



**eSoTer Project**  
www.esoter.org

SoTerML: Soil and Terrain Markup Language

## **Annexe A:**

# **SoTerML Data Model Specification**

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## eSoTer

*Type:*

**Package**

*Package:*

Domain Model

*Detail:*

*Created on 04/08/2009. Last modified on 13/10/2009.*

*Notes:*

eSoTer is the main package for the sSoTer project. The *e-SOTER* project addresses the need for a global soil and terrain database.

Two sub-packages are SoTerML which represents the classes for defining the markup language, and SoilClassification which is designed to handle classes for different soil classification, in particular WRB 2006/2007 and FAO1998..

## SoTerML

**Type:** **Package**  
**Package:** eSoTer  
**Detail:** Created on 02/07/2009. Last modified on 13/10/2009.  
**Notes:** SoTerML package is a placeholder for the classes necessary in order to build the markup language. SoTerML will be used to exchange (and potentially to store) Soil and Terrain information in the eSoTer project framework.

### Summary

**Created By:** Amir on 24/09/2009  
**Last Modified:** 28/09/2010, **Version:** 1.0

This diagram draws an outline summary of the main classes in SoTerML sub-package. Not all of attributes or connections are shown in this diagram. Other diagrams of the sub-package include detailed information for each of the shown class.

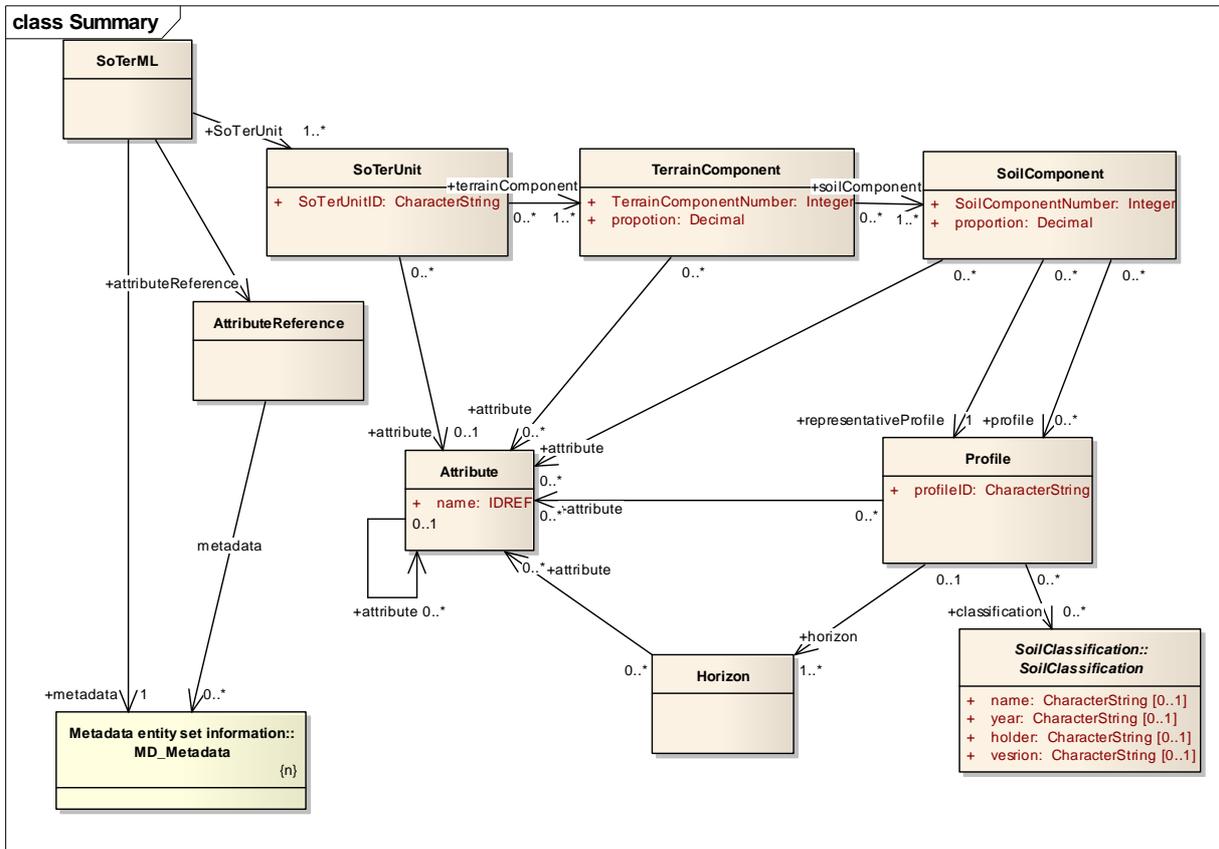


Figure: 1

**SoTerML**

*Created By:* Amir on 02/07/2009

*Last Modified:* 28/09/2010, *Version:* 1.0

This diagram describes the hierarchy of SoTer-Terrain-Soil in a SoTerML document. A SoTerML document has a root element which has a number of SoTer units, Each SoTer unit consists of a number of Terrain components and each Terrain Component can optionally include a number of Soil Components.

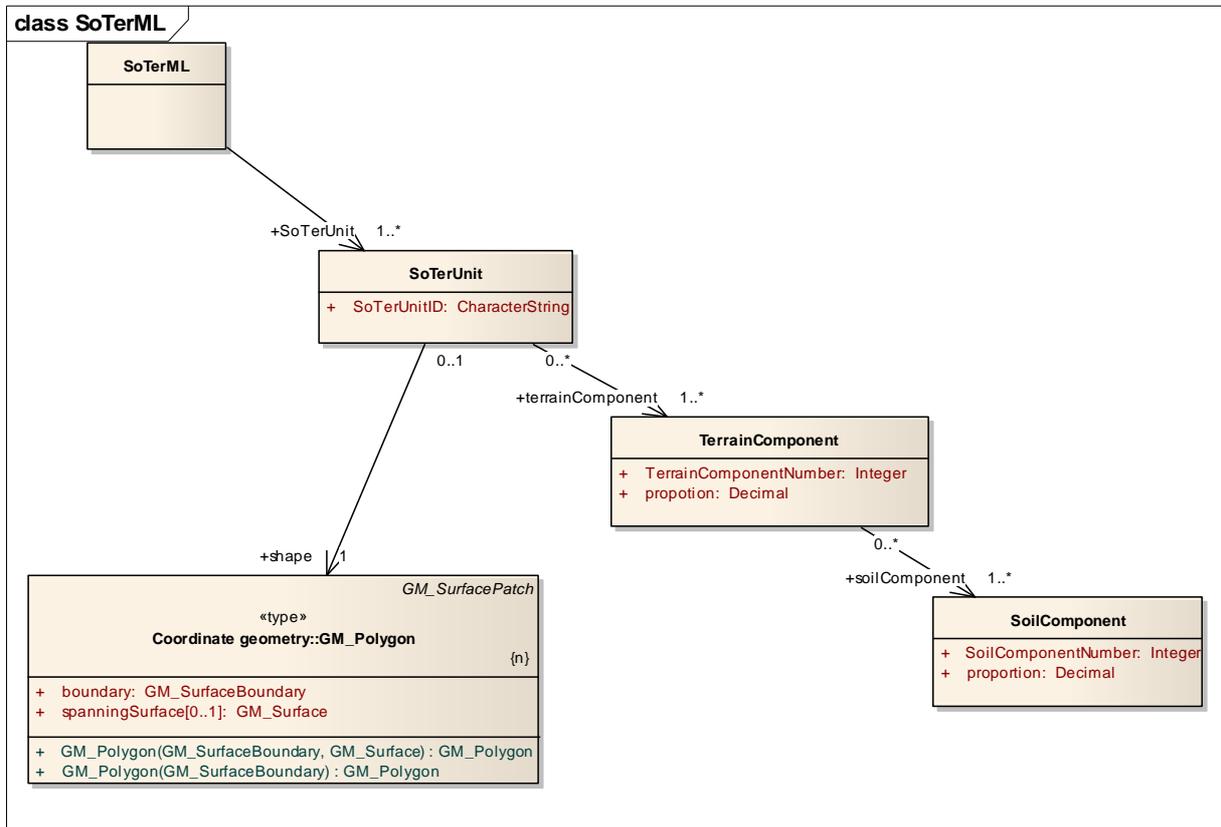


Figure: 2

**SoTerUnit**

*Created By:* Amir on 09/07/2009

*Last Modified:* 28/09/2010, *Version:* 1.0

A SoTerUnit, as the first-level of hierarchy in SoTerML, has the structure shown in this diagram.

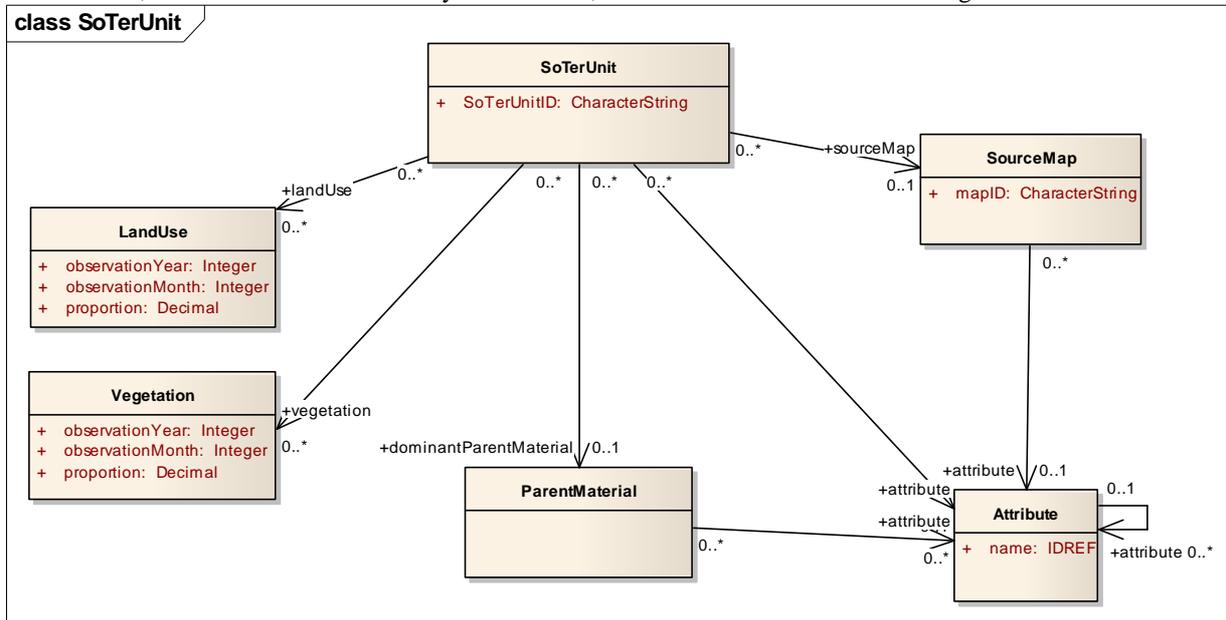


Figure: 3

**TerrainComponent**

*Created By:* itxap1 on 09/07/2009

*Last Modified:* 28/09/2010, *Version:* 1.0

Each TerrainComponent in a SoTerUnit has its own structure as shown in this diagram.

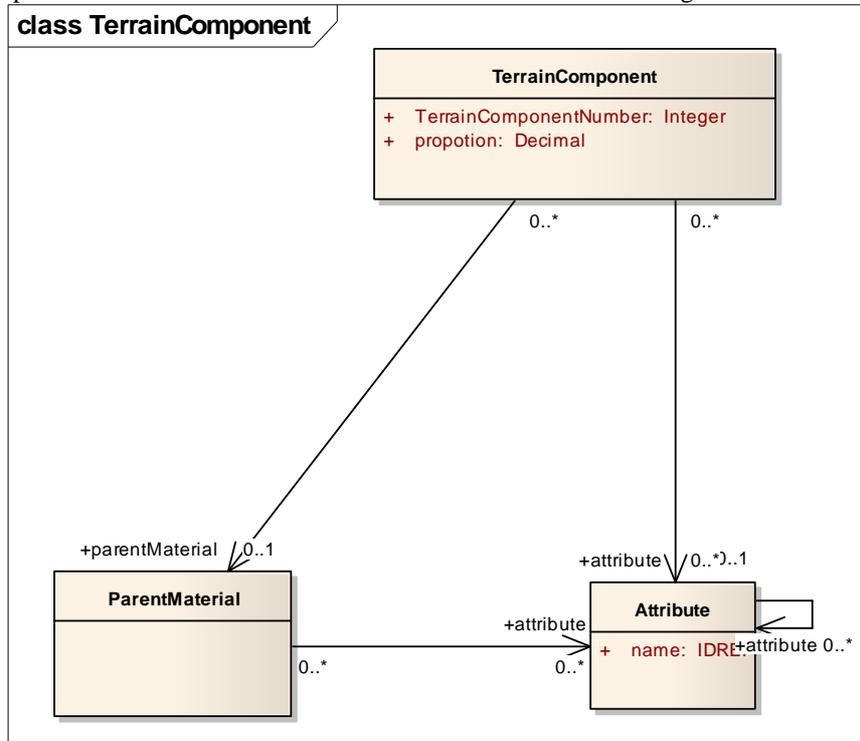


Figure: 4

**SoilComponent**

*Created By:* Amir on 10/07/2009

*Last Modified:* 28/09/2010, *Version:* 1.0

SoilComponent is the 3rd level of hierarchy in SoTerML. Each soil component has a number of profile and Erosion and Deposition properties, as well as other SoTer specific attributes.

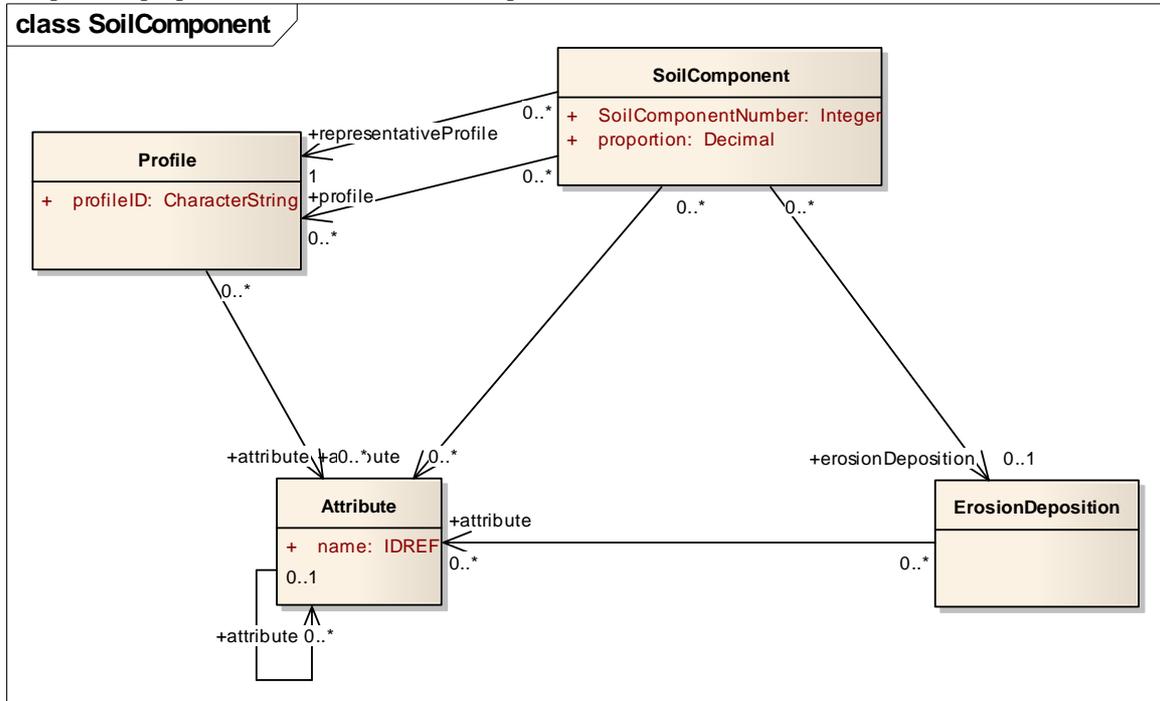


Figure: 5

**Profile**

Created By: Amir on 10/07/2009

Last Modified: 28/09/2010, Version: 1.0

This diagram shows the structure of profile class and its linked classes.

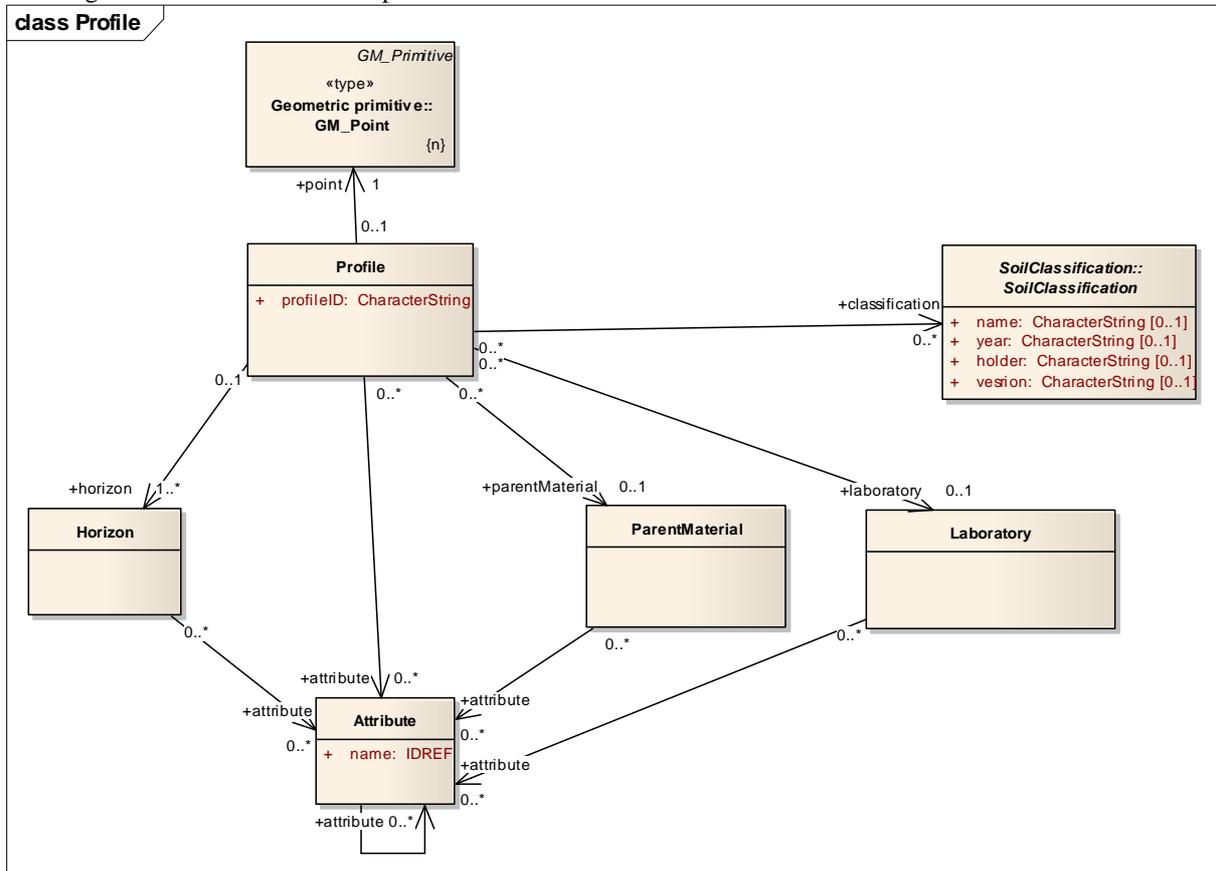


Figure: 6

**Attribute**

*Created By:* Amir on 14/07/2009

*Last Modified:* 28/09/2010, *Version:* 1.0

This diagrams shows the mechanism of assigning attribute values to the other main classes in SoTerML, whenever they might have a SoTer-specific attribute.

