

# Sydney Environmental & Soil Laboratory

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## Soil Landscape Rehabilitation - An Example

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## Soil Landscape Rehabilitation: An Example

To function properly within the cultural and environmental context of an urbanised landscape careful thought must be given to the soil profile, the basis of your landscape rehabilitation. A soil is not an inert thing it has a profile form (a series of ordered soil horizons) which is in equilibrium with the climate, geology, and natural and cultural processes at work on the surface (vegetation and animals). A landscape rehabilitation must start with consideration of the soil landscape.

I know of no better example of successful consideration of the multiplicity of factors that go into choosing and reconstructing a soil type than the reconstructed facsimile podsol profiles used at the Millennium Parklands site in Sydney's Olympic Park. The reburial of waste from old landfills, and the exposure of large areas of poor quality clayey fill left very sizeable landscape areas without a topsoil layer. Planting into this low quality clayey fill had given significant problems and failures previously. A severe shortfall (about 250,000 tonnes) in available topsoil from the stripping of the Newington Village site left Waste Services and the Olympic Coordination Authority with no choice but to look at waste soil fill materials for the reconstruction of a workable profile. The cost both economic and environmental of importing quality commercial topsoil in such quantities rendered this option impossible.

Happily the most commonly available waste fill at this time in Sydney was crushed sandstone from various construction jobs throughout the city. These materials are usually quite sandy (and hence compaction resistant in a heavily used park), very cheaply obtained, and when the suggestion was made by Waste Services, the possibility of reconstructing a soil profile which would function in the same way as the indigenous Blacktown and Newington podsol profiles of the area became immediately obvious and was fully supported by me.

The podsol profile form has a sandier A horizon overlying a usually clayey B horizon subsoil. It is in equilibrium with a climate where long dry periods can be followed by intense rain. The sandy A horizon admits water rapidly reducing erosion and runoff hazards, is more compaction resistant than the clayey B horizon and provides better pore space for root growth than the subsoil below. The chemical poverty of crushed sandstone could be overcome with judicious amounts of fertiliser (we do not want to encourage weeds with excessive fertility) and composted green waste materials which are cheap and abundant. One precaution was that only the less clayey sandstone materials could be used. We specified that the clay plus silt content should not be higher than 10% or the material would compact and hardset.

The advantages of the suggestion were-

- Significantly lower cost of using waste materials, the soil landscape is 100% recycled waste
- The avoidance of exploitative soil mining

A profile form to which the indigenous vegetation is adapted

- Good compaction resistance, compaction being the enemy of all urbanised vegetation
- The fascinating possibility of kickstarting a soil landscape which is already largely in equilibrium with its environment

The full story of this reconstruction can be obtained in the references cited some of which can only be obtained from the OCA. Figure 1 illustrates the primary profile form for the grassland areas, the only difference for the forested areas being that the A horizons are deeper. Figure 2 shows the generalised soil/vegetation concept for the landfill reburials.

While working on the Millennium Parklands Concept Design team I was also anxious to get across the concept of horizontal anisotropy, that is to say, that soils differ not only as we go down the profile but also as we go downhill. Put simply, the topsoil depth is greater at the bottom of a hill thus allowing a higher status vegetation community to function. At the top of

the hill the soil is shallow and the vegetation accordingly stunted. This is the natural order of things in any vegetation community.

Given scarce resources it was thus logical to place shallower topsoil layers at the top of the hill, where native grassland mimicking the predevelopment landscape of Homebush was to be used, saving soil volumes to provide a deeper profile at the bottom of the hills where a tree and shrub landscape was wanted. This allowed the designers to mimic the natural vegetation succession that would occur in a denuded landscape, and was essential to the "rooms with walls" concept which is the central idea of the Concept Plan. The vegetation then could naturally "clothe" the hills, tall status Blue Gum and riparian vegetation at the bottom, lower status multi-trunked trees and shrubs half way up and grassland leaving glorious views but a naturalistic association at the top of the hills. See *Down to Earth, Landscape Australia 4-1998* for an explanation of the vegetation/soil associations of Homebush.

