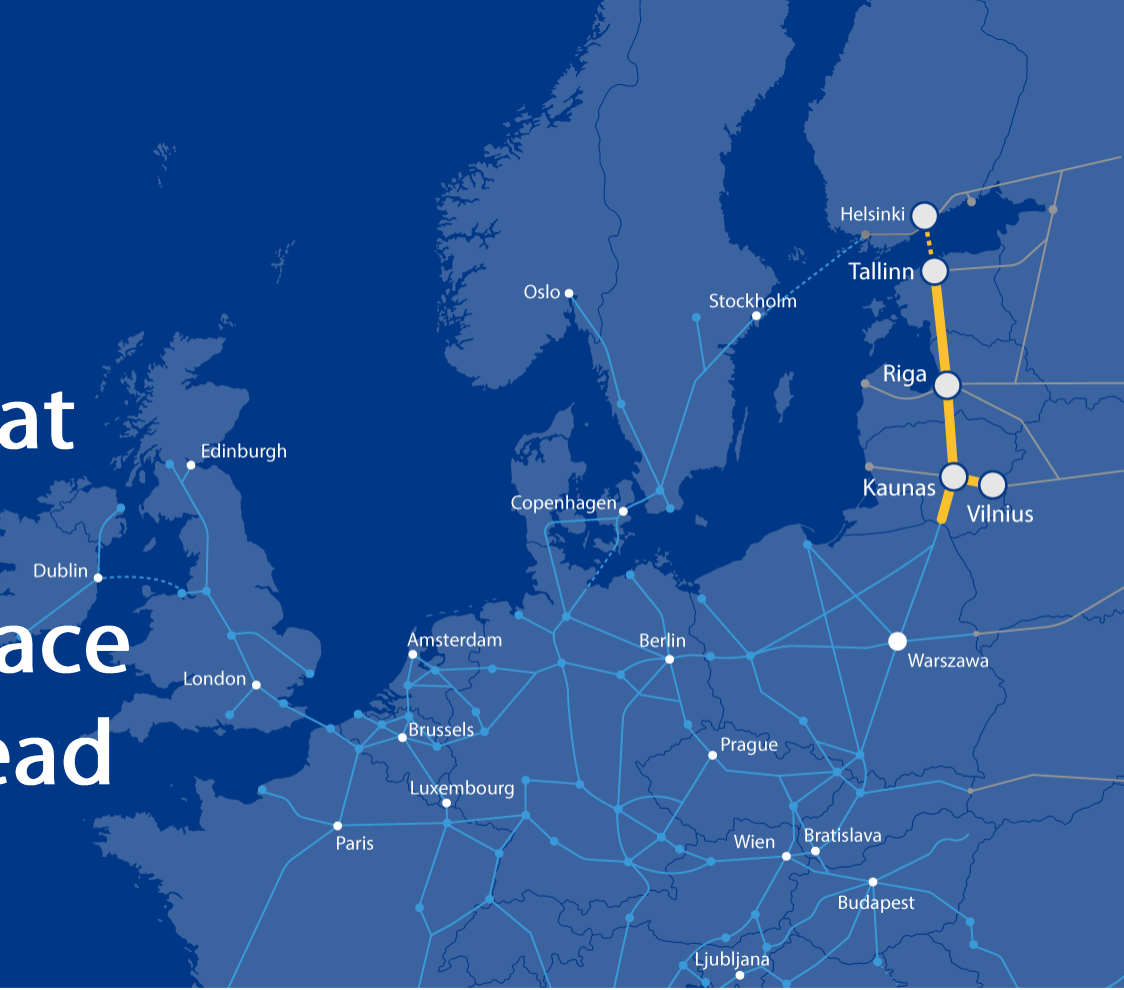
Rail Baltica

GIS Development at Rail Baltica: What Solutions are in Place and What Lies Ahead



Co-financed by the Connecting Europe Facility of the European Union

RB Rail AS

Vaidas Ulenskas
GIS and BIM Coordinator

Urmas Alber
BIM and AIM Coordinator

2021.04.21

Design Speed
249 km/h – passenger trains
120 km/h – freight trains

Standard Gauge
1435 mm

Double-track Electrified
2x25kV AC

Axle Load
25 t

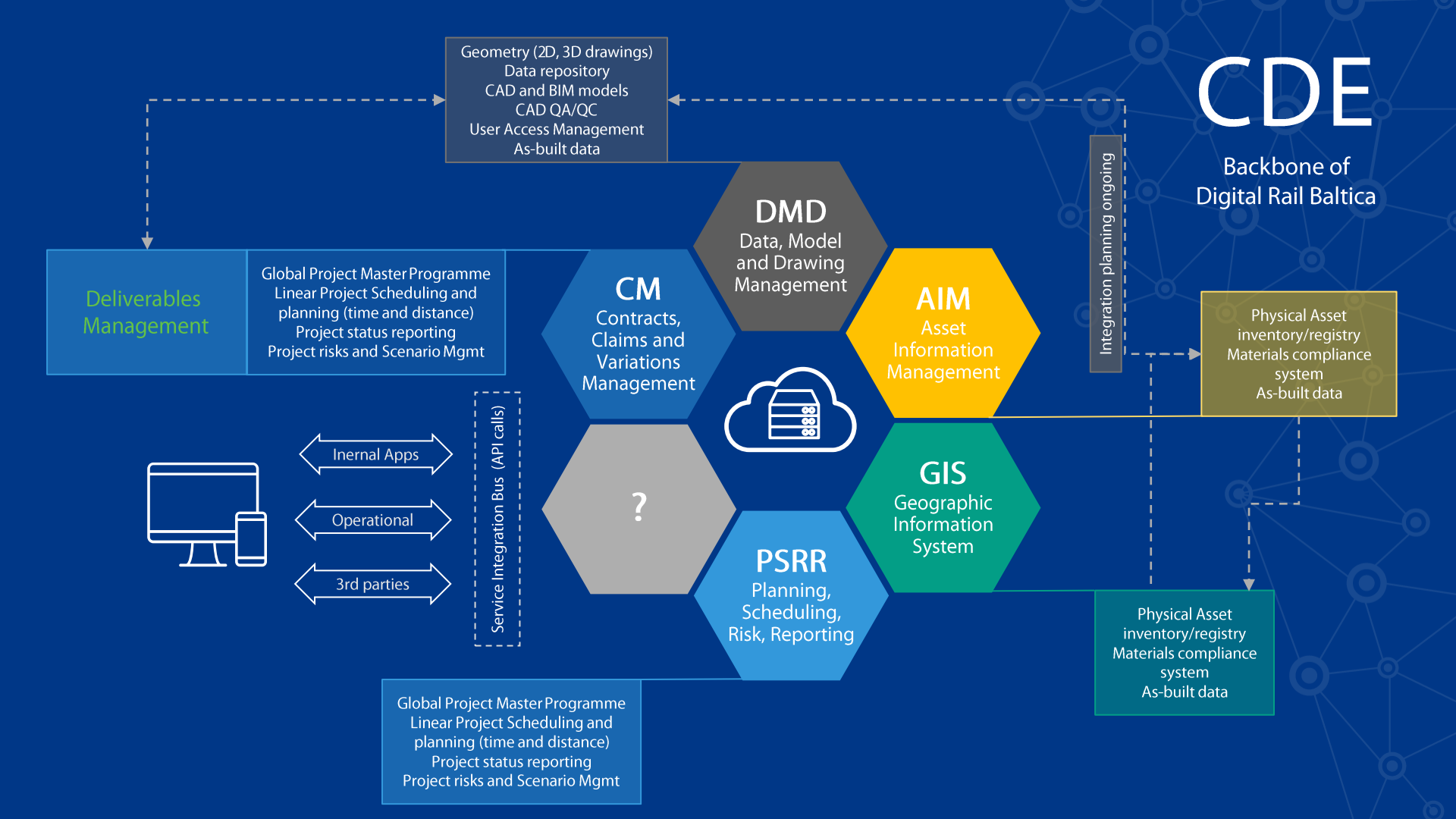
Traffic Management
ERTMS 2

Max. Freight Train Length
1050 m

- 3 mainline design sections
- 2 passenger stations
- 1 multimodal terminal

- 4 mainline design sections
- 2 passenger stations
- 1 multimodal terminal

- 4 mainline design sections
- 3 passenger stations
- 1 multimodal terminal


Geometry (2D, 3D drawings)
Data repository
CAD and BIM models
CAD QA/QC
User Access Management
As-built data
CDE
Backbone of
Digital Rail Baltica
DMD
Data, Model and Drawing Management
Deliverables Management
Global Project Master Programme
Linear Project Scheduling and planning (time and distance)
Project status reporting
Project risks and Scenario Mgmt
CM
Contracts, Claims and Variations Management
AIM
Asset Information Management
Integration planning ongoing
Physical Asset inventory/registry
Materials compliance system
As-built data
Inernal Apps
Operational
3rd parties
Service Integration Bus (API calls)
?
GIS
Geographic Information System
PSRR
Planning, Scheduling, Risk, Reporting
Physical Asset inventory/registry
Materials compliance system
As-built data
Global Project Master Programme
Linear Project Scheduling and planning (time and distance)
Project status reporting
Project risks and Scenario Mgmt

GIS - Significant part of Rail Baltica Digital Twin

Internal & External training and Support service

- Provide basic training materials to RB GIS users

Data Management System

- Create, Collect internal and external GIS data
- Convert non-GIS data to GIS data
- GIS data accessibility
- GIS integration with other software's

Operational & Maintenance

- Create Rail Baltica Digital Twin
- Prepare GIS for Infrastructure Manager

Global Project Partners Engagement

- Create GIS connections between RB Rail AS and partners (BENs, IBs, Designers, etc.)