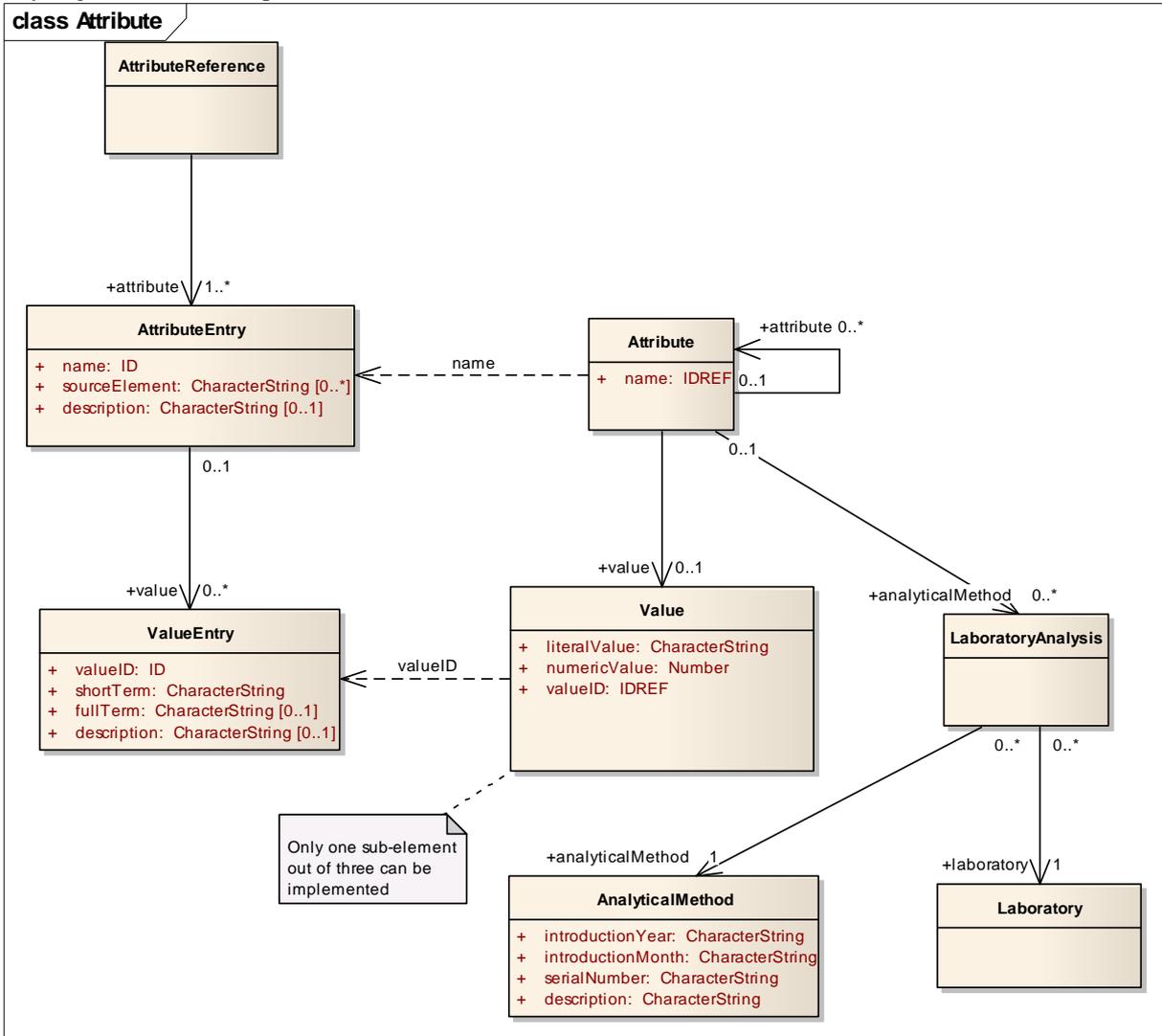


Figure: 7

## AnalyticalMethod

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 22/07/2009. Last modified on 13/10/2009.

*Notes:* A class representing the specification of the analytical method that has been used for evaluating an attribute.

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	introductionYear	Character String							
	introductionMonth	Character String							
	serialNumber	Character String							
	description	Character String							

### Relationships

Columns	Association	Notes
	<b>0..*</b> LaboratoryAnalysis.	
	<b>1</b> AnalyticalMethod.analyticalMethod	

## Attribute

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 14/07/2009. Last modified on 13/10/2009.

*Notes:* SoTerML uses the "Attribute" mechanism to establish a system to assign values to different controlled concepts of an element. Different classes within SoTerML have an attribute called "attribute" that associate their source class to this class. Through this mechanism, each of those classes can have zero to many attributes, each having a name and a value. For example, a SoTerUnit may have a plain "majorLandForm", so it has an "attribute" with name="majorLandForm" and a value="LP". An attribute may also have a sub-attribute, that's why this class has a cyclic or recursive association to itself.

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	name	IDREF							The name of the attribute. This name must refer to one of the names defined as AttributeEntry.

### Relationships

Columns	Association	Notes
	0..* ParentMaterial. 0..* Attribute.attribute	
	0..* ErosionDeposition. 0..* Attribute.attribute	
	0..* TerrainComponent. 0..* Attribute.attribute	
	0..* Laboratory. 0..* Attribute.attribute	
	0..* SoilComponent. 0..* Attribute.attribute	
	0..1 Attribute. 0..* LaboratoryAnalysis.analyticalMethod	The analysis method used for evaluating the attribute. This has been particularly designed for the attributes associated to a soil profile.
TBD: Not sure, but may be a generalization	Attribute. ControlledConcept.	
	0..* SoTerUnit. 0..1 Attribute.attribute	
name	Attribute. AttributeEntry.	
	0..* Profile. 0..* Attribute.attribute	
	0..* SourceMap. 0..1 Attribute.attribute	
	0..1 Attribute. 0..* Attribute.attribute	This has been designed for the case when an attribute has a sub-attribute.
	0..* Horizon. 0..* Attribute.attribute	
	Attribute. 0..1 Value.value	The value of this attribute.

## AttributeEntry

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 15/07/2009. Last modified on 04/08/2009.

*Notes:* This class represent an attribute as a pre-definable element.

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	name	ID							An attribute must have a unique name.
	sourceElement	Character String							sourceElement is the name of the XML element that this attribute is going to be assigned to. This has been put because not all of the elements are supposed to accept all of the attributes. The validation must be done in the application level.
	description	Character String							The description about the attribute meaning and application.

### Relationships

Columns	Association	Notes
	<b>0..1</b> AttributeEntry. <b>0..*</b> ValueEntry.value	If the attribute is supposed to accept values from an enumeration, the list of validated entries are connected through this association.
name	Attribute. AttributeEntry.	
	<b>1..*</b> AttributeReference. AttributeEntry.attribute	The only element of the root element. There can be an unlimited number of attribute entries for the metadata bank. This name should not be confused with the attribute of other classes in SoTerML.

## AttributeReference

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 31/07/2009. Last modified on 04/09/2009.

*Notes:* This is the root element for defining the data bank of attribute names and values.

### Relationships

Columns	Association	Notes
metadata	0..* AttributeReference. MD_Metadata.	
	1..* AttributeReference. AttributeEntry.attribute	The only element of the root element. There can be an unlimited number of attribute entries for the metadata bank. This name should not be confused with the attribute of other classes in SoTerML.
	SoTerML. AttributeReference.attributeReference	

## Designation

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 13/07/2009. Last modified on 13/07/2009.

*Notes:*

### Relationships

Columns	Association	Notes
	0..* Horizon.	
	0..1 Designation.designation	

## ErosionDeposition

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 14/07/2009. Last modified on 13/10/2009.

*Notes:* The class representing the erosion and deposition properties of a geologic unit in SoTer. The properties of this class are defined through the association to the Attribute class.

### Relationships

Columns	Association	Notes
	<b>0..*</b> SoilComponent. <b>0..1</b> ErosionDeposition.erosionDeposition	Any visible signs of (accelerated) erosion are to be indicated according to type, area affected, and degree. If more than two types of erosion are active at the same time, then only the dominant type is indicated.
	<b>0..*</b> ErosionDeposition. <b>0..*</b> Attribute.attribute	

## Horizon

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 10/07/2009. Last modified on 13/10/2009.

*Notes:* A class representing the attributes of a soil horizon in the eSoTer context.

### Relationships

Columns	Association	Notes
	<b>0..1</b> Profile. <b>1..*</b> Horizon.horizon	The attributes for the diagnosed soil horizons of the profiles.
	<b>0..*</b> Horizon. <b>0..1</b> Designation.designation	
	<b>0..*</b> Horizon. <b>0..*</b> Attribute.attribute	

## Laboratory

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 13/07/2009. Last modified on 03/08/2009.

*Notes:* The class representing a laboratory that analyzed the soil profile, attributes are defined and evaluated through its association to the Attribute class. The laboratory methods properties are also realized through the association (or cyclic association) to the Attribute class.

### Relationships

Columns	Association	Notes
	<b>0..*</b> Laboratory. <b>0..*</b> Attribute.attribute	
	<b>0..*</b> Profile. <b>0..1</b> Laboratory.laboratory	The laboratory that analyzed the reference soil profile.
	<b>0..*</b> LaboratoryAnalysis. <b>1</b> Laboratory.laboratory	

## LaboratoryAnalysis

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 09/09/2009. Last modified on 13/10/2009.

*Notes:* A class representing the analysis laboratory information used to measure an attribute. This itself include the methodology (link to AnalyticalMethod class) and the laboratory (link to Laboratory class).

### Relationships

Columns	Association	Notes
	<b>0..1</b> Attribute. <b>0..*</b> LaboratoryAnalysis.analyticalMethod	The analysis method used for evaluating the attribute. This has been particularly designed for the attributes associated to a soil profile.
	<b>0..*</b> LaboratoryAnalysis. <b>1</b> AnalyticalMethod.analyticalMethod	
	<b>0..*</b> LaboratoryAnalysis. <b>1</b> Laboratory.laboratory	

## LandUse

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 17/07/2009. Last modified on 03/08/2009.

*Notes:* A class to represent the land use properties of a SoTer unit.

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	observationYear	Integer							The year in which the land use was observed
	observationMonth	Integer							The month of the year in which the land use was observed
	proportion	Decimal							Proportion that the specified land use occupies within the SoTer unit

### Relationships

Columns	Association	Notes
	0..* SoTerUnit.	The land use type, possibly at various dates, to a SoTer unit
	0..* LandUse.landUse	

## ParentMaterial

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 10/07/2009. Last modified on 28/09/2010.

*Notes:* A class representing the type of "parent material" in SoTer information.

### Relationships

Columns	Association	Notes
	0..* Profile.	
	0..1 ParentMaterial.parentMaterial	
	0..* SoTerUnit.	A generalized description of the parent material, either consolidated or unconsolidated, underlying a dominant part of the terrain of the SOTER unit.
	0..1 ParentMaterial.dominantParentMaterial	
	0..* TerrainComponent.	The parent material of the individual terrain components forming a SOTER unit
	0..1 ParentMaterial.parentMaterial	
	0..* ParentMaterial.	
	0..* Attribute.attribute	

## Profile

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 10/07/2009. Last modified on 28/09/2010.

*Notes:* A class representing a soil profile. The geometry of the profile is declared as a GML Point object. Other eSoTer-specific attributes are defined through the association to the Attribute class.

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	profileID	Character String							Identification code for soil profile. (SOTER 2009)

### Relationships

Columns	Association	Notes
	<b>0..*</b> Profile. <b>0..*</b> SoilClassification.classification	Classification(s) of the profile according to a number of different standard.
	<b>0..1</b> Profile. <b>1..*</b> Horizon.horizon	The attributes for the diagnosed soil horizons of the profiles.
	<b>0..*</b> SoilComponent. <b>0..*</b> Profile.profile	The set of soil profiles in a soil component.
	<b>0..*</b> SoilComponent. <b>1</b> Profile.representativeProfile	The representative profile that is considered to be representative for the corresponding soil component
	<b>0..*</b> Profile. <b>0..1</b> ParentMaterial.parentMaterial	
	<b>0..*</b> Profile. <b>0..1</b> Laboratory.laboratory	The laboratory that analyzed the reference soil profile.
	<b>0..1</b> Profile. <b>1</b> GM_Point.point	The point that this profile is positioned
	<b>0..*</b> Profile. <b>0..*</b> Attribute.attribute	

## SoTerML

*Database:* Java, *Stereotype:* , *Package:* SoTerML  
*Detail:* Created on 31/07/2009. Last modified on 03/08/2009.  
*Notes:* The root Element of SoTerML

### Relationships

Columns	Association	Notes
	SoTerML. 1..* SoTerUnit.SoTerUnit	The root elemnt has a number of SoTer Units.
	SoTerML. AttributeReference.attributeReference	
	1 SoTerML. MD_Metadata.metadata	The metadata information of the whole main SOTerML element. The metadata of other other SoTer units and sub-units are expressed through their superclasses.

## SoTerUnit

*Database:* Java, *Stereotype:* , *Package:* SoTerML  
*Detail:* Created on 02/07/2009. Last modified on 28/09/2010.  
*Notes:* A SoTerUnit is the basic building block of a SoTerML document. (Equivalent to the Terrain relation in the SOTER database).

The geometry description of SoTer units are defined in the shape attribute as linked to GML object. A SoTerUnit can have a number of other SoTer-specific attributes that can be expressed by the associated Attribute class.

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	SoTerUnitID	Character String							Identification Code for SoTer Unit (SOTER 2009)

### Relationships

Columns	Association	Notes
	0..* SoTerUnit. 0..1 SourceMap.sourceMap	The source map from which the data were derived for the compilation of the SOTER-units
	1..* SoTerML. SoTerUnit.SoTerUnit	The root elemnt has a number of SoTer Units.
	0..1 SoTerUnit. 1 GM_Polygon.shape	The shape of the unit (polygon)
	0..* SoTerUnit. 0..* Vegetation.vegetation	The vegetation type, possibly at various dates, to a SOTER unit
	0..* SoTerUnit. 0..1 ParentMaterial.dominantParentMaterial	A generalized description of the

Columns	Association	Notes
		parent material, either consolidated or unconsolidated, underlying a dominant part of the terrain of the SOTER unit.
	<b>0..*</b> SoTerUnit. <b>1..*</b> TerrainComponent.terrainComponent	
	<b>0..*</b> SoTerUnit. <b>0..*</b> LandUse.landUse	The land use type, possibly at various dates, to a SoTer unit
	<b>0..*</b> SoTerUnit. <b>0..1</b> Attribute.attribute	
	<b>1</b> SoilComponent. <b>0..*</b> Soil.	

## SoilComponent

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 02/07/2009. Last modified on 28/09/2010.

*Notes:* Soil components are parts of a TerrainComponent. The proportion attribute in its superclass stores the proportion (in percent) of the unit within its container. A SoilComponent can have a number of other SoTer-specific attributes that can be expressed by the associated Attribute class.

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	SoilComponentNumber	Integer							The number of Soil Component within a Terrain Component
	proportion	Decimal							

### Relationships

Columns	Association	Notes
	<b>1</b> SoilComponent. <b>0..*</b> Soil.	
	<b>0..*</b> SoilComponent. <b>0..*</b> Profile.profile	The set of soil profiles in a soil component.
	<b>0..*</b> SoilComponent. <b>1</b> Profile.representativeProfile	The representative profile that is considered to be representative for the corresponding soil component
	<b>0..*</b> SoilComponent. <b>0..1</b> ErosionDeposition.erosionDeposition	Any visible signs of (accelerated) erosion are to be indicated according to type, area affected, and degree. If more than two types of erosion are active at the same time, then only the dominant type is

Columns	Association	Notes
		indicated.
	0..* SoilComponent. 0..* Attribute.attribute	
	0..* TerrainComponent. 1..* SoilComponent.soilComponent	

## SourceMap

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 07/07/2009. Last modified on 03/08/2009.

*Notes:* Class SourceMap contains information on the type of source map, its scale, location and year of issue and exact position or coverage of the source map within the SOTER map.

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	mapID	Character String							The citation of the source map title

### Relationships

Columns	Association	Notes
	0..* SourceMap. 0..1 Attribute.attribute 0..* SoTerUnit. 0..1 SourceMap.sourceMap	The source map from which the data were derived for the compilation of the SOTER-units

## TerrainComponent

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 02/07/2009. Last modified on 28/09/2010.

*Notes:* Terrain components are parts of a SoTerUnit which can only be mapped at the small scale SoTer mapping. The proportion attribute in its superclass stores the proportion (in percent) of the unit within its container. A TerrainComponent can have a number of other SoTer-specific attributes that can be expressed by the associated Attribute class.

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	TerrainComponentNumber	Integer							The number of component within a SoTer Unit
	propotion	Decimal							

### Relationships

Columns	Association	Notes
	0..* TerrainComponent. 0..1 ParentMaterial.parentMaterial	The parent material of the individual terrain components forming a SOTER unit
	0..* TerrainComponent. 0..* Attribute.attribute	
	0..* SoTerUnit. 1..* TerrainComponent.terrainComponent	
	0..* TerrainComponent. 1..* SoilComponent.soilComponent	

## Value

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 31/07/2009. Last modified on 05/05/2010.

*Notes:* This class represent the value assigned to each attribute. This can be an exclusive choice from being literal value, numeric value or selective value (value id). In the case of value id, an XML's IDREF is used to refer the value from the pre-listed values in ValueEntry class.

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	literalValue	Character String							The value of the attribute if it is of the literal type.
	numericValue	Number							The value of the attribute if it is of the numeric type.
	valueID	IDREF							The value of the attribute if it is of the enumerated type. The value of the valueID must be a valueID defined as ValueEntry class.

### Relationships

Columns	Association	Notes
valueID	Value. ValueEntry.	
	<anonymous>. Value.	
	Attribute. <b>0..1</b> Value.value	The value of this attribute.

## ValueEntry

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 14/07/2009. Last modified on 13/10/2009.

*Notes:* A class representing a validated value for an enumerated attribute.

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	valueID	ID							The unique reference to this enumerated value. A suggestion to make this unique would be using the sourceElement+"."+shortTerm.
	shortTerm	Character String							The value of this entry in its short or abbreviated form.
	fullTerm	Character String							The value of this entry in its full term.
	description	Character String							The description of the meaning of this value entry.

**Relationships**

Columns	Association	Notes
valueID	Value. ValueEntry.	
	<b>0..1</b> AttributeEntry. <b>0..*</b> ValueEntry.value	If the attribute is supposed to accept values from an enumeration, the list of validated entries are connected through this association.

**Vegetation**

*Database:* Java, *Stereotype:* , *Package:* SoTerML

*Detail:* Created on 17/07/2009. Last modified on 03/08/2009.

*Notes:* A class to represent the vegetation properties of a SoTer unit.

**Columns**

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	observationYear	Integer							Year of observation for the native vegetation
	observationMonth	Integer							The month of the year of observation for the native vegetation
	proportion	Decimal							Proportion that the specified vegetation occupies within the SOTER unit

**Relationships**

Columns	Association	Notes
	<b>0..*</b> SoTerUnit. <b>0..*</b> Vegetation.vegetation	The vegetation type, possibly at various dates, to a SOTER unit

## **SoilClassification**

*Type:* **Package**

*Package:* eSoTer

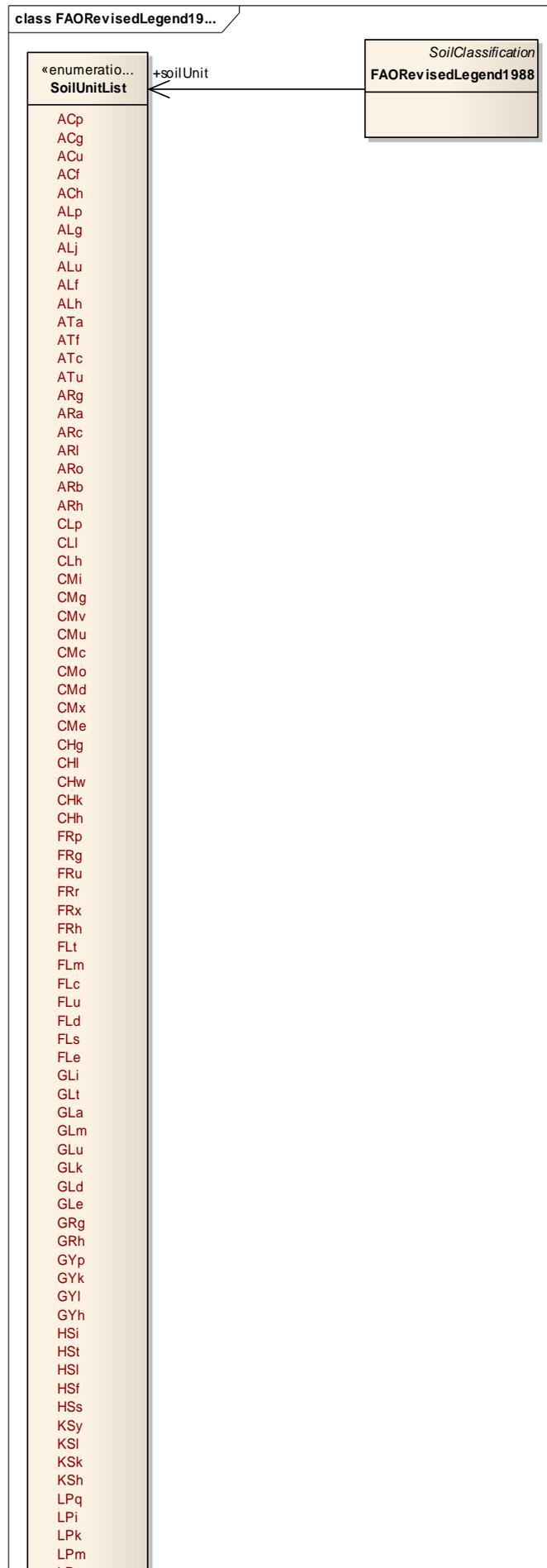
*Detail:* Created on 29/07/2009. Last modified on 04/08/2009.

*Notes:* This package include necessary classes and attributes for soil classification standards. Among different standards, the classes and enumerations required by WRB2006 has been implemented and the rest of classification has been left for furthur developments.

### **FAORevisedLegend1988**

*Created By:* Amir on 08/09/2009

*Last Modified:* 08/09/2009, *Version:* 1.0



HSi
HSt
HSI
HSf
HSs
KSy
KSI
KSk
KSh
LPq
LPi
LPk
LPm
LPu
LPd
LPe
LXp
LXg
LXj
LXa
LXf
LXh
LVg
LVj
LVa
LVv
LVk
LVf
LVx
LVh
NTu
NTr
NTh
PHg
PHj
PHI
PHc
PHh
PLi
PLm
PLu
PLd
PLe
PTa
PTu
PTd
PTe
PZi
PZg
PZc
PZf
PZb
PZh
PDi
PDg
PDj
PDd
PDe
RGi
RGu
RGy
RGc
RGd
RGe
SCi
SCg
SCm
SCy
SCh
SCk
SCn
SCh
SNg
SNj
SNm

SCi
SCg
SCm
SCy
SCk
SCn
SCh
SNg
SNj
SNm
SNy
SNk
SNh
VRy
VRk
VRd
VRe

Figure: 8

**SoilClassification**

*Created By:* Amir on 13/07/2009

*Last Modified:* 21/04/2010, *Version:* 1.0

In general, there are many soil classifications, in which WRB2006/2007 and FAO1998 are examples of. This diagram shows (but is not limited to) some other standards mentioned in SOTER documentations (SOTER manual 2002) without implementing their structure. It is anticipated that WRB will form the most widely adopted system.

