

Staderegistrering

Hovedstadens Letbane Ring 3

DATO 2022-11-08





Get in touch with me

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LIDT OM DRONER I NIRAS

Droner supplerer andre registreringsmetoder



- Droner siden 2013
- Operations håndbog 2014
- Operationel Autorisation 2021 (SORA)
- 16 Operatør specifikke scenarier
- 6 Operations typer
- 4 Drone klasser
- 21 Specifik Piloter (15 nye på vej)
- 6 Open piloter (om lidt kun 2)
- Droner som et standard værktøj
- Udrulning i resten af EU, næste land Sverige start april 2023

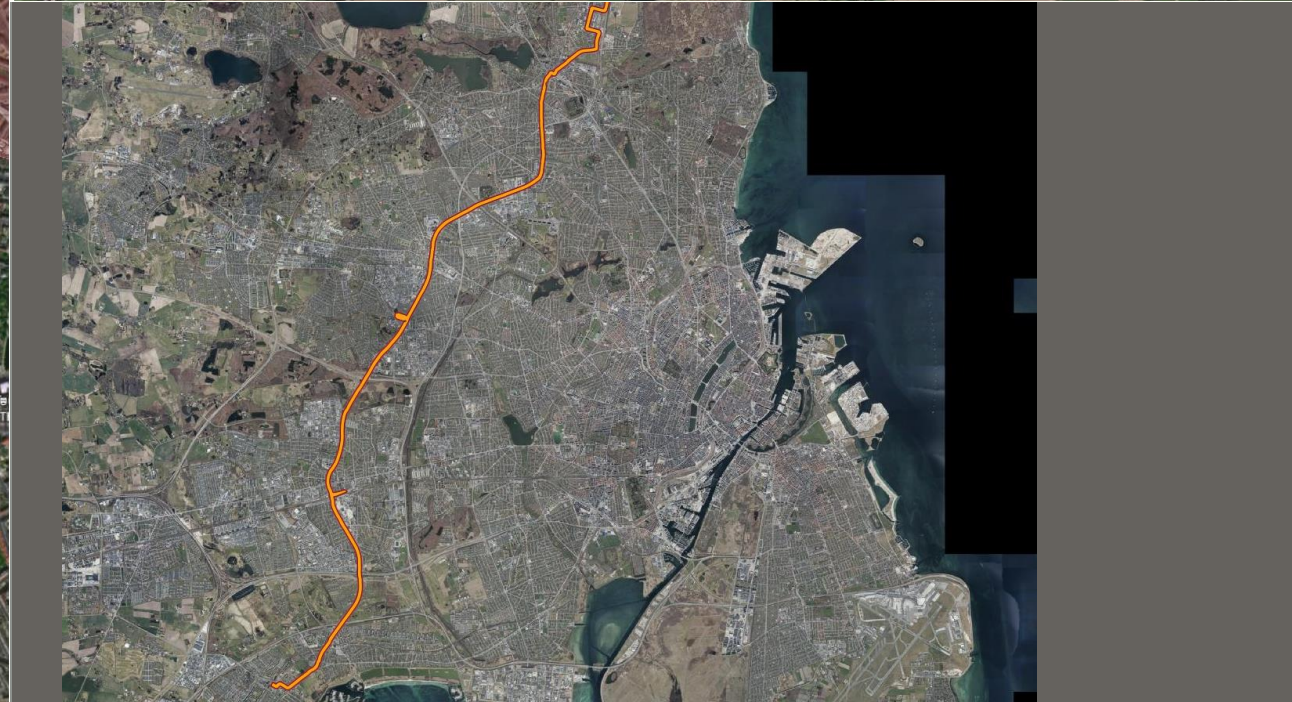
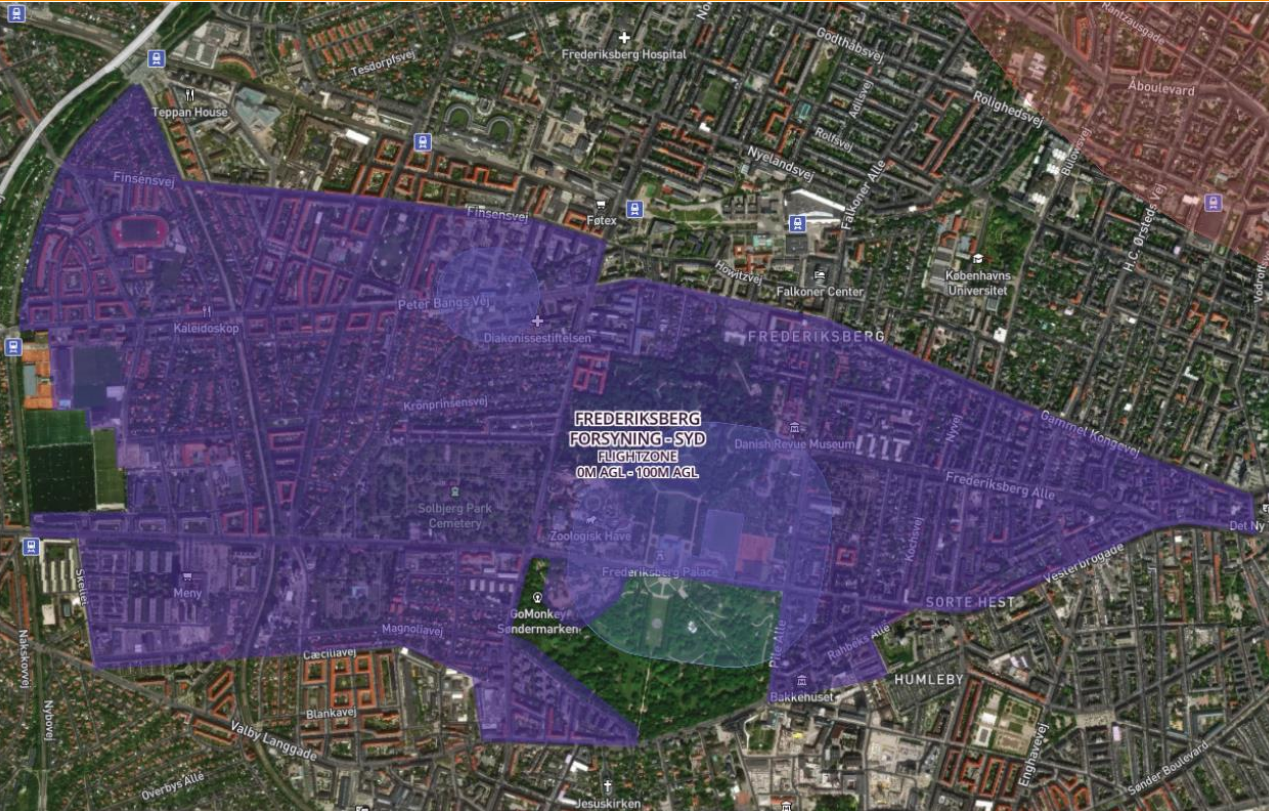
Drones overall will be more impactful than I think people recognize, in positive ways to help society.

