## CLAIMS

1. An engineered soil composition comprising:

a natural occurring soil component in an amount ranging from 30 wt% to 60 wt% of the total dry weight of the composition;

a sand component in an amount ranging from 25 wt% to 55 wt% of the total dry weight of the composition; and

a waste component capable of adsorbing dissolved phosphates, the waste component present in an amount of more than 0 wt% and no more than 15 wt% of the total dry weight of the composition,

wherein a total amount of clay and silt derived from the natural occurring soil component is in an amount of more than 0 wt% and no more than 15 wt% of the total dry weight of the composition and

wherein the engineered soil composition has a hydraulic conductivity in a range from 50 mm/hr to 450 mm/hr.

2. The engineered soil composition of claim 1, wherein the engineered soil composition is a substantially homogeneous mixture of the natural occurring soil component, the sand component, and the waste component.

3. The engineered soil composition of any one of claims 1 or 2, wherein the waste component comprises water treatment residues.

~~4. The engineered soil composition of any one of claims 1 to 3, wherein the engineered soil composition has a hydraulic conductivity of no less than 20 mm/hr.~~

~~5. The engineered soil composition of any one of claims 1 to 3, wherein the engineered soil composition has a hydraulic conductivity in a range from 50 mm/hr to 450 mm/hr.~~

~~6.~~4. The engineered soil composition of any one of claims 1 to 3, wherein the engineered soil composition has a hydraulic conductivity in a range from 50 mm/hr to 200 mm/hr.

~~7.~~5. The engineered soil composition of any one of claims 1 to 3, wherein the engineered soil composition has a hydraulic conductivity in a range from 200 mm/hr to 400 mm/hr.

~~8.~~6. The engineered soil composition of any one of claims 1 to ~~7~~5, wherein the engineered soil composition has a pH level in a range from 5.5 to 8.5.

~~9.~~7. The engineered soil composition of any one of claims 1 to ~~8~~6, wherein the engineered soil composition has an electrical conductivity of no less than 0.1 mS/cm and not more than 0.3 mS/cm.

~~10.~~8. The engineered soil composition of any one of claims 1 to ~~9~~7, wherein the clay, or the silt or both have a particle size distribution of no more than 0.075 mm.

~~11.~~9. The engineered soil composition of any one of claims 1 to ~~10~~8, further comprising an organic carbon-containing component that is different from the natural occurring soil component, the organic carbon-containing component being present in an amount of more than 0 wt% and no more than 35 wt% of the total dry weight of the composition.

~~12.~~10. The engineered soil composition of claim ~~11~~9, wherein the organic carbon-containing component comprises a plant-based compost.

~~13.~~11. The engineered soil composition of claim ~~12~~10, wherein the plant-based compost is selected from the group consisting of coconut fibres, palm fibres, rice husk, jute fibres, wood chips and mixtures thereof.

~~14.~~12. The engineered soil composition of any one of claims 1 to ~~13~~11, wherein each of the components is derived from a different source.

~~15.~~13. The engineered soil composition of any one of claims 1 to ~~14~~12, wherein the natural occurring soil component is derived from a top layer of soil that is no more than 1.5 m from ground.

~~16.~~14. The engineered soil composition of any one of claims 1 to ~~15~~13, wherein the natural occurring soil component is derived from a site at which the engineered soil composition is to be used.

~~17.~~15. The engineered soil composition of any one of claims 1 to ~~16~~14, wherein the sand component comprises sand particles having a particle size distribution in a range from 0.2 mm to 0.6 mm.

~~18.~~16. The engineered soil composition of any one of claims 1 to ~~17~~15, wherein the sand component comprises sand particles that have been pre-washed and cleaned.

~~19.~~17. The engineered soil composition of any one of claims 1 to ~~18~~16, wherein the waste component is derived from a water treatment plant.

~~20.~~18. The engineered soil composition of any one of claims 1 to ~~19~~17, wherein the waste component comprises particles having grain sizes in a range from 0.10 mm to 1.20 mm.

