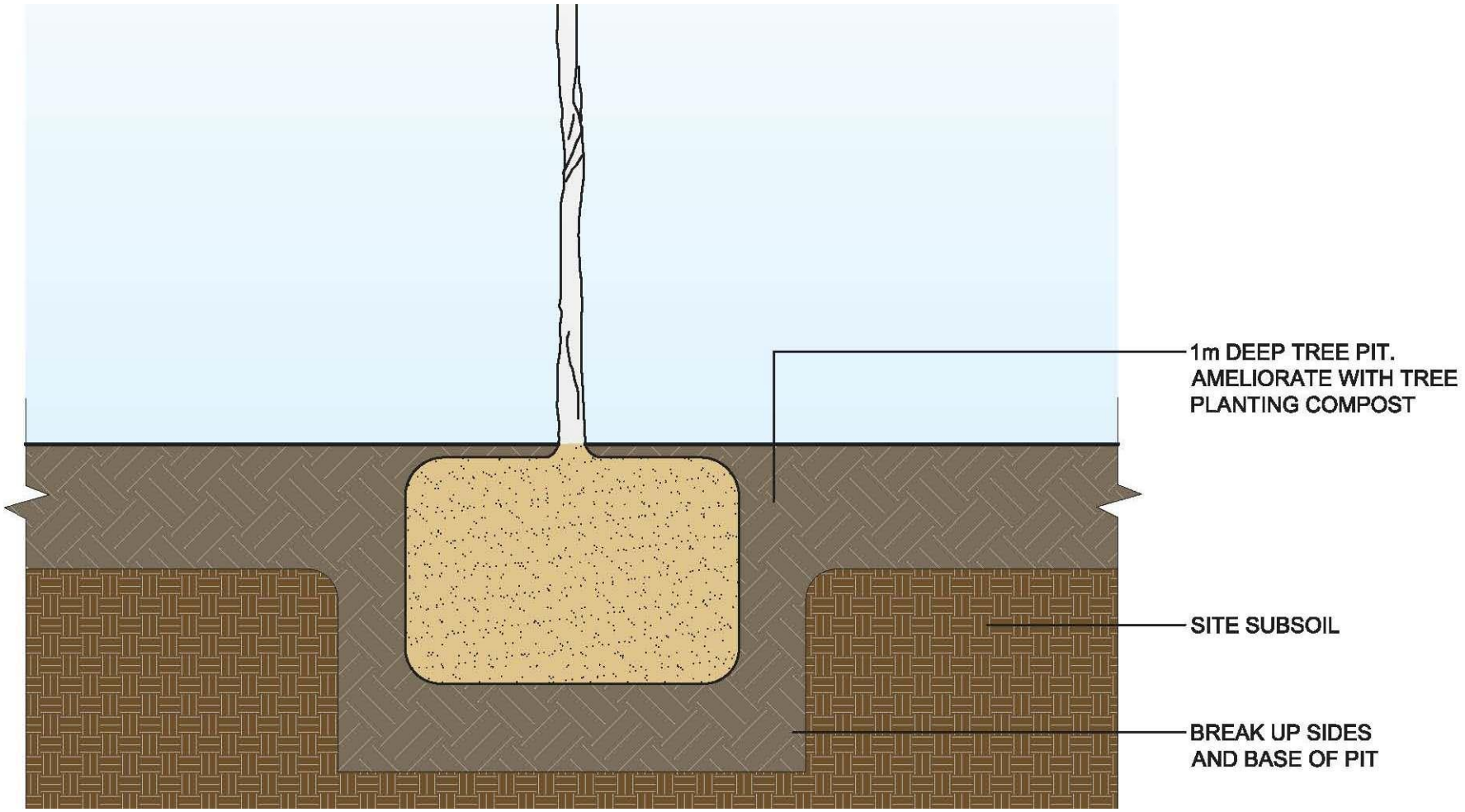
The causes of soil compaction

The less obvious ones …….

