# OGC Underground Infrastructure Mapping and Modeling Workshop

# OGC LandInfra / InfraGML Standards for Infrastructure

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Chair, OGC Land and Infrastructure Standards Working Group

24 April 2017

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Making location count.

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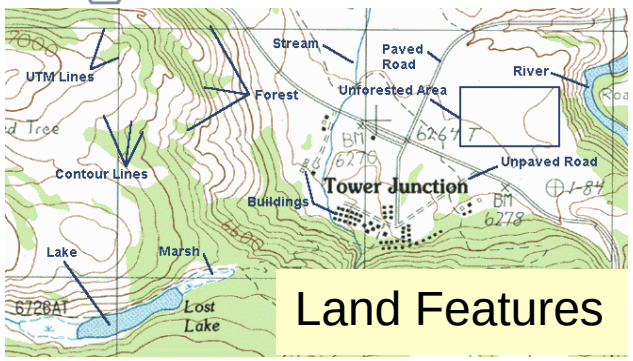
# LandInfra / InfraGML

http://www.opengeospatial.org/standards/landinfra

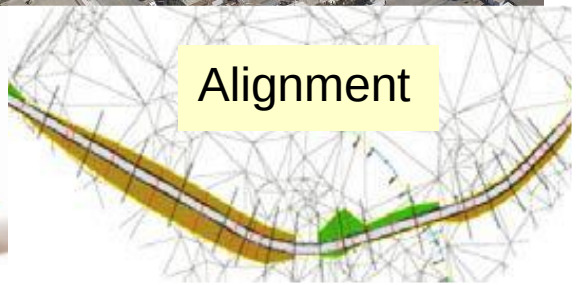



Land Features

Core

Facilities

Projects



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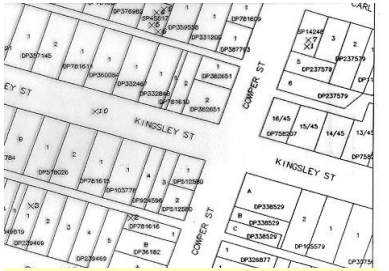


Land Division

Roads

Railway

Survey

Condominiums

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# Land and Infrastructure (LandInfra)

- Land and Infrastructure Conceptual Model Standard (LandInfra)
  - It's all about the land upon which infrastructure facilities are built
  - and the infrastructure facility improvements themselves
  - including the surveying necessary for the construction and recording of the facilities and land interests
- "use case driven subset of LandXML functionality, but … supported by a UML (Unified Modeling Language) conceptual model"
- LandInfra is a Conceptual Model, specified as an approved OGC Standard (OGC 15-111r1), independent of implementations but whose target is encoding standards
- InfraGML is one of those LandInfra encodings

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# InfraGML Encoding Standards

- InfraGML marks a significant, pragmatic realization in the often idealized integration of GIS/CAD/BIM
- Based on the LandInfra consensus concepts developed by OGC with buildingSMART International
- Follows the OGC Modular Specification for extensibility
- Builds upon and extends GML3.2 and 3.3 foundation for features, data types, spatial schema, coordinate and linear referencing, and observation and measurement
- Provides a framework for addressing the full facility life cycle
- Capitalizes on the numerous extensions to the OGC baseline that have been added since “GIS” Simple Features
- Parallels extensions by bSI beyond just “buildings”

