Assessing the Underworld: Infrastructure Asset Ontologies

ASSESSING THE UNDERWORLD

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ATU Infrastructure Asset Ontologies

An ontology defines a ***common vocabulary*** for people who need to share information in a domain. It includes ***machine-interpretable definitions*** of basic concepts in a domain and relations among them. It provides a way of integrating data from multiple sources.

The ATU infrastructure asset ontologies define ***main concepts*** describing utilities (e.g. pipes), soil, roads, as well as their relationships with the natural environment (e.g. rain) and human activities (e.g. maintenance).
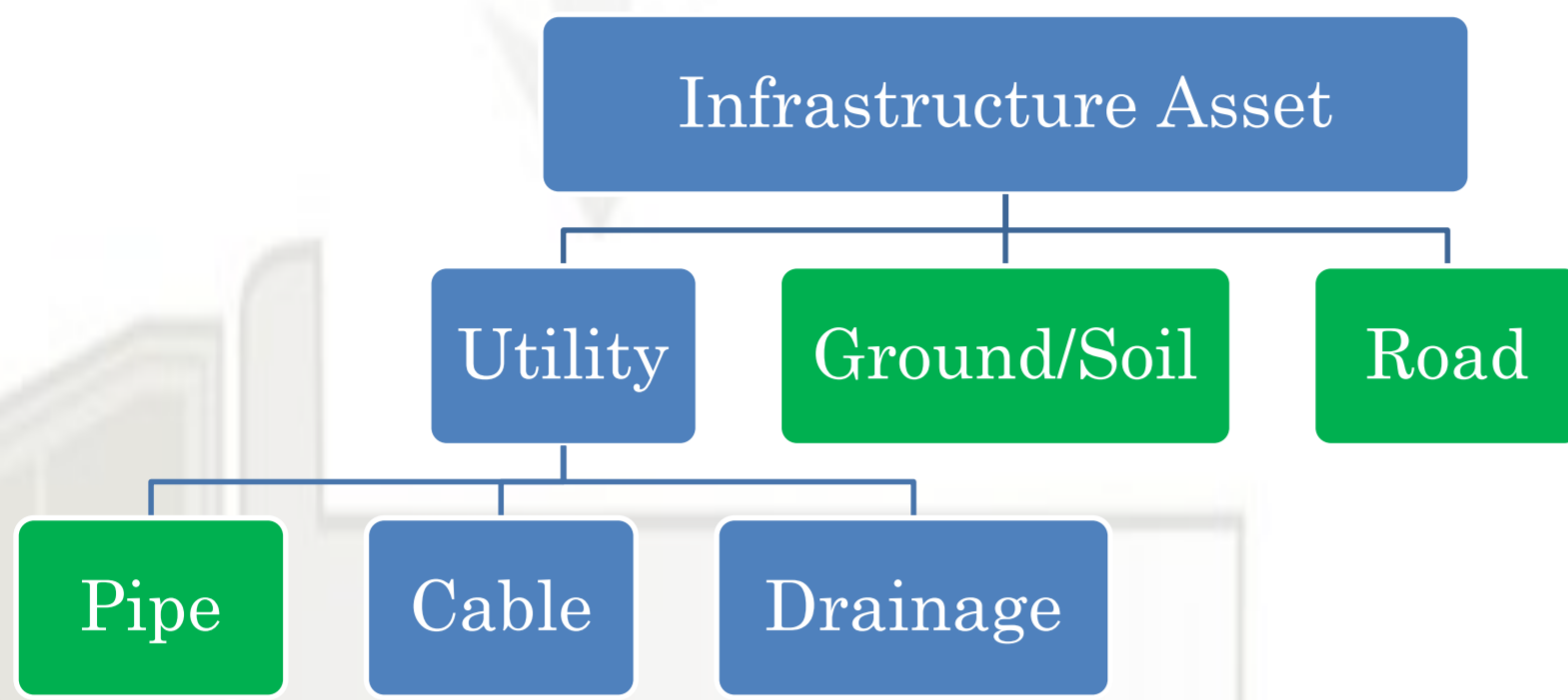
The ATU infrastructure asset ontologies reuse the top-level concepts from the SWEET ontology (https://sweet.jpl.nasa.gov) developed by NASA and specify them for different infrastructure assets.

The ATU infrastructure asset ontologies are used together in the ATU decision support system to help users understand
- how different assets affect each other;
- how asset properties and processes affect each other;
- possible causes and effects of asset defects or failures;
- possible consequences of maintenance/repair activities.