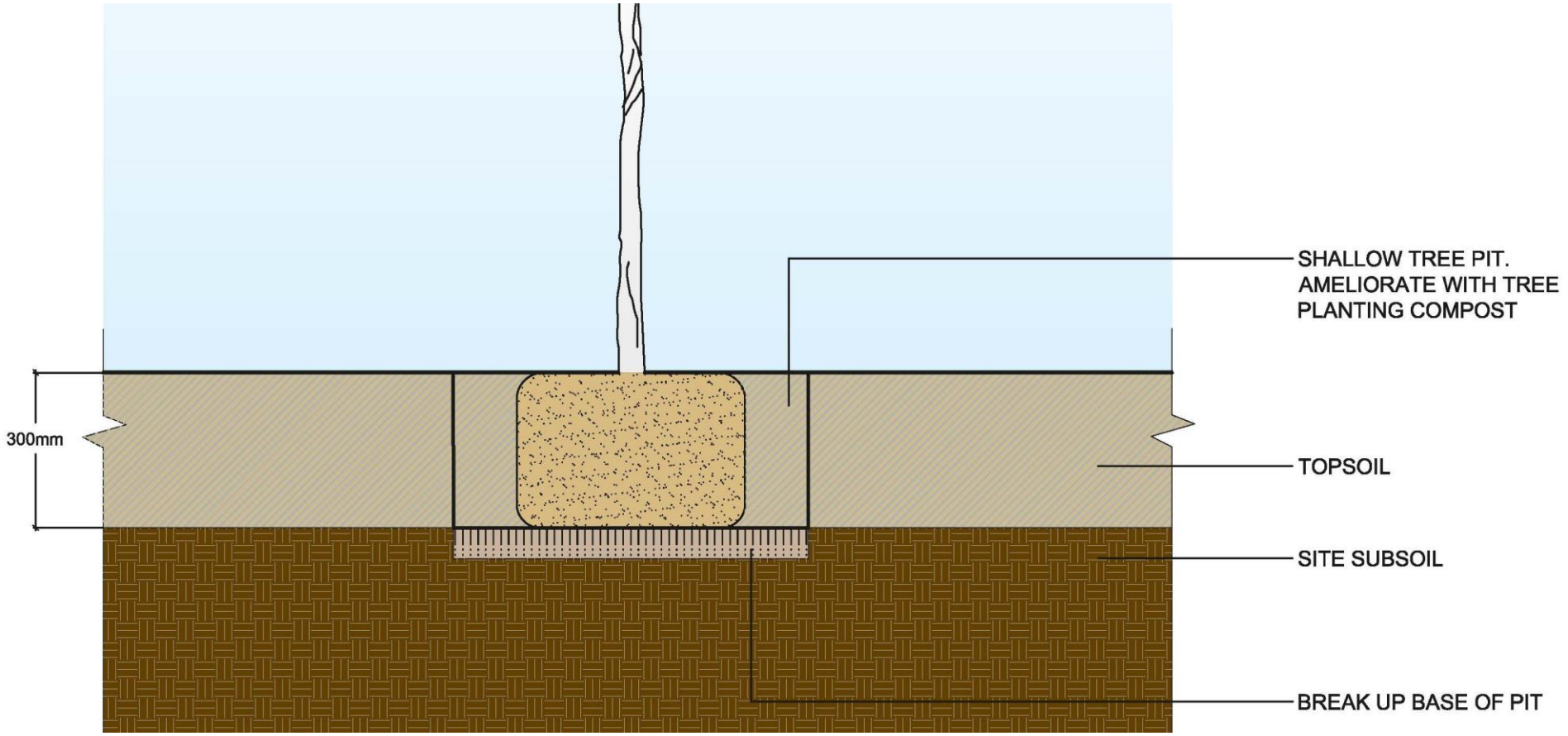
- Excessive topsoil depths
- Self-compaction
- Tree rootballs