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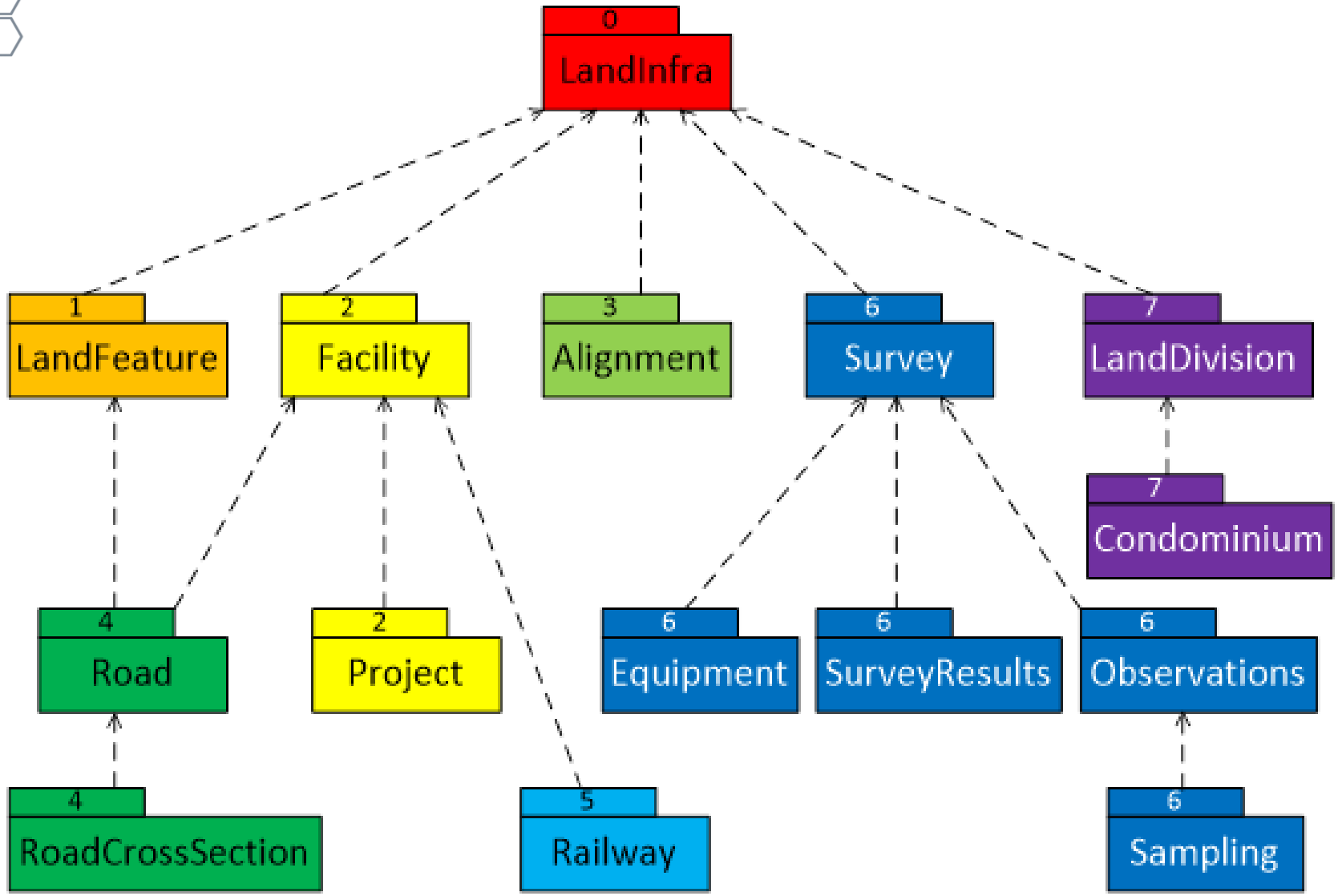
# Flexibility of LandInfra Requirements Classes