Public Engagement

- Provide official information about Rail Baltica Global Project to public and 3rd parties
- Open Data Portal

Monitoring the Construction process

- Collect and analyze data from the field to monitor the construction process
- Create assignments for field workers

BIG Data Management

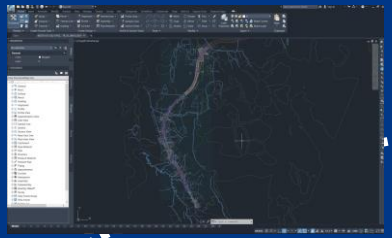
- BIM
- AIM
- Raster
- LAS
- 3D

ArcGIS Pro · ArcGIS Enterprise · ArcGIS Online · Web App Builder · Collector for ArcGIS · ArcGIS Survey123 · ArcGIS QuickCapture · Operational Dashboard · ArcGIS Sites · Story Maps · ArcGIS AppStudio · Workforce for ArcGIS · Insights for ArcGIS · Drone2Map for ArcGIS

Data interoperability

2D

Autodesk (.dwg)



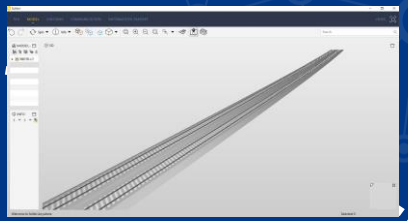
.tif, .ecw

Aerial photography

3D

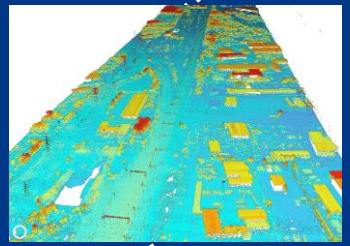
BIM

Industry Foundation Classes(.ifc)



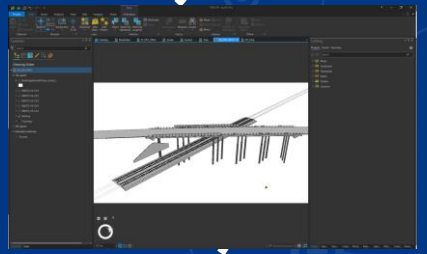
Terrain

LiDAR



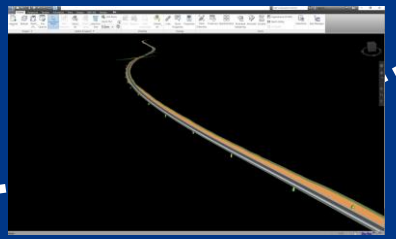
esri

Autodesk Revit (.rwt)



LandXML

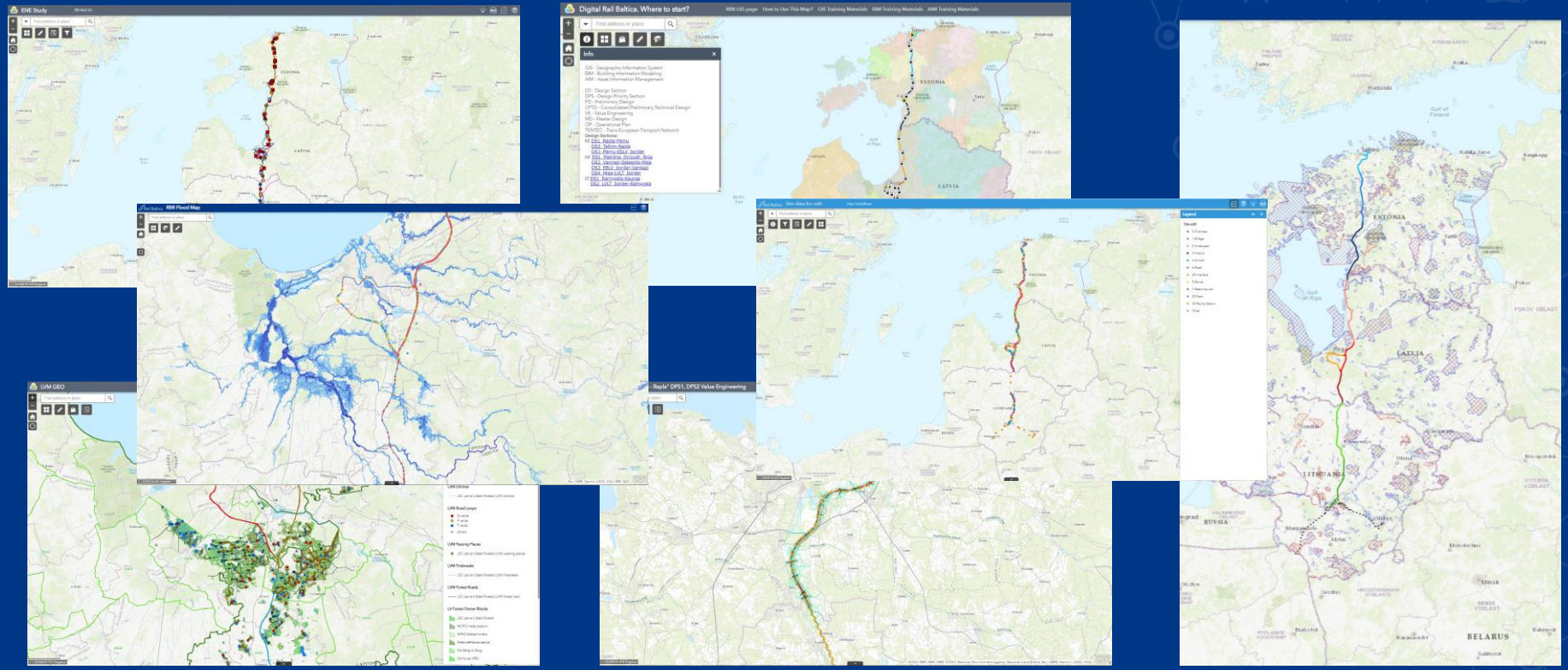
MS Excel (.xls)



Autodesk Navisworks (.nwd)

Web Maps

All key information in one place

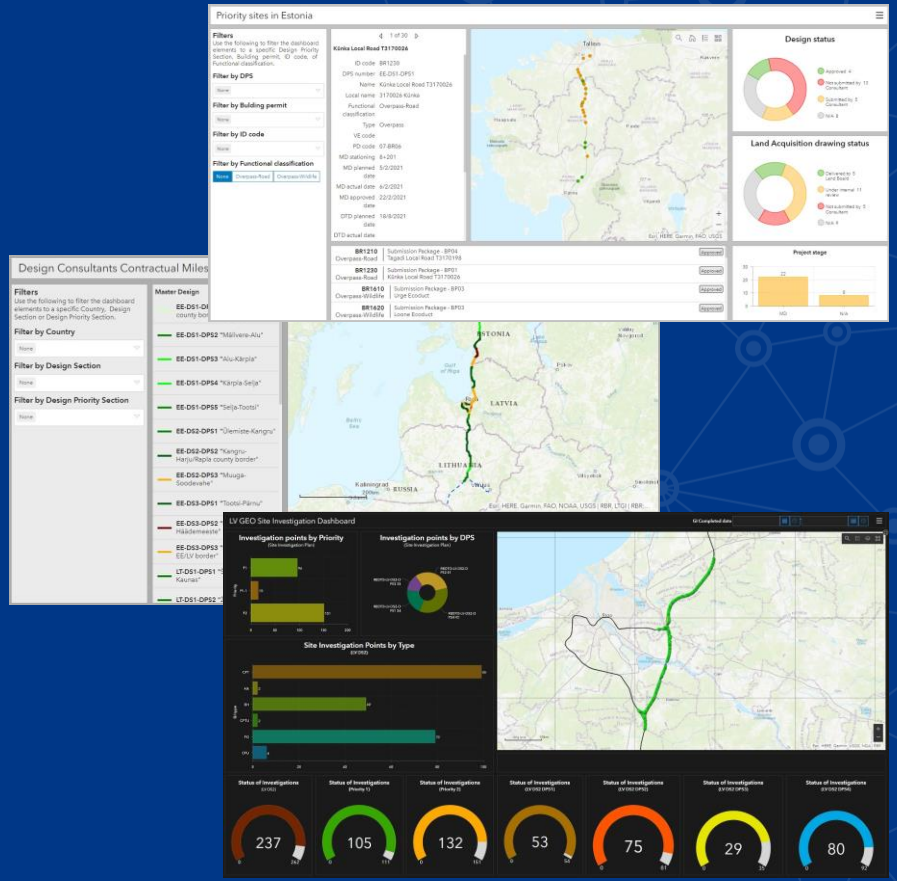


Monitoring and Reporting

Dashboards that provide key information and are available to all parties at any time and in any place