Common (and incorrect) Tree Pit Detail

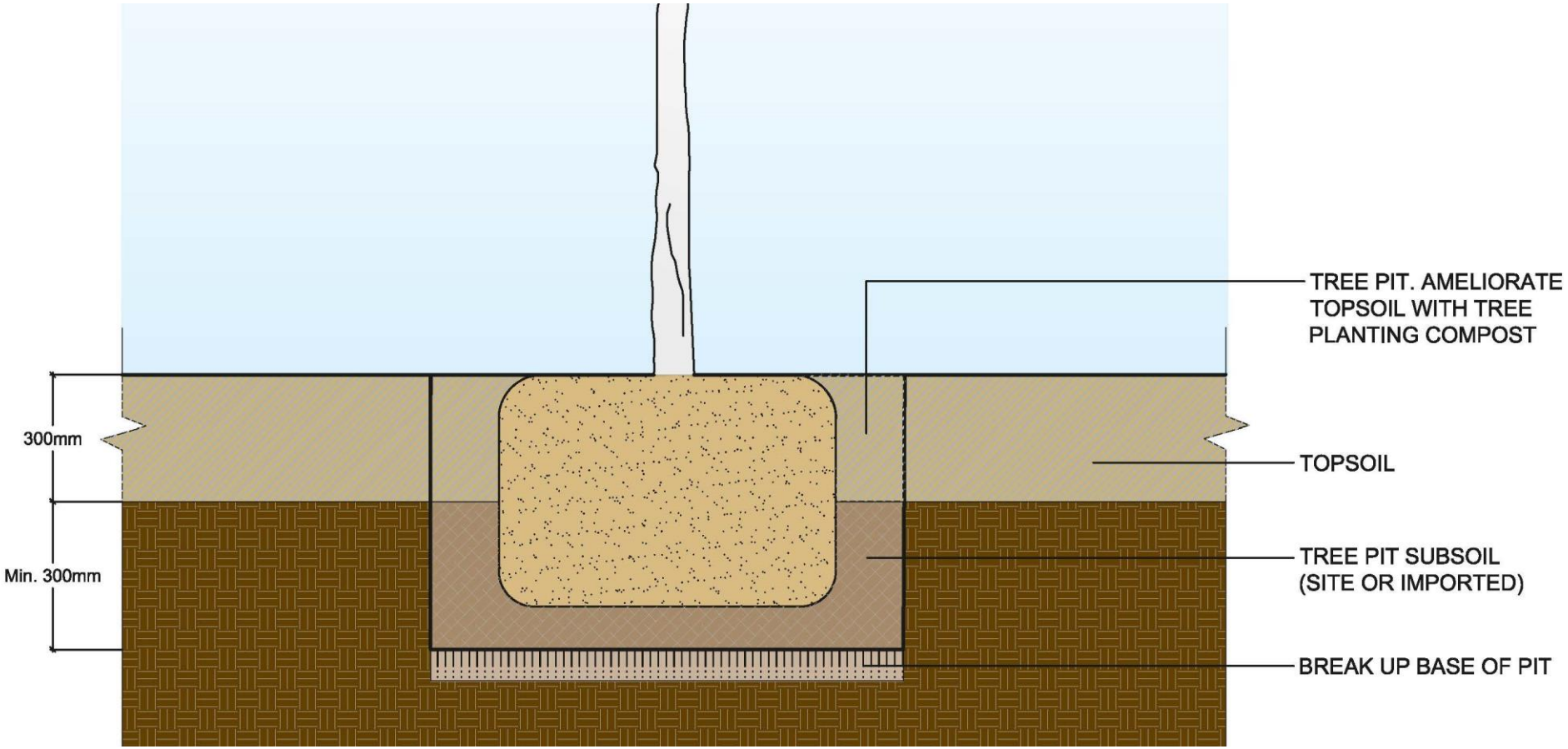


Resultant soil conditions – compaction! anaerobism!