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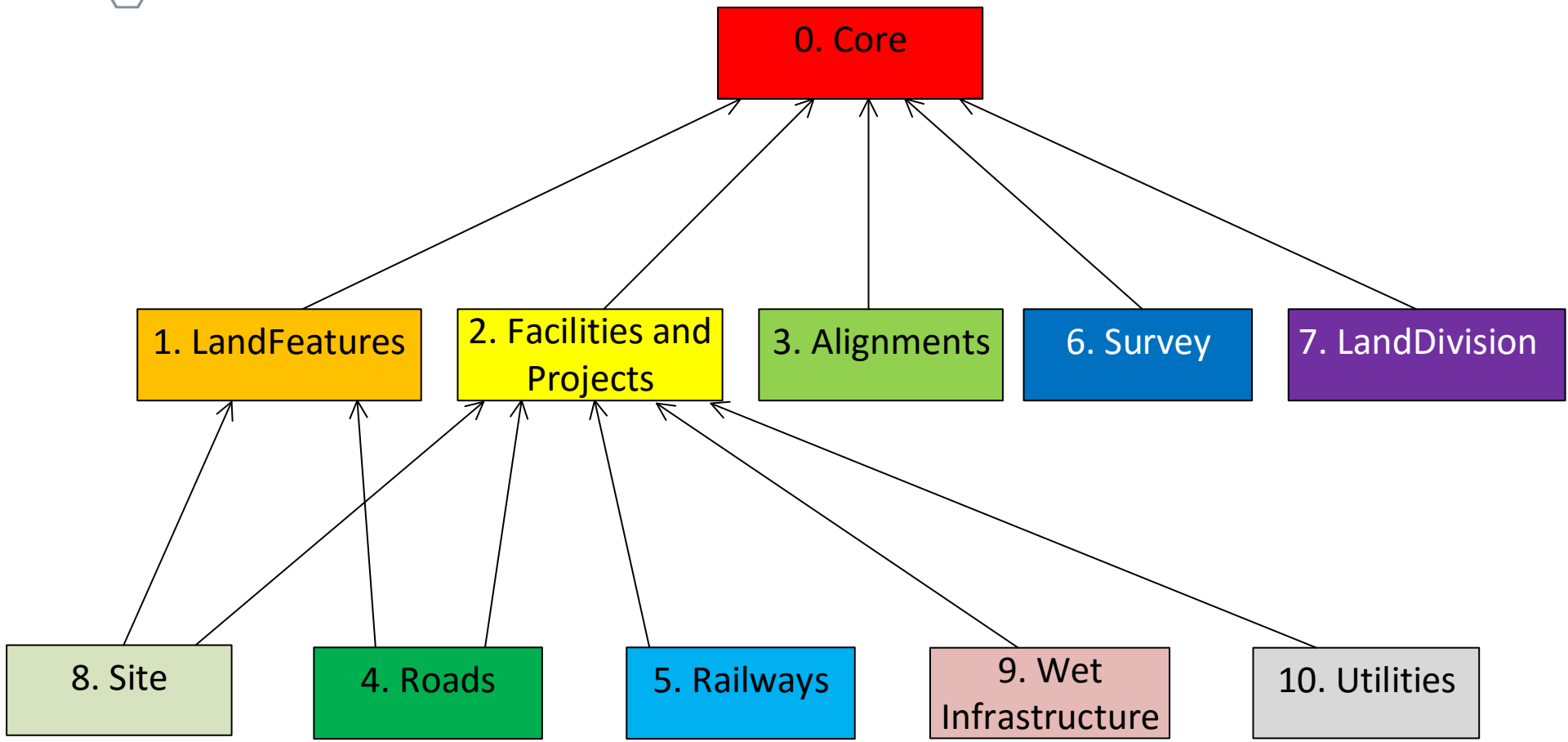
# Extendable InfraGML: a Multi-Part Standard; each Part contains one or more RCs