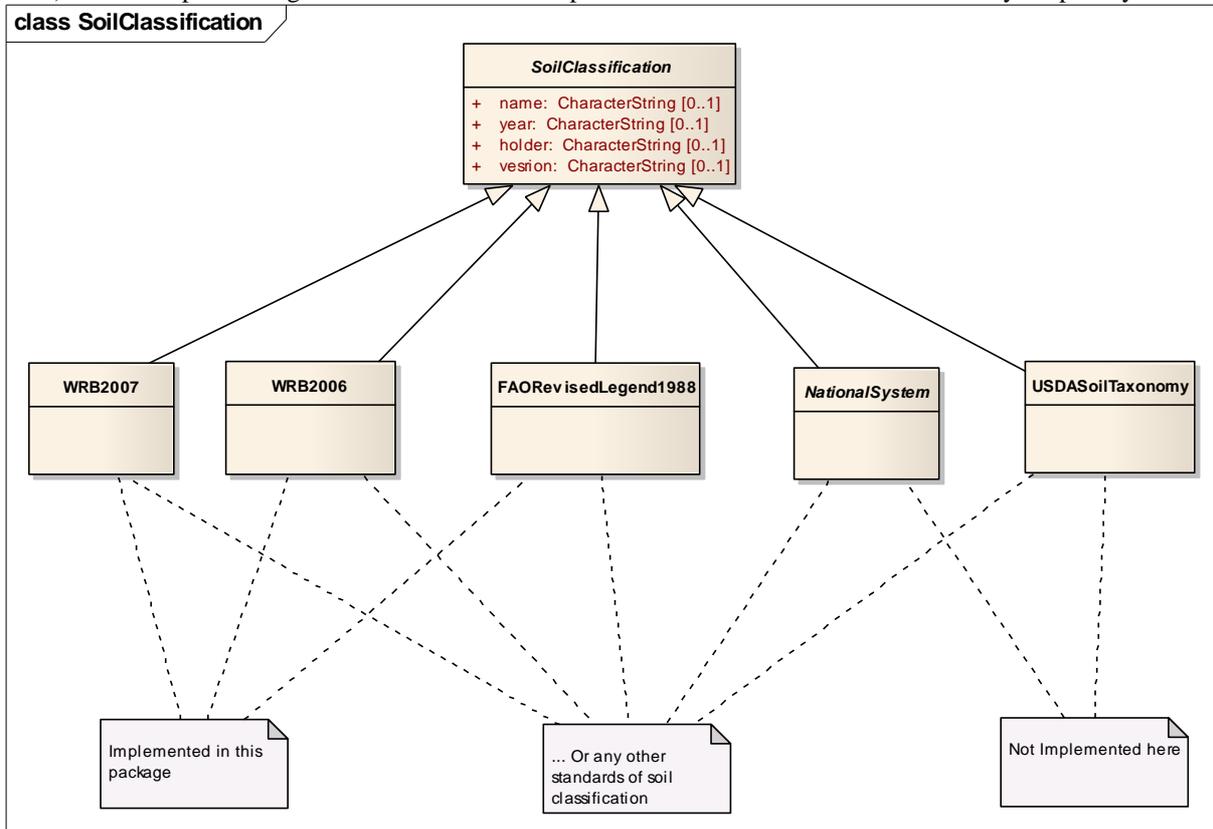


Figure: 9

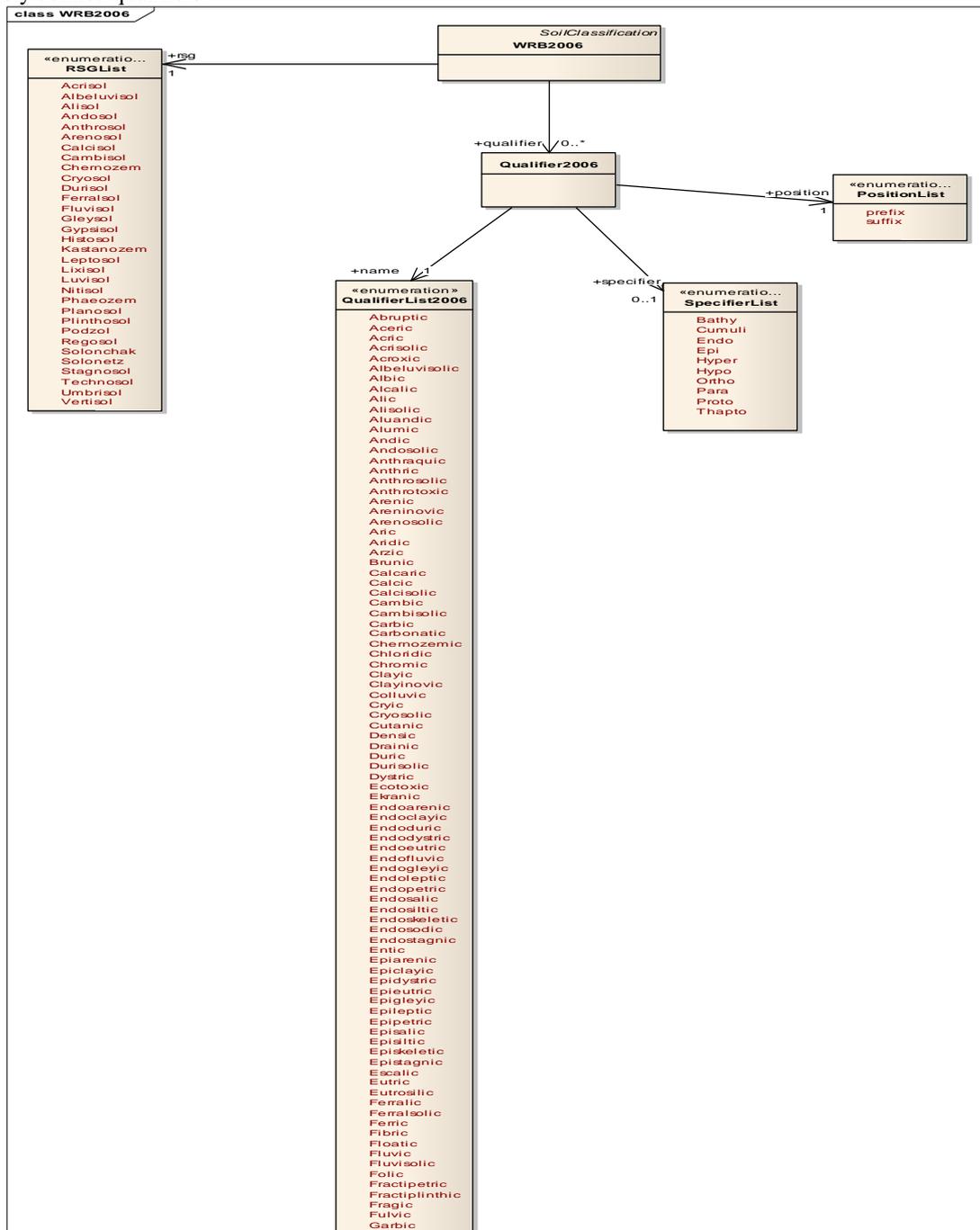
**WRB2006**

Created By: Amir on 10/07/2009

Last Modified: 06/11/2009, Version: 1.0

This diagram shows the structure of a soil classification in the WRB2006 standard. the WRB comprises two tiers of categorical details:

1. **Tier 1: The RSGs**, comprising 32 RSGs;
2. **Tier 2: The combination of RSGs with qualifiers**, detailing the properties of the RSGs by adding a set of uniquely defined qualifiers.



Sarcenic  
 Sarcenic  
 Scotic  
 Ekanic  
 Endoarenic  
 Endoclayic  
 Endoduric  
 Endodystric  
 Endoeutric  
 Endofluvic  
 Endogleyic  
 Endoleptic  
 Endopetric  
 Endosalic  
 Endosiltic  
 Endoskeletal  
 Endosodic  
 Endostagnic  
 Entic  
 Epiaenic  
 Epiclayic  
 Epidystric  
 Epieutric  
 Epigleyic  
 Epileptic  
 Epipetric  
 Episalic  
 Episiltic  
 Episkeletic  
 Epistagnic  
 Escalic  
 Eutric  
 Eutrosolic  
 Ferralic  
 Ferralsolic  
 Femic  
 Fibric  
 Floatic  
 Fluvic  
 Fluvisolic  
 Follic  
 Fractipetric  
 Fractiplinthic  
 Fragic  
 Fulvic  
 Garbic  
 Gelic  
 Gelistagnic  
 Geric  
 Gibbsic  
 Glacic  
 Gleyic  
 Gleysolic  
 Glossalic  
 Glossic  
 Greyic  
 Grumic  
 Gypsic  
 Gypsic  
 Gypsolic  
 Haplic  
 Hemic  
 Histic  
 Histosolic  
 Hortic  
 Humic  
 Hydragric  
 Hydric  
 Hydrophobic  
 Hyperalbic  
 Hyperallic  
 Hypercalcic  
 Hyperduric  
 Hyperdystric  
 Hypereutric  
 Hyperferralic  
 Hyperferric  
 Hypergypsic  
 Hyperhumic  
 Hyperochric  
 Hypersalic  
 Hyperskeletal  
 Hyperthionic  
 Hypocalcic  
 Hypoferralic  
 Hypogypsic  
 Hypoluvic  
 Hyposalic  
 Hyposodic  
 Irragric  
 Kastanozemnic  
 Lamellic  
 Loxic  
 Leptic  
 Leptosolic  
 Lignic  
 Limnic  
 Lincic  
 Lithic  
 Lixic  
 Lixisolic  
 Luvic  
 Luvisolic  
 Magnesic  
 Manganiferic  
 Mazic  
 Melanic  
 Mesotrophic  
 Mollic  
 Molliglossic  
 Natric  
 Nitic  
 Nitisolic  
 Novic  
 Nudilithic  
 Nudiyemic  
 Ombric  
 Omithic  
 Orthodystric  
 Orthoeutric  
 Orthothionic  
 Orsteinic  
 Oxyaquic  
 Pachic  
 Pellic  
 Petric  
 Petrocalcic  
 Petroduric  
 Petrogleyic  
 Petrogypsic  
 Petroplinthic  
 Petrosalic  
 Phaeozemic  
 Phytotoxic  
 Pisolinthic  
 Placic  
 Plaggic  
 Planosolic  
 Plinthic  
 Plinthosolic  
 Podzolic  
 Posic  
 Profondic  
 Protic  
 Protothionic

<p>Plinthosolic Podzolic Psolic Profondic Protic Protothionic Puffic Reductaquic Reductic Regic Regosolic Rendzic Rheic Rhodic Rubic Ruptic Rustic Salic Sapric Silandic Siltic Siltinovic Skeletal Sodic Solodic Solonchakic Solonetzic Sombic Spodic Spolic Stagnic Stagnosolic Subaquatic Sulphatic Takyric Technic Technosolic Tephric Terric Thaptaluandic Thaptandic Thaptofolic Thaptohistic Thaptovitric Thionic Thixotropic Tidalic Toxic Transportic Turbic Umbric Umbriglossic Umbrisolic Urbic Vermic Vertic Vertisolic Vetric Vitric Voronnic Xanthic Yermic Zootoxic</p>
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Figure: 10

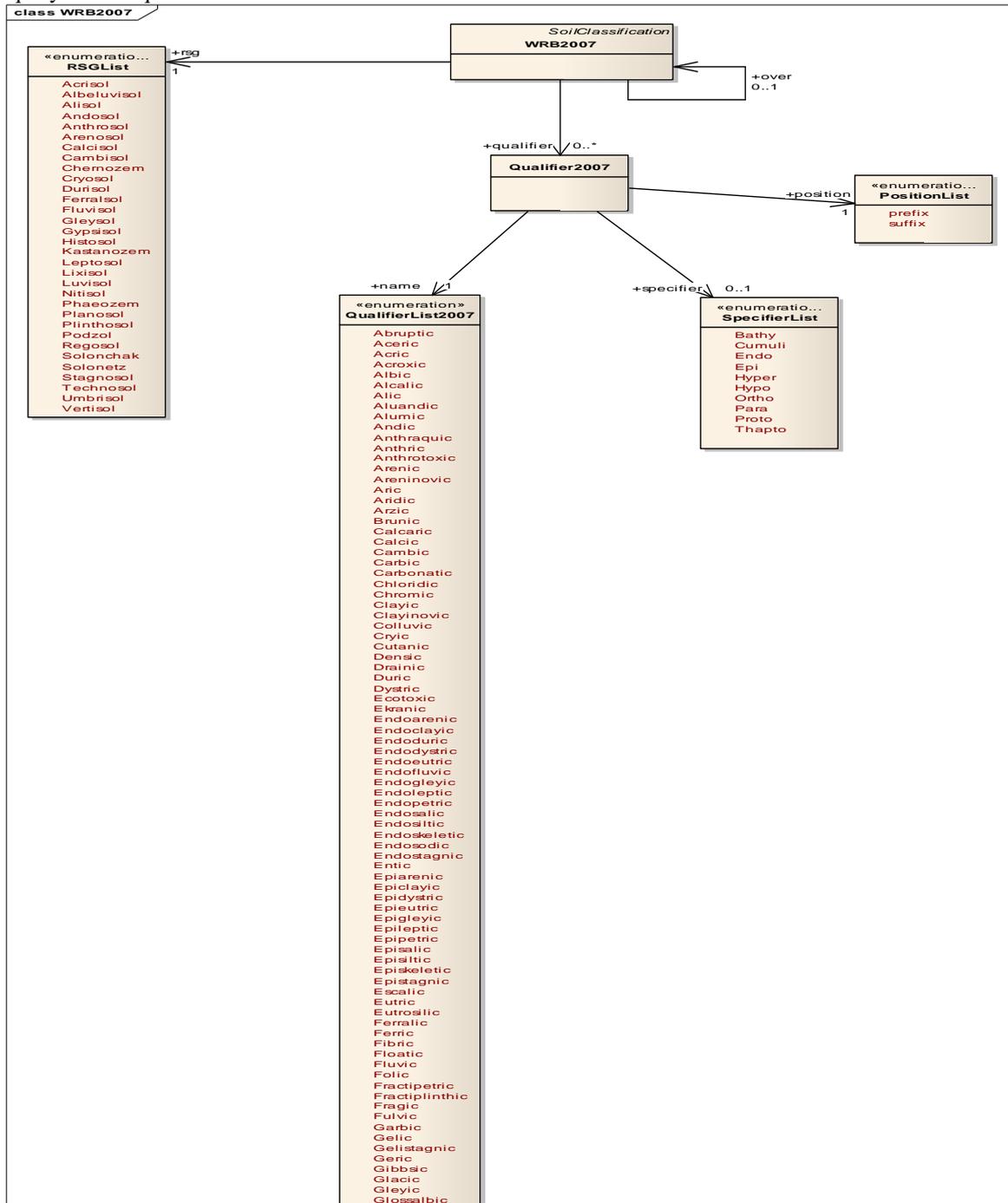
**WRB2007**

*Created By:* Amir on 29/10/2009

*Last Modified:* 29/10/2009, *Version:* 1.0

This diagram shows the structure of a soil classification in the WRB2006 standard. the WRB comprises two tiers of categorical details:

1. **Tier 1: The RSGs**, comprising 32 RSGs;
2. **Tier 2: The combination of RSGs with qualifiers**, detailing the properties of the RSGs by adding a set of uniquely defined qualifiers.



Glicic  
 Gleyic  
 Glossalbic  
 Glossic  
 Greyic  
 Grumic  
 Gypsic  
 Gypsic  
 Haplic  
 Hemlic  
 Histic  
 Hortic  
 Humic  
 Hydragric  
 Hydric  
 Hydrophobic  
 Hyperalbic  
 Hyperallic  
 Hypercalcic  
 Hyperduric  
 Hyperdystic  
 Hypereutric  
 Hyperferralic  
 Hyperferric  
 Hypergypsic  
 Hyperhumic  
 Hyperochric  
 Hypersallic  
 Hyperskeletalic  
 Hyperthionic  
 Hypocalcic  
 Hypoferralic  
 Hypogypsic  
 Hypoluvic  
 Hyposalic  
 Hyposodic  
 Irragric  
 Lamellic  
 Loxic  
 Leptic  
 Lignic  
 Limnic  
 Lincic  
 Lithic  
 Lixic  
 Luvic  
 Magnesian  
 Manganiferic  
 Mazic  
 Melanic  
 Mesotrophic  
 Mollic  
 Molliglossic  
 Natric  
 Nitic  
 Novic  
 Nudilithic  
 Nudiyermic  
 Ombic  
 Omithic  
 Orthodystic  
 Orthoeutric  
 Orthothionic  
 Orsteinic  
 Oxyaquic  
 Pachic  
 Pellic  
 Petric  
 Petrocalcic  
 Petroduric  
 Petrogleyic  
 Petrogypsic  
 Petroplinthic  
 Petrosalic  
 Phytotoxic  
 Pisoplinthic  
 Placic  
 Plaggic  
 Plinthic  
 Posic  
 Profondic  
 Protic  
 Protothionic  
 Puffic  
 Reductaquic  
 Reductic  
 Regic  
 Rendzic  
 Rheic  
 Rhodic  
 Rubic  
 Ruptic  
 Ruslic  
 Salic  
 Sapric  
 Silandic  
 Sillic  
 Siltinovic  
 Skeletic  
 Sodic  
 Solodic  
 Sombric  
 Spodic  
 Spolic  
 Stagnic  
 Subaquatic  
 Sulphatic  
 Takyric  
 Technic  
 Tephric  
 Temic  
 Thaptauandic  
 Thaptandic  
 Thaptofolic  
 Thaptofistic  
 Thaptovitric  
 Thionic  
 Thixotropic  
 Tidalic  
 Toxic  
 Transportic  
 Turbic  
 Umbric  
 Umbriglossic  
 Urbic  
 Vermic  
 Vertic  
 Vetic  
 Vitric  
 Voronic  
 Xanthic  
 Yermic  
 Zootoxic

Figure: 11

## FAORevisedLegend1988

*Database:* Java, *Stereotype:* , *Package:* SoilClassification

*Detail:* Created on 13/07/2009. Last modified on 08/09/2009.

*Notes:* The classification at soil unit level according to Revised Legend of the FAO-Unesco Soil Map of the World (FAO-Unesco 1988)

### Relationships

Columns	Association	Notes
	FAORevisedLegend1988. <anonymous>.	
	FAORevisedLegend1988. SoilClassification. <anonymous>.	
	FAORevisedLegend1988. SoilUnitList.soilUnit	

## NationalSystem

*Database:* Java, *Stereotype:* , *Package:* SoilClassification

*Detail:* Created on 13/07/2009. Last modified on 13/10/2009.

*Notes:* The classification according to a given national system

### Relationships

Columns	Association	Notes
	NationalSystem. <anonymous>.	
	NationalSystem. SoilClassification. <anonymous>.	
	NationalSystem.	

## PositionList

*Database:* Java, *Stereotype:* «enumeration», *Package:* SoilClassification

*Detail:* Created on 07/07/2009. Last modified on 29/07/2009.

*Notes:* List of three levels of qualifiers.

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	prefix				0				Indicates that the current qualifier is a prefix to the RSG.
	suffix				0				Indicates that the current qualifier is a suffix to the RSG.

### Relationships

Columns	Association	Notes
	1 Qualifier2006. PositionList.position	
	1 Qualifier2007. PositionList.position	

## Qualifier2006

*Database:* Java, *Stereotype:* , *Package:* SoilClassification

*Detail:* Created on 10/07/2009. Last modified on 29/10/2009.

*Notes:* Qualifier class represents an combination of a qualifier, a position and [optionaly] a specifier. This combination forms one of the assigned prefixes or suffixes to be puit before or after a RSG.

### Relationships

Columns	Association	Notes
	Qualifier2006. <b>1</b> PositionList.position	
	Qualifier2006. <b>0..1</b> SpecifierList.specifier	
	WRB2006. <b>0..*</b> Qualifier2006.qualifier	
	Qualifier2006. <b>1</b> QualifierList2006.name	

## Qualifier2007

*Database:* Java, *Stereotype:* , *Package:* SoilClassification

*Detail:* Created on 10/07/2009. Last modified on 29/10/2009.

*Notes:* Qualifier class represents an combination of a qualifier, a position and [optionaly] a specifier. This combination forms one of the assigned prefixes or suffixes to be puit before or after a RSG.

### Relationships

Columns	Association	Notes
	WRB2007. <b>0..*</b> Qualifier2007.qualifier	
	Qualifier2007. <b>1</b> QualifierList2007.name	
	Qualifier2007. <b>1</b> PositionList.position	
	Qualifier2007. <b>0..1</b> SpecifierList.specifier	

## QualifierList2006

*Database:* Java, *Stereotype:* «enumeration», *Package:* SoilClassification

*Detail:* Created on 07/07/2009. Last modified on 29/10/2009.

*Notes:* A list of available qualifiers, according to WRB2006.