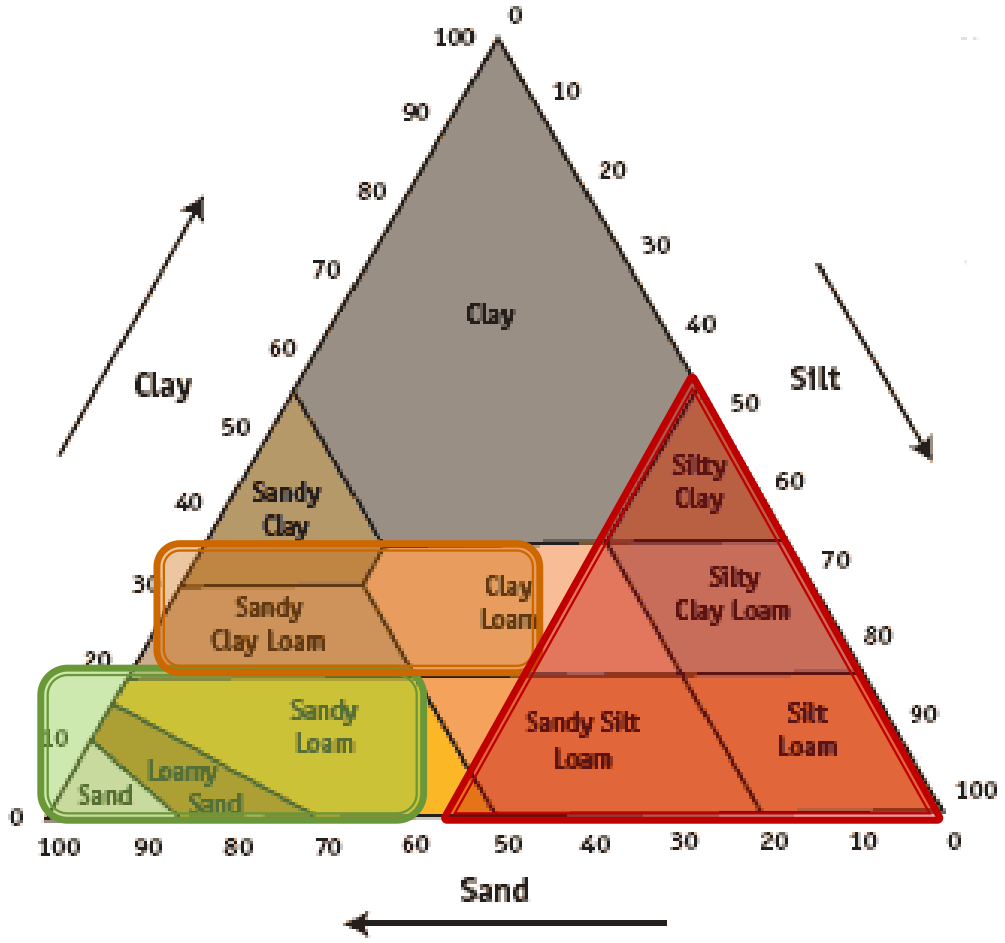
Correct Tree Pit Soil Profile – small trees



Correct Tree Pit Soil Profile – larger trees



Compaction resistant soils



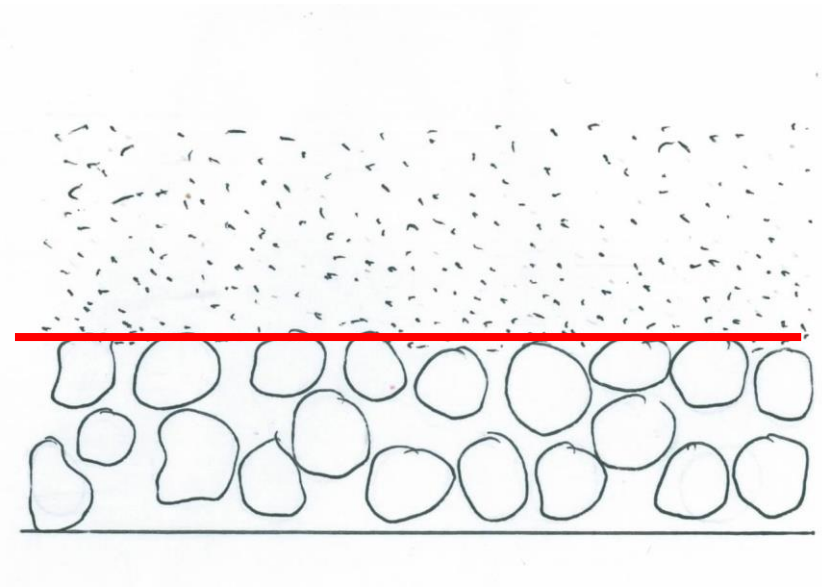
Tree Pit Drainage

- Poor soil drainage is a major cause of failures in new tree planting
- Tree Pit ‘sumps’
- Must assess water inputs (hydrology, climate) and drainage potential of the ground as part of the design process.