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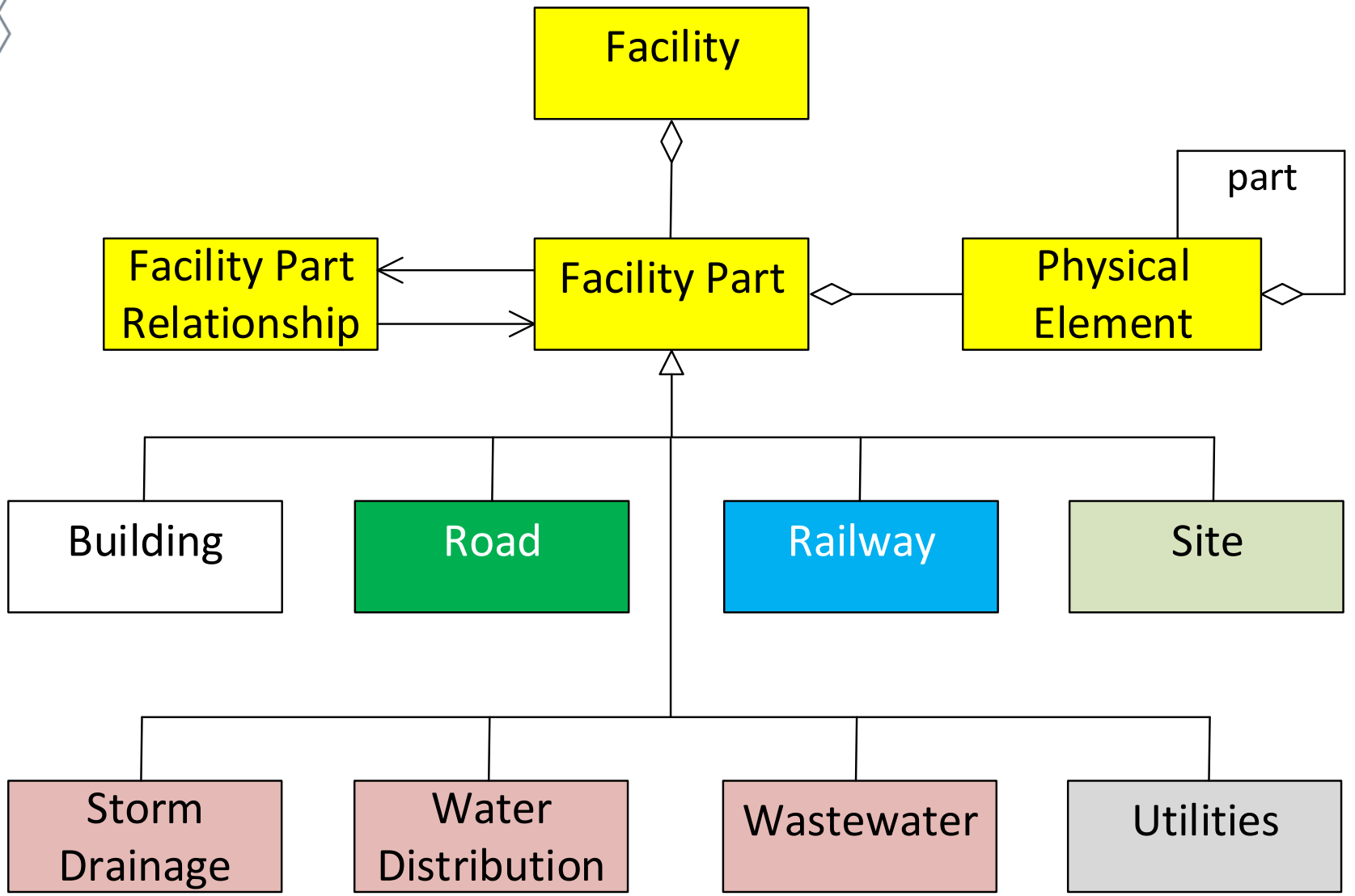
# Facility – Facility Part - Element

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# Road Elements, for example

**class RoadElement**

«CodeList»
**RoadElementType**

+ pavement
+ pavementSurfaceCourse
+ pavementIntermediateCourse
+ pavementBaseCourse
+ pavementSubbase
+ shoulder
+ hardShoulder
+ softShoulder
+ barrier
+ guardRail
+ curb
+ verticalCurb
+ mountablelCurb
+ curbAndGutter
+ gutter
+ crossPan
+ median
+ greenAreaMedian
+ pavedMedian
+ raisedMedian
+ fencedMedian
+ medianGuardRail
+ medianConcreteBarrier
+ verge
+ sidewalk
+ bikePath
+ drainageDitch
+ cutSlope
+ fillSlope
+ codeList: URI [0..1]

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# What is “wet infrastructure” ?

- LandInfra differentiates between “wet” infrastructure and “utilities”
- Wet infrastructure:
  - facilities typically designed by civil engineers and owned and operated by government agencies (though public-private partnerships are arising)
  - are usually built in public right-of-way (or easements)
  - include storm drainage, wastewater, and water distribution systems

# What are “Utilities” ?

- Utilities:
  - facilities typically designed, owned, and operated by (public or private) companies
  - include electrical distribution, gas networks, telecommunications, etc.