An Ontology of Soil Properties and Processes (OSP)

The OSP ontology mainly describes
- different kinds of soil properties and processes;
- how of soil properties and processes affect each other. E.g. the strength of soil is influenced by the water content ~~of it~~.

The first version of the OSP ontology is openly available from the University of Leeds data repository: **http://doi.org/10.5518/54**. The second version is under development.
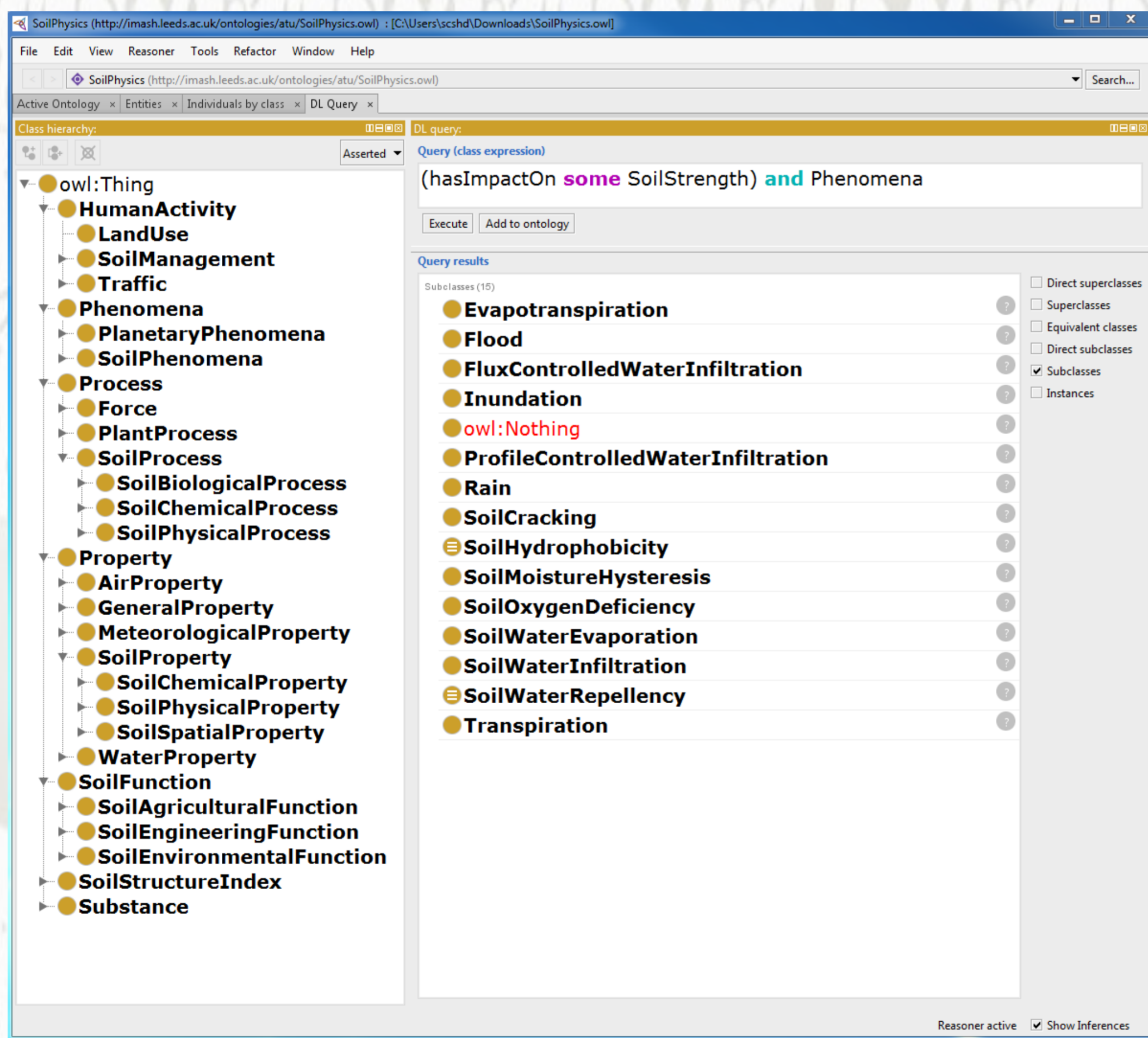
Visualization of the OSP ontology using Protégé

The concepts and relation statements are created based on
- the knowledge of domain experts,
- the SWEET ontology developed by NASA