### Columns

Name	Type	Notes
Abruptic	string	Abruptic (ap): Having an abrupt textural change within 100 cm of the soil surface.
Aceric	string	Aceric (ae): Having a pH (1:1 in water) between 3.5 and 5 and jarosite mottles in some layer within 100 cm of the soil surface (in Solonchaks only).
Acric	string	Acric (ac): Having an argic horizon that has a CEC (by 1 M NH <sub>4</sub> OAc) of less than 24 cmolc kg <sup>-1</sup> clay in some part to a maximum depth of 50 cm below its upper limit, either starting within 100 cm of the soil surface or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout, and a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent in the major part between 50 and 100 cm from the soil surface.
Acrisolic	string	Acrisolic (AC): Intergrade qualifier, related to Acrisol RSG.
Acroxic	string	Acroxic (ao): Having less than 2 cmolc kg <sup>-1</sup> fine earth exchangeable bases plus 1 M KCl exchangeable Al <sup>3+</sup> in one or more layers with a combined thickness of 30 cm or more within 100 cm of the soil surface (in Andosols only).
Albeluvisolic	string	Albeluvisolic (AB): Intergrade qualifier, related to Albeluvisol RSG.
Albic	string	Albic (ab): Having an albic horizon starting within 100 cm of the soil surface.
Alcalic	string	Alcalic (ax): Having a pH (1:1 in water) of 8.5 or more throughout within 50 cm of the soil surface or to continuous rock or a cemented or indurated layer, whichever is shallower.
Alic	string	Alic (al): Having an argic horizon that has a CEC (by 1 M NH <sub>4</sub> OAc) of 24 cmolc kg <sup>-1</sup> clay or more throughout or to a depth of 50 cm below its upper limit, whichever is shallower, either starting within 100 cm of the soil surface or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout, and a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent in the major part between 50 and 100 cm from the soil surface.
Alisolic	string	Alisolic (AL): Intergrade qualifier, related to Alisol RSG.
Aluandic	string	Aluandic (aa): Having one or more layers, cumulatively 30 cm or more thick, with andic properties and an acid oxalate (pH 3) extractable silica content of less than 0.6 percent, and an Al <sub>p1</sub> /Al <sub>ox2</sub> of 0.5 or more, within 100 cm of the soil surface (in Andosols only).
Alumic	string	Alumic (au): Having an Al saturation (effective) of 50 percent or more in some layer between 50 and 100 cm from the surface.
Andic	string	Andic (an): Having one or more layers, cumulatively 30 cm or more thick, with andic properties, within 100 cm of the soil surface.
Andosolic	string	Andosolic (AN): Intergrade qualifier, related to Andosol RSG.
Anthraquic	string	Anthraquic (aq): Having an anthraquic horizon.
Anthric	string	Anthric (am): Having an anthric horizon.
Anthrosolic	string	Anthrosolic (AT): Intergrade qualifier, related to Anthrosol RSG.
Anthrotoxic	string	Anthrotoxic (atx): Having in some layer within 50 cm of the soil surface sufficiently high and persistent concentrations of organic or inorganic substances to markedly affect the health of humans who come in regular contact with the soil.
Arenic	string	Arenic (ar): Having a texture of loamy fine sand or coarser in a layer, 30 cm or more thick, within 100 cm of the soil surface.
Areninovic	string	Areninovic (anv): Having above the soil that is classified at the RSG level, a layer with recent sediments (new material), 5 cm or more and less than 50 cm thick, which has a texture of loamy fine sand or coarser in its major part.
Arenosolic	string	Arenosolic (AR): Intergrade qualifier, related to Arenosol RSG.
Aric	string	Aric (ai): Having only remnants of diagnostic horizons – disturbed by deep ploughing.
Aridic	string	Aridic (ad): Having aridic properties without a takyric or yermic horizon.
Arzic	string	Arzic (az): Having sulphate-rich groundwater in some layer within 50 cm of the soil surface during some time in most years and containing 15 percent or more gypsum averaged over a depth of 100 cm from the soil surface or to continuous rock or a cemented

		or indurated layer, whichever is shallower (in Gypsisols only).
Brunic	string	Brunic (br): Having a layer, 15 cm or more thick, which meets criteria 2?4 of the cambic horizon but fails criterion 1, starting within 50 cm of the soil surface.
Calcaric	string	Calcaric (ca): Having calcaric material between 20 and 50 cm from the soil surface or between 20cm and continuous rock or a cemented or indurated layer, whichever is shallower.
Calcic	string	Calcic (cc): Having a calcic horizon or concentrations of secondary carbonates starting within 100 cm of the soil surface.
Calcisolic	string	Calcisolic (CL): Intergrade qualifier, related to Calcisol RSG.
Cambic	string	Cambic (cm): Having a cambic horizon starting within 50 cm of the soil surface.
Cambisolic	string	Cambisolic (CM): Intergrade qualifier, related to Cambisol RSG.
Carbic	string	Carbic (cb): Having a spodic horizon that does not turn redder on ignition (in Podzols only).
Carbonatic	string	Carbonatic (cn): Having a salic horizon with a soil solution (1:1 in water) with a pH of 8.5 or more and $[HCO_3^-] > [SO_4^{2-}] \gg [Cl^-]$ (in Solonchaks only).
Chernozemic	string	Chernozemic (CH): Intergrade qualifier, related to Chernozem RSG.
Chloridic	string	Chloridic (cl): Having a salic horizon with a soil solution (1:1 in water) with $[Cl^-] \gg [SO_4^{2-}] \gg [HCO_3^-]$ (in Solonchaks only).
Chromic	string	Chromic (cr): Having within 150 cm of the soil surface a subsurface layer, 30 cm or more thick, that has a Munsell hue redder than 7.5 YR or that has both, a hue of 7.5 YR and a chroma, moist, of more than 4.
Clayic	string	Clayic (ce): Having a texture of clay in a layer, 30 cm or more thick, within 100 cm of the soil surface.
Clayinovic	string	Clayinovic (cnv): Having above the soil that is classified at the RSG level, a layer with recent sediments (new material), 5cm or more and less than 50 cm thick, which has a texture of clay in its major part.
Colluvic	string	Colluvic (co): Having colluvic material, 20cm or more thick, created by human-induced lateral movement.
Cryic	string	Cryic (cy): Having a cryic horizon starting within 100 cm of the soil surface or a cryic horizon starting within 200cm of the soil surface with evidence of cryoturbation in some layer within 100 cm of the soil surface.
Cryosolic	string	Cryosolic (CR): Intergrade qualifier, related to Cryosol RSG.
Cutanic	string	Cutanic (ct): Having clay coatings in some parts of an argic horizon either starting within 100cm of the soil surface or within 200cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout.
Densic	string	Densic (dn): Having natural or artificial compaction within 50 cm of the soil surface to the extent that roots cannot penetrate.
Drainic	string	Drainic (dr): Having a histic horizon that is drained artificially starting within 40 cm of the soil surface.
Duric	string	Duric (du): Having a duric horizon starting within 100 cm of the soil surface.
Durisolic	string	Durisolic (DU): Intergrade qualifier, related to Durisol RSG.
Dystric	string	Dystric (dy): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent in the major part between 20 and 100 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer, or, in Leptosols, in a layer, 5 cm or more thick, directly above continuous rock.
Ecotoxic	string	Ecotoxic (etx): Having in some layer within 50 cm of the soil surface sufficiently high and persistent concentrations of organic or inorganic substances to markedly affect soil ecology, in particular the populations of the mesofauna.
Ekranic	string	Ekranic (ek): Having technic hard rock starting within 5 cm of the soil surface and covering 95 percent or more of the horizontal extent of a pedon (in Technosols only).
Endoarenic	string	Endoarenic (arn): Having a texture of loamy fine sand or coarser in a layer, 30 cm or more thick, between 50 and 100 cm from the soil surface.1 Alpy: pyrophosphate-extractable aluminium, expressed as percent of the fine earth (0?2 mm) fraction on an oven-dried (105 °C) basis.2 Alox: acid oxalate-extractable aluminium (Blakemore, Searle and Daly, 1981), expressed as percent of the fine earth (0?2 mm) fraction on an oven-dried (105 °C) basis.3 Alpy: pyrophosphate-extractable aluminium, expressed as percent of the fine earth (0?2 mm) fraction on an oven-dried (105 °C) basis.4 Alox: acid oxalate-extractable aluminium (Blakemore, Searle and Daly, 1981), expressed as percent of the fine earth (0?2 mm) fraction on an oven-dried (105 °C) basis.

Endoclayic	string	Endoclayic (cen): Having a texture of clay in a layer, 30 cm or more thick, within 50 and 100 cm of the soil surface.
Endoduric	string	Endoduric (nd): Having a duric horizon starting between 50 and 100 cm from the soil surface.
Endodystric	string	Endodystric (ny): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent throughout between 50 and 100 cm from the soil surface.
Endoeutric	string	Endoeutric (ne): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more throughout between 50 and 100 cm from the soil surface.
Endofluvic	string	Endofluvic (nf): Having fluvic material in a layer, 25 cm or more thick, between 50 and 100 cm from the soil surface.
Endogleyic	string	Endogleyic (ng): Having between 50 and 100 cm from the mineral soil surface in some parts reducing conditions and in 25 percent or more of the soil volume a gleyic colour pattern.
Endoleptic	string	Endoleptic (nl): Having continuous rock starting between 50 and 100 cm from the soil surface.
Endopetric	string	Endopetric (ptn): Having a strongly cemented or indurated layer starting between 50 and 100 cm from the soil surface.
Endosalic	string	Endosalic (ns): Having a salic horizon starting between 50 and 100 cm from the soil surface.
Endosiltic	string	Endosiltic (sln): Having a texture of silt, silt loam, silty clay loam or silty clay in a layer, 30 cm or more thick, within 50 and 100 cm of the soil surface.
Endoskeletal	string	Endoskeletal (skn): Having 40 percent or more (by volume) gravel or other coarse fragments averaged over a depth between 50 and 100 cm from the soil surface.
Endosodic	string	Endosodic (son): Having 15 percent or more exchangeable Na plus Mg on the exchange complex between 50 and 100 cm from the soil surface throughout.
Endostagnic	string	Endostagnic (stn): Having between 50 and 100 cm from the mineral soil surface in some parts reducing conditions for some time during the year and in 25 percent or more of the soil volume, single or in combination, a stagnic colour pattern or an albic horizon.
Entic	string	Entic (et): Not an albic horizon and a loose spodic horizon (in Podzols only).
Epiarenic	string	Epiarenic (arp): Having a texture of loamy fine sand or coarser in a layer, 30 cm or more thick, within 50 cm of the soil surface.
Epiclayic	string	Epiclayic (cep): Having a texture of clay in a layer, 30 cm or more thick, within 50 cm of the soil surface.
Epidystric	string	Epidystric (ed): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent throughout between 20 and 50 cm from the soil surface
Epieutric	string	Epieutric (ee): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more throughout between 20 and 50 cm from the soil surface.
Epigleyic	string	Epigleyic (glp): Having within 50 cm of the mineral soil surface in some parts reducing conditions and in 25 percent or more of the soil volume a gleyic colour pattern.
Epileptic	string	Epileptic (el): Having continuous rock starting within 50 cm of the soil surface.
Epipetric	string	Epipetric (ptp): Having a strongly cemented or indurated layer starting within 50 cm of the soil surface.
Episalic	string	Episalic (ea): Having a salic horizon starting within 50 cm of the soil surface.
Episiltic	string	Episiltic (slp): Having a texture of silt, silt loam, silty clay loam or silty clay in a layer, 30 cm or more thick, within 50 cm of the soil surface.
Episkeletic	string	Episkeletic (skp): Having 40 percent or more (by volume) gravel or other coarse fragments averaged over a depth of 50 cm from the soil surface.
Epistagnic	string	Epistagnic (stn): Having within 50 cm of the mineral soil surface in some parts reducing conditions for some time during the year and in 25 percent or more of the soil volume, single or in combination, a stagnic colour pattern or an albic horizon.
Escallic	string	Escallic (ec): Occurring in human-made terraces.
Eutric	string	Eutric (eu): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more in the major part between 20 and 100 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer, or, in Leptosols, in a layer, 5 cm or more thick, directly above continuous rock.
Eutrosilic	string	Eutrosilic (es): Having one or more layers, cumulatively 30 cm or more thick, with andic properties and a sum of exchangeable bases of 15 cmolc kg <sup>-1</sup> fine earth or more within 100 cm of the surface (in Andosols only).
Ferrallic	string	Ferrallic (fl): Having a ferrallic horizon starting within 200 cm of the soil surface (in

		Anthrosols only) ,or ferralic properties in at least some layer starting within 100 cm of the soil surface (in other soils).
Ferralsolic	string	Ferralsolic (FR): Intergrade qualifier, related to Ferralsol RSG.
Ferric	string	Ferric (fr): Having a ferric horizon starting within 100 cm of the soil surface.
Fibric	string	Fibric (fi): Having, after rubbing, two-thirds or more (by volume) of the organic material consisting of recognizable plant tissue within 100 cm of the soil surface (in Histosols only).
Floatic	string	Floatic (ft): Having organic material floating on water (in Histosols only).
Fluvic	string	Fluvic (fv): Having fluvic material in a layer, 25 cm or more thick, within 100 cm of the soil surface.
Fluvisolic	string	Fluvisolic (FL): Intergrade qualifier, related to Fluvisol RSG.
Folic	string	Folic (fo): Having a folic horizon starting within 40 cm of the soil surface.
Fractipetric	string	Fractipetric (fp): Having a strongly cemented or indurated horizon consisting of fractured or broken clods with an average horizontal length of less than 10 cm, starting within 100 cm of the soil surface.
Fractiplinthic	string	Fractiplinthic (fa): Having a petroplinthic horizon consisting of fractured or broken clods with an average horizontal length of less than 10 cm, starting within 100 cm of the soil surface.
Fragic	string	Fragic (fg): Having a fragic horizon starting within 100 cm of the soil surface.
Fulvic	string	Fulvic (fu): Having a fulvic horizon starting within 30 cm of the soil surface.
Garbic	string	Garbic (ga): Having a layer, 20 cm or more thick within 100 cm of the soil surface, with 20 percent or more (by volume, by weighted average) artefacts containing 35 percent or more (by volume) organic waste materials (in Technosols only).
Gelic	string	Gelic (ge): Having a layer with a soil temperature of 0 °C or less for two or more consecutive years starting within 200 cm of the soil surface.
Gelistagnic	string	Gelistagnic (gt): Having temporary water saturation at the soil surface caused by a frozen subsoil.
Geric	string	Geric (gr): Having geric properties in some layer within 100 cm of the soil surface.
Gibbsic	string	Gibbsic (gi): Having a layer, 30 cm or more thick, containing 25 percent or more gibbsite in the fine earth fraction within 100 cm of the soil surface.
Glacic	string	Glacic (gc): Having a layer, 30 cm or more thick, containing 75 percent (by volume) or more ice within 100 cm of the soil surface.
Gleyic	string	Gleyic (gl): Having within 100 cm of the mineral soil surface in some parts reducing conditions and in 25 percent or more of the soil volume a gleyic colour pattern.
Gleysolic	string	Gleysolic (GL): Intergrade qualifier, related to Gleysol RSG.
Glossalbic	string	Glossalbic (gb): Showing tonguing of an albic into an argic or natric horizon.
Glossic	string	Glossic (gs): Showing tonguing of a mollic or umbric horizon into an underlying layer.
Greyic	string	Greyic (gz): Having Munsell colours with a chroma of 3 or less when moist, a value of 3 or less when moist and 5 or less when dry and uncoated silt and sand grains on structural faces within 5 cm of the mineral soil surface.
Grumic	string	Grumic (gm): Having a soil surface layer with a thickness of 3 cm or more with a strong structure finer than very coarse granular (in Vertisols only).
Gypsic	string	Gypsic (gy): Having a gypsic horizon starting within 100 cm of the soil surface.
Gypsic	string	Gypsic (gp): Having a gypsic material between 20 and 50 cm from the soil surface.
Gypsisolic	string	Gypsisolic (GY): Intergrade qualifier, related to Gypsisol RSG.
Haplic	string	Haplic (ha): Having a typical expression of certain features (typical in the sense that there is no further or meaningful characterization) and only used if none of the preceding qualifiers applies.
Hemic	string	Hemic (hm): Having, after rubbing, between two-thirds and one-sixth (by volume) of the organic material consisting of recognizable plant tissue within 100 cm from the soil surface (in Histosols only).
Histic	string	Histic (hi): Having a histic horizon starting within 40 cm of the soil surface.
Histosolic	string	Histosolic (HS): Intergrade qualifier, related to Histosol RSG.
Hortic	string	Hortic (ht): Having a hortric horizon.
Humic	string	Humic (hu): Having the following organic carbon contents in the fine earth fraction as a weighted average in Ferralsols and Nitisols, 1.4 percent or more to a depth of 100 cm from the mineral soil surface; in Leptosols, 2 percent or more to a depth of 25 cm from the mineral soil surface; in other soils, 1 percent or more to a depth of 50 cm from the mineral soil surface.

Hydragric	string	Hydragric (hg): Having an anthraquic horizon and an underlying hydragric horizon, the latter starting within 100 cm of the soil surface.
Hydric	string	Hydric (hy): Having within 100 cm of the soil surface one or more layers with a combined thickness of 35 cm or more, which have a water retention at 1 500 kPa (in undried samples) of 100 percent or more (in Andosols only).
Hydrophobic	string	Hydrophobic (hf): Water-repellent, i.e. water stands on a dry soil for the duration of 60 seconds or more (in Arenosols only).
Hyperalbic	string	Hyperalbic (ha): Having an albic horizon starting within 50 cm of the soil surface and its lower boundary at a depth of 100 cm or more from the soil surface.
Hyperallic	string	Hyperallic (hl): Having an argic horizon that has a silt to clay ratio of less than 0.6 and an AI saturation (effective) of 50 percent or more, throughout or to a depth of 50 cm below its upper limit, whichever is shallower (in Alisols only).
Hypercalcic	string	Hypercalcic (hc): Having a calcic horizon with 50 percent or more (by mass) calcium carbonate equivalent (in Calcisols only).
Hyperduric	string	Hyperduric (duh): Having a duric horizon with 50 percent or more (by volume) durinodes starting within 100 cm of the soil surface.
Hyperdystric	string	Hyperdystric (hd): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent throughout between 20 and 100 cm from the soil surface, and less than 20 percent in some layer within 100 cm of the soil surface.
Hypereutric	string	Hypereutric (he): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more throughout between 20 and 100 cm from the soil surface and 80 percent or more in some layer within 100 cm of the soil surface.
Hyperferralic	string	Hyperferralic (flh): Having a Ferralic properties and a CEC <sub>1</sub> (by 1 M NH <sub>4</sub> OAc) of less than 16 cmolc kg <sup>-1</sup> clay in at least some layer starting within 100 cm of the soil surface.
Hyperferric	string	Hyperferric (frh): Having a ferric horizon with 40 percent or more of the volume discrete reddish to blackish nodules starting within 100 cm of the soil surface.
Hypergyptic	string	Hypergyptic (hp): Having a gypsic horizon with 50 percent or more (by mass) gypsum (in Gypsisols only).
Hyperhumic	string	Hyperhumic (huh): Having an organic carbon content of 5 percent or more as a weighted average in the fine earth fraction to a depth of 50 cm from the mineral soil surface.
Hyperochric	string	Hyperochric (ho): Having a mineral topsoil layer, 5 cm or more thick, with a Munsell value, dry, of 5.5 or more that turns darker on moistening, an organic carbon content of less than 0.4 percent, a platy structure in 50 percent or more of the volume, and a surface crust.
Hypersalic	string	Hypersalic (hs): Having an ECE of 30 dS m <sup>-1</sup> or more at 25 °C in some layer within 100 cm of the soil surface.
Hyperskeletal	string	Hyperskeletal (hk): Containing less than 20 percent (by volume) fine earth averaged over a depth of 75 cm from the soil surface or to continuous rock, whichever is shallower.
Hyperthionic	string	Hyperthionic (tih): Having a thionic horizon starting within 100 cm of the soil surface and a pH (1:1 in water) less than 3.5.
Hypocalcic	string	Hypocalcic (wc): Having a calcic horizon with a calcium carbonate equivalent content in the fine earth fraction of less than 25 percent and starting within 100 cm of the soil surface (in Calcisols only).
Hypoferralic	string	Hypoferralic (flw): Having in a layer, 30 cm or more thick, within 100 cm of the soil surface a CEC (by 1 M NH <sub>4</sub> OAc) of less than 4 cmolc kg <sup>-1</sup> fine earth and a Munsell chroma, moist, of 5 or more or a hue redder than 10 YR (in Arenosols only).
Hypogypsic	string	Hypogypsic (wg): Having a gypsic horizon with a gypsum content in the fine earth fraction of less than 25 percent and starting within 100 cm of the soil surface (in Gypsisols only).
Hypoluvic	string	Hypoluvic (wl): Having an absolute clay increase of 3 percent or more within 100 cm of the soil surface (in Arenosols only).
Hyposalic	string	Hyposalic (ws): Having an ECE of 4 dS m <sup>-1</sup> or more at 25 °C in some layer within 100 cm of the soil surface.
Hyposodic	string	Hyposodic (sow): Having 6 percent or more exchangeable Na on the exchange complex in a layer, 20 cm or more thick, within 100 cm of the soil surface.
Irragric	string	Irragric (ir): Having an irrigric horizon.
Kastanozem	string	Kastanozem (KS): Intergrade qualifier, related to Kastanozem RSG.
Lamellic	string	Lamellic (ll): Having clay lamellae with a combined thickness of 15 cm or more within 200 cm of the soil surface.