  Not when the project is at the construction phase.

Geotextile membranes

Widely used to separate soil and granular materials to maintain the integrity of the drainage layer by keeping the soil out of it



Soil

Granular drainage layer

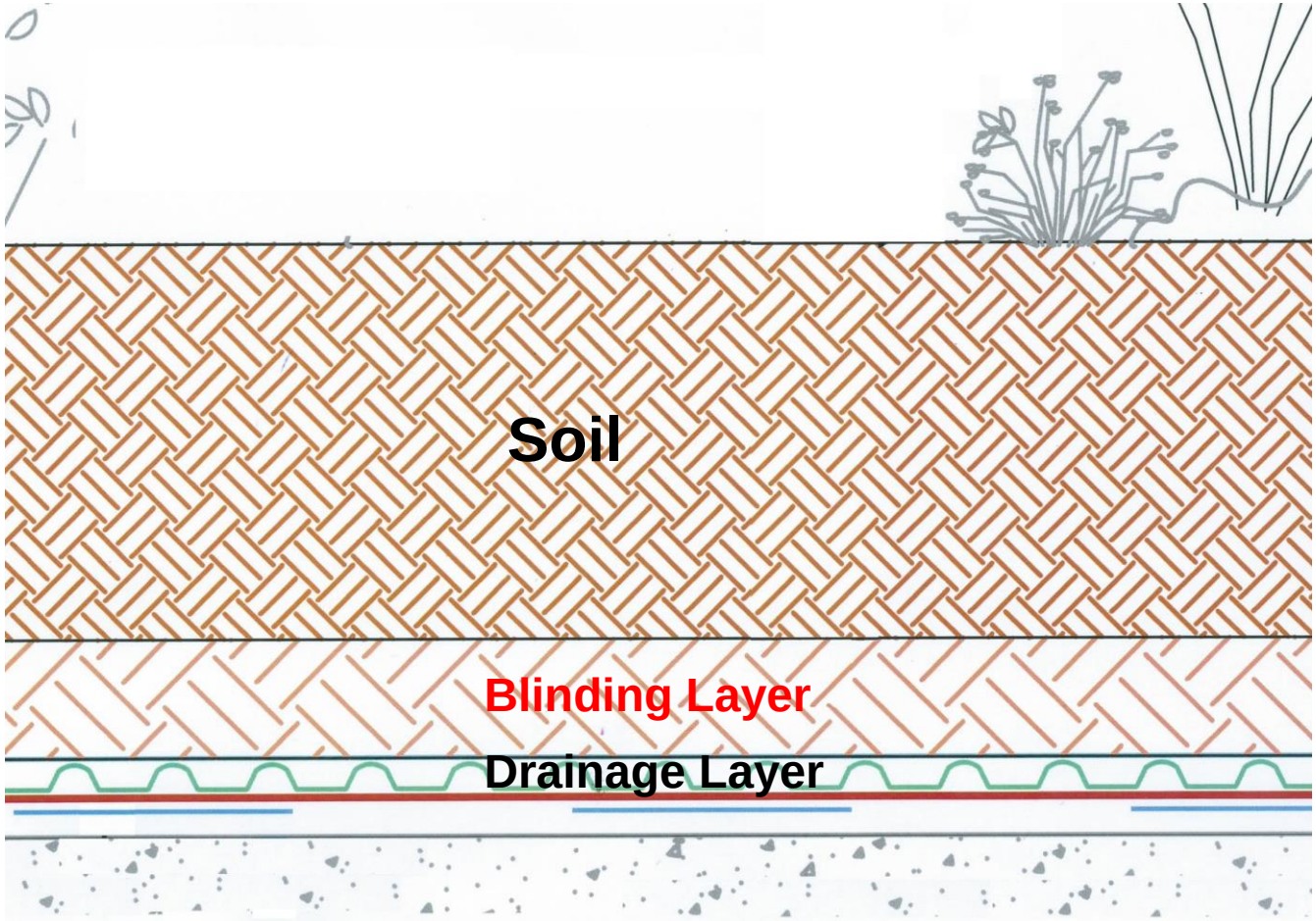
Geotextile membrane

- The construction industry has a love for geotextiles and these are the first choice by most engineers.
- However, geotextiles are not widely used by the sports turf / golf industry.
- **Why? ……**

Geotextile membrane

…. Because they block up and become impermeable!