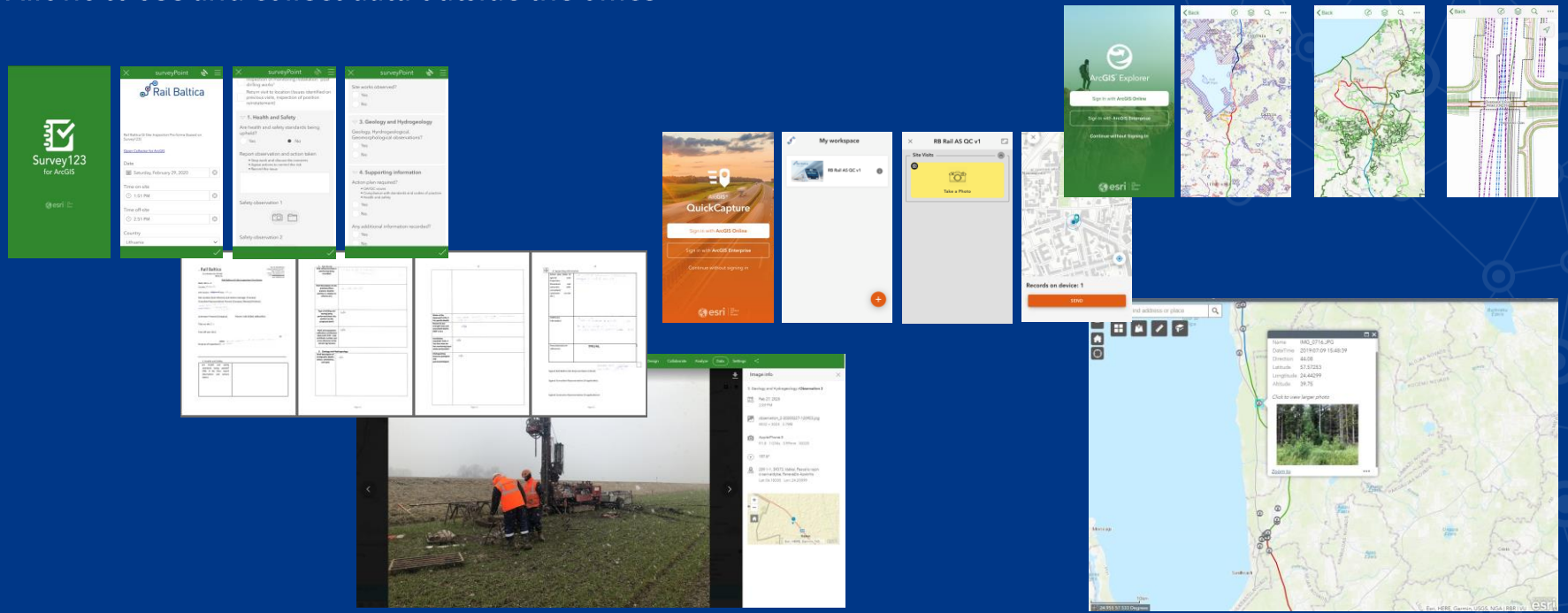
Less time spent updating PowerPoint presentations and Excel spreadsheets

Ongoing integration with ArcGIS and Oracle Primavera P6 will ensure rapid transmission of information without additional human intervention (machine to machine communication)



From Office to Field

Allows to see and collect data outside the office



Construction Phase is just around the corner, so Field Apps will be used to collect information directly from the construction site

3D

Most people find it easy to understand information when it is presented in 3D

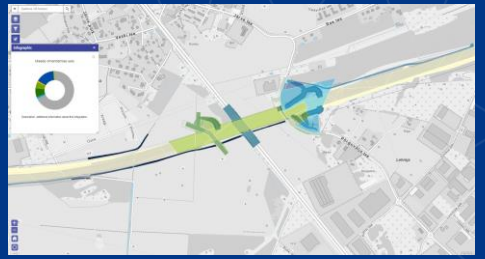
The integration of GIS and BIM allows to enrich BIM with the surrounding information

Global Project Partners Engagement

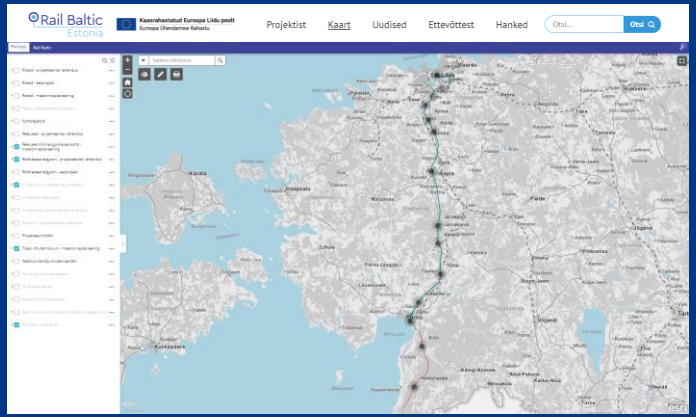
RB Rail AS & Rail Baltic Estonia OÜ

Sharing common environment and data creates new cooperation opportunities between project coordinators and implementing bodies

Land Acquisition



Public Map



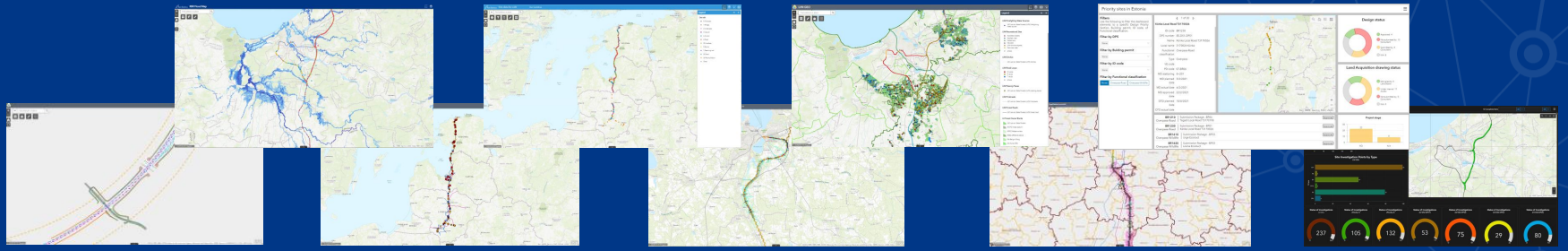
https://rbestonia.ee/

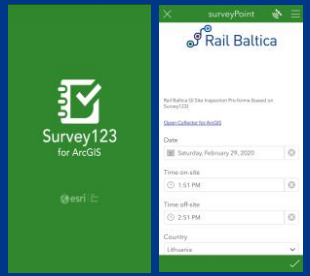
3D

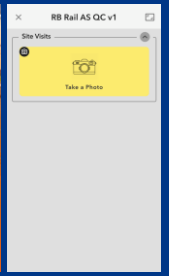
BIM + GIS data

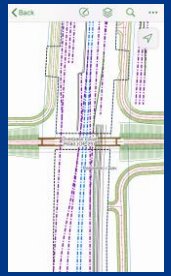
Rail Baltic Estonia OÜ
Tõnis Kundla
GIS Specialist
E-mail: tonis.kundla@rbe.ee