Laxic	string	Laxic (la): Having a bulk density of less than 0.8 kg dm <sup>-3</sup> , in a mineral soil layer, 20 cm or more thick, starting within 75 cm of the soil surface.
Leptic	string	Leptic (le): Having continuous rock starting within 100 cm of the soil surface.
Leptosolic	string	Leptosolic (LP): Intergrade qualifier, related to Leptosol RSG.
Lignic	string	Lignic (lg): Having inclusions of intact wood fragments, which make up one-quarter or more of the soil volume, within 50 cm of the soil surface (in Histosols only).
Limnic	string	Limnic (lm): Having limnic material, cumulatively 10 cm or more thick, within 50 cm of the soil surface.
Linic	string	Linic (lc): Having a continuous, very slowly permeable to impermeable constructed geomembrane of any thickness starting within 100 cm of the soil surface.
Lithic	string	Lithic (li): Having continuous rock starting within 10 cm of the soil surface (in Leptosols only).
Lixic	string	Lixic (lx): Having an argic horizon that has a CEC (by 1 M NH <sub>4</sub> OAc) of 24 cmolc kg <sup>-1</sup> clay or more in some part to a maximum depth of 50 cm below its upper limit, either starting within 100 cm of the soil surface or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout, and a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more in the major part between 50 and 100 cm from the soil surface.
Lixisolic	string	Lixisolic (LX): Intergrade qualifier, related to Lixisol RSG.
Luvic	string	Luvic (lv): Having an argic horizon that has a CEC of 24 cmolc kg <sup>-1</sup> clay or more throughout or to a depth of 50 cm below its upper limit, whichever is shallower, either starting within 100 cm of the soil surface or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout, and a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more in the major part between 50 and 100 cm from the soil surface.
Luvisolic	string	Luvisolic (LV): Intergrade qualifier, related to Luvisol RSG.
Magnesian	string	Magnesian (mg): Having an exchangeable Ca to Mg ratio of less than 1 in the major part within 100 cm of the soil surface or to continuous rock or a cemented or indurated layer, whichever is shallower.
Manganiferrous	string	Manganiferrous (mf): Having a ferric horizon starting within 100 cm of the soil surface in which half or more of the nodules or mottles are black.
Mazic	string	Mazic (mz): Massive and hard to very hard in the upper 20 cm of the soil (in Vertisols only).
Melanic	string	Melanic (ml): Having a melanic horizon starting within 30 cm of the soil surface (in Andosols only).
Mesotrophic	string	Mesotrophic (ms): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 75 percent at a depth of 20 cm from the soil surface (in Vertisols only).
Mollic	string	Mollic (mo): Having a mollic horizon.
Molliglossic	string	Molliglossic (mi): Showing tonguing of a mollic horizon into an underlying layer.
Natric	string	Natric (na): Having a natric horizon starting within 100 cm of the soil surface.
Nitic	string	Nitic (ni): Having a nitic horizon starting within 100 cm of the soil surface.
Nitisolic	string	Nitisolic (NT): Intergrade qualifier, related to Nitisol RSG.
Novic	string	Novic (nv): Having above the soil that is classified at the RSG level, a layer with recent sediments (new material), 5 cm or more and less than 50 cm thick.
Nudilithic	string	Nudilithic (nt): Having continuous rock at the soil surface (in Leptosols only).
Nudiyermic	string	Nudiyermic (yes): Having a yermic horizon without a desert pavement.
Ombic	string	Ombic (om): Having a histic horizon saturated predominantly with rainwater starting within 40 cm of the soil surface (in Histosols only).
Ornithic	string	Ornithic (oc): Having a layer 15 cm or more thick with ornithogenic material starting within 50 cm of the soil surface.
Orthodystric	string	Orthodystric (dyo): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent throughout between 20 and 100 cm from the soil surface.
Orthoetric	string	Orthoetric (euo): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more throughout between 20 and 100 cm from the soil surface.
Orthothionic	string	Orthothionic (tio): Having a thionic horizon starting within 100 cm of the soil surface and a pH (1:1 in water) between 3.5 and 4.0.
Ortsteinic	string	Ortsteinic (os): Having a cemented spodic horizon (ortstein) (in Podzols only).
Oxyaquic	string	Oxyaquic (oa): Saturated with oxygen-rich water during a period of 20 or more consecutive days and not a gleyic or stagnic colour pattern in some layer within 100 cm of

		the soil surface.
Pachic	string	Pachic (ph): Having a mollic or umbric horizon 50 cm or more thick.
Pellic	string	Pellic (pe): Having in the upper 30 cm of the soil a Munsell value, moist, of 3.5 or less and achroma, moist, of 1.5 or less (in Vertisols only).
Petric	string	Petric (pt): Having a strongly cemented or indurated layer starting within 100 cm of the soil surface.
Petrocalcic	string	Petrocalcic (pc): Having a petrocalcic horizon starting within 100 cm of the soil surface.
Petroduric	string	Petroduric (pd): Having a petroduric horizon starting within 100 cm of the soil surface.
Petrogleyic	string	Petrogleyic (py): Having a layer, 10 cm or more thick, with an oximorphic colour pattern 1, 15 percent or more (by volume) of which is cemented (bog iron), within 100 cm of the surface.
Petrogypsic	string	Petrogypsic (pg): Having a petrogypsic horizon starting within 100 cm of the soil surface.
Petroplinthic	string	Petroplinthic (pp): Having a petroplinthic horizon starting within 100 cm of the soil surface.
Petrosalic	string	Petrosalic (ps): Having within 100 cm of the soil surface, a layer, 10 cm or more thick, which is cemented by salts more soluble than gypsum.
Phaeozemic	string	Phaeozemic (PH): Intergrade qualifier, related to Phaeozem RSG.
Phytotoxic	string	Phytotoxic (ptx): Having in some layer within 50 cm of the soil surface sufficiently high or low concentrations of ions other than Al, Fe, Na, Ca and Mg, to markedly affect plant growth.
Pisoplinthic	string	Pisoplinthic (px): Having a pisoplinthic horizon starting within 100 cm of the soil surface.
Placic	string	Placic (pi): Having within 100 cm of the soil surface, an iron pan, between 1 and 25 mm thick, that is continuously cemented by a combination of organic matter, Fe and/or Al.
Plaggic	string	Plaggic (pa): Having a plaggic horizon.
Planosolic	string	Planosolic (PL): Intergrade qualifier, related to Planosol RSG.
Plinthic	string	Plinthic (pl): Having a plinthic horizon starting within 100 cm of the soil surface.
Plinthosolic	string	Plinthosolic (PT): Intergrade qualifier, related to Plinthosol RSG.
Podzolic	string	Podzolic (PZ): Intergrade qualifier, related to Podzol RSG.
Posic	string	Posic (po): Having a zero or positive charge (pHKCl - pH water, both 1:1) in a layer, 30 cm or more thick, starting within 100 cm of the soil surface (in Plinthosols and Ferralsols only).
Profondic	string	Profondic (pf): Having an argic horizon in which the clay content does not decrease by 20 percent or more (relative) from its maximum within 150 cm of the soil surface.
Protic	string	Protic (pr): Showing no soil horizon development (in Arenosols only).
Protothionic	string	Protothionic (tip): Having a layer with sulphidic material, 15 cm or more thick, starting within 100 cm of the soil surface.
Puffic	string	Puffic (pu): Having a crust pushed up by salt crystals (in Solonchaks only).
Reductaquic	string	Reductaquic (ra): Saturated with water during the thawing period and at some time of the year reducing conditions above a cryic horizon and within 100 cm of the soil surface (in Cryosols only).
Reductic	string	Reductic (rd): Having reducing conditions in 25 percent or more of the soil volume within 100 cm of the soil surface caused by gaseous emissions, e.g. methane or carbon dioxide (in Technosols only).
Regic	string	Regic (rg): Not having buried horizons (in Anthrosols only).
Regosolic	string	Regosolic (RG): Intergrade qualifier, related to Regosol RSG.
Rendzic	string	Rendzic (rz): Having a mollic horizon that contains or immediately overlies calcareous materials containing 40 percent or more calcium carbonate equivalent.
Rheic	string	Rheic (rh): Having a histic horizon saturated predominantly with groundwater or flowing surface water starting within 40 cm of the soil surface (in Histosols only).
Rhodic	string	Rhodic (ro): Having within 150 cm of the soil surface a subsurface layer, 30 cm or more thick, with a Munsell hue redder than 5 YR (3.5 YR or redder), a value, moist, of less than 3.5 and a value, dry, no more than one unit higher than the moist value.
Rubic	string	Rubic (ru): Within 100 cm of the soil surface a subsurface layer, 30 cm or more thick, with a Munsell hue redder than 10 YR or a chroma, moist, of 5 or more (in Arenosols only).
Ruptic	string	Ruptic (rp): Having a lithological discontinuity within 100 cm of the soil surface.
Rustic	string	Rustic (rs): Having a spodic horizon that turns redder on ignition (in Podzols only).
Salic	string	Salic (sz): Having a salic horizon starting within 100 cm of the soil surface.
Sapric	string	Sapric (sa): Having, after rubbing, less than one-sixth (by volume) of the organic material

		consisting of recognizable plant tissue within 100 cm of the soil surface (in Histosols only).
Silandic	string	Silandic (sn): Having one or more layers, cumulatively 30 cm or more thick, with andic properties and an acid oxalate (pH 3) extractable silica (Siox) content of 0.6 percent or more, or an Alpy to Alox ratio of less than 0.5 within 100 cm of the soil surface (in Andosols only). Thaptosilandic (snb) Having one or more buried layers, cumulatively 30 cm or more thick, with andic properties and an acid oxalate (pH 3) extractable silica (Siox) content of 0.6 percent or more, or an Alpy to Alox ratio of less than 0.5 within 100 cm of the soil surface.
Siltic	string	Siltic (sl): Having a texture of silt, silt loam, silty clay loam or silty clay in a layer, 30 cm or more thick, within 100 cm of the soil surface.
Siltinovic	string	Siltinovic (snv): Having above the soil that is classified at the RSG level, a layer with recent sediments (new material), 5 cm or more and less than 50 cm thick, which has a texture of silt, silt loam, silty clay loam or silty clay in its major part.
Skeletal	string	Skeletal (sk): 40 percent or more (by volume) gravel or other coarse fragments averaged over a depth of 100 cm from the soil surface or to continuous rock or a cemented or indurated layer, whichever is shallower.
Sodic	string	Sodic (so): Having 15 percent or more exchangeable Na plus Mg on the exchange complex within 50 cm of the soil surface throughout.
Solodic	string	Solodic (sc): Having a layer, 15 cm or more thick within 100 cm of the soil surface, with the columnar or prismatic structure of the natric horizon, but lacking its sodium saturation requirements.
Solonchakic	string	Solonchakic (SC): Intergrade qualifier, related to Solonchak RSG.
Solonetzic	string	Solonetzic (SN): Intergrade qualifier, related to Solonetz RSG.
Sombric	string	Sombric (sm): Having a sombric horizon starting within 150 cm of the soil surface.
Spodic	string	Spodic (sd): Having a spodic horizon starting within 200 cm of the mineral soil surface.
Spolic	string	Spolic (sp): Having a layer, 20 cm or more thick within 100 cm of the soil surface, with 20 percent or more (by volume, by weighted average) artefacts containing 35 percent or more (by volume) of industrial waste (mine spoil, dredgings, rubble, etc.) (in Technosols only).
Stagnic	string	Stagnic (st): Having within 100 cm of the mineral soil surface in some parts reducing conditions for some time during the year and in 25 percent or more of the soil volume, single or in combination, a stagnic colour pattern or an albic horizon.
Stagnosolic	string	Stagnosolic (ST): Intergrade qualifier, related to Stagnosol RSG.
Subaquatic	string	Subaquatic (sq): Being permanently submerged under water not deeper than 200 cm.
Sulphatic	string	Sulphatic (su): Having a salic horizon with a soil solution (1:1 in water) with $[SO_4^{2-}] \gg [HCO_3^-] > [Cl^-]$ (in Solonchaks only).
Takyric	string	Takyric (ty): Having a takyric horizon.
Technic	string	Technic (te): Having 10 percent or more (by volume, by weighted average) artefacts in the upper 100 cm from the soil surface or to continuous rock or a cemented or indurated layer, whichever is shallower.
Technosolic	string	Technosolic (TC): Intergrade qualifier, related to Technosol RSG.
Tephric	string	Tephric (tf): Having tephric material to a depth of 30 cm or more from the soil surface or to continuous rock, whichever is shallower.
Terric	string	Terric (tr): Having a terric horizon.
Thaptaluandic	string	Thaptaluandic (aab): Having one or more buried layers, cumulatively 30 cm or more thick, with andic properties and an acid oxalate (pH 3) extractable silica content of less than 0.6 percent, or an Alpy3/Alox4 of 0.5 or more, within 100 cm of the soil surface.
Thaptandic	string	Thaptandic (ba): Having one or more buried layers, cumulatively 30 cm or more thick, with andic properties, within 100 cm of the soil surface.
Thaptofolic	string	Thaptofolic (fob): Having a buried folic horizon starting between 40 and 100 cm from the soil surface.
Thaptohistic	string	Thaptohistic (hib): Having a buried histic horizon starting between 40 and 100 cm from the soil surface.
Thaptovitric	string	Thaptovitric (bv): Having one or more buried layers, cumulatively 30 cm or more thick, with vitric properties, within 100 cm of the soil surface.
Thionic	string	Thionic (ti): Having a thionic horizon or a layer with sulphidic material, 15 cm or more thick, starting within 100 cm of the soil surface.
Thixotropic	string	Thixotropic (tp): Having in some layer within 50 cm of the soil surface material that

		changes, under pressure or by rubbing, from a plastic solid into a liquefied stage and back into the solid condition.
Tidalic Toxic	string string	Tidalic (td): Being flooded by tidewater but not covered by water at mean low tide. Toxic (tx): Having in some layer within 50 cm of the soil surface toxic concentrations of organic or inorganic substances other than ions of Al, Fe, Na, Ca and Mg.
Transportic	string	Transportic (tn): Having a layer, 30 cm or more thick, with solid or liquid material that has been moved from a source area outside the immediate vicinity of the soil by intentional human activity, usually with the aid of machinery, and without substantial reworking or displacement by natural forces
Turbic	string	Turbic (tu): Having cryoturbation features (mixed material, disrupted soil horizons, involutions, organic intrusions, frost heave, separation of coarse from fine materials, cracks or patterned ground) at the soil surface or above a cryic horizon and within 100 cm of the soil surface.
Umbric	string	Umbric (um): Having an umbric horizon.
Umbriglossic	string	Umbriglossic (ug): Showing tonguing of an umbric horizon into an underlying layer.
Umbrisolic	string	Umbrisolic (UM): Intergrade qualifier, related to Umbrisol RSG.
Urbic	string	Urbic (ub): Having a layer, 20 cm or more thick within 100 cm of the soil surface, with 20 percent or more (by volume, by weighted average) artefacts containing 35 percent or more (by volume) of rubble and refuse of human settlements (in Technosols only).
Vermic	string	Vermic (vm): Having 50 percent or more (by volume, by weighted average) of worm holes, casts, or filled animal burrows in the upper 100 cm of the soil or to continuous rock or cemented or indurated layer, whichever is shallower.
Vertic	string	Vertic (vr): Having a vertic horizon or vertic properties starting within 100 cm of the soil surface.
Vertisolic	string	Vertisolic (VR): Intergrade qualifier, related to Vertisol RSG.
Vetic	string	Vetic (vt): Having an ECEC (sum of exchangeable bases plus exchangeable acidity in 1 M KCl) of less than 6 cmolc kg <sup>-1</sup> clay in some subsurface layer within 100 cm of the soil surface.
Vitric	string	Vitric (vi): Having one or more layers, cumulatively 30 cm or more thick, with vitric properties, within 100 cm of the soil surface.
Voronic	string	Voronic (vo): Having a voronic horizon (in Chernozems only).
Xanthic	string	Xanthic (xa): Having a ferralic horizon that has in a subhorizon, 30 cm or more thick within 150 cm of the soil surface, a Munsell hue of 7.5 YR or yellower and a value, moist, of 4 or more and a chroma, moist, of 5 or more.
Yermic	string	Yermic (ye): Having a yermic horizon, including a desert pavement.
Zootoxic	string	Zootoxic (ztx): Having in some layer within 50 cm of the soil surface sufficiently high and persistent concentrations of organic or inorganic substances to markedly affect the health of animals, including humans, that ingest plants grown on these soils.

### Relationships

Columns	Association	Notes
	Qualifier2006.	
1	QualifierList2006.name	

## QualifierList2007

*Database:* Java, *Stereotype:* «enumeration», *Package:* SoilClassification

*Detail:* Created on 07/07/2009. Last modified on 29/10/2009.

*Notes:* A list of available qualifiers, according to WRB2007.

### Columns

Name	Type	Notes
Abruptic	string	Abruptic (ap): Having an abrupt textural change within 100 cm of the soil surface.
Aceric	string	Aceric (ae): Having a pH (1:1 in water) between 3.5 and 5 and jarosite mottles in some layer within 100 cm of the soil surface (in Solonchaks only).
Acric	string	Acric (ac): Having an argic horizon that has a CEC (by 1 M NH <sub>4</sub> OAc) of less than 24 cmolc kg <sup>-1</sup> clay in some part to a maximum depth of 50 cm below its upper limit, either starting within 100 cm of the soil surface or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout, and a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent in the major part between 50 and 100 cm from the soil surface.
Acroxic	string	Acroxic (ao): Having less than 2 cmolc kg <sup>-1</sup> fine earth exchangeable bases plus 1 M KCl exchangeable Al <sup>3+</sup> in one or more layers with a combined thickness of 30 cm or more within 100 cm of the soil surface (in Andosols only).
Albic	string	Albic (ab): Having an albic horizon starting within 100 cm of the soil surface.
Alcalic	string	Alcalic (ax): Having a pH (1:1 in water) of 8.5 or more throughout within 50 cm of the soil surface or to continuous rock or a cemented or indurated layer, whichever is shallower.
Alic	string	Alic (al): Having an argic horizon that has a CEC (by 1 M NH <sub>4</sub> OAc) of 24 cmolc kg <sup>-1</sup> clay or more throughout or to a depth of 50 cm below its upper limit, whichever is shallower, either starting within 100 cm of the soil surface or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout, and a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent in the major part between 50 and 100 cm from the soil surface.
Aluandic	string	Aluandic (aa): Having one or more layers, cumulatively 30 cm or more thick, with andic properties and an acid oxalate (pH 3) extractable silica content of less than 0.6 percent, and an Al <sub>pyl</sub> /Al <sub>ox2</sub> of 0.5 or more, within 100 cm of the soil surface (in Andosols only).
Alumic	string	Alumic (au): Having an Al saturation (effective) of 50 percent or more in some layer between 50 and 100 cm from the surface.
Andic	string	Andic (an): Having one or more layers, cumulatively 30 cm or more thick, with andic properties, within 100 cm of the soil surface.
Anthraquic	string	Anthraquic (aq): Having an anthraquic horizon.
Anthric	string	Anthric (am): Having an anthric horizon.
Anthrotoxic	string	Anthrotoxic (atx): Having in some layer within 50 cm of the soil surface sufficiently high and persistent concentrations of organic or inorganic substances to markedly affect the health of humans who come in regular contact with the soil.
Arenic	string	Arenic (ar): Having a texture of loamy fine sand or coarser in a layer, 30 cm or more thick, within 100 cm of the soil surface.
Areninovic	string	Areninovic (anv): Having above the soil that is classified at the RSG level, a layer with recent sediments (new material), 5 cm or more and less than 50 cm thick, which has a texture of loamy fine sand or coarser in its major part.
Aric	string	Aric (ai): Having only remnants of diagnostic horizons – disturbed by deep ploughing.
Aridic	string	Aridic (ad): Having aridic properties without a takyric or yermic horizon.
Arzic	string	Arzic (az): Having sulphate-rich groundwater in some layer within 50 cm of the soil surface during some time in most years and containing 15 percent or more gypsum averaged over a depth of 100 cm from the soil surface or to continuous rock or a cemented or indurated layer, whichever is shallower (in Gypsisols only).
Brunic	string	Brunic (br): Having a layer, 15 cm or more thick, which meets criteria 2?4 of the cambic horizon but fails criterion 1, starting within 50 cm of the soil surface.
Calcaric	string	Calcaric (ca): Having calcaric material between 20 and 50 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer, whichever is shallower.

Calcic	string	Calcic (cc): Having a calcic horizon or concentrations of secondary carbonates starting within 100 cm of the soil surface.
Cambic	string	Cambic (cm): Having a cambic horizon starting within 50 cm of the soil surface.
Carbic	string	Carbic (cb): Having a spodic horizon that does not turn redder on ignition (in Podzols only).
Carbonatic	string	Carbonatic (cn): Having a salic horizon with a soil solution (1:1 in water) with a pH of 8.5 or more and $[HCO_3^-] > [SO_4^{2-}] \gg [Cl^-]$ (in Solonchaks only).
Chloridic	string	Chloridic (cl): Having a salic horizon with a soil solution (1:1 in water) with $[Cl^-] \gg [SO_4^{2-}] \gg [HCO_3^-]$ (in Solonchaks only).
Chromic	string	Chromic (cr): Having within 150 cm of the soil surface a subsurface layer, 30 cm or more thick, that has a Munsell hue redder than 7.5 YR or that has both, a hue of 7.5 YR and a chroma, moist, of more than 4.
Clayic	string	Clayic (ce): Having a texture of clay in a layer, 30 cm or more thick, within 100 cm of the soil surface.
Clayinovic	string	Clayinovic (cnv): Having above the soil that is classified at the RSG level, a layer with recent sediments (new material), 5 cm or more and less than 50 cm thick, which has a texture of clay in its major part.
Colluvic	string	Colluvic (co): Having colluvic material, 20 cm or more thick, created by human-induced lateral movement.
Cryic	string	Cryic (cy): Having a cryic horizon starting within 100 cm of the soil surface or a cryic horizon starting within 200 cm of the soil surface with evidence of cryoturbation in some layer within 100 cm of the soil surface.
Cutanic	string	Cutanic (ct): Having clay coatings in some parts of an argic horizon either starting within 100 cm of the soil surface or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout.
Densic	string	Densic (dn): Having natural or artificial compaction within 50 cm of the soil surface to the extent that roots cannot penetrate.
Drainic	string	Drainic (dr): Having a histic horizon that is drained artificially starting within 40 cm of the soil surface.
Duric	string	Duric (du): Having a duric horizon starting within 100 cm of the soil surface.
Dystric	string	Dystric (dy): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent in the major part between 20 and 100 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer, or, in Leptosols, in a layer, 5 cm or more thick, directly above continuous rock.
Ecotoxic	string	Ecotoxic (etx): Having in some layer within 50 cm of the soil surface sufficiently high and persistent concentrations of organic or inorganic substances to markedly affect soil ecology, in particular the populations of the mesofauna.
Ekranic	string	Ekranic (ek): Having technic hard rock starting within 5 cm of the soil surface and covering 95 percent or more of the horizontal extent of a pedon (in Technosols only).
Endoarenic	string	Endoarenic (arn): Having a texture of loamy fine sand or coarser in a layer, 30 cm or more thick, between 50 and 100 cm from the soil surface.1 Alpy: pyrophosphate-extractable aluminium, expressed as percent of the fine earth (0.2 mm) fraction on an oven-dried (105 °C) basis.2 Alox: acid oxalate-extractable aluminium (Blakemore, Searle and Daly, 1981), expressed as percent of the fine earth (0.2 mm) fraction on an oven-dried (105 °C) basis.3 Alpy: pyrophosphate-extractable aluminium, expressed as percent of the fine earth (0.2 mm) fraction on an oven-dried (105 °C) basis.4 Alox: acid oxalate-extractable aluminium (Blakemore, Searle and Daly, 1981), expressed as percent of the fine earth (0.2 mm) fraction on an oven-dried (105 °C) basis.
Endoclayic	string	Endoclayic (cen): Having a texture of clay in a layer, 30 cm or more thick, within 50 and 100 cm of the soil surface.
Endoduric	string	Endoduric (nd): Having a duric horizon starting between 50 and 100 cm from the soil surface.
Endodystric	string	Endodystric (ny): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent throughout between 50 and 100 cm from the soil surface.
Endoeutric	string	Endoeutric (ne): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more throughout between 50 and 100 cm from the soil surface.
Endofluvic	string	Endofluvic (nf): Having fluvic material in a layer, 25 cm or more thick, between 50 and 100 cm from the soil surface.
Endogleyic	string	Endogleyic (ng): Having between 50 and 100 cm from the mineral soil surface in some

		parts reducing conditions and in 25 percent or more of the soil volume a gleyic colour pattern.
Endoleptic	string	Endoleptic (nl): Having continuous rock starting between 50 and 100 cm from the soil surface.
Endopetric	string	Endopetric (ptn): Having a strongly cemented or indurated layer starting between 50 and 100 cm from the soil surface.
Endosalic	string	Endosalic (ns): Having a salic horizon starting between 50 and 100 cm from the soil surface.
Endosiltic	string	Endosiltic (sln): Having a texture of silt, silt loam, silty clay loam or silty clay in a layer, 30 cm or more thick, within 50 and 100 cm of the soil surface.
Endoskeletal	string	Endoskeletal (skn): Having 40 percent or more (by volume) gravel or other coarse fragments averaged over a depth between 50 and 100 cm from the soil surface.
Endosodic	string	Endosodic (son): Having 15 percent or more exchangeable Na plus Mg on the exchange complex between 50 and 100 cm from the soil surface throughout.
Endostagnic	string	Endostagnic (stn): Having between 50 and 100 cm from the mineral soil surface in some parts reducing conditions for some time during the year and in 25 percent or more of the soil volume, single or in combination, a stagnic colour pattern or an albic horizon.
Entic	string	Entic (et): Not an albic horizon and a loose spodic horizon (in Podzols only).
Epiarenic	string	Epiarenic (arp): Having a texture of loamy fine sand or coarser in a layer, 30 cm or more thick, within 50 cm of the soil surface.
Epiclayic	string	Epiclayic (cep): Having a texture of clay in a layer, 30 cm or more thick, within 50 cm of the soil surface.
Epidystric	string	Epidystric (ed): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent throughout between 20 and 50 cm from the soil surface
Epieutric	string	Epieutric (ee): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more throughout between 20 and 50 cm from the soil surface.
Epigleyic	string	Epigleyic (glp): Having within 50 cm of the mineral soil surface in some parts reducing conditions and in 25 percent or more of the soil volume a gleyic colour pattern.
Epileptic	string	Epileptic (el): Having continuous rock starting within 50 cm of the soil surface.
Epipetric	string	Epipetric (ptp): Having a strongly cemented or indurated layer starting within 50 cm of the soil surface.
Episalic	string	Episalic (ea): Having a salic horizon starting within 50 cm of the soil surface.
Episiltic	string	Episiltic (slp): Having a texture of silt, silt loam, silty clay loam or silty clay in a layer, 30 cm or more thick, within 50 cm of the soil surface.
Episkeletic	string	Episkeletic (skp): Having 40 percent or more (by volume) gravel or other coarse fragments averaged over a depth of 50 cm from the soil surface.
Epistagnic	string	Epistagnic (stn): Having within 50 cm of the mineral soil surface in some parts reducing conditions for some time during the year and in 25 percent or more of the soil volume, single or in combination, a stagnic colour pattern or an albic horizon.
Escalic	string	Escalic (ec): Occurring in human-made terraces.
Eutric	string	Eutric (eu): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more in the major part between 20 and 100 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer, or, in Leptosols, in a layer, 5 cm or more thick, directly above continuous rock.
Eutrosilic	string	Eutrosilic (es): Having one or more layers, cumulatively 30 cm or more thick, with andic properties and a sum of exchangeable bases of 15 cmolc kg <sup>-1</sup> fine earth or more within 100 cm of the surface (in Andosols only).
Ferralic	string	Ferralic (fl): Having a ferralic horizon starting within 200 cm of the soil surface (in Anthrosols only) ,or ferralic properties in at least some layer starting within 100 cm of the soil surface (in other soils).
Ferric	string	Ferric (fr): Having a ferric horizon starting within 100 cm of the soil surface.
Fibric	string	Fibric (fi): Having, after rubbing, two-thirds or more (by volume) of the organic material consisting of recognizable plant tissue within 100 cm of the soil surface (in Histosols only).
Floatic	string	Floatic (ft): Having organic material floating on water (in Histosols only).
Fluvic	string	Fluvic (fv): Having fluvic material in a layer, 25 cm or more thick, within 100 cm of the soil surface.
Folic	string	Folic (fo): Having a folic horizon starting within 40 cm of the soil surface.
Fractipetric	string	Fractipetric (fp): Having a strongly cemented or indurated horizon consisting of fractured

		or broken clods with an average horizontal length of less than 10 cm, starting within 100 cm of the soil surface.
Fractiplinthic	string	Fractiplinthic (fa): Having a petroplinthic horizon consisting of fractured or broken clods with an average horizontal length of less than 10 cm, starting within 100 cm of the soil surface.
Fragic	string	Fragic (fg): Having a fragic horizon starting within 100 cm of the soil surface.
Fulvic	string	Fulvic (fu): Having a fulvic horizon starting within 30 cm of the soil surface.
Garbic	string	Garbic (ga): Having a layer, 20 cm or more thick within 100 cm of the soil surface, with 20 percent or more (by volume, by weighted average) artefacts containing 35 percent or more (by volume) organic waste materials (in Technosols only).
Gelic	string	Gelic (ge): Having a layer with a soil temperature of 0 °C or less for two or more consecutive years starting within 200 cm of the soil surface.
Gelistagnic	string	Gelistagnic (gt): Having temporary water saturation at the soil surface caused by a frozen subsoil.
Geric	string	Geric (gr): Having geric properties in some layer within 100 cm of the soil surface.
Gibbsic	string	Gibbsic (gi): Having a layer, 30 cm or more thick, containing 25 percent or more gibbsite in the fine earth fraction within 100 cm of the soil surface.
Glacic	string	Glacic (gc): Having a layer, 30 cm or more thick, containing 75 percent (by volume) or more ice within 100 cm of the soil surface.
Gleyic	string	Gleyic (gl): Having within 100 cm of the mineral soil surface in some parts reducing conditions and in 25 percent or more of the soil volume a gleyic colour pattern.
Glossalbic	string	Glossalbic (gb): Showing tonguing of an albic into an argic or natric horizon.
Glossic	string	Glossic (gs): Showing tonguing of a mollic or umbric horizon into an underlying layer.
Greyic	string	Greyic (gz): Having Munsell colours with a chroma of 3 or less when moist, a value of 3 or less when moist and 5 or less when dry and uncoated silt and sand grains on structural faces within 5 cm of the mineral soil surface.
Grumic	string	Grumic (gm): Having a soil surface layer with a thickness of 3 cm or more with a strong structure finer than very coarse granular (in Vertisols only).
Gypsic	string	Gypsic (gy): Having a gypsic horizon starting within 100 cm of the soil surface.
Gypsic	string	Gypsic (gp): Having a gypsic material between 20 and 50 cm from the soil surface.
Haplic	string	Haplic (ha): Having a typical expression of certain features (typical in the sense that there is no further or meaningful characterization) and only used if none of the preceding qualifiers applies.
Hemic	string	Hemic (hm): Having, after rubbing, between two-thirds and one-sixth (by volume) of the organic material consisting of recognizable plant tissue within 100 cm from the soil surface (in Histosols only).
Histic	string	Histic (hi): Having a histic horizon starting within 40 cm of the soil surface.
Hortic	string	Hortic (ht): Having a hortic horizon.
Humic	string	Humic (hu): Having the following organic carbon contents in the fine earth fraction as a weighted average in Ferralsols and Nitisols, 1.4 percent or more to a depth of 100 cm from the mineral soil surface; in Leptosols, 2 percent or more to a depth of 25 cm from the mineral soil surface; in other soils, 1 percent or more to a depth of 50 cm from the mineral soil surface.
Hydragric	string	Hydragric (hg): Having an anthraquic horizon and an underlying hydragric horizon, the latter starting within 100 cm of the soil surface.
Hydric	string	Hydric (hy): Having within 100 cm of the soil surface one or more layers with a combined thickness of 35 cm or more, which have a water retention at 1 500 kPa (in undried samples) of 100 percent or more (in Andosols only).
Hydrophobic	string	Hydrophobic (hf): Water-repellent, i.e. water stands on a dry soil for the duration of 60 seconds or more (in Arenosols only).
Hyperalbic	string	Hyperalbic (ha): Having an albic horizon starting within 50 cm of the soil surface and its lower boundary at a depth of 100 cm or more from the soil surface.
Hyperallic	string	Hyperallic (hl): Having an argic horizon that has a silt to clay ratio of less than 0.6 and an Al saturation (effective) of 50 percent or more, throughout or to a depth of 50 cm below its upper limit, whichever is shallower (in Alisols only).
Hypercalcic	string	Hypercalcic (hc): Having a calcic horizon with 50 percent or more (by mass) calcium carbonate equivalent (in Calcisols only).
Hyperduric	string	Hyperduric (duh): Having a duric horizon with 50 percent or more (by volume) durinodes starting within 100 cm of the soil surface.

Hyperdystric	string	Hyperdystric (hd): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent throughout between 20 and 100 cm from the soil surface, and less than 20 percent in some layer within 100 cm of the soil surface.
Hypereutric	string	Hypereutric (he): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more throughout between 20 and 100 cm from the soil surface and 80 percent or more in some layer within 100 cm of the soil surface.
Hyperferralic	string	Hyperferralic (flh): Having a Ferralic properties and a CEC <sub>1</sub> (by 1 M NH <sub>4</sub> OAc) of less than 16 cmolc kg <sup>-1</sup> clay in at least some layer starting within 100 cm of the soil surface.
Hyperferric	string	Hyperferric (fih): Having a ferric horizon with 40 percent or more of the volume discrete reddish to blackish nodules starting within 100 cm of the soil surface.
Hypergyptic	string	Hypergyptic (hp): Having a gypsic horizon with 50 percent or more (by mass) gypsum (in Gypsisols only).
Hyperhumic	string	Hyperhumic (huh): Having an organic carbon content of 5 percent or more as a weighted average in the fine earth fraction to a depth of 50 cm from the mineral soil surface.
Hyperochric	string	Hyperochric (ho): Having a mineral topsoil layer, 5 cm or more thick, with a Munsell value, dry, of 5.5 or more that turns darker on moistening, an organic carbon content of less than 0.4 percent, a platy structure in 50 percent or more of the volume, and a surface crust.
Hypersalic	string	Hypersalic (hs): Having an ECE of 30 dS m <sup>-1</sup> or more at 25 °C in some layer within 100 cm of the soil surface.
Hyperskeletal	string	Hyperskeletal (hk): Containing less than 20 percent (by volume) fine earth averaged over a depth of 75 cm from the soil surface or to continuous rock, whichever is shallower.
Hyperthionic	string	Hyperthionic (tih): Having a thionic horizon starting within 100 cm of the soil surface and a pH (1:1 in water) less than 3.5.
Hypocalcic	string	Hypocalcic (wc): Having a calcic horizon with a calcium carbonate equivalent content in the fine earth fraction of less than 25 percent and starting within 100 cm of the soil surface (in Calcisols only).
Hypoferralic	string	Hypoferralic (flw): Having in a layer, 30 cm or more thick, within 100 cm of the soil surface a CEC (by 1 M NH <sub>4</sub> OAc) of less than 4 cmolc kg <sup>-1</sup> fine earth and a Munsell chroma, moist, of 5 or more or a hue redder than 10 YR (in Arenosols only).
Hypogyptic	string	Hypogyptic (wg): Having a gypsic horizon with a gypsum content in the fine earth fraction of less than 25 percent and starting within 100 cm of the soil surface (in Gypsisols only).
Hypoluvic	string	Hypoluvic (wl): Having an absolute clay increase of 3 percent or more within 100 cm of the soil surface (in Arenosols only).
Hyposalic	string	Hyposalic (ws): Having an ECE of 4 dS m <sup>-1</sup> or more at 25 °C in some layer within 100 cm of the soil surface.
Hyposodic	string	Hyposodic (sow): Having 6 percent or more exchangeable Na on the exchange complex in a layer, 20 cm or more thick, within 100 cm of the soil surface.
Irragric	string	Irragric (ir): Having an irrigric horizon.
Lamellic	string	Lamellic (ll): Having clay lamellae with a combined thickness of 15 cm or more within 200 cm of the soil surface.
Laxic	string	Laxic (la): Having a bulk density of less than 0.8 kg dm <sup>-3</sup> , in a mineral soil layer, 20 cm or more thick, starting within 75 cm of the soil surface.
Leptic	string	Leptic (le): Having continuous rock starting within 100 cm of the soil surface.
Lignic	string	Lignic (lg): Having inclusions of intact wood fragments, which make up one-quarter or more of the soil volume, within 50 cm of the soil surface (in Histosols only).
Limnic	string	Limnic (lm): Having limnic material, cumulatively 10 cm or more thick, within 50 cm of the soil surface.
Linic	string	Linic (lc): Having a continuous, very slowly permeable to impermeable constructed geomembrane of any thickness starting within 100 cm of the soil surface.
Lithic	string	Lithic (li): Having continuous rock starting within 10 cm of the soil surface (in Leptosols only).
Lixic	string	Lixic (lx): Having an argic horizon that has a CEC (by 1 M NH <sub>4</sub> OAc) of 24 cmolc kg <sup>-1</sup> clay or more in some part to a maximum depth of 50 cm below its upper limit, either starting within 100 cm of the soil surface or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout, and a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more in the major part between 50 and 100 cm from the soil surface.

Luvic	string	Luvic (lv): Having an argic horizon that has a CEC of 24 cmolc kg <sup>-1</sup> clay or more throughout or to a depth of 50 cm below its upper limit, whichever is shallower, either starting within 100 cm of the soil surface or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout, and a base saturation (by 1 MNH <sub>4</sub> OAc) of 50 percent or more in the major part between 50 and 100 cm from the soil surface.
Magnesian	string	Magnesian (mg): Having an exchangeable Ca to Mg ratio of less than 1 in the major part within 100 cm of the soil surface or to continuous rock or a cemented or indurated layer, whichever is shallower.
Manganiferous	string	Manganiferous (mf): Having a ferric horizon starting within 100 cm of the soil surface in which half or more of the nodules or mottles are black.
Mazic	string	Mazic (mz): Massive and hard to very hard in the upper 20 cm of the soil (in Vertisols only).
Melanic	string	Melanic (ml): Having a melanic horizon starting within 30 cm of the soil surface (in Andosols only).
Mesotrophic	string	Mesotrophic (ms): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 75 percent at a depth of 20 cm from the soil surface (in Vertisols only).
Mollic	string	Mollic (mo): Having a mollic horizon.
Molliglossic	string	Molliglossic (mi): Showing tonguing of a mollic horizon into an underlying layer.
Natric	string	Natric (na): Having a natric horizon starting within 100 cm of the soil surface.
Nitic	string	Nitic (ni): Having a nitic horizon starting within 100 cm of the soil surface.
Novic	string	Novic (nv): Having above the soil that is classified at the RSG level, a layer with recent sediments (new material), 5 cm or more and less than 50 cm thick.
Nudilithic	string	Nudilithic (nt): Having continuous rock at the soil surface (in Leptosols only).
Nudiyermic	string	Nudiyermic (yes): Having a yermic horizon without a desert pavement.
Ombic	string	Ombic (om): Having a histic horizon saturated predominantly with rainwater starting within 40 cm of the soil surface (in Histosols only).
Ornithic	string	Ornithic (oc): Having a layer 15 cm or more thick with ornithogenic material starting within 50 cm of the soil surface.
Orthodystric	string	Orthodystric (dyo): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent throughout between 20 and 100 cm from the soil surface.
Orthoetric	string	Orthoetric (euo): Having a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more throughout between 20 and 100 cm from the soil surface.
Orthothionic	string	Orthothionic (tio): Having a thionic horizon starting within 100 cm of the soil surface and a pH (1:1 in water) between 3.5 and 4.0.
Ortsteinic	string	Ortsteinic (os): Having a cemented spodic horizon (ortstein) (in Podzols only).
Oxyaquic	string	Oxyaquic (oa): Saturated with oxygen-rich water during a period of 20 or more consecutive days and not a gleyic or stagnic colour pattern in some layer within 100 cm of the soil surface.
Pachic	string	Pachic (ph): Having a mollic or umbric horizon 50 cm or more thick.
Pellic	string	Pellic (pe): Having in the upper 30 cm of the soil a Munsell value, moist, of 3.5 or less and achroma, moist, of 1.5 or less (in Vertisols only).
Petric	string	Petric (pt): Having a strongly cemented or indurated layer starting within 100 cm of the soil surface.
Petrocalcic	string	Petrocalcic (pc): Having a petrocalcic horizon starting within 100 cm of the soil surface.
Petroduric	string	Petroduric (pd): Having a petroduric horizon starting within 100 cm of the soil surface.
Petrogleyic	string	Petrogleyic (py): Having a layer, 10 cm or more thick, with an oximorphic colour pattern, 15 percent or more (by volume) of which is cemented (bog iron), within 100 cm of the surface.
Petrogypsic	string	Petrogypsic (pg): Having a petrogypsic horizon starting within 100 cm of the soil surface.
Petroplinthic	string	Petroplinthic (pp): Having a petroplinthic horizon starting within 100 cm of the soil surface.
Petrosalic	string	Petrosalic (ps): Having within 100 cm of the soil surface, a layer, 10 cm or more thick, which is cemented by salts more soluble than gypsum.
Phytotoxic	string	Phytotoxic (ptx): Having in some layer within 50 cm of the soil surface sufficiently high or low concentrations of ions other than Al, Fe, Na, Ca and Mg, to markedly affect plant growth.
Pisoplinthic	string	Pisoplinthic (px): Having a pisoplinthic horizon starting within 100 cm of the soil surface.
Placic	string	Placic (pi): Having within 100 cm of the soil surface, an iron pan, between 1 and 25 mm

		thick, that is continuously cemented by a combination of organic matter, Fe and/or Al.
Plaggic	string	Plaggic (pa): Having a plaggic horizon.
Plinthic	string	Plinthic (pl): Having a plinthic horizon starting within 100 cm of the soil surface.
Posic	string	Posic (po): Having a zero or positive charge (pHKCl - pH water, both 1:1) in a layer, 30 cm or more thick, starting within 100 cm of the soil surface (in Plinthosols and Ferralsols only).
Profondic	string	Profondic (pf): Having an argic horizon in which the clay content does not decrease by 20 percent or more (relative) from its maximum within 150 cm of the soil surface.
Protic	string	Protic (pr): Showing no soil horizon development (in Arenosols only).
Protothionic	string	Protothionic (tip): Having a layer with sulphidic material, 15 cm or more thick, starting within 100 cm of the soil surface.
Puffic	string	Puffic (pu): Having a crust pushed up by salt crystals (in Solonchaks only).
Reductaquic	string	Reductaquic (ra): Saturated with water during the thawing period and at some time of the year reducing conditions above a cryic horizon and within 100 cm of the soil surface (in Cryosols only).
Reductic	string	Reductic (rd): Having reducing conditions in 25 percent or more of the soil volume within 100 cm of the soil surface caused by gaseous emissions, e.g. methane or carbon dioxide (in Technosols only).
Regic	string	Regic (rg): Not having buried horizons (in Anthrosols only).
Rendzic	string	Rendzic (rz): Having a mollic horizon that contains or immediately overlies calcaric materials containing 40 percent or more calcium carbonate equivalent.
Rheic	string	Rheic (rh): Having a histic horizon saturated predominantly with groundwater or flowing surface water starting within 40 cm of the soil surface (in Histosols only).
Rhodic	string	Rhodic (ro): Having within 150 cm of the soil surface a subsurface layer, 30 cm or more thick, with a Munsell hue redder than 5 YR (3.5 YR or redder), a value, moist, of less than 3.5 and a value, dry, no more than one unit higher than the moist value.
Rubic	string	Rubic (ru): Within 100 cm of the soil surface a subsurface layer, 30 cm or more thick, with a Munsell hue redder than 10 YR or a chroma, moist, of 5 or more (in Arenosols only).
Ruptic	string	Ruptic (rp): Having a lithological discontinuity within 100 cm of the soil surface.
Rustic	string	Rustic (rs): Having a spodic horizon that turns redder on ignition (in Podzols only).
Salic	string	Salic (sz): Having a salic horizon starting within 100 cm of the soil surface.
Sapric	string	Sapric (sa): Having, after rubbing, less than one-sixth (by volume) of the organic material consisting of recognizable plant tissue within 100 cm of the soil surface (in Histosols only).
Silandic	string	Silandic (sn): Having one or more layers, cumulatively 30 cm or more thick, with andic properties and an acid oxalate (pH 3) extractable silica (S <sub>iox</sub> ) content of 0.6 percent or more, or an Al <sub>py</sub> to Al <sub>ox</sub> ratio of less than 0.5 within 100 cm of the soil surface (in Andosols only). Thaptosilandic (snb) Having one or more buried layers, cumulatively 30 cm or more thick, with andic properties and an acid oxalate (pH 3) extractable silica (S <sub>iox</sub> ) content of 0.6 percent or more, or an Al <sub>py</sub> to Al <sub>ox</sub> ratio of less than 0.5 within 100 cm of the soil surface.
Siltic	string	Siltic (sl): Having a texture of silt, silt loam, silty clay loam or silty clay in a layer, 30 cm or more thick, within 100 cm of the soil surface.
Siltinovic	string	Siltinovic (snv): Having above the soil that is classified at the RSG level, a layer with recent sediments (new material), 5 cm or more and less than 50 cm thick, which has a texture of silt, silt loam, silty clay loam or silty clay in its major part.
Skeletal	string	Skeletal (sk): 40 percent or more (by volume) gravel or other coarse fragments averaged over a depth of 100 cm from the soil surface or to continuous rock or a cemented or indurated layer, whichever is shallower.
Sodic	string	Sodic (so): Having 15 percent or more exchangeable Na plus Mg on the exchange complex within 50 cm of the soil surface throughout.
Solodic	string	Solodic (sc): Having a layer, 15 cm or more thick within 100 cm of the soil surface, with the columnar or prismatic structure of the natric horizon, but lacking its sodium saturation requirements.
Sombric	string	Sombric (sm): Having a sombric horizon starting within 150 cm of the soil surface.
Spodic	string	Spodic (sd): Having a spodic horizon starting within 200 cm of the mineral soil surface.
Spolic	string	Spolic (sp): Having a layer, 20 cm or more thick within 100 cm of the soil surface, with 20 percent or more (by volume, by weighted average) artefacts containing 35 percent or

		more (by volume) of industrial waste (mine spoil, dredgings, rubble, etc.) (in Technosols only).
Stagnic	string	Stagnic (st): Having within 100 cm of the mineral soil surface in some parts reducing conditions for some time during the year and in 25 percent or more of the soil volume, single or in combination, a stagnic colour pattern or an albic horizon.
Subaquatic	string	Subaquatic (sq): Being permanently submerged under water not deeper than 200 cm.
Sulphatic	string	Sulphatic (su): Having a salic horizon with a soil solution (1:1 in water) with $[SO_4^{2-}] \gg [HCO_3^-] > [Cl^-]$ (in Solonchaks only).
Takyric	string	Takyric (ty): Having a takyric horizon.
Technic	string	Technic (te): Having 10 percent or more (by volume, by weighted average) artefacts in the upper 100 cm from the soil surface or to continuous rock or a cemented or indurated layer, whichever is shallower.
Tephric	string	Tephric (tf): Having tephric material to a depth of 30 cm or more from the soil surface or to continuous rock, whichever is shallower.
Terric	string	Terric (tr): Having a terric horizon.
Thaptaluandic	string	Thaptaluandic (aab): Having one or more buried layers, cumulatively 30 cm or more thick, with andic properties and an acid oxalate (pH 3) extractable silica content of less than 0.6 percent, or an $Alp_3/Al_{ox4}$ of 0.5 or more, within 100 cm of the soil surface.
Thaptandic	string	Thaptandic (ba): Having one or more buried layers, cumulatively 30 cm or more thick, with andic properties, within 100 cm of the soil surface.
Thaptofolic	string	Thaptofolic (fob): Having a buried folic horizon starting between 40 and 100 cm from the soil surface.
Thaptohistic	string	Thaptohistic (hib): Having a buried histic horizon starting between 40 and 100 cm from the soil surface.
Thaptovitric	string	Thaptovitric (bv): Having one or more buried layers, cumulatively 30 cm or more thick, with vitric properties, within 100 cm of the soil surface.
Thionic	string	Thionic (ti): Having a thionic horizon or a layer with sulphidic material, 15 cm or more thick, starting within 100 cm of the soil surface.
Thixotropic	string	Thixotropic (tp): Having in some layer within 50 cm of the soil surface material that changes, under pressure or by rubbing, from a plastic solid into a liquefied stage and back into the solid condition.
Tidalic	string	Tidalic (td): Being flooded by tidewater but not covered by water at mean low tide.
Toxic	string	Toxic (tx): Having in some layer within 50 cm of the soil surface toxic concentrations of organic or inorganic substances other than ions of Al, Fe, Na, Ca and Mg.
Transportic	string	Transportic (tn): Having a layer, 30 cm or more thick, with solid or liquid material that has been moved from a source area outside the immediate vicinity of the soil by intentional human activity, usually with the aid of machinery, and without substantial reworking or displacement by natural forces.
Turbic	string	Turbic (tu): Having cryoturbation features (mixed material, disrupted soil horizons, involutions, organic intrusions, frost heave, separation of coarse from fine materials, cracks or patterned ground) at the soil surface or above a cryic horizon and within 100 cm of the soil surface.
Umbric	string	Umbric (um): Having an umbric horizon.
Umbriglossic	string	Umbriglossic (ug): Showing tonguing of an umbric horizon into an underlying layer.
Urbic	string	Urbic (ub): Having a layer, 20 cm or more thick within 100 cm of the soil surface, with 20 percent or more (by volume, by weighted average) artefacts containing 35 percent or more (by volume) of rubble and refuse of human settlements (in Technosols only).
Vermic	string	Vermic (vm): Having 50 percent or more (by volume, by weighted average) of worm holes, casts, or filled animal burrows in the upper 100 cm of the soil or to continuous rock or a cemented or indurated layer, whichever is shallower.
Vertic	string	Vertic (vr): Having a vertic horizon or vertic properties starting within 100 cm of the soil surface.
Vetic	string	Vetic (vt): Having an ECEC (sum of exchangeable bases plus exchangeable acidity in 1 M KCl) of less than 6 cmolc kg <sup>-1</sup> clay in some subsurface layer within 100 cm of the soil surface.
Vitric	string	Vitric (vi): Having one or more layers, cumulatively 30 cm or more thick, with vitric properties, within 100 cm of the soil surface.
Voronic	string	Voronic (vo): Having a voronic horizon (in Chernozems only).
Xanthic	string	Xanthic (xa): Having a ferralic horizon that has in a subhorizon, 30 cm or more thick

		within 150 cm of the soil surface, a Munsell hue of 7.5 YR or yellower and a value, moist, of 4 or more and a chroma, moist, of 5 or more.
Yermic Zootoxic	string string	Yermic (ye): Having a yermic horizon, including a desert pavement. Zootoxic (ztx): Having in some layer within 50 cm of the soil surface sufficiently high and persistent concentrations of organic or inorganic substances to markedly affect the health of animals, including humans, that ingest plants grown on these soils.

***Relationships***

Columns	Association	Notes
	Qualifier2007.	
	<b>1</b> QualifierList2007.name	

## RSGList

*Database:* Java, *Stereotype:* «enumeration», *Package:* SoilClassification

*Detail:* Created on 07/07/2009. Last modified on 29/07/2009.

*Notes:* List of 32 Reference Soil Group according to WRB 2006 manual.

### Columns

Name	Type	Notes
Acrisol	string	Other soils having 1. an argic horizon that has a CEC (by 1 M NH <sub>4</sub> OAc) of less than 24 cmolc kg <sup>-1</sup> clay <sub>2</sub> in some part to a maximum depth of 50 cm below its upper limit, either starting within 100 cm of the soil surface, or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout, and 2. a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent in the major part between 50 and 100 cm.
Albeluvisol	string	Other soils having an argic horizon starting within 100 cm of the soil surface with albeluvisol tonguing at its upper boundary.
Alisol	string	Other soils having 1. an argic horizon, which has a CEC (by 1 M NH <sub>4</sub> OAc) of 24 cmolc kg <sup>-1</sup> clay <sub>1</sub> or more throughout or to a depth of 50 cm below its upper limit, whichever is shallower, either starting within 100 cm of the soil surface, or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout; and 2. a base saturation (by 1 M NH <sub>4</sub> OAc) of less than 50 percent in the major part between 50 and 100 cm.
Andosol	string	Other soils having 1. one or more layers with andic or vitric properties with a combined thickness of either a. 30 cm or more within 100 cm of the soil surface and starting within 25 cm of the soil surface; or b. 60 percent or more of the entire thickness of the soil when continuous rock or a cemented or indurated layer is starting between 25 and 50 cm from the soil surface; and 2. no argic, ferralic, petroplinthic, pisoplinthic, plinthic or spodic horizon (unless buried deeper than 50 cm).
Anthrosol	string	Other soils having 1. either a hortic, irrigric, plaggic or terric horizon 50 cm or more thick; or 2. an anthraquic horizon and an underlying hydric horizon with a combined thickness of 50 cm or more.
Arenosol	string	Other soils having 1. a weighted average texture of loamy sand or coarser, if cumulative layers of finer texture are less than 15 cm thick, either to a depth of 100 cm from the soil surface or to a petroplinthic, pisoplinthic, plinthic or salic horizon starting between 50 and 100 cm from the soil surface; and 2. less than 40 percent (by volume) of gravels or coarser fragments in all layers within 100 cm of the soil surface or to a petroplinthic, pisoplinthic, plinthic or salic horizon starting between 50 and 100 cm from the soil surface; and 3. no fragic, irrigric, hortic, plaggic or terric horizon; and 4. no layers with andic or vitric properties with a combined thickness of 15 cm.
Calcisol	string	Other soils having 1. a petrocalcic horizon starting within 100 cm of the soil surface; or 2. a calcic horizon starting within 100 cm of the soil surface and a. a calcareous matrix between 50 cm from the soil surface and the calcic horizon throughout if the calcic horizon starts below 50 cm; and b. no argic horizon unless the argic horizon is permeated with calcium carbonate.
Cambisol	string	Other soils having 1. a cambic horizon starting within 50 cm of the soil surface and having its base 25 cm or more below the soil surface or 15 cm or more below any plough layer; or 2. an anthraquic, hortic, hydric, irrigric, plaggic or terric horizon; or 3. a fragic, petroplinthic, pisoplinthic, plinthic, salic or vertic horizon starting within 100 cm of the soil surface; or

		4. one or more layers with <i>andic or vitric properties with a combined thickness of 15 cm or more within 100 cm of the soil surface.
Chernozem	string	Other soils having 1. a mollic horizon with a moist chroma of 2 or less to a depth of 20 cm or more, or having this chroma directly below any plough layer that is 20 cm or more deep; and 2. a calcic horizon, or concentrations of secondary carbonates starting within 50 cm below the lower limit of the mollic horizon and, if present, above a cemented or indurated layer; and 3. a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more from the soil surface to the calcic horizon or the concentrations of secondary carbonates throughout.
Cryosol	string	Other soils having 1. a cryic horizon starting within 100 cm of the soil surface; or 2. a cryic horizon starting within 200 cm of the soil surface and evidence of cryoturbation in some layer within 100 cm of the soil surface.
Durisol	string	Other soils having a petroduric or duric horizon starting within 100 cm of the soil surface.
Ferralsol	string	Other soils having 1. a ferralic horizon starting within 150 cm of the soil surface; and 2. no argic horizon that has, in the upper 30 cm, 10 percent or more water-dispersible clay unless the upper 30 cm of the argic horizon has one or both of the following: a. geric properties; or b. 1.4 percent or more organic carbon.
Fluvisol	string	Other soils having 1. fluvic material starting within 25 cm of the soil surface or starting immediately below a plough layer of any depth and continuing to a depth of 50 cm or more; and 2. no layers with andic or vitric properties with a combined thickness of 30 cm or more within 100 cm of the soil surface and starting within 25 cm of the soil surface.
Gleysol	string	Other soils having 1. within 50 cm of the mineral soil surface in some parts reducing conditions and in half or more of the soil volume a gleyic colour pattern; and 2. no layers with andic or vitric properties with a combined thickness of either a. 30 cm or more within 100 cm of the soil surface and starting within 25 cm of the soil surface; or b. 60 percent or more of the entire thickness of the soil when continuous rock or a cemented or indurated layer is starting between 25 and 50 cm from the soil surface.
Gypsisol	string	Other soils having 1. a petrogypsic horizon starting within 100 cm of the soil surface; or 2. a gypsic horizon starting within 100 cm of the soil surface and no argic horizon unless the argic horizon is permeated with gypsum or calcium carbonate.
Histosol	string	Soils having organic material, either 1. 10 cm or more thick starting at the soil surface and immediately overlying ice, continuous rock, or fragmental materials, the interstices of which are filled with organic material; or 2. cumulatively within 100 cm of the soil surface either 60 cm or more thick if 75 percent (by volume) or more of the material consists of moss fibres or 40 cm or more thick in other materials and starting within 40 cm of the soil surface.
Kastanozem	string	Other soils having 1. a mollic horizon; and 2. a calcic horizon, or concentrations of secondary carbonates starting within 50 cm below the lower limit of the mollic horizon and, if present, above a cemented or indurated layer; and 3. a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more from the soil surface to the calcic horizon or the concentrations of secondary carbonates throughout.
Leptosol	string	Other soils having 1. one of the following: a. limitation of depth by continuous rock within 25 cm of the soil surface; or b. less than 20 percent (by volume) fine earth averaged over a depth of 75 cm from the soil surface or to continuous rock, whichever is shallower; and 2. no calcic, gypsic or spodic horizon.

Lixisol	string	Other soils having an argic horizon, either starting within 100 cm of the soil surface or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout.
Luvisol	string	Other soils having an argic horizon with a CEC (by 1 M NH <sub>4</sub> OAc) of 24 cmolc kg <sup>-1</sup> clay <sup>1</sup> or more throughout or to a depth of 50 cm below its upper limit, whichever is shallower, either starting within 100 cm of the soil surface or within 200 cm of the soil surface if the argic horizon is overlain by loamy sand or coarser textures throughout.
Nitisol	string	Other soils having 1. a nitic horizon starting within 100 cm of the soil surface; and 2. gradual to diffuse <sup>1</sup> horizon boundaries between the soil surface and the nitic horizon; and 3. no ferric, petroplinthic, pisoplinthic, plinthic or vertic horizon starting within 100 cm of the soil surface; and 4. no gleyic or stagnic colour pattern starting within 100 cm of the soil surface.
Phaeozem	string	Other soils having 1. a mollic horizon; and 2. a base saturation (by 1 M NH <sub>4</sub> OAc) of 50 percent or more throughout to a depth of 100 cm or more from the soil surface or to continuous rock or a cemented or indurated layer, whichever is shallower.
Planosol	string	Other soils having 1. an abrupt textural change within 100 cm of the soil surface and, directly above or below, a layer 5 cm or more thick, that has in some parts reducing conditions for some time during the year and in half or more of the soil volume, single or in combination a. a stagnic colour pattern; or b. an albic horizon; and 2. no albeluvic tonguing starting within 100 cm of the soil surface.
Plinthosol	string	Other soils having either 1. a plinthic, petroplinthic or pisoplinthic horizon starting within 50 cm of the soil surface; or 2. a plinthic horizon starting within 100 cm of the soil surface and, directly above, a layer 10 cm or more thick, that has in some parts reducing conditions for some time during the year and in half or more of the soil volume, single or in combination a. a stagnic colour pattern; or b. an albic horizon.
Podzol	string	Other soils having a spodic horizon starting within 200 cm of the mineral soil surface.
Regosol	string	Other soils.
Solonchak	string	Other soils having 1. a salic horizon starting within 50 cm of the soil surface; and 2. no thionic horizon starting within 50 cm of the soil surface.
Solonetz	string	Other soils having a natric horizon starting within 100 cm of the soil surface.
Stagnosol	string	Other soils having 1. within 50 cm of the mineral soil surface in some parts reducing conditions for some time during the year and in half or more of the soil volume, single or in combination, a. a stagnic colour pattern; or b. an albic horizon; and 2. no albeluvic tonguing starting within 100 cm of the soil surface.
Technosol	string	Other soils having 1. 20 percent or more (by volume, by weighted average) artefacts in the upper 100 cm from the soil surface or to continuous rock or a cemented or indurated layer, whichever is shallower; or 2. a continuous, very slowly permeable to impermeable, constructed geomembrane of any thickness starting within 100 cm of the soil surface; or 3. technic hard rock starting within 5 cm of the soil surface and covering 95 percent or more of the horizontal extent of the soil.
Umbrisol	string	Other soils having an umbric or mollic horizon.
Vertisol	string	Other soils having 1. a vertic horizon starting within 100 cm of the soil surface; and 2. after the upper 20 cm have been mixed, 30 percent or more clay between the soil surface and the vertic horizon throughout; and

	3. cracks1 that open and close periodically.
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***Relationships***

<b>Columns</b>	<b>Association</b>	<b>Notes</b>
	1 WRB2007. RSGList.rsg	
	1 WRB2006. RSGList.rsg	

## SoilClassification

*Database:* Java, *Stereotype:* , *Package:* SoilClassification

*Detail:* Created on 10/07/2009. Last modified on 03/08/2009.

*Notes:* This class represents a generalized classification applied to a soil profile (e.g. WRB 2006).

### Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
	name	Character String							
	year	Character String							
	holder	Character String							
	vesrion	Character String							

### Relationships

Columns	Association	Notes
	SoilClassification. <b>1</b> Borehole.borehole	
	<b>0..*</b> Profile. <b>0..*</b> SoilClassification.classification	Classification(s) of the profile according to a number of different standard.
	WRB2006. SoilClassification.	
	FAORevisedLegend1988. SoilClassification.	
	NationalSystem. SoilClassification.	
	USDAsoilTaxonomy. SoilClassification.	
	WRB2007. SoilClassification.	

## SoilUnitList

*Database:* Java, *Stereotype:* «enumeration», *Package:* SoilClassification

*Detail:* Created on 08/09/2009. Last modified on 08/09/2009.

*Notes:* The enumerated list of valid soil units, according to FAO revised legend 1988.

### Columns

Name	Type	Notes
ACp		<b>Plinthic Acrisols (ACp)</b> Acrisols having plinthite within 125 cm of the surface.
ACg		<b>Gleyic Acrisols (ACg)</b> Other Acrisols showing gleyic properties within 100 cm of the surface.
ACu		<b>Humic Acrisols (ACu)</b> Other Acrisols which are strongly humic, having an umbric or a mollic A-horizon.
ACf		<b>Ferric Acrisols (ACf)</b> Other Acrisols showing ferric properties.
ACh		<b>Haplic Acrisols (ACh)</b> Other Acrisols.
ALp		<b>Plinthic Alisols (ALp)</b> Alisols having plinthite within 125 cm of the surface.
ALg		<b>Gleyic Alisols (ALg)</b> Other Alisols showing gleyic properties within 100 cm of the surface.
ALj		<b>Stagnic Alisols (ALj)</b> Other Alisols showing stagnic properties within 50 cm of the surface.
ALu		<b>Humic Alisols (ALu)</b> <b>Humic Alisols (ALu)</b> Other Alisols which are strongly humic, having an umbric or a mollic A-horizon.
ALf		<b>Ferric Alisols (ALf)</b> Other Alisols showing ferric properties.
ALh		<b>Haplic Alisols (ALh)</b> Other Alisols.
ATa		<b>Aric Anthrosols (ATa)</b> Anthrosols showing remnants of diagnostic horizons due to deep cultivation.
ATf		<b>Fimic Anthrosols (ATf)</b> Other Anthrosols having a fimic A-horizon.
ATc		<b>Cumulic Anthrosols (ATc)</b> Other Anthrosols having an accumulation layer of fine sediments, thicker than 50 cm resulting from long-continued irrigation or artificial raising of the soil surface.
ATu		<b>Urbic Anthrosols (ATu)</b> Other Anthrosols having, to a depth of more than 50 cm, admixtures of wastes from mines, town refuses, fills from urban developments, etc.
ARg		<b>Gleyic Arenosols (ARg)</b> Arenosols showing gleyic properties within 100cm of the surface.
ARa		<b>Albic Arenosols (ARa)</b> Other Arenosols having an albic E-horizon with a minimum thickness of 50 cm within 125 cm from the surface.
ARc		<b>Calcaric Arenosols (ARc)</b> Other Arenosols which are calcareous at least between 20 and 50 cm from the surface.
ARl		<b>Luvic Arenosols (ARl)</b> Other Arenosols showing an increase of 3 percent clay or mor lamellae of clay accumulation within 125 cm of the surface.
ARo		<b>Ferralic Arenosols (ARo)</b> Other Arenosols showing ferralic properties within 125 cm of the surface and colouring of the B-horizon expressed by chromass of 5 or more and/or hues redder than 10 YR.
ARb		<b>Cambic Arenosols (ARb)</b> Other Arenosols showing colouring of a cambic B-horizon.
ARh		<b>Haplic Arenosols (ARh)</b>

		Other Arenosols.
CLp		<b>Petric Calcisols (CLp)</b> Calcisols having a petrocalcic horizon, the upper part of which occurs within 100 cm of the surface.
CLI		<b>Luvic Calcisols (CLI)</b> Other Gypsisols that are calcareous at least between 20 and 50 cm from the surface and have an argic B-horizon.
CLh		<b>Haplic Calcisols (CLh)</b> Other Calcisols.
CMi		<b>Gelic Cambisols (CMi)</b> Cambisols having permafrost within 200cm of the surface.
CMg		<b>Gleyic Cambisols (CMg)</b> Other Cambisols showing gleyic properties within 100cm of the surface.
CMv		<b>Vertic Cambisols (CMv)</b> Other Cambisols showing vertic properties.
CMu		<b>Humic Cambisols (CMu)</b> Other Cambisols showing an umbric A-horizon or a mollic A-horizon overlying a cambic B-horizon with a base saturation (by 1M NH <sub>4</sub> OAc at pH 7.0) of less than 50 percent.
CMc		<b>Calcaric Cambisols (CMc)</b> Other Cambisols which are calcareous at least between 20 and 50 cm from the surface.
CMo		<b>Ferralic Cambisols (CMo)</b> Other Cambisols having a cambic B-horizon with ferralic properties.
Cmd		<b>Dystric Cambisols (Cmd)</b> Other Cambisols having a base saturation of less than 50 percent (by 1M NH <sub>4</sub> OAc at pH 7.0) at least in some part of the B-horizon.
CMx		<b>Chromic Cambisols (CMx)</b> Other Cambisols having a strong brown to red B-horizon (rubbed soil has a hue of 7.5YR and a chroma of more than 4, or a hue redder than 7.5YR).
CMe		<b>Eutric Cambisols (CMe)</b> Other Cambisols.
CHg		<b>Gleyic Chernozems (CHg)</b> Chernozems having a argic B-horizon and showing gleyic properties within 100 cm of the surface.
CHI		<b>Luvic Chernozems (CHI)</b> Other Chernozems having an argic B-horizon.
CHw		<b>Glossic Chernozems (CHw)</b> Other Chernozems showing tonguing of the A-horizon into a cambic B-horizon or into a C-horizon.
CHk		<b>Calcic Chernozems (CHk)</b> Other Chernozems having a calcic horizon or a petrocalcic horizon.
CHh		<b>Haplic Chernozems (CHh)</b> Other Chernozems.
FRp		<b>Plinthic Ferralsols (FRp)</b> Histosols having plinthic within 125 cm of the surface.
FRg		<b>Geric Ferralsols (FRg)</b> Other Ferralsols having geric properties in at least some part of the ferralic B-horizon within 125cm of the surface.
FRu		<b>Humic Ferralsols (FRu)</b> Other Ferralsols which are strongly humic, having an umbric A-horizon, or a mollic A-horizon and a base saturation (by 1M NH <sub>4</sub> OAc at pH 7.0) of less than 50 percent in at least a part of the B-horizon within 100 cm of the surface.
FRr		<b>Rhodic Ferralsols (FRr)</b> Other Ferralsols having a red to dusky red B-horizon (rubbed soil has hues redder than 5YR with a moist value of less than 4 and a dry value not more than one unit higher then the moist value.
FRx		<b>Xanthic Ferralsols (FRx)</b> Other Ferralsols having a yellow to pale yellow B-horizon (rubbed soil has hues of 7.5YR or yellower with a moist value of 4 or more and a moist chroma of 5 or more).
FRh		<b>Haplic Ferralsols (FRh)</b>

		Other Ferralsols.
FLt		<b>Thionic Fluvisols (FLt)</b> Fluvisols having a sulfuric horizon or sulfidic material, or both, at less than 125 cm from the surface.
FLm		<b>Calcic Fluvisols (FLm)</b> Other Fluvisols having a mollic A-horizon or a eutric histic H-horizon.
FLc		<b>Calcic Fluvisols (FLc)</b> Other Fluvisols which are calcareous at least between 20 and 50 cm from the surface.
FLu		<b>Umbric Fluvisols (FLu)</b> Other Fluvisols having an umbric A-horizon or a dystric histic H-horizon.
FLd		<b>Dystric Fluvisols (FLd)</b> Other Fluvisols having a base saturation (by 1M NH <sub>4</sub> OAc at pH 7.0) of less than 50 percent, at least between 20 and 50 cm from the surface.
FLs		<b>Salic Fluvisols (FLs)</b> Other Fluvisols showing salic properties.
FLe		<b>Eutric Fluvisols (FLe)</b> Other Fluvisols.
GLi		<b>Gelic Gleysols (GLi)</b> Gleysols having permafrost within 200cm of the surface.
GLt		<b>Thionic Gleysols (GLt)</b> Other Gleysols having a sulfuric horizon at less 125 cm from the surface.
GLa		<b>Andic Gleysols (GLa)</b> Other Gleysols having andic properties.
GLm		<b>Mollic Gleysols (GLm)</b> Other Gleysols having a mollic A-horizon or a eutric histic H-horizon.
GLu		<b>Umbric Gleysols (GLu)</b> Other Gleysols having an umbric A-horizon or a dystric histic H-horizon.
GLk		<b>Calcic Gleysols (GLk)</b> Other Gleysols having a calcic horizon within 125 cm of the surface.
GLd		<b>Dystric Gleysols (GLd)</b> Other Gleysols having a base saturation (by 1M NH <sub>4</sub> OAc at pH 7.0) of less than 50 percent, at least between 20 and 50 cm from the surface.
GLE		<b>Eutric Gleysols (GLE)</b> Other Gleysols.
GRg		<b>Gleyic Greyzems (GRg)</b> Greyzems showing gleyic properties within 100 cm of the surface.
GRh		<b>Haplic Greyzems (GRh)</b> Other Greyzems.
GYp		<b>Petric Gypsisols (GYp)</b> Gypsisols having a petrogypsic horizon, the upper part of which occurs within 100 cm of the surface.
GYk		<b>Calcic Gypsisols (GYk)</b> Other Gypsisols having a calcic horizon or a petrocalcic horizon.
GYl		<b>Luvic Gypsisols (GYl)</b> Other Gypsisols that are calcareous or gypsiferous at least between 20 and 50 cm from the surface, having an argic B-horizon.
GYh		<b>Haplic Gypsisols (GYh)</b> Other Gypsisols.
HSi		<b>Gelic Histosols (HSi)</b> Histosols having permafrost within 200cm of the surface.
HSt		<b>Thionic Histosols (HSt)</b> Other Histosols having a sulfuric horizon or sulfidic materials at less than 125cm from the surface.
HSI		<b>Folic Histosols (HSI)</b> Other Histosols that are well drained and are never saturated with water for more than a few days.
HSf		<b>Fibric Histosols (HSf)</b> Other Histosols having raw or weakly decomposed organic materials, the fibre content of which is dominant to a depth of 35cm or more from the surface; having very poor drainage or

		being undrained.
HSs		<b>Terric Histosols (HSs)</b> Other Histosols having highly decomposed organic materials with only small amounts of visible plant fibers and a very dark grey to black color to a depth of 35cm or more from the surface, having an imperfect to very poor drainage.
KSy		<b>Gypsic Kastanozems (KSy)</b> Kastanozems having a gypsic horizon or a petrogypsic horizon.
KSl		<b>Luvic Kastanozems (KSl)</b> Other Kastanozems having an argic B-horizon.
KSk		<b>Calcic Kastanozems (KSk)</b> Other Kastanozems having a calcic horizon or a petrocalcic horizon.
KSh		<b>Haplic Kastanozems (KSh)</b> Other Kastanozems.
LPq		<b>Lithic Leptosols (LPq)</b> Leptosols which are limited in depth by continuous hard rock within 10 cm of the surface .
LPi		<b>Gelic Leptosols (LPi)</b> Other Leptosols having permafrost within 200 cm of the surface.
LPk		<b>Rendzic Leptosols (LPk)</b> Other Leptosols having a mollic A-horizon which contains or immediatly overlies calcareous material with a calcium carbonate equivalent of more than 40 percent.
LPm		<b>Mollic Leptosols (LPm)</b> Other Leptosols having a mollic A-horizon.
LPu		<b>Umbric Leptosols (LPu)</b> Other Leptosols having a umbric A-horizon.
LPd		<b>Dystric Leptosols (LPd)</b> Other Leptosols having an ochric A-horizon and a base saturation (by 1M NH <sub>4</sub> OAc at pH 7.0) of less than 50 percent.
LPe		<b>Eutric Leptosols (LPe)</b> Other Leptosols.
LXp		<b>Plinthic Lixisols (LXp)</b> Lixisols having plinthite within 125 cm of the surface.
LXg		<b>Gleyic Lixisols (LXg)</b> Other Lixisols showing gleyic properties within 100 cm of the surface.
LXj		<b>Stagnic Lixisols (LXj)</b> Other Lixisols showing stagnic properties within 50 cm of the surface.
LXa		<b>Albic Lixisols (LXa)</b> Other Lixisols having an albic E-horizon.
LXf		<b>Ferric Lixisols (LXf)</b> Other Lixisols showing ferric properties.
LXh		<b>Haplic Lixisols (LXh)</b> Other Lixisols.
LVg		<b>Gleyic Luvisols (LVg)</b> Luvisols showing gleyic properties within 100 cm of the surface.
LVj		<b>Stagnic Luvisols (LVj)</b> Other Luvisols showing stagnic properties within 50 cm of the surface.
LVa		<b>Albic Luvisols (LVa)</b> Other Luvisols having an albic E-horizon.
LVv		<b>Vertic Luvisols (LVv)</b> Other Luvisols showing vertic properties.
LVk		<b>Calcic Luvisols (LVk)</b> Other Luvisols having a calcic horizon or concentrations of soft powdery lime within 125 cm of the surface.
LVf		<b>Ferric Luvisols (LVf)</b> Other Luvisols showing ferric properties.
LVx		<b>Chromic Luvisols (LVx)</b> Other Luvisols having a strong brown to red B-horizon (rubbed soil has a hue of 7.5YR and a chroma of more than 4, or a hue redder than 7.5YR).
LVh		<b>Haplic Luvisols (LVh)</b> Other Luvisols.

NTu	<b>Humic Nitisols (NTu)</b> Nitisols which are strongly humic, having an umbric A-horizon, or a mollic A-horizon and a base saturation (by 1M NH <sub>4</sub> OAc at pH 7.0) of less than 50 percent in at least a part of the B-horizon within 125 cm of the surface.
NTr	<b>Rhodic Nitisols (NTr)</b> Other Nitisols having a red to dusky red argic B-horizon (rubbed soil having hues redder than 5YR with a moist value of less than 4 and a dry value not more than one unit higher than the moist value).
NTh	<b>HAPLIC NITISOLS (NTh)</b> Other Nitisols.
PHg	<b>Gleyic Phaeozems (PHg)</b> Phaeozems showing gleyic properties within 100 cm of the surface.
PHj	<b>Stagnic Phaeozems (PHj)</b> Other Phaeozems showing stagnic properties within 50 cm of the surface.
PHI	<b>Luvic Phaeozems (PHI)</b> Other Phaeozems having an argic B-horizon.
PHc	<b>Calcaric Phaeozems (CHc)</b> Other Phaeozems that are calcareous at least between 20 and 50 cm from the surface.
PHh	<b>Haplic Phaeozems(CHh)</b> Other Phaeozems.
PLi	<b>Gelic Planosols (PLi)</b> Planosols having permafrost within 200 cm of the surface.
PLm	<b>Mollic Planosols (PLm)</b> Other Planosols having a mollic A-horizon or a eutric histic H-horizon.
PLu	<b>Umbric Planosols(PLu)</b> Other Planosols having an umbric A-horizon or a dystric histic H-horizon.
PLd	<b>Dystric Planosols (PLd)</b> Other Planosols having a base saturation (by 1M NH <sub>4</sub> OAc at pH 7.0) of less than 50 percent in at least a part of the slowly permeable horizon within 125 cm of the surface.
PLe	<b>Eutric Planosols (PLe)</b> Other Planosols.
PTa	<b>Albic Plinthosols (PTa)</b> Plinthosols having an albic E-horizon.
PTu	<b>Humic Plinthosols (PTu)</b> Other Plinthosols having an umbric A-horizon or a dystric H-horizon and which are strongly humic.
PTd	<b>Dystric Plinthosols (PTd)</b> Other Plinthosols having an ochric A-horizon and a base saturation (by 1M NH <sub>4</sub> OAc at pH 7.0) of less than 50 percent throughout upper 50 cm of the plinthite horizon.
PTe	<b>Eutric Plinthosols (PTe)</b> Other Plinthosols.
PZi	<b>Gelic Podzols (PZi)</b> Podzols having permafrost within 200 cm of the surface.
PZg	<b>Gleyic Podzols (PZg)</b> Other Podzols showing gleying properties within 100 cm of the surface.
PZc	<b>Carbic Podzols (PZc)</b> Other Podzols having a B-horizon in which a subhorizon contains dispersed organic matter and lacks sufficient free iron to turn redder ignition.
PZf	<b>Ferric Podzols (PZf)</b> Other Podzols in which the ratio of percentage of free iron to percentage of organic carbon is 6 or more in all subhorizons of the B-horizon.
PZb	<b>Cambic Podzols (PZb)</b> Other Podzols lacking or having only a thin (2 cm or less) and discontinuous albic E-horizon; lacking a subhorizon within the B-horizon which is visibly more enriched with organic carbon.
PZh	<b>Haplic Podzols (PZh)</b> Other Podzols.
PDi	<b>Gelic Podzoluisols (PDi)</b> Podzols having permafrost within 200 cm of the surface.
PDg	<b>Gleyic Podzols (PDg)</b>

		Other Podzols showing gleying properties within 100 cm of the surface.
PDj		<b>Stagnic Podzoluvisols (PDj)</b> Other Podzoluvisols showing stagnic properties within 50 cm of the surface.
PDd		<b>Dystric Podzols (PDd)</b> Other Podzoluvisols having aa base saturation (by 1M NH <sub>4</sub> OAc at pH 7.0) of less than 50 percent in at least a part of the B-horizon within 125 cm of the surface.
PDe		<b>Eutric Podzols (PDe)</b> Other Podzoluvisols.
RGi		<b>Gelic Regosols (RGi)</b> Regosols having permafrost within 200cm of the surface.
RGu		<b>Umbric Regosols (RGu)</b> Other Regosols having an umbric A-horizon.
RGy		<b>Gypsic Regosols (RGy)</b> Other Regosols which are gypsiferous at least between 20 and 50 cm from the surface.
RGc		<b>Calcaric Regosols (RGc)</b> Other Regosols which are calcareous at least from 20 to 50 cm from the surface.
RGd		<b>Dystric Regosols (RGd)</b> Other Regosols having a base saturation (by 1M NH <sub>4</sub> OAc at pH 7.0) of less than 50 percent at least from 20 to 50 cm from the surface.
RGe		<b>Eutric Regosols (RGe)</b> Other Regosols.
SCi		<b>Gelic Solonchaks (SCi)</b> Solonchaks having permafrost within 200 cm of the surface.
SCg		<b>Gleyic Solonchaks (SCg)</b> Other Solonchaks showing gleyic properties within 100 cm from the surface.
SCm		<b>Mollic Solonchaks (SCm)</b> Other Solonchaks having a mollic A-horizon.
SCy		<b>Gypsic Solonchaks (SCy)</b> Other Solonchaks having a gypsic horizon within 125 cm of the surface.
SCK		<b>Calcic Solonchaks (SCK)</b> Other Solonchaks having a calcic horizon within 125 cm of the surface.
SCn		<b>Sodic Solonchaks (SCn)</b> Other Solonchaks showing sodic properties at least between 20 and 50 cm of the surface.
SCh		<b>Haplic Solonchaks (SCh)</b> Other Solonchaks.
SNg		<b>Gleyic Solonetz (SNg)</b> Solonetz showing gleyic properties within 100 cm of the surface.
SNj		<b>Stagnic Solonetz (SNj)</b> Other Solonetz showing stagnic properties within 50 cm of the surface.
SNm		<b>Mollic Solonetz (SNm)</b> Other Solonetz having a mollic A-horizon.
SNy		<b>Gypsic Solonetz (SNy)</b> Other Solonetz having a gypsic horizon within 125 cm of the surface.
SNk		<b>Calcic Solonetz (SNk)</b> Other Solonetz having a calcic horizon within 125 cm of the surface.
SNh		<b>Haplic Solonetz (SNh)</b> Other Solonetz.
VRy		<b>Gypsic Vertisols (VRy)</b> Vertisols having a gypsic horizon within 125 cm of the surface.
VRk		<b>Calcic Vertisols (VRk)</b> Other Vertisols having a calcic horizon or concentration of soft powdery lime within 125 cm of the surface.
VRd		<b>Dystric Vertisols (VRd)</b> Other Vertisols having a base saturation (by 1M NH <sub>4</sub> OAc at pH 7.0) of less than 50 percent at least between 20 and 50 cm from the surface.
VRe		<b>Eutric Vertisols (VRe)</b> Other Vertisols.

## SpecifierList

*Database:* Java, *Stereotype:* «enumeration», *Package:* SoilClassification

*Detail:* Created on 07/07/2009. Last modified on 29/07/2009.

*Notes:* A list of specifiers.

### Columns

Name	Type	Notes
Bathy	string	<b>Bathy</b> ( <b>..d</b> ): the criteria of the qualifier are fulfilled for the required thickness somewhere between 100 and 200 cm from the soil surface.
Cumuli	string	<b>Cumuli</b> ( <b>..c</b> ): having a repetitive accumulation of material with a cumulative thickness of 50 cm or more at the soil surface (e.g. cumulinovic and cumulimollic).
Endo	string	<b>Endo</b> ( <b>..n</b> ): the criteria of the qualifier are fulfilled for the required thickness somewhere between 50 and 100 cm from the soil surface.
Epi	string	<b>Epi</b> ( <b>..p</b> ): the criteria of the qualifier are fulfilled for the required thickness somewhere within 50 cm of the soil surface.
Hyper	string	<b>Hyper</b> ( <b>..h</b> ): having a strong expression of certain features.
Hypo	string	<b>Hypo</b> ( <b>..w</b> ): having a weak expression of certain features.
Ortho	string	<b>Ortho</b> ( <b>..o</b> ): having a typical expression of certain features (typical in the sense that no further or meaningful characterization is made).
Para	string	<b>Para</b> ( <b>..r</b> ): having resemblance to certain features (e.g. Paralithic).
Proto	string	<b>Proto</b> ( <b>..t</b> ): indicating a precondition or an early stage of development of certain features (e.g. Protothionic).
Thapto	string	<b>Thapto</b> ( <b>..b</b> ): having a buried layer relating to diagnostic horizons, properties or materials starting within 100 cm of the surface (e.g. Thaptomollic).

### Relationships

Columns	Association	Notes
	Qualifier2006. <b>0..1</b> SpecifierList.specifier	
	Qualifier2007. <b>0..1</b> SpecifierList.specifier	

## USDA Soil Taxonomy

*Database:* Java, *Stereotype:* , *Package:* SoilClassification

*Detail:* Created on 13/07/2009. Last modified on 04/08/2009.

*Notes:* USDA Soil Taxonomy classification, as provided in the source material, as indicated in the national database or relevant report

### Relationships

Columns	Association	Notes
	USDA Soil Taxonomy. SoilClassification.	
	USDA Soil Taxonomy. <anonymous>.	
	<anonymous>. USDA Soil Taxonomy.	

## WRB2006

*Database:* Java, *Stereotype:* , *Package:* SoilClassification

*Detail:* Created on 10/07/2009. Last modified on 23/10/2009.

*Notes:* The WRB is a comprehensive classification system that enables people to accommodate their national classification system. WRB2006 here is used as both WRB 2006 and its 2007 update. It comprises two tiers of categorical detail:

- the **Reference Base**, limited to the first level only and having 32 RSGs;
- the **WRB Classification System**, consisting of combinations of prefix and suffix qualifiers that are uniquely defined and added to the name of the RSG, allowing very precise characterization and classification of individual soil profiles.

### Relationships

Columns	Association	Notes
	WRB2006. <anonymous>.	
	WRB2006. SoilClassification.	
	<anonymous>. WRB2006.	
	WRB2006. <b>1</b> RSGList.rsg	
	WRB2006. <b>0..*</b> Qualifier2006.qualifier	

## WRB2007

*Database:* Java, *Stereotype:* , *Package:* SoilClassification

*Detail:* Created on 29/10/2009. Last modified on 29/10/2009.

*Notes:*

### Relationships

Columns	Association	Notes
	WRB2007. <b>0..*</b> Qualifier2007.qualifier	
	WRB2007. SoilClassification. WRB2007. <b>1</b> RSGList.rsg	
	WRB2007. <b>0..1</b> WRB2007.over	
	<anonymous>. WRB2007.	
	<anonymous>. WRB2007.	