~~21.~~19. The engineered soil composition of any one of claims 1 to ~~20~~18, wherein the engineered soil composition is capable of supporting growth of one or more plant species.

~~22.~~20. The engineered soil composition of claim ~~21~~19, wherein the one or more plant species is selected from the group consisting of *Clerodendrum*

*inerme*, *Cordyline fruticosa*, *Codiaeum variegatum*, *Iris domestica*, *Iris domestica*, *Murraya paniculata*, *Ophiopogon jaburan*, *Premna serratifolia*, *Sanchezia oblonga*, *Scaevola taccada*, *Sphagneticola trilobata*, *Sphagneticola trilobata*, *Syzygium myrtifolium*, *Tarenna odorata* and *Trimezia steyermarkii*.

~~23.~~21. The engineered soil composition of any one of claims 1 to ~~22~~20, wherein the engineered soil composition is capable of supporting growth of one or more plant species such that the plant stress Fv/Fm ratio of the one or more plant species during growth is from 0.79 to 0.84.

~~24.~~22. The engineered soil composition of any one of claims 1 to ~~23~~21, wherein the engineered soil composition is capable of supporting growth of one or more plant species such that the chlorophyll content SPAD value index of the one or more plant species during growth indicates healthy plant growth.

~~25.~~23. The engineered soil composition of any one of claims 1 to ~~24~~22, wherein the engineered soil composition is capable of removing no less than 80% of Total Suspended Solids (TSS) from a TSS-containing influent water stream passing through the engineered soil composition.

~~26.~~24. The engineered soil composition of any one of claims 1 to ~~25~~23, wherein the engineered soil composition is capable of removing no less than 45% of Total Nitrogen (TN) from a TN-containing influent water stream passing through the engineered soil composition.

~~27.~~25. The engineered soil composition of any one of claims 1 to ~~26~~24, wherein the engineered soil composition is capable of removing no less than 45% of Total Phosphorus (TP) from a TP-containing influent water stream passing through the engineered soil composition.

~~28.~~26. An engineered soil composition consisting essentially of:

a natural occurring soil component in an amount ranging from 35 wt% to 55 wt% of the total dry weight of the composition;

a sand component in an amount ranging from 30 wt% to 50 wt% of the total dry weight of the composition;

a water treatment residue component in an amount of more than 0 wt% and less than 10 wt% of the total dry weight of the composition; and

an organic carbon-containing component in an amount of more than 0 wt% and less than 10 wt% of the total dry weight of the composition,

wherein a total amount of clay and silt derived from the natural occurring soil component is in an amount of more than 0 wt% and no more than 10 wt% of the total dry weight of the composition, and

wherein the engineered soil composition has a hydraulic conductivity in a range of from 50 mm/hr to 450 mm/hr.

~~29.~~27. A method of preparing an engineered soil composition of any one of claims 1 to ~~28~~26, the method comprising:

determining a desired hydraulic conductivity range for the engineered soil composition to be obtained that is at or within a range from 50 mm/hr to 450 mm/hr;

obtaining an amount of natural occurring soil from a source;

determining a measure of silt and/or clay present in the amount of natural occurring soil from the source;

based on the determined measure of silt and/or clay, mixing the natural occurring soil obtained from the source in an amount ranging from 30 wt% to 60 wt% of the total dry weight of the composition with, a sand component in an amount ranging from 30 wt% to 50 wt% of the total dry weight of the composition, and with a waste component in an amount of more than 0 wt% and no more than 15 wt% of the total dry weight of the composition, the waste component being capable of adsorbing dissolved phosphates, to form the engineered soil composition, such that the total amount of clay and silt derived from the natural occurring soil is in an

amount of more than 0 wt% and no more than 15 wt% of the total dry weight of the engineered soil composition and wherein the engineered soil composition has a hydraulic conductivity value ~~within the desired hydraulic conductivity range~~that is at or within a range from 50 mm/hr to 450 mm/hr.