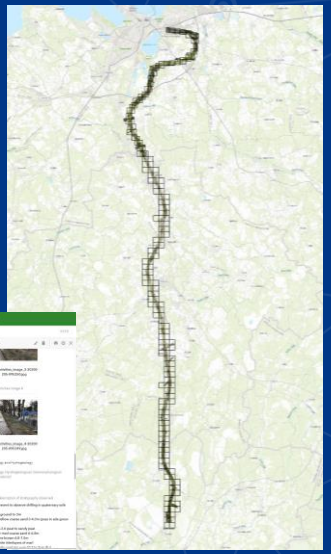
Digital Rail Baltica: GIS

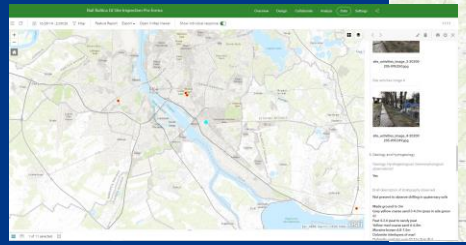












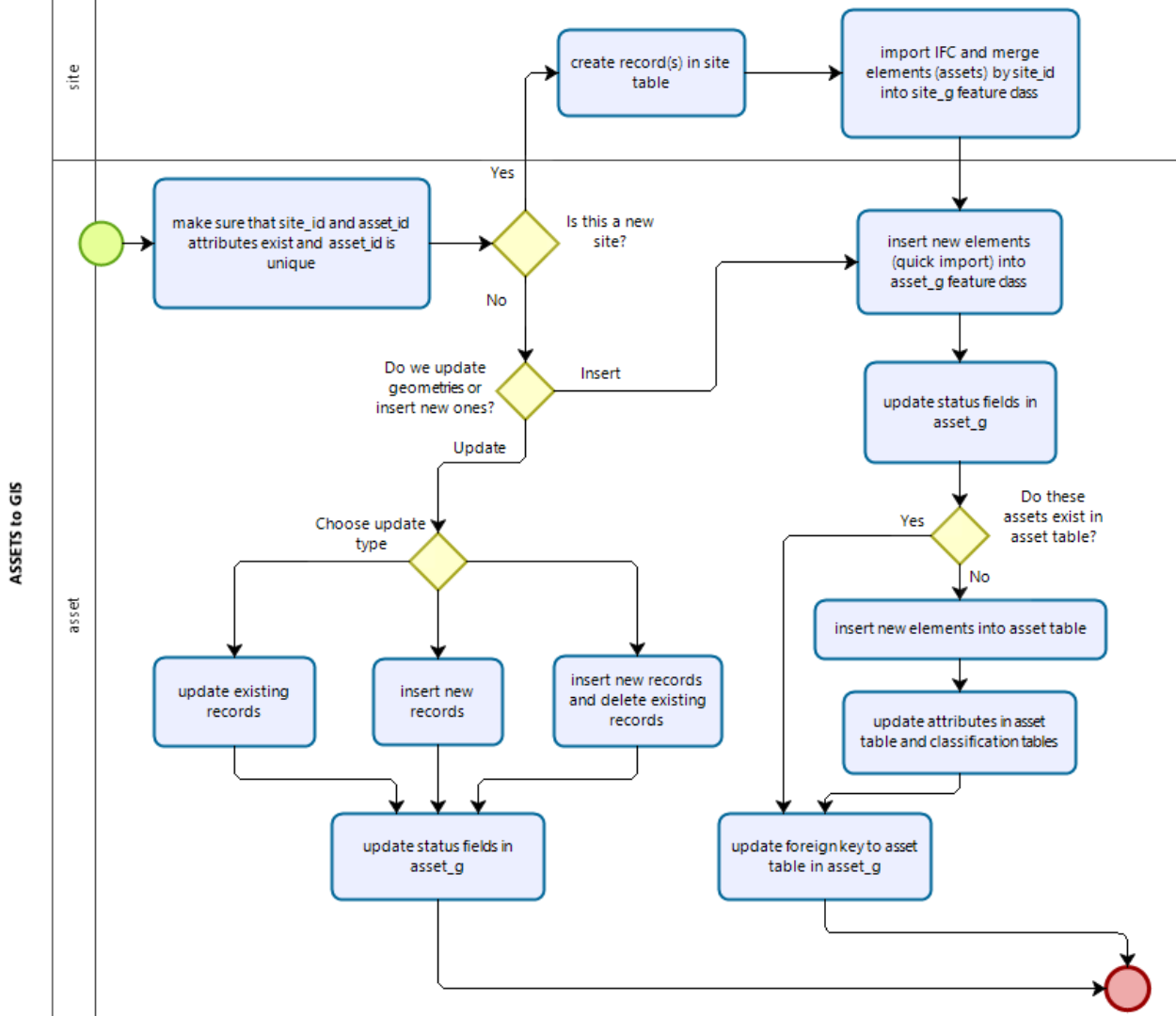

Excel is not a database
Excel is not a database
Excel is not a database
Excel is not a database
Excel is not a database
Excel is not a database
Excel is not a database
Excel is not a database
Excel is not a database
GIS is a DB
STARECAT.COM

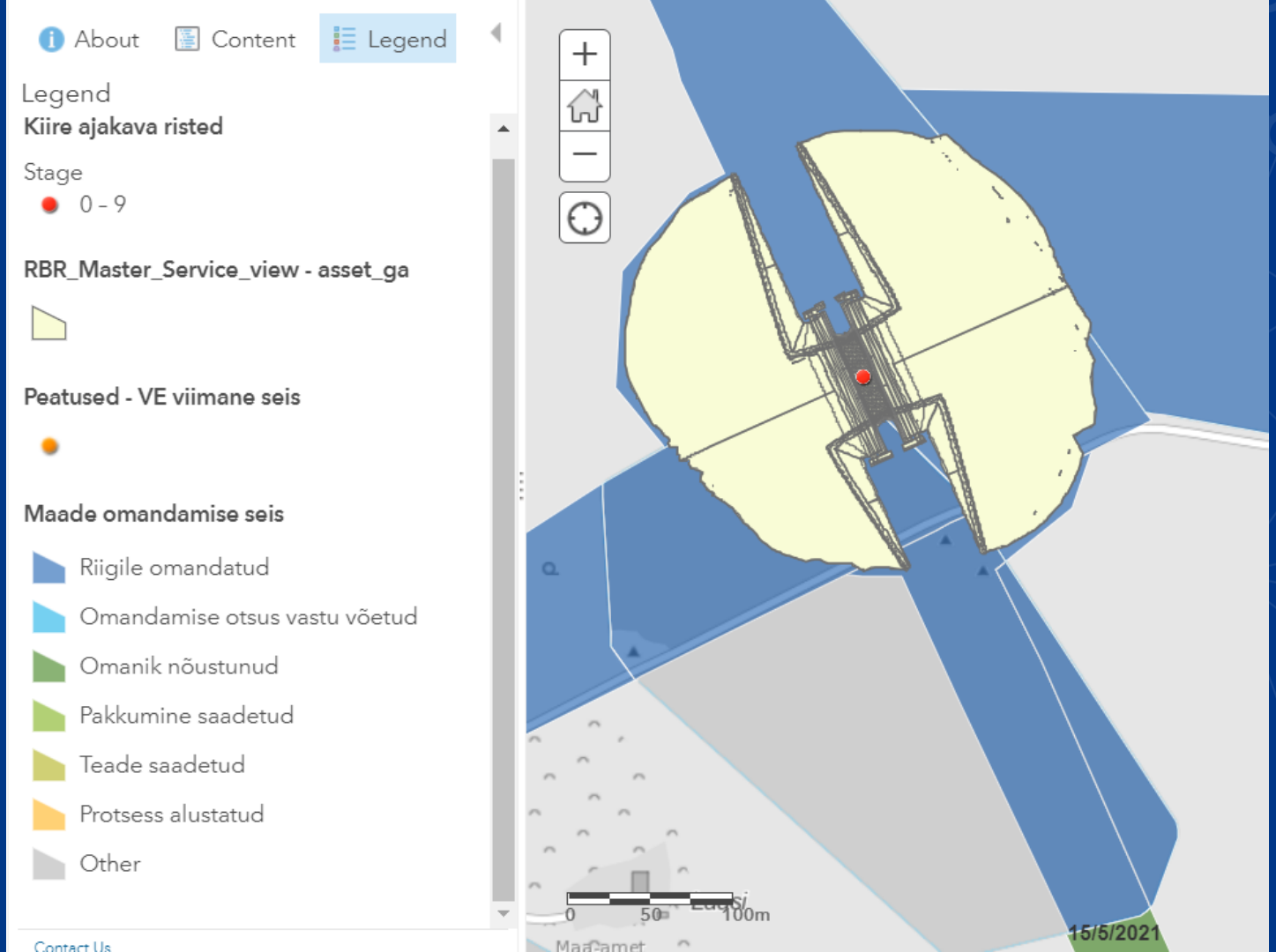
Urmas Alber

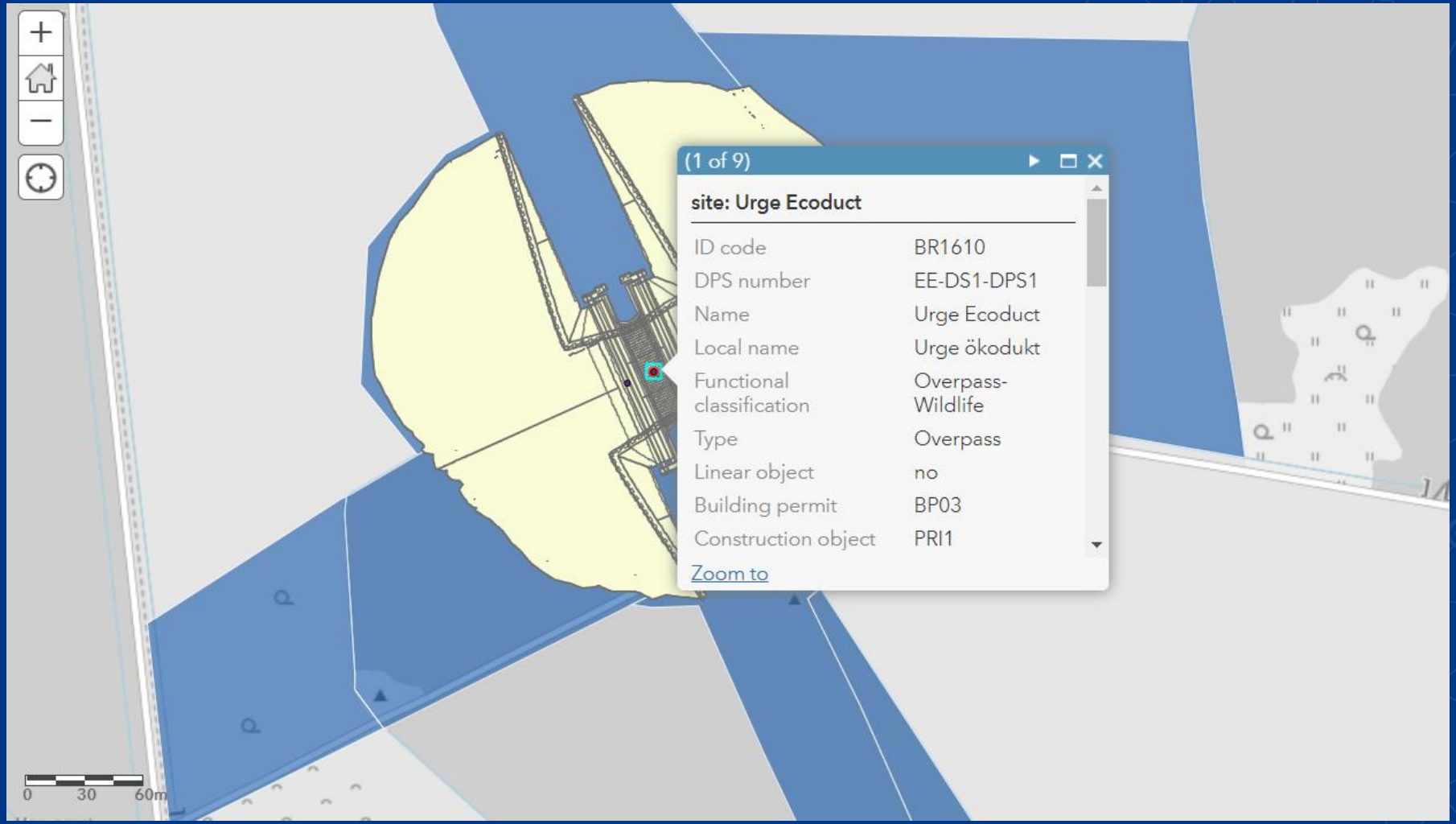
Sustainable AIM (2020 – …)