Ontologies describing Roads and Pipes
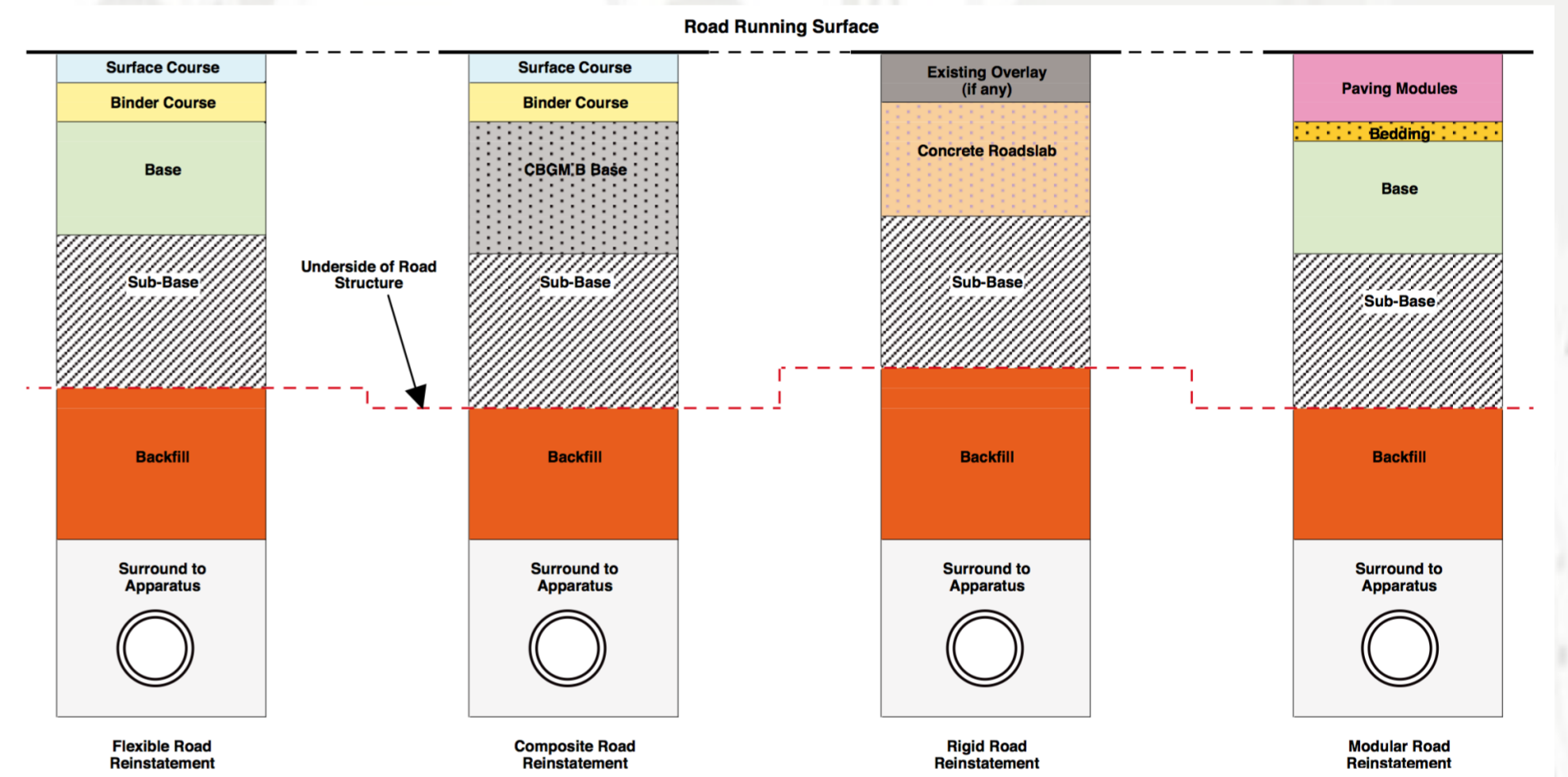
Structures of Different Types of Road
Source: New Roads and Street Works Act 1991 Specification for the Reinstatement of Openings in Highways

The road/pipe ontology mainly describes
- different kinds of roads/pipes, their properties and components;
- road/pipe defects, factors influencing or influenced by them, as well as possible causes and effects of defects;
- road/pipe maintenance and repair activities.

As shown in the figure above, different types of road have different structures/layers. The road ontology defines different types of roads and describes the properties of roads regarding different road layers.

Similarly, the pipe ontology classifies pipes into different categories based on their functions/usages, materials and diameters. The current version focuses on describing water pipes.