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# LandInfra Scope

- LandInfra considers wet infrastructure to be in scope:
  - attention is paid to design information similar to what has been done for road and railway facilities, and to that level of detail (bSI IFCs will most likely go deeper into design details)
  - a network model is fundamental
  - properties (identification, material, geometry, location, etc.) of elements (pipe, manholes, etc.) will be included

# LandInfra Scope

- For utilities, LandInfra:
  - does not anticipate that the design will be explicitly included as facilities,
  - though the detailed location of such facilities may be added for referenceability, as it impacts the design of civil engineered facilities
  - rough location and legal protection of such facilities are covered in this standard by easements
- Superficie Objects are already supported
  - buildings or other construction, including pipes, cables or tunnels, located above, on, or below the land parcel surface, established and owned by a party other than the owner of that land parcel, nonetheless linked to the land parcels on which they are located

# Foundation for Extension

- Extensible Feature Model: features, data types, spatial schema, coordinate and linear referencing, and observation and measurement
- Incorporates:
  - OGC-AS Topic 1 – Feature Geometry
  - OGC-AS Topic 2 – Spatial Referencing By Coordinates
  - OGC-AS Topic 19 – Linear Referencing
  - OGC-AS Topic 20 – Observations And Measurement
  - OGC 07-036 Geography Markup Language (GML)
  - OGC 10-129r1 Extended schemas and encoding rules GML3.3
  - ISO-19103 – Core Data Types
  - ISO-19109 – Application Schema
- Full facility life cycle asset management approach for various types of infrastructure facilities

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# Extension Considerations

- Add support for the design of wet infrastructure facility parts similar to what was done for road and railway, that is with (state = proposed)
- Support other subsurface (utility) facility parts with (state = existing)
  - follow ASCE38-02 Collection and Depiction of Existing Subsurface Utility Data (SUE)
  - support four levels of quality and reliability of underground information by multiple representation schemes (as for Roads)
- Work with other ongoing efforts as was done with bSI
  - CityGML Utility ADE revision
  - PipelineML
  - this Underground Infrastructure Mapping and Modeling project