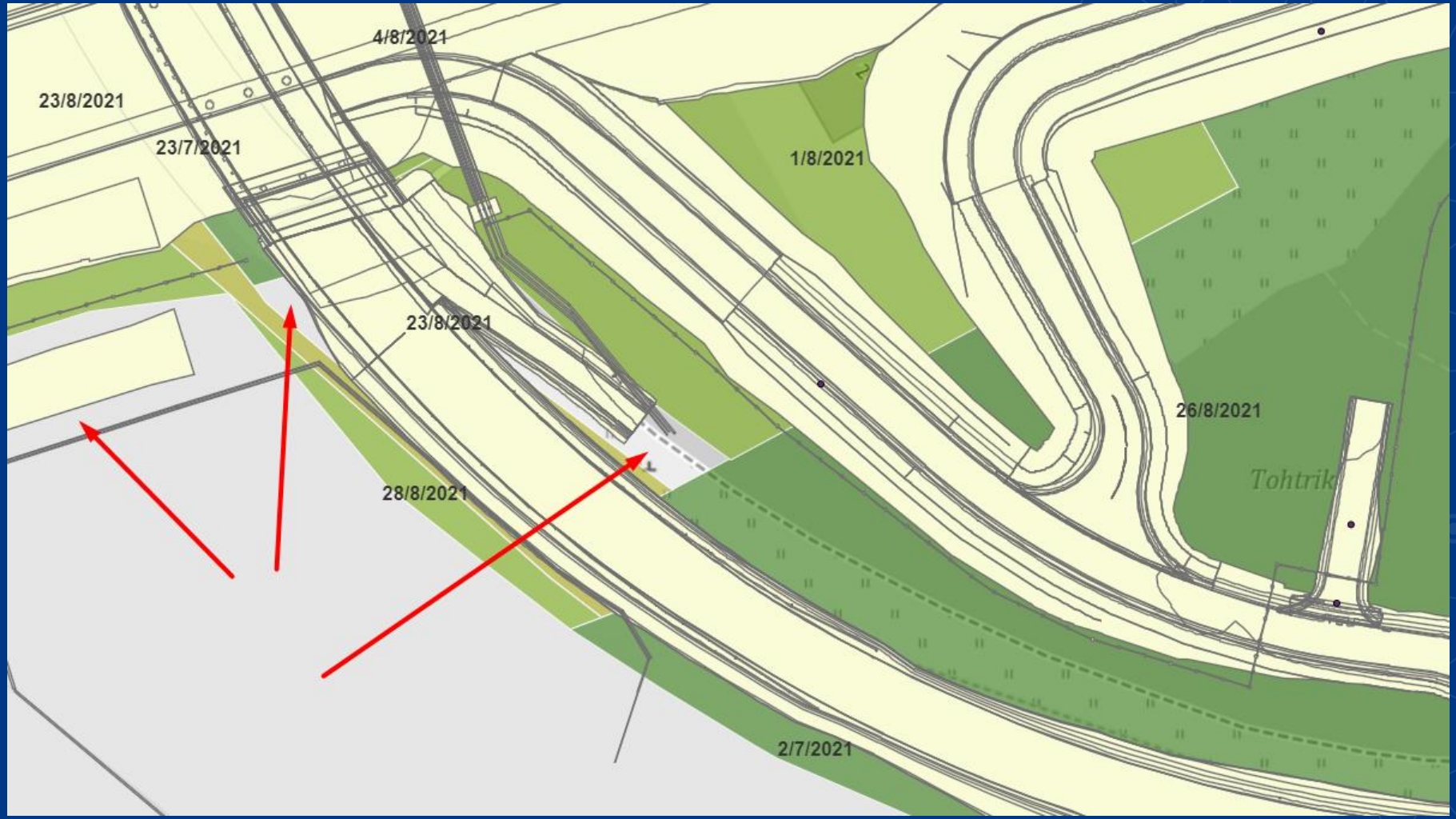
- Evaluation of multiple SW solutions
- POC
- **Support from Management Board**
- Technical Working Group – Asset Information Management (TWG-AIM)
- Enforcing codification rules (introduced in DG)

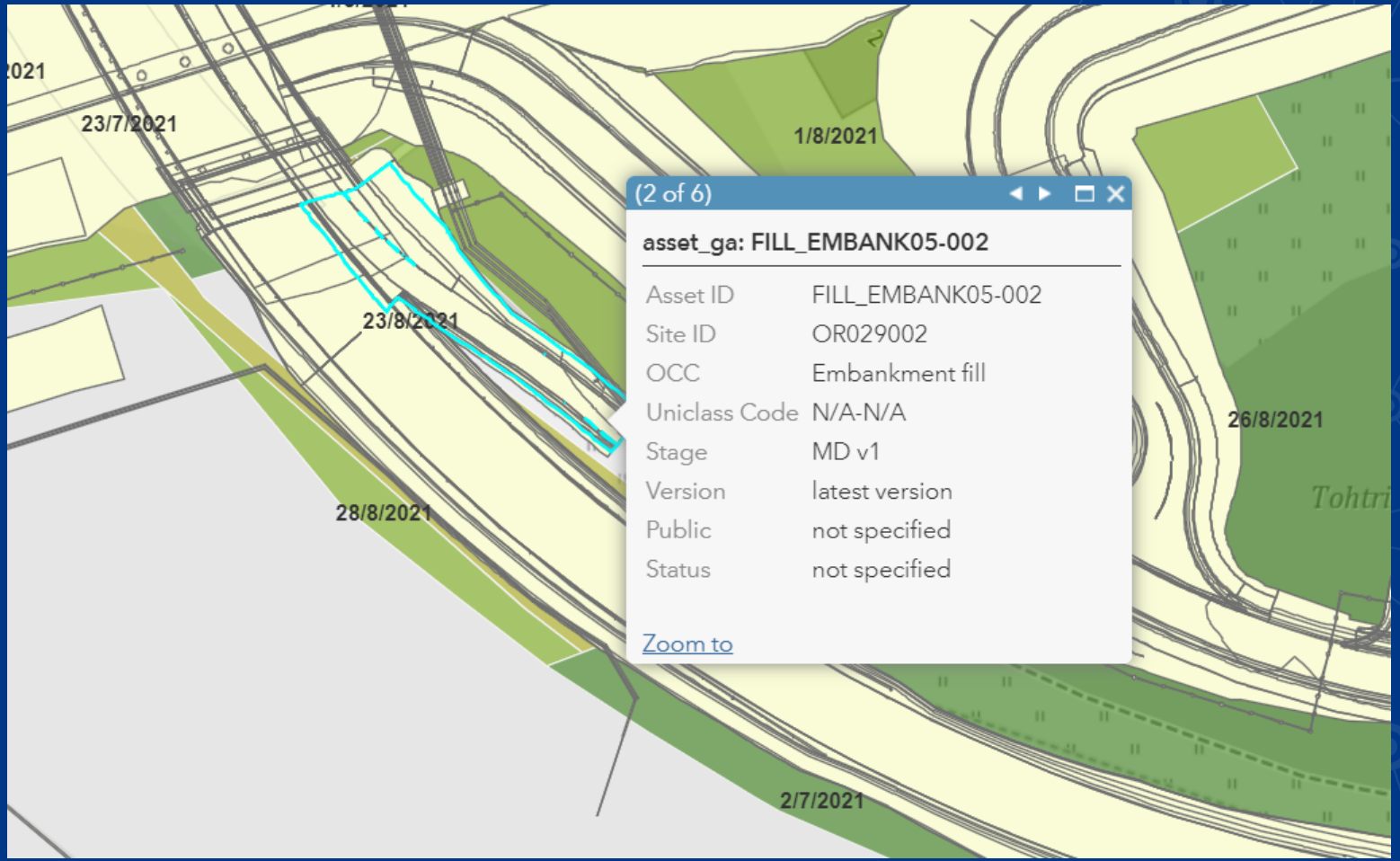
AR process


ASSETS to GIS
site
asset
create record(s) in site table
import IFC and merge elements (assets) by site_id into site_g feature class
make sure that site_id and asset_id attributes exist and asset_id is unique
Is this a new site?
Yes
No
insert new elements (quick import) into asset_g feature class
Do we update geometries or insert new ones?
Insert
update status fields in asset_g
Update
Choose update type
Do these assets exist in asset table?
Yes
No
update existing records
insert new records
insert new records and delete existing records
insert new elements into asset table
update attributes in asset table and classification tables
update status fields in asset_g
update foreign key to asset table in asset_g


About
Content
Legend
Legend
Kiire ajakava risted
Stage
0 – 9
RBR_Master_Service_view - asset_ga
Peatused - VE viimane seis
Maade omandamise seis
Riigile omandatud
Omandamise otsus vastu võetud
Omanik nõustunud
Pakkumine saadetud
Teade saadetud
Protsess alustatud
Other
Contact Us
0
50
100m
15/5/2021


(1 of 9)
site: Urge Ecoduct
ID code BR1610
DPS number EE-DS1-DPS1
Name Urge Ecoduct
Local name Urge ökodukt
Functional classification Overpass-Wildlife
Type Overpass
Linear object no
Building permit BP03
Construction object PRI1
Zoom to
0 30 60m


4/8/2021
23/8/2021
23/7/2021
1/8/2021
23/8/2021
26/8/2021
28/8/2021
2/7/2021


23/7/2021
1/8/2021
23/8/2021
26/8/2021
28/8/2021
2/7/2021
(2 of 6)
asset_ga: FILL_EMBANK05-002
Asset ID FILL_EMBANK05-002
Site ID OR029002
OCC Embankment fill
Uniclass Code N/A-N/A
Stage MD v1
Version latest version
Public not specified
Status not specified
Zoom to

- Country – EE, LV, LT
  - DS – DS1, DS2, DS3, DS4, DS5
    - DPS – DPS1, DPS2, …
      - Submission Package – BP06 or 02-01
        - Site – BR1234 (if in VE phase then BR-2616)

LT-DS1-DPS4-03-02; EE-DS1-DPS3-BP06

Integration with

- Bentley ProjectWise
- Oracle Primavera P6

Submission Packages

Field: Add Calculate | Selection: Select By Attributes Zoom To Switch Clear Delete Copy

DPS *	Submission Package	SP name	DPS SP	Description	MD contractual date	MD planned date	MD actual date	MD target date	MD approved date
LT-DS1-DPS2	01-01	Railway track	LT-DS1-DPS2-01-01	Railway track	<Null>	03.06.2020	31.03.2021	<Null>	30.04.2021
LT-DS2-DPS1	01-01	Culvert-Railway	LT-DS2-DPS1-01-01	Culvert-Railway	<Null>	30.07.2021	30.07.2021	<Null>	23.09.2021
LT-DS1-DPS3	01-01	Railway track	LT-DS1-DPS3-01-01	Railway track	<Null>	03.07.2020	12.03.2021	<Null>	03.04.2021
LT-DS1-DPS1	01-01	Railway track	LT-DS1-DPS1-01-01	Railway track	<Null>	03.09.2020	03.05.2021	<Null>	30.05.2021
LT-DS1-DPS4	01-01	Railway track	LT-DS1-DPS4-01-01	Railway track	<Null>	03.08.2020	26.03.2021	<Null>	27.04.2021

AutoSave Off — Site202102EEDS2v20210322.xlsx - Excel

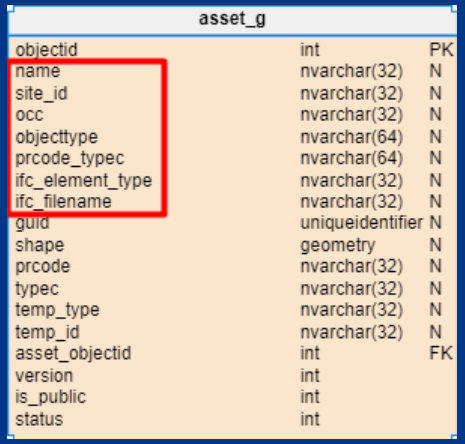
File Home Insert Page Layout Formulas Data Review View Help ArcGIS Maps ProjectWise

J13

	A	B	C	D	E	F	G	H	I
1	DPS	Submission Package (SP)	Name	MD Contractual date	MD Planned Date	MD Actual Date	MD Approved Date	DTD Planned Date	DPS-SP
2	EE-DS2-DPS1	BP01	Järveküla-Jüri National Road	2020-12-26	2021-03-25	2020-10-16			EE-DS2-DPS1-BP01
3	EE-DS2-DPS1	BP02	T2 National Road	2020-12-26	2021-02-19	2021-02-19			EE-DS2-DPS1-BP02
4	EE-DS2-DPS1	BP03	Rukki Local Road	2020-12-26	2021-03-24	2020-10-16			EE-DS2-DPS1-BP03
5	EE-DS2-DPS1	BP04	Põdra Local Road	2020-12-26	2021-04-07	2020-11-26			EE-DS2-DPS1-BP04
6	EE-DS2-DPS1	BP05	Assaku-Jüri National Road						
7	EE-DS2-DPS1	BP06	Tallinn-Lagedi National Road						
8	EE-DS2-DPS1	BP07	Vaskjala-Ülemiste Water Channel Bridge						
9	EE-DS2-DPS1	BP08	Kurnaoja&Kurna Stream						

DPS	Submission Package (SP)	N
EE-DS2-DPS1	BP01	Jä
EE-DS2-DPS1	BP02	T
EE-DS2-DPS1	BP03	R
EE-DS2-DPS1	BP04	P

Urmas Alber:
EE and LV
Please use the letters and numbers without dashes. BP08 is OK; BP-08, BP8, 8 are NOT OK
LT
Pllease use just the numbers and dash between them "02-01"



asset_g		
objectid	int	PK
name	nvarchar(32)	N
site_id	nvarchar(32)	N
occ	nvarchar(32)	N
objecttype	nvarchar(64)	N
prcode_typec	nvarchar(64)	N
ifc_element_type	nvarchar(32)	N
ifc_filename	nvarchar(32)	N
guid	uniqueidentifier	N
shape	geometry	N
prcode	nvarchar(32)	N
typec	nvarchar(32)	N
temp_type	nvarchar(32)	N
temp_id	nvarchar(32)	N
asset_objectid	int	FK
version	int	
is_public	int	
status	int	

Python/Jupyter notebook

1 - asset_gm 3D

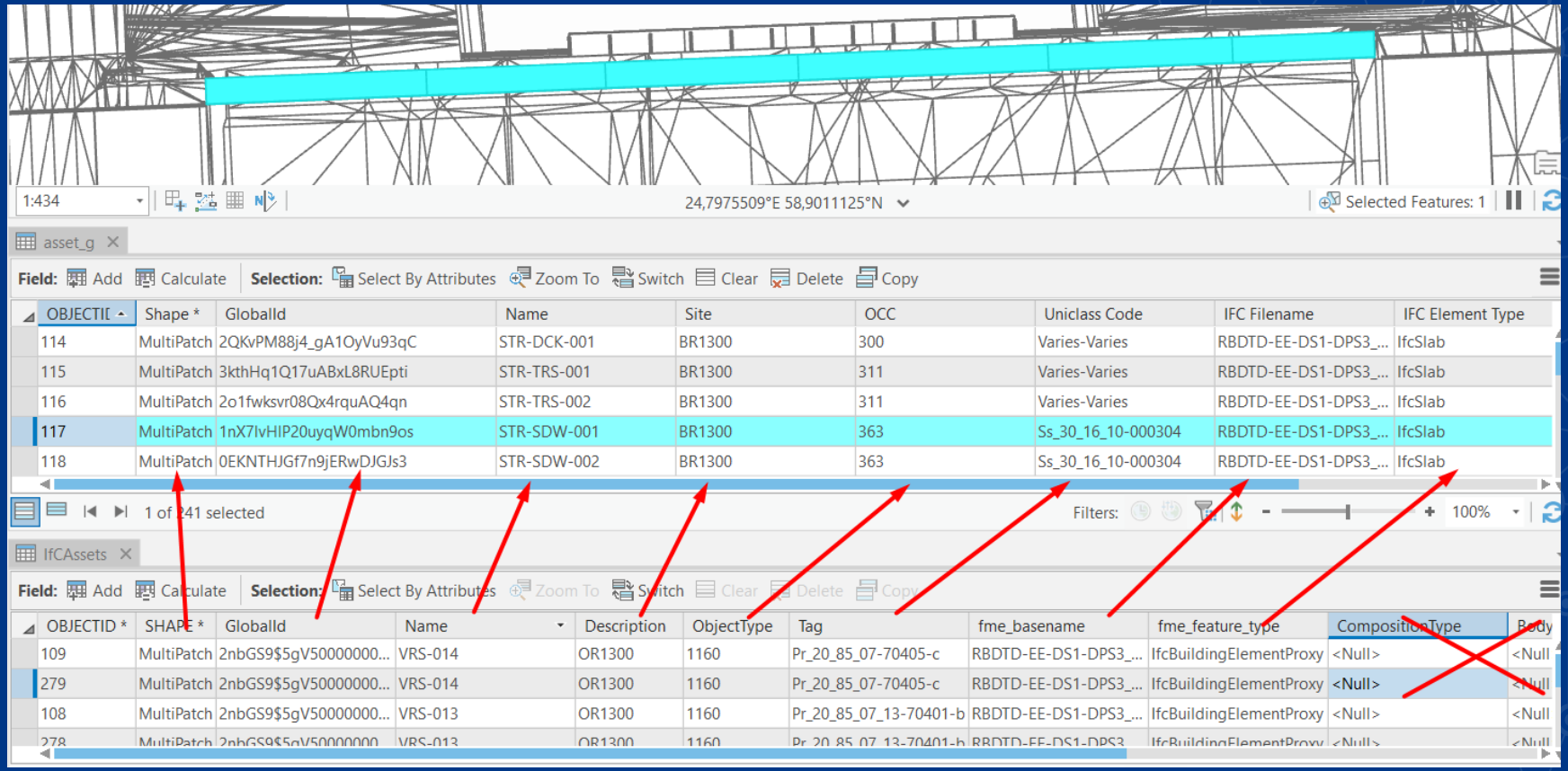
2 - asset_ga 2D

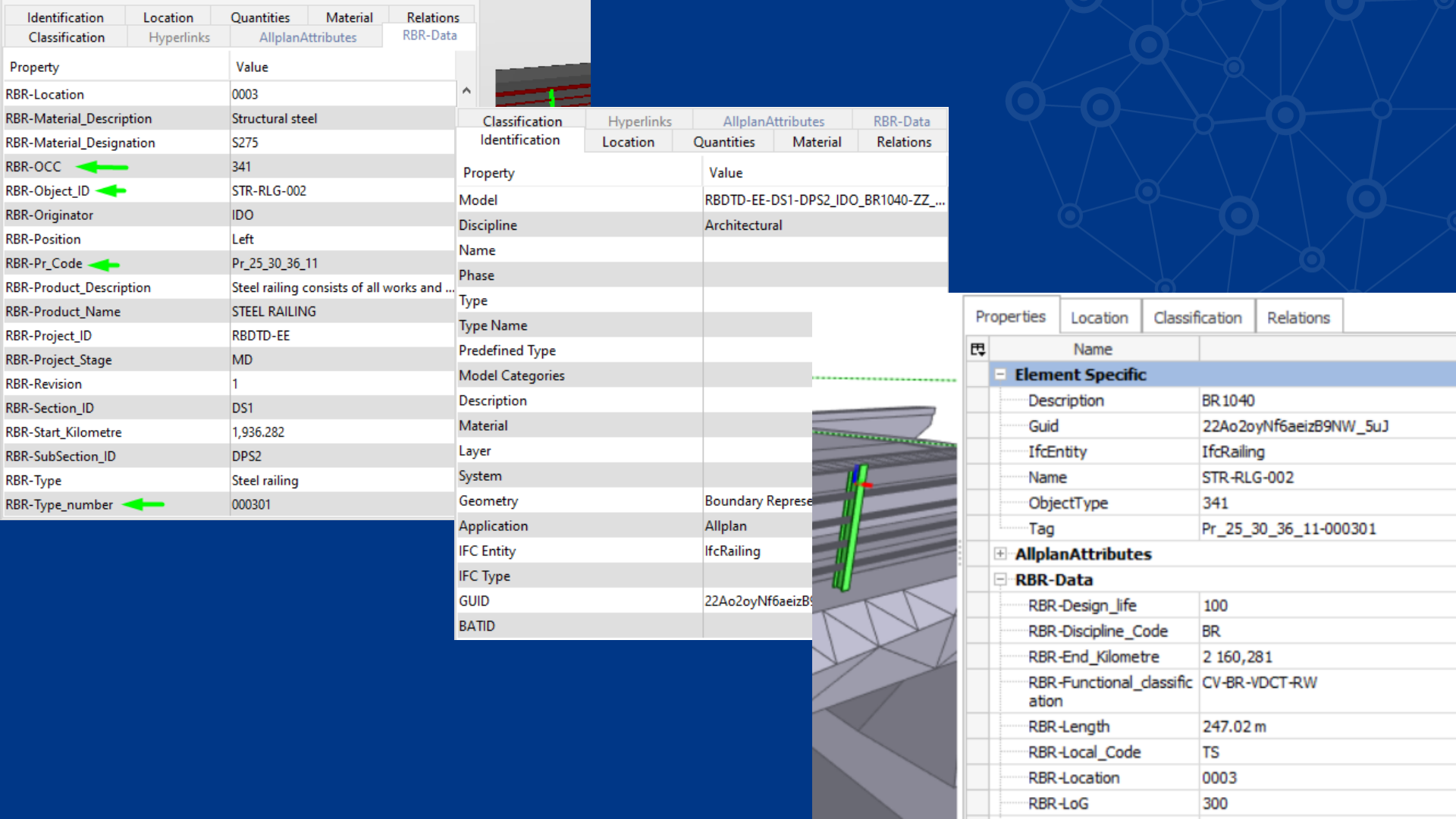
3 - asset 1D

```
    arcpy.DeleteField_management(fullpathfc, fldsList)
# rename the fields 'Name', 'Description', 'ObjectType', 'Tag', 'fme_basename', 'fme_feature_type'
    arcpy.AlterField_management(fullpathfc, 'Name', 'name', 'Name')
    arcpy.AlterField_management(fullpathfc, 'Description', 'site_id','Site')
    arcpy.AlterField_management(fullpathfc, 'ObjectType', 'occ', 'OCC')
    arcpy.AlterField_management(fullpathfc, 'Tag', 'prcode_typec','Uniclass Code')
    arcpy.AlterField_management(fullpathfc, 'fme_basename', 'ifc_filename', 'IFC Filename')
    arcpy.AlterField_management(fullpathfc, 'fme_feature_type', 'ifc_element_type', 'IFC Element Type')


arcpy.Append_management(fullpathfc, os.path.join(targetdbpath, 'asset_g'),'NO_TEST')
```

Interoperability Extension (4 attributes)




Identification
Location
Quantities
Material
Relations
Classification
Hyperlinks
AllplanAttributes
RBR-Data
Property
Value
RBR-Location
0003
RBR-Material_Description
Structural steel
RBR-Material_Designation
S275
RBR-OCC
341
RBR-Object_ID
STR-RLG-002
RBR-Originator
IDO
RBR-Position
Left
RBR-Pr_Code
Pr_25_30_36_11
RBR-Product_Description
Steel railing consists of all works and ...
RBR-Product_Name
STEEL RAILING
RBR-Project_ID
RBDTD-EE
RBR-Project_Stage
MD
RBR-Revision
1
RBR-Section_ID
DS1
RBR-Start_Kilometre
1,936.282
RBR-SubSection_ID
DPS2
RBR-Type
Steel railing
RBR-Type_number
000301
Classification
Hyperlinks
AllplanAttributes
RBR-Data
Identification
Location
Quantities
Material
Relations
Property
Value
Model
RBDTD-EE-DS1-DPS2_IDO_BR1040-ZZ_...
Discipline
Architectural
Name
Phase
Type
Type Name
Predefined Type
Model Categories
Description
Material
Layer
System
Geometry
Boundary Represe
Application
Allplan
IFC Entity
IfcRailing
IFC Type
GUID
22Ao2oyNf6aeizB
BATID
Properties
Location
Classification
Relations
Name
Element Specific
Description
BR1040
Guid
22Ao2oyNf6aeizB9NW_5uJ
IfcEntity
IfcRailing
Name
STR-RLG-002
ObjectType
341
Tag
Pr_25_30_36_11-000301
AllplanAttributes
RBR-Data
RBR-Design_life
100
RBR-Discipline_Code
BR
RBR-End_Kilometre
2 160,281
RBR-Functional_classification
CV-BR-VDCT-RW
RBR-Length
247.02 m
RBR-Local_Code
TS
RBR-Location
0003
RBR-LoG
300

Submission Packages (SP) – “Excel-like-editing”

Submission Packages

DPS SP	
LV-DS1-DPS3-BP3.1	(18)
LV-DS1-DPS3-BP3.2	(14)
LV-DS1-DPS3-BP3.3	(8)
LV-DS1-DPS3-BP3.4	(24)
LV-DS1-DPS3-BP3.5	(28)
LV-DS1-DPS3-BP3.6	(25)
LV-DS1-DPS3-BP3.7	(6)
LV-DS2-DPS1-BP01	(19)
LV-DS2-DPS1-BP02	(33)
LV-DS2-DPS1-BP03	(25)
LV-DS2-DPS1-BP04	(1)

site (Features: 24, Selected: 1)

OBJECTID	ID code	DPS number	Name	Local name	Functional classification
390	OS480	LV-DS1-DPS3	Olaine Local Stop	Olaine reģionālā pietura	Local Passenger Stop or Station
2909	BR4740	LV-DS1-DPS3	Ecoduct		Underpass-Wildlife
2910	OS4802	LV-DS1-DPS3	Olaine station platform (right)		Platform-Train Stn
2911					
2912					

Submission Packages (Features: 230, Selected: 1)

ate	DTD Actual Date	DTD Target Date	DPS	Submission Package	SP name	DPS SP	gis_db.GISADME
			LV-DS1-DPS2	BP2.1	Stopiņi municipality, Building permit Nr. 2.1	LV-DS1-DPS2-BP2.1	(1) Show
			LV-DS1-DPS2	BP2.2	Stopiņi municipality, Building permit Nr. 2.2	LV-DS1-DPS2-BP2.2	(0)
			LV-DS1-DPS2	BP2.3	Stopiņi and Riga municipalities, Building permit Nr. 2.3	LV-DS1-DPS2-BP2.3	(0)
			LV-DS1-DPS2	BP2.4	Riga municipality, Building permit Nr. 2.4	LV-DS1-DPS2-BP2.4	(0)
			LV-DS1-DPS2	BP2.5	Riga municipality, Building permit Nr. 2.5	LV-DS1-DPS2-BP2.5	(1) Show
			LV-DS1-DPS2	BP2.6	Riga municipality, Building permit Nr. 2.6	LV-DS1-DPS2-BP2.6	(0)

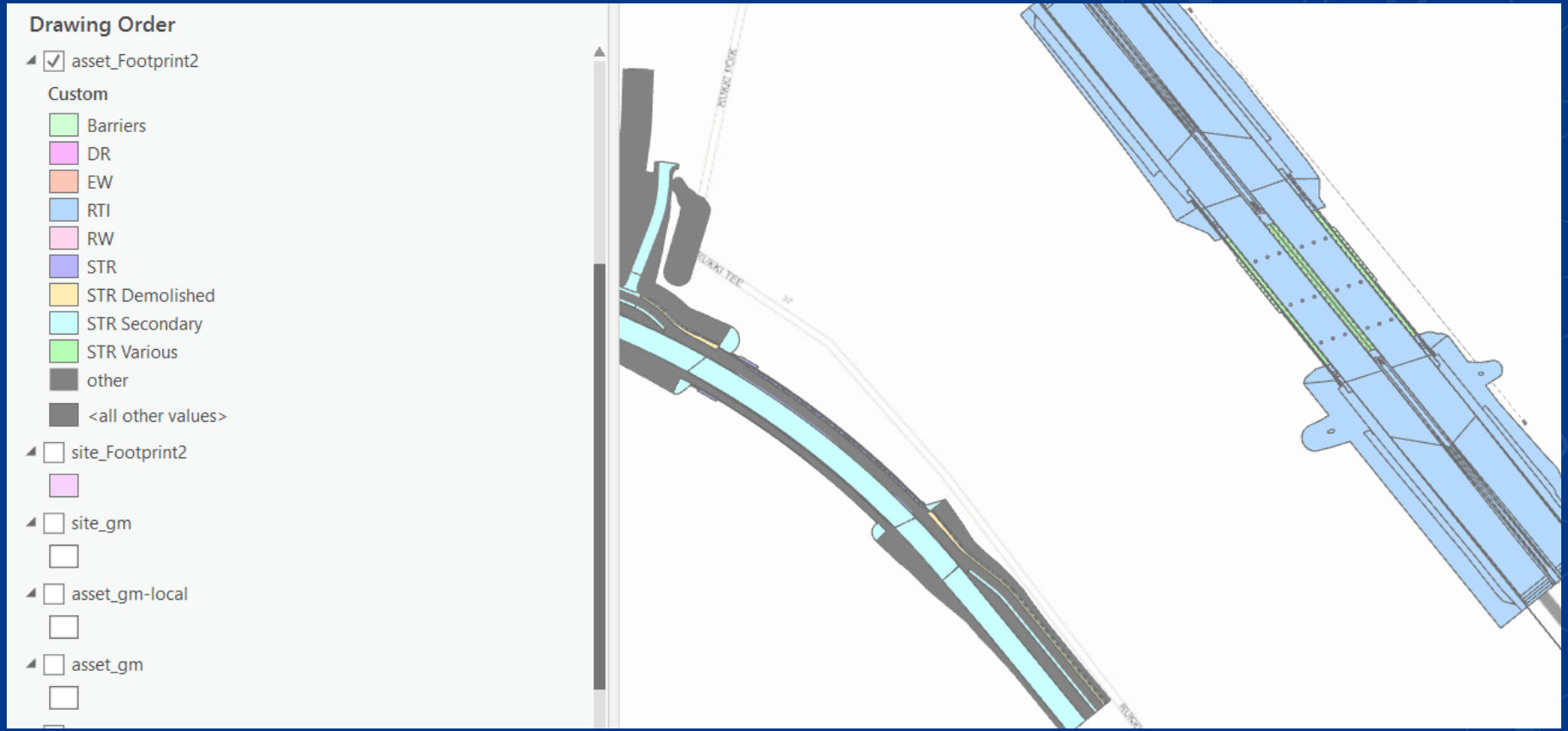
March

M	T	W	T	F	S	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4
5	6	7	8	9	10	11

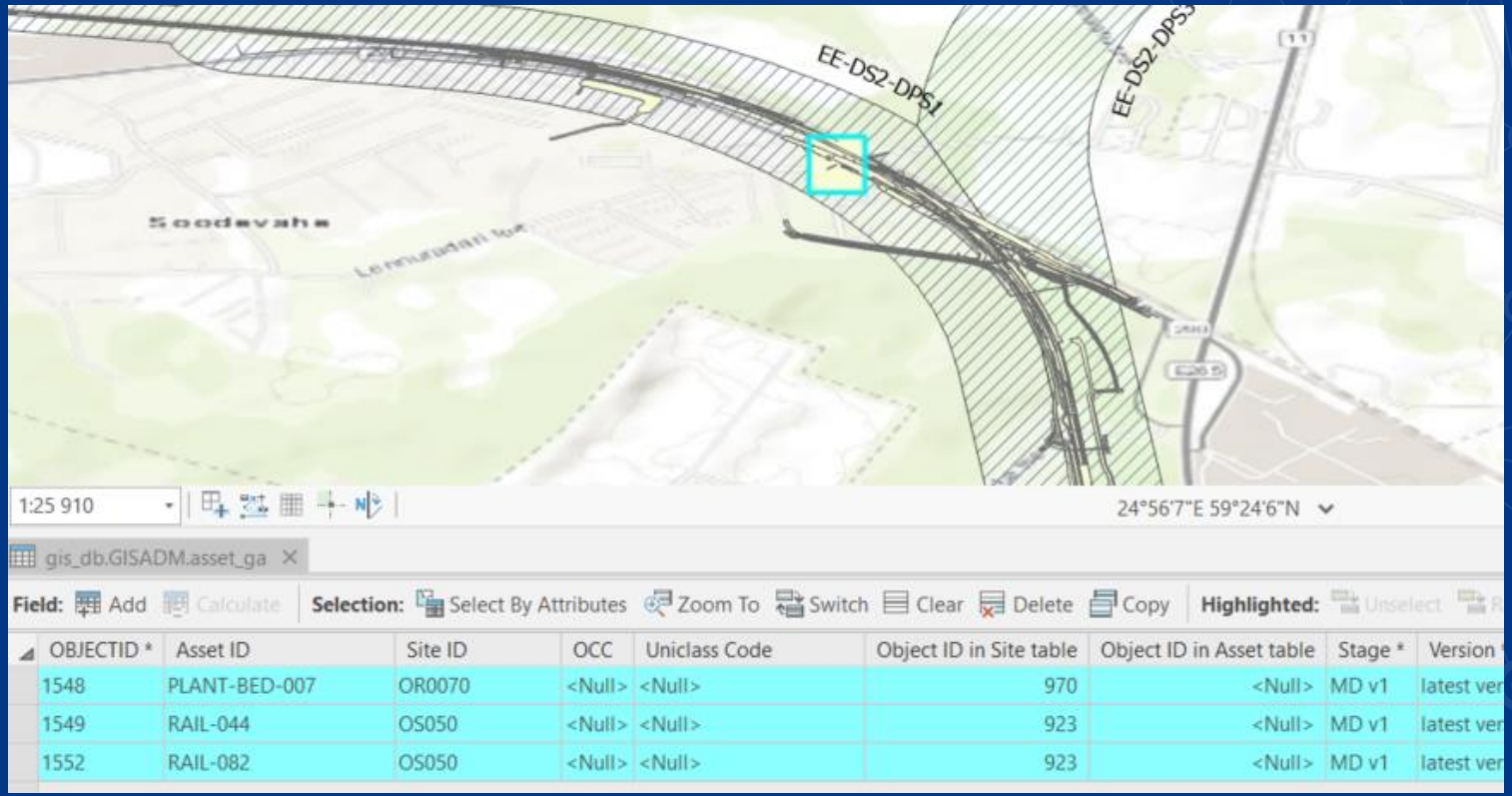
2020 2021 2022

Assets from models 2D and 3D

Get 2D (polygons) from 3D – group by OCC



Faulty geometries in IFC



OBJECTID *	Asset ID	Site ID	OCC	Uniclass Code	Object ID in Site table	Object ID in Asset table	Stage *	Version
1548	PLANT-BED-007	OR0070	<Null>	<Null>	970	<Null>	MD v1	latest ver
1549	RAIL-044	OS050	<Null>	<Null>	923	<Null>	MD v1	latest ver
1552	RAIL-082	OS050	<Null>	<Null>	923	<Null>	MD v1	latest ver

Next steps

- Systematize maintenance info
- According to element types
- By using
  - Uniclass 2015 and
  - CCI https://cci-collaboration.org/

CONSTRUCTION CLASSIFICATION INTERNATIONAL COLLABORATION

THANK YOU

SEE
WHAT
OTHERS
CAN'T

RB Rail AS

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