Blinding Layer



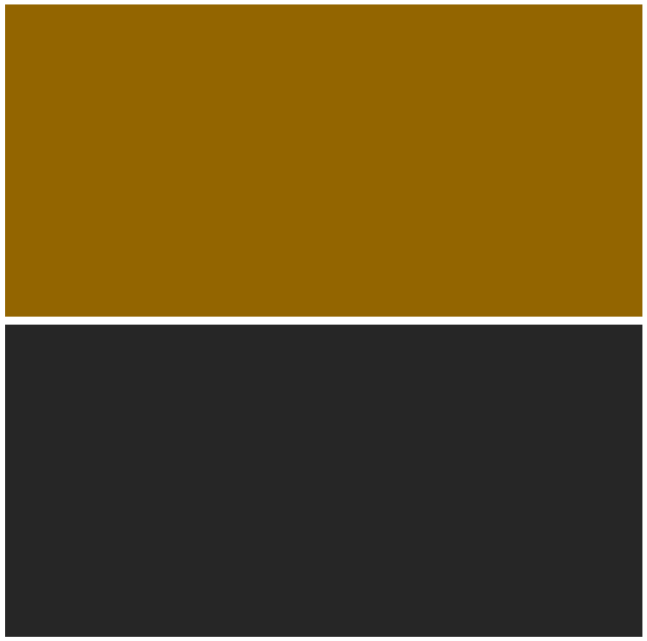
Land Remediation Strategies

1. Cover Systems
2. Marker Layers

What is a Cover System?

"A physical remediation treatment that provides sufficient clean cover over contaminated land to break the link (pathway) between the contaminant (source) and ***humans and animals*** *(receptor)."*

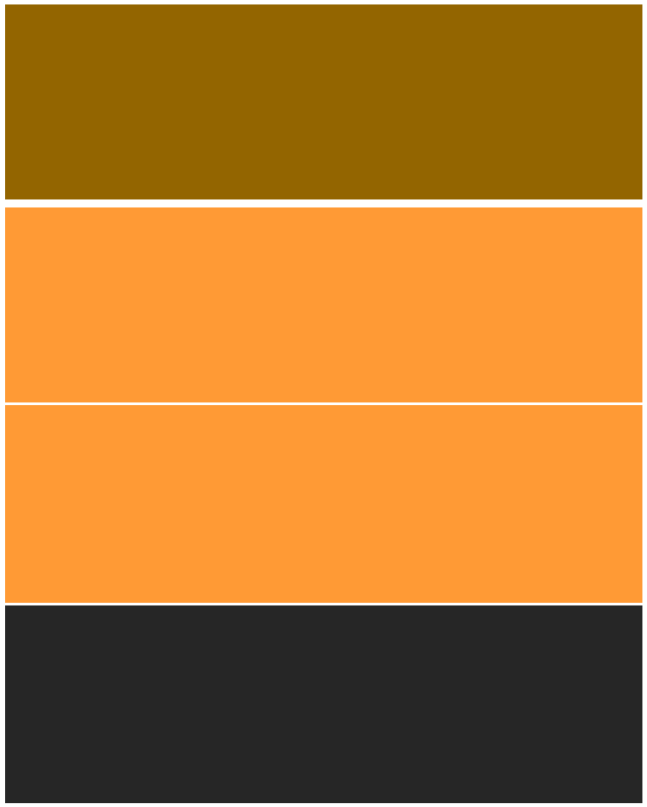
Typical Cover System



300mm Topsoil

Contaminated ground
(compacted)

Typical Cover System



150mm Topsoil

300mm ‘Clean’ Clay (compacted)

Contaminated ground (compacted)

Cover System Design

- There must be better collaboration amongst the designers and regulators
  - environmental consultant
  - civil engineer
  - landscape architect
  - arboricultural consultant
  - soil scientist
  - Local Authority (tree officer, contaminated land officer, etc)

- **Cover Thickness** and **Soil Type** must also consider plants and the site's hydrology (water attenuation and drainage)

Marker Layer

Marker Layer

Thank you for your time

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