~~30.~~28. The method of claim ~~29~~27, wherein the engineered soil composition obtained from the mixing step is a substantially homogeneous mixture of the natural occurring soil, the sand component, and the waste component.

~~31.~~29. The method of claim ~~29 27~~ or ~~30~~29, wherein the step of mixing the natural occurring soil with the sand component and the waste component further comprises mixing the natural occurring soil, the sand component and the waste component with an organic carbon-containing component in an amount of more than 0 wt% and no more than 35 wt% of the total dry weight of the composition.

~~32.~~30. The method of claim ~~31~~29, wherein the organic carbon-containing component comprises a plant-based compost.

~~33.~~31. The method of claim ~~32~~30, wherein the plant-based compost is selected from the group consisting of coconut fibres, palm fibres, rice husk, jute fibres, wood chips and mixtures thereof.

~~34. The method of any one of claims 29 to 33, wherein the desired hydraulic conductivity range is at or within a range from 50 mm/hr to 450 mm/hr.~~

~~35.~~32. The method of any one of claims ~~29 27~~ to ~~34~~31, further comprising prior to the mixing step, the step of determining a desired pH range for the engineered soil composition to be obtained such that the mixing step forms the engineered soil composition having a pH value within the desired pH range.

~~36.~~33. The method of claim ~~35~~32, wherein the desired pH range is at or within a range from 5.5 to 8.5.

~~37.~~34. The method of any one of claims ~~29-~~22 to ~~36~~33, further comprising the step of determining a desired electrical conductivity limit for the engineered soil composition prior to the mixing step such that the mixing step forms the engineered soil composition having an electrical conductivity value not more than the desired electrical conductivity limit.

~~38.~~35. The method of claim ~~37~~34, wherein the desired electrical conductivity limit is 0.1 mS/cm.

~~39.~~36. The method of any one of claims ~~29-~~27 to ~~38~~35, wherein the step of determining the desired hydraulic conductivity range for the engineered soil composition to be obtained comprises determining at least one of a desired removal rate of Total Suspended Solids (TSS), a desired removal rate of Total Nitrogen (TN) or a desired removal rate of Total Phosphorus (TP) from an influent water stream passing through the engineered soil composition.

~~40.~~37. The method of any one of claims ~~29-~~27 to ~~39~~36, wherein the clay, or the silt or both have a particle size distribution of no more than 0.075 mm.

~~41.~~38. The method of any one of claims ~~29-~~27 to ~~40~~37, wherein the natural occurring soil is derived from a top layer of soil that is no more than 1.5 m from ground.

~~42.~~39. The method of any one of claims ~~29-~~27 to ~~41~~38, wherein the natural occurring soil is derived from a site at which the engineered soil composition is to be used.

~~43.~~40. The method of any one of claims ~~29~~ 27 to ~~42~~39, wherein the sand component comprises sand particles having a particle size distribution in a range from 0.2 mm to 0.6 mm.

~~44.~~41. The method of any one of claims ~~29~~ 27 to ~~43~~40, further comprising, prior to the mixing step, the steps of providing sand particles; and
washing and cleaning the sand particles to form the sand component.

~~45.~~42. The method of any one of claims ~~29~~ 27 to ~~44~~41, wherein the waste component comprises water treatment residues.

~~46.~~43. The method of any one claims ~~29~~ 27 to ~~45~~42, further comprising, prior to the mixing step, the steps of providing a waste material having particles therein; and
sieving the waste material to obtain the waste component having particle grain sizes in a range from 0.10 mm to 1.20 mm.

~~47.~~44. The method of claim ~~46~~43, further comprising, prior to the sieving step, the step of pulverizing the waste material.

~~48.~~45. A water treatment system for simultaneously supporting plant growth and filtering stormwater, the system comprising an engineered soil composition of any one of claims 1 to ~~28~~26.

~~49.~~46. The water treatment system of claim ~~48~~45, wherein the water treatment system is a bioretention system or a rain garden.