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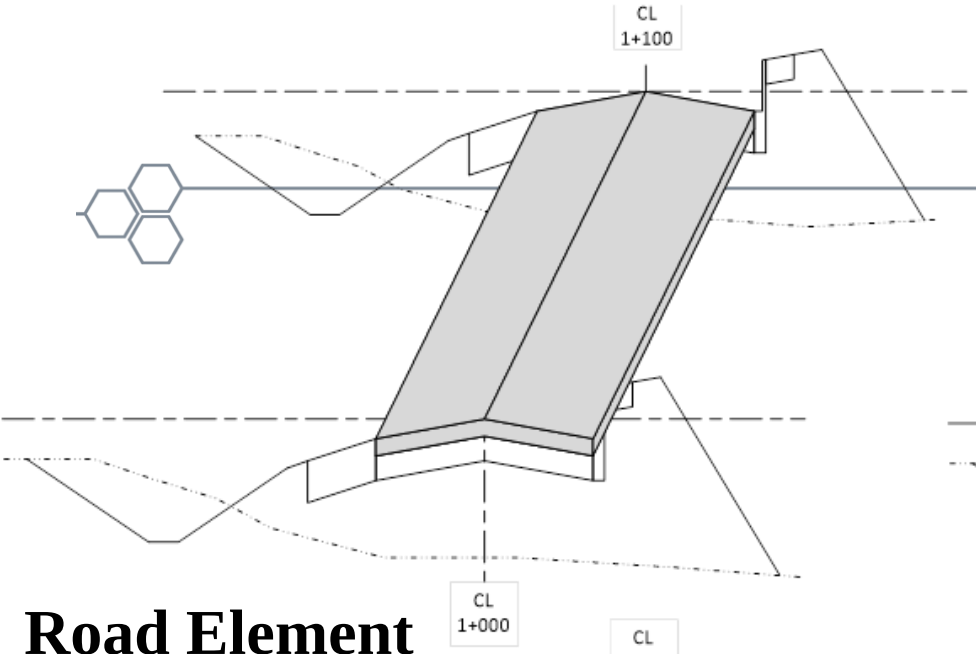
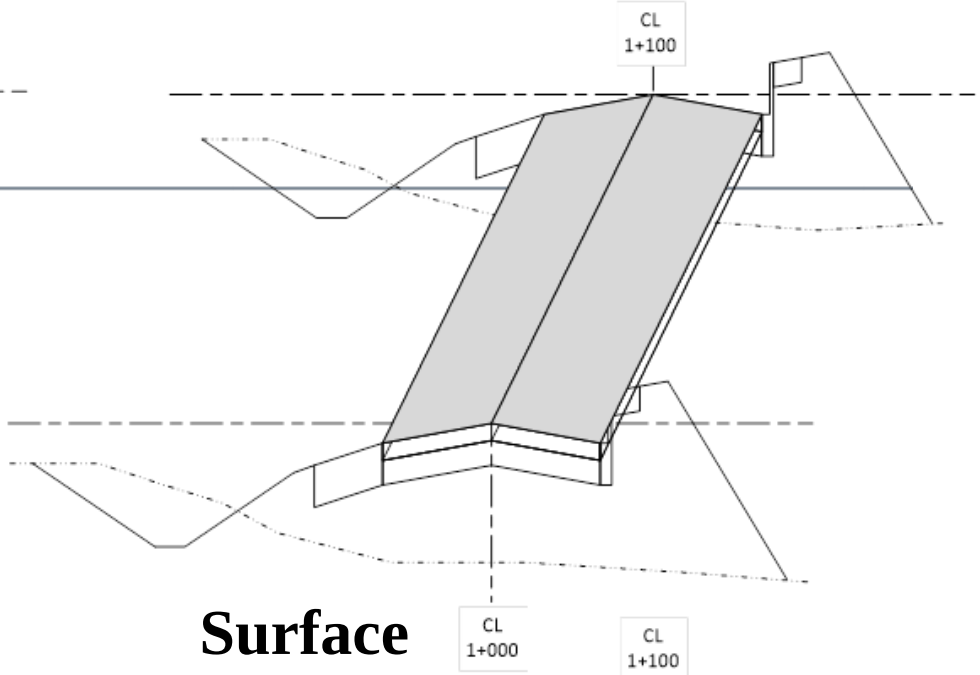
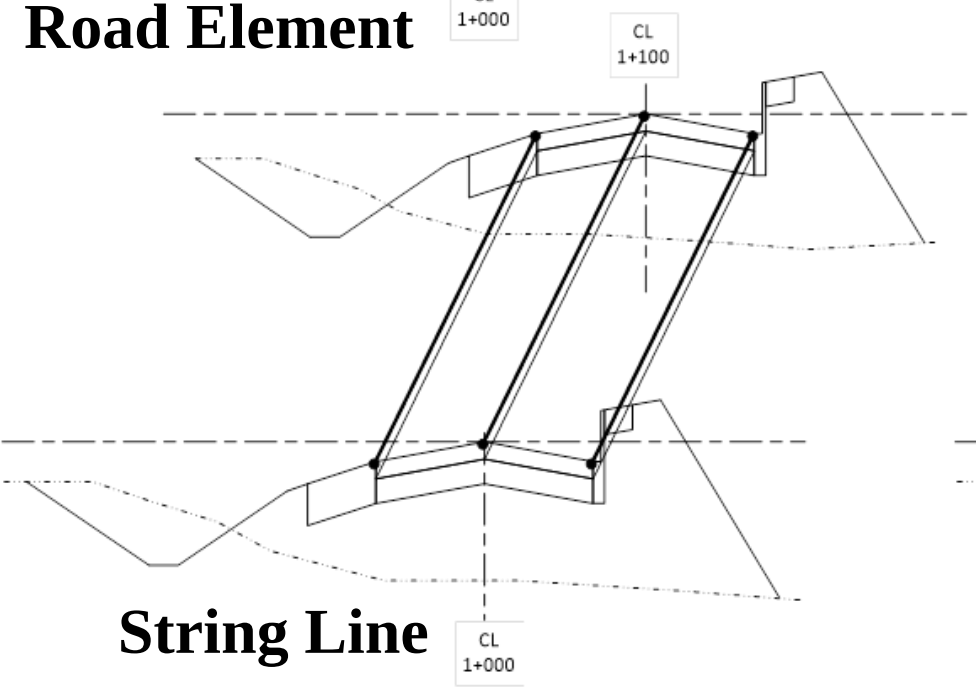