These profiles were established on the waste reburial mounds and on the Olympic Markers. On the Markers an erosion resistant topsoil was critically important on the 1:3 batters used. They were not used in riparian corridors where compaction does not occur, straight subsoil clay being quite suitable for hydromorphic vegetation. Initial results are outstandingly successful with phenomenal growth of nearly all plant material. Growth rates appear at this stage to be limited by our reluctance to use much fertiliser but it does leave us the freedom to manage the chemical fertility carefully and slowly up to the desired level.

Reconstruction of a landscape starts with the soil and its ecological function will be improved by considering the natural soil profiles of the area which are highly ordered and in equilibrium with the natural order. The new soil landscape must be replaced in a similar order if it is to support a low maintenance landscape able to support a fully functioning urban ecosystem. The Millennium Parklands is an outstanding example of how to do this well and anyone interested in such total reconstruction sites would do well to study the example carefully. I have the relevant excerpts from the literature below if anyone is interested.

### **Further Reading**

Chapman, G. A. and Murphy, C.L. (1989), *Soil Landscapes of the Sydney 1:100,000 sheet*. Soil Conservation Service of NSW., Sydney.

Leake, S.W. and A. Todd. (1996) *Soil Conditions: Newington South Olympic Village Site*. Olympic Coordination Authority.

Leake, S.W. (1997) *Reconstruction of Soil Profiles; Natural and Anthropogenic in Millennium Park*. Produced for Olympic Coordination Authority.

HASSELL Pty. Ltd. (1997) *Millennium Parklands Concept Design Plan*. Report Prepared for Olympic Co-ordination Authority.

Figure 1. Reconstructed Soil Profile:  
Grassland

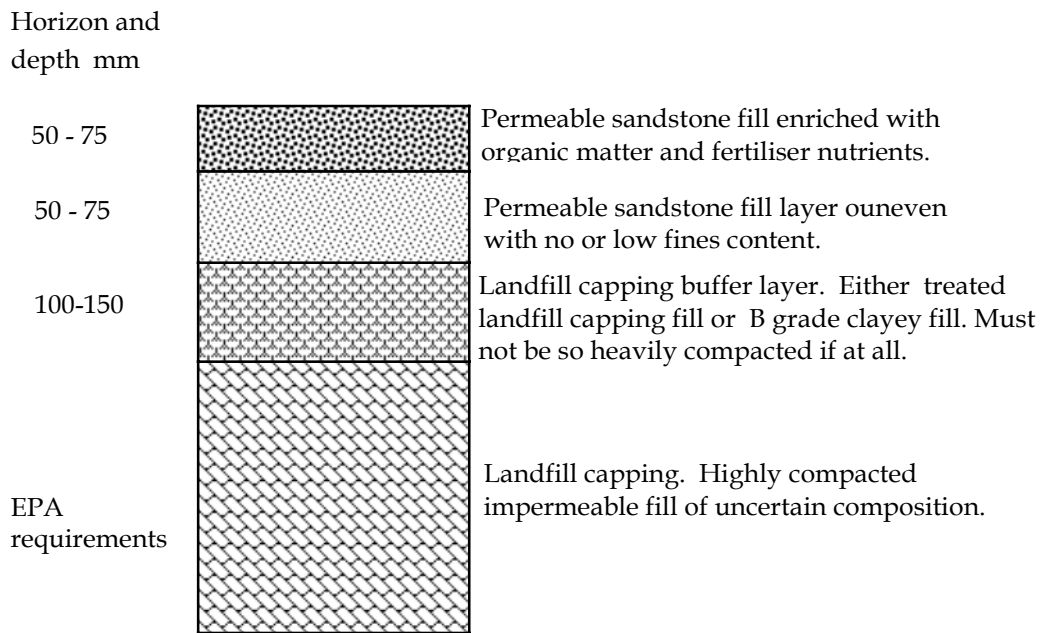


Figure 2. Typical Naturalistic Soil and Planting Sequence.  
(Source: Millennium Parklands Concept Design Plan)