Bill Gates



• Forretningens Ambitioner!

- Stor infrastruktur
- Byer
- Hele kommuner



Droner i NIRAS

- 15 Autel EVO II droner
- 2 Skydio S2+
- 6 Mikrokofter OKTO/HEXA
- 3 DeltaQuad V2 Map
- 5 M600 Pro

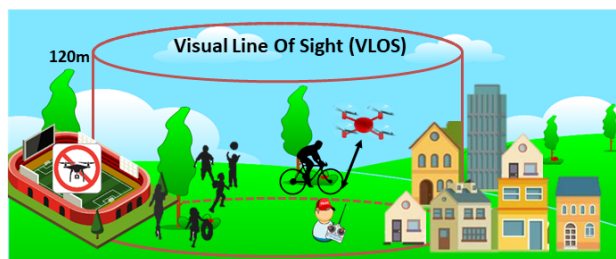



Rejsen til Operationel Autorisation (SORA)

Et stigende behov for større og mere komplicerede opgaver, det er tydeligt at "Open" er ikke for os.

- Den åbne Kategori
 - Lav risiko
 - Lette droner
 - "Controlled ground"
- PDRA begrænsninger
- STS begrænsninger
- DK-ST5-03 begrænsninger
- 2020 vi begynder at skrive SORA.

Open category - Subcategory A1



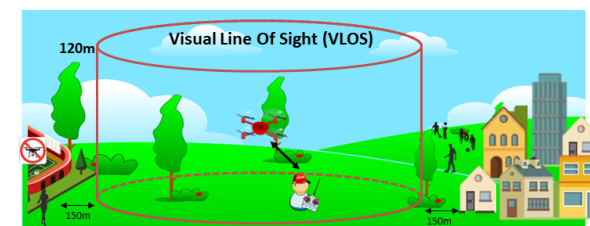
- CE  MTOM<900g
- No fly over assembly of people
 - reasonably expect that no uninvolved person is overflown. In case of unexpected overfly over uninvolved persons, the remote pilot shall reduce as much as possible the time during which the unmanned aircraft overflies those persons


Open category - Subcategory A1



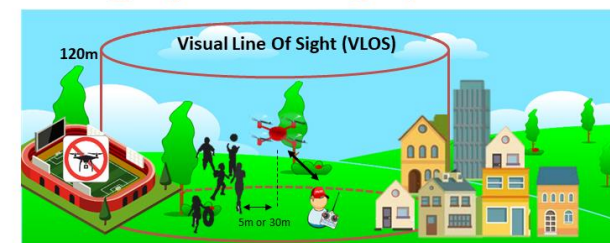
- CE  MTOM<250g
- No fly over assembly of people
- Privately built with MTOM<250g

Open category - Subcategory A3



- CE  MTOM<25kg
- No fly over uninvolved people
 - conducted in an area where the remote pilot reasonably expects that no uninvolved person will be endangered within the range where the unmanned aircraft is flown during the entire time of the UAS operation
- Privately built with MTOM<25kg

Open category - Subcategory A2



- CE  MTOM<4kg
- No fly over uninvolved people
 - UAS at a horizontal distance of at least 30 metres from uninvolved persons, or up to a of 5 metres when low speed mode function is activated

Rejsen til Operationel Autorisation (SORA)

Livet som ~~voksen~~-teenager i luftfartsindustrien

- Egne scenarier
 - Hvor vil jeg flyve med hvad
- Egne operation typer
 - Hvordan vil jeg flyve
- Dispensationer
 - Operationer i sikringskritiske områder
 - Overflyvning af 3. parts person
 - Overflyvning af 3. parts hegn, hæk og mur
- Avancerede opgaver uden ansøgning hos trafikstyrelsen
 - Flyvning ved erklæring
- Ingen ventetid

NIRAS Erklæring om droneoperation			
Ver. 1	Rev. 0	Date: 10.02.2022	Page 1 of 1

Under henvisning til ovennævnte, erklæres hermed følgende:

Beskrivelse af operation	NIRAS A/S udfører termografering af ledningsnet for Svendborg Fjernvarme A.m.b.a. Se vedhæftede ordrebekræftelse. Flyvningen udføres efter NIRAS A/S scenarie OSS-01 iht. og NIRAS A/S Se indsatte operationsplan i denne erklæring.
Tidsperiode	Dato/tid fra: 2022.02.10 kl. 21.00 Dato/tid til: 2022.02.24 kl. 21.00
Sted/omfang	Se indsatte operationsplan i denr
Opgave/operationstype	VLOS Survey, Annex A – ConOps i
Kunde	Svendborg Fjernvarme A.m.b.a Bagergade40A 5700 Svendborg Danmark
Formål	Kortlægning af fjernvarmenet, m brud, begyndende brud og rørstr.
Scenarie	OSS-01 VLOS in urban areas, in 3 meter, < 34000 joule, <120 m

Med venlig hilsen

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Søren Rolin Hvorup Jensen
Flight Operations Manager
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NIRAS Concept of Operation and Operations Manual			
Ver. 1.0	Rev. 0	Date: 2021.03.03	Annex A – ConOps & Opps Manual Page 2 of 32

Operating Manual Annex A

Concept of Operation and Operations Manual

NIRAS NIRAS-OSS-05			
Ver. 1.0	Rev. 0	Date: 2021.05.03	Annex B – Scenarios Page 1 of 6

Operating Manual Annex B

NIRAS-OSS-05 Mikrokofter 8



Rejsen til Operationel Autorisation (SORA)

4 måneder, en pandemi og 250 sider senere.... 😊





Operational autorisation



Old Reference: [REDACTED]
New Reference: [REDACTED]

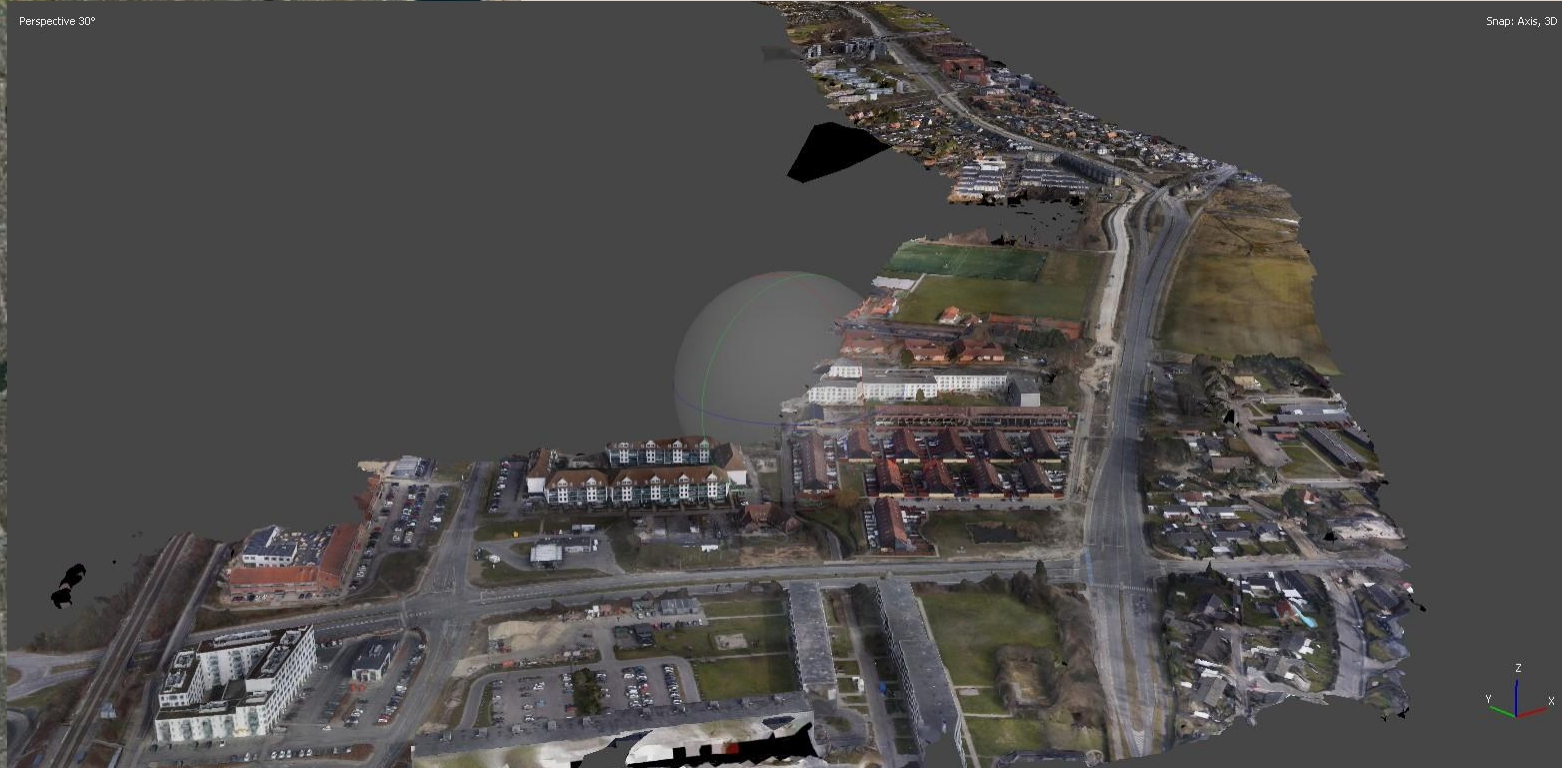
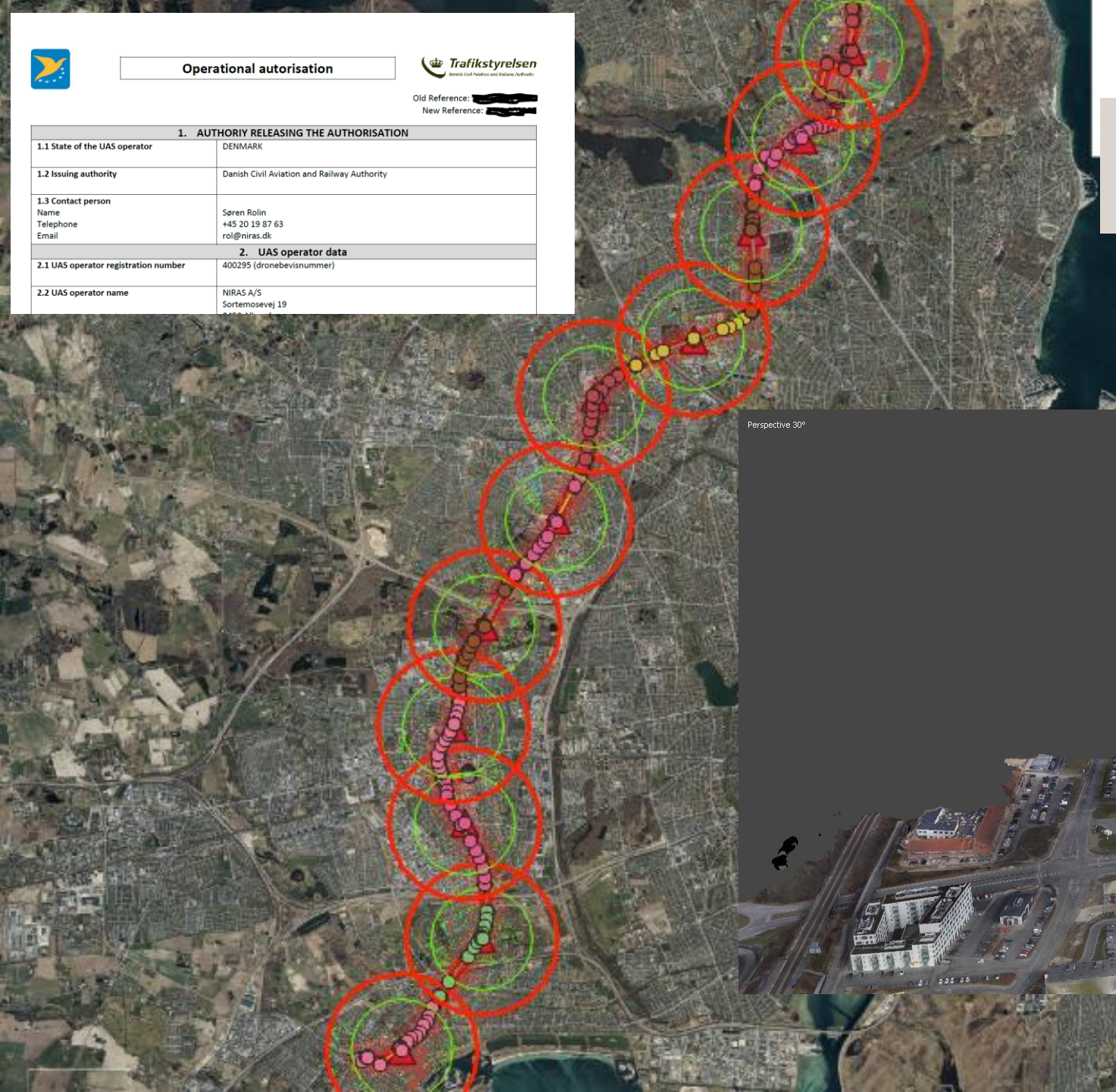
1. AUTHORITY RELEASING THE AUTHORISATION

1.1 State of the UAS operator	DENMARK
1.2 Issuing authority	Danish Civil Aviation and Railway Authority
1.3 Contact person Name Telephone Email	Søren Rolin +45 20 19 87 63 rol@niras.dk

2. UAS operator data

2.1 UAS operator registration number	400295 (dronebevisnummer)
2.2 UAS operator name	NIRAS A/S Sortemosevej 19

Og når det hele er på plads kan man lave missioner som den her.



I reject your reality
and substitute it with
my own.

Adam Savage, Mythbusters

Øvrige gældende regler skal overholdes.

Såfremt droneoperationen afviger fra de godkendte procedurer, udgør unødvendig risiko for tredjemand eller droneflyvning foregår ulovlig kan autorisationen inddrages uden varsel.

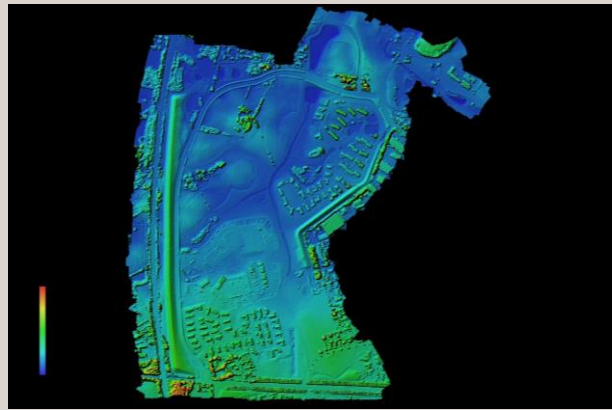
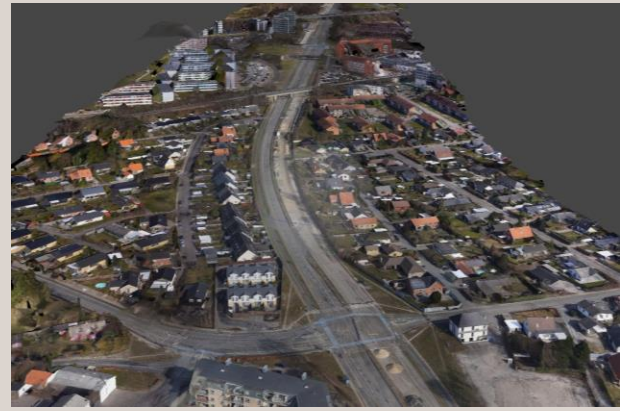
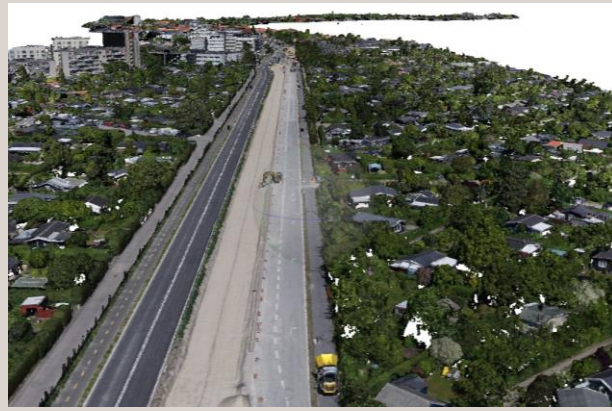
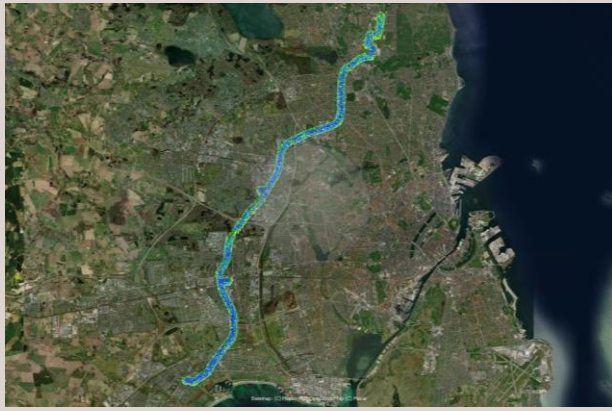
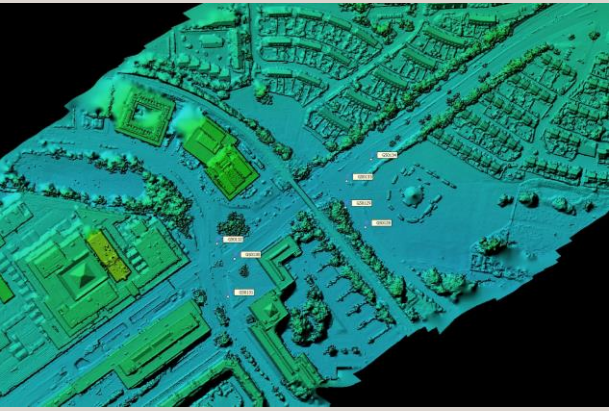
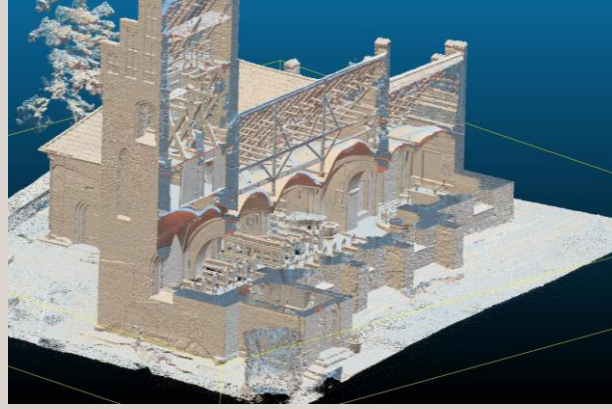
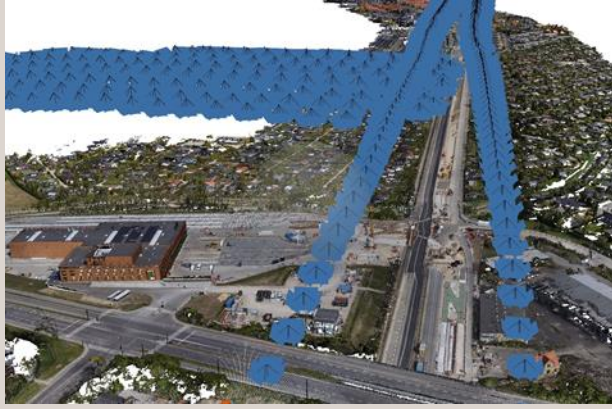
Held og lykke med droneaktiviteterne.

Med venlig hilsen



Trafikstyrelsen







AMTICK 035m



AMTICK 01m



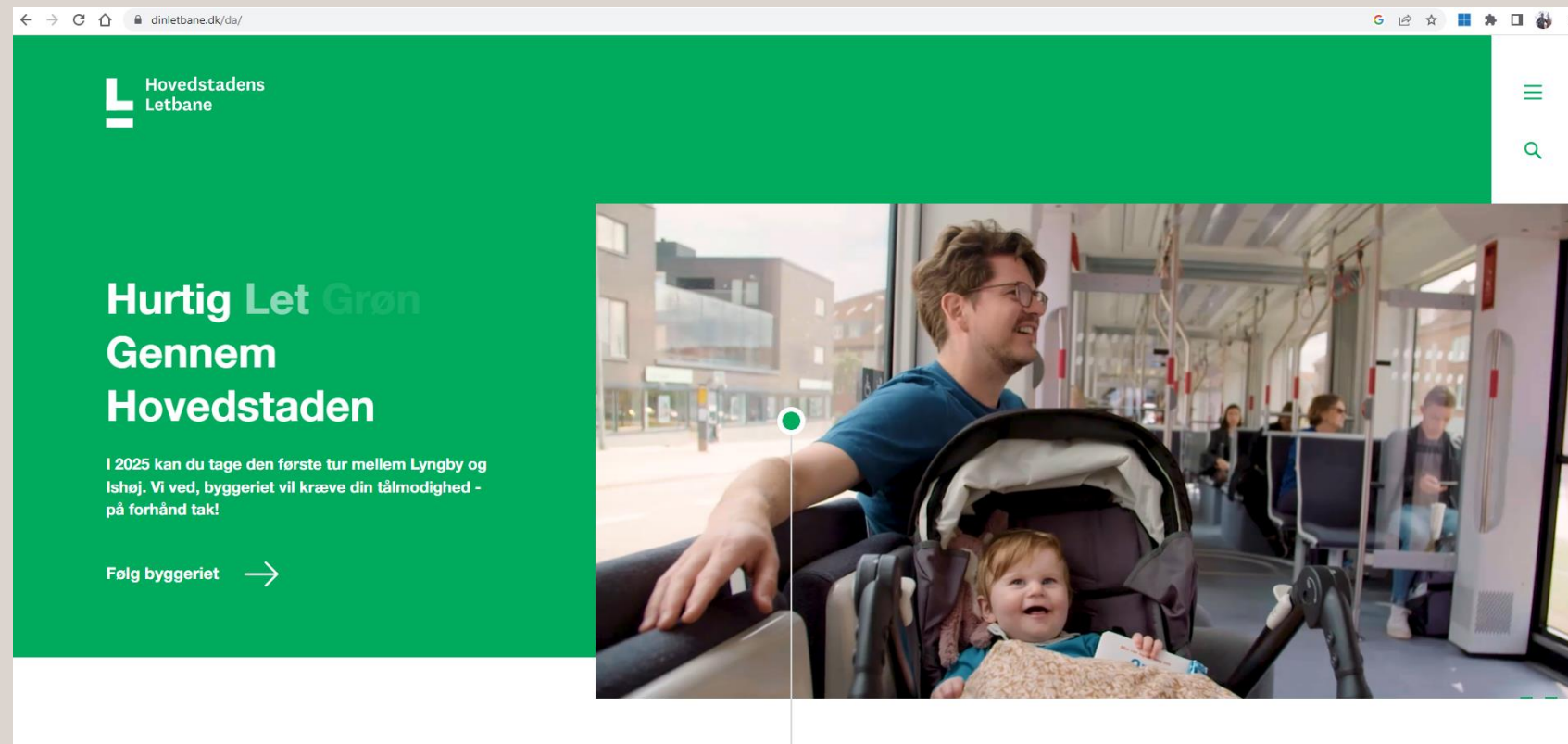
AMTICK 43m



AMTICK 100m

Staderegistrering

Hovedstadens letbane Ring 3



The screenshot shows a web browser window with the URL dinletbane.dk/da/. The page features a green header with the Hovedstadens Letbane logo. The main content area has a green background with the following text:

**Hurtig Let Grøn
Gennem
Hovedstaden**

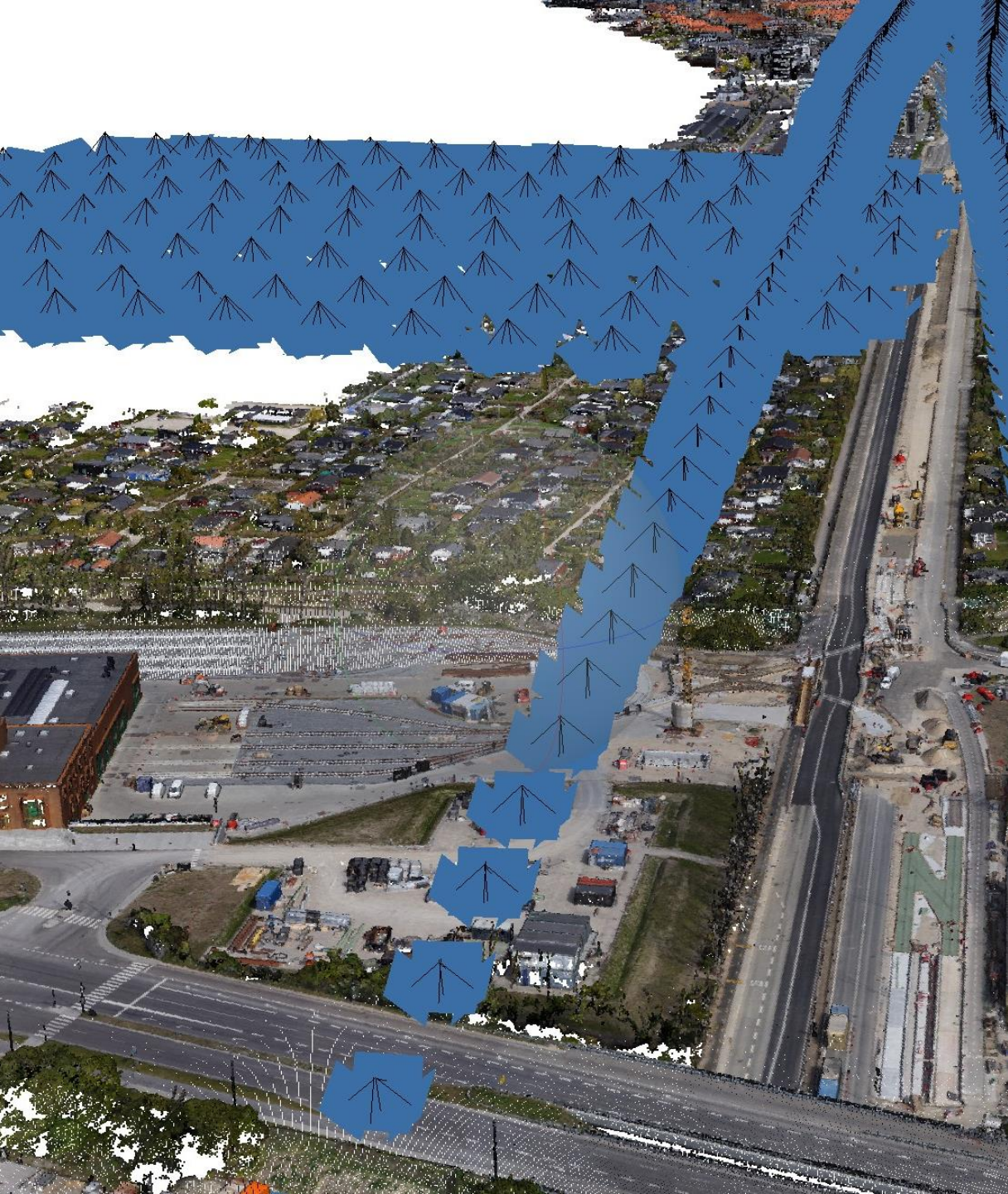
I 2025 kan du tage den første tur mellem Lyngby og Ishøj. Vi ved, byggeriet vil kræve din tålmodighed - på forhånd tak!

Følg byggeriet →

Below the text is a photograph of a man in a blue shirt pushing a stroller with a smiling child inside, both on a train. A green circle highlights a small icon on the left side of the photo.



8 stedeflyvninger
til dato yderligere 22 skal laves
62km flyvning per gang



10 flyvninger

10 flyvninger per gang af ca. 20 minutter

10 lokationer

Der flyves fra 10 lokationer som skifter fra gang til gang

20000 billeder

Fra 4000 positioner

Data

6.6 mio tiepoints, 2.1 mia målepunkter i medium opløsning
7cm grid på højdemodel, Ortofoto 17mm opløsning



Optimeringer

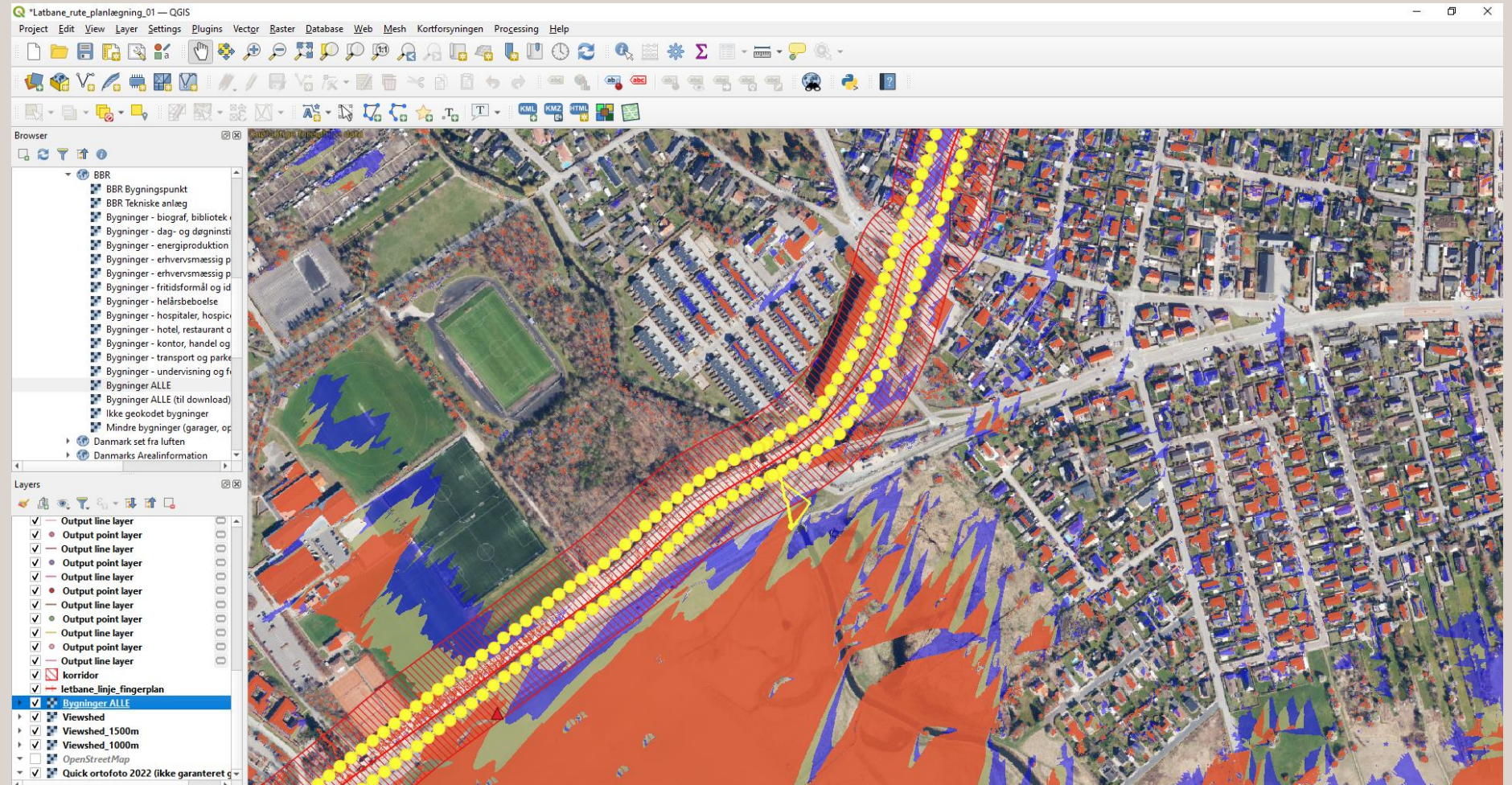
1. Reduktion af flyvninger
2. Køre rute / transporttid imellem flyvninger

Udfordringer

1. Trafik
2. Dynamisk miljø
3. Vejret

Mobilisering

Klar til at flyve