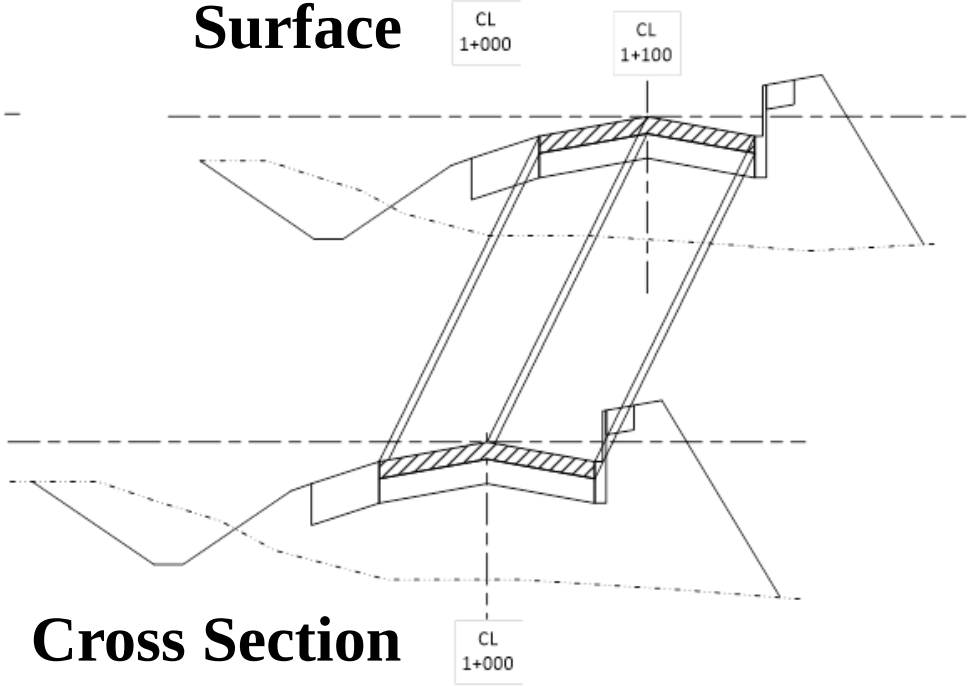

Road Element




Surface




String Line




Cross Section

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# Multiple Representation Schemes

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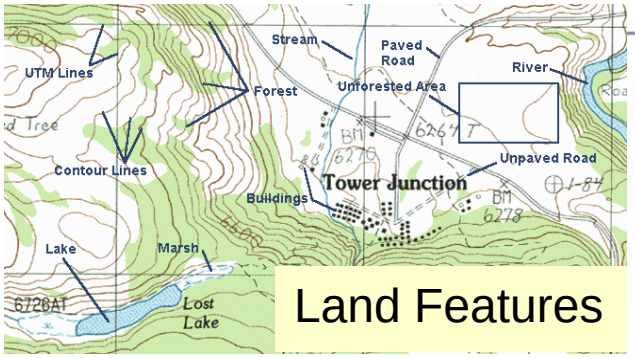


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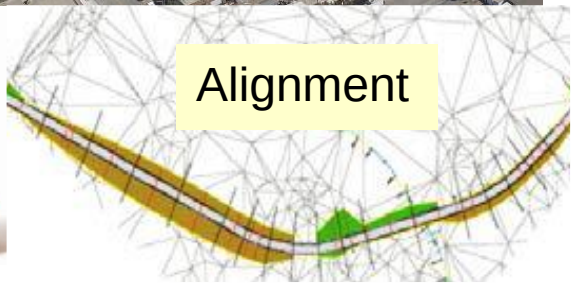

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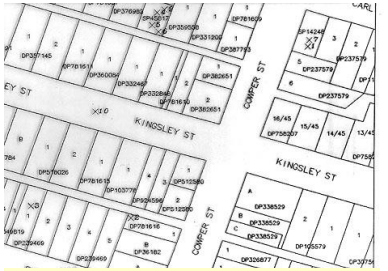


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Water Distribution

Storm Drainage


Wastewater

Underground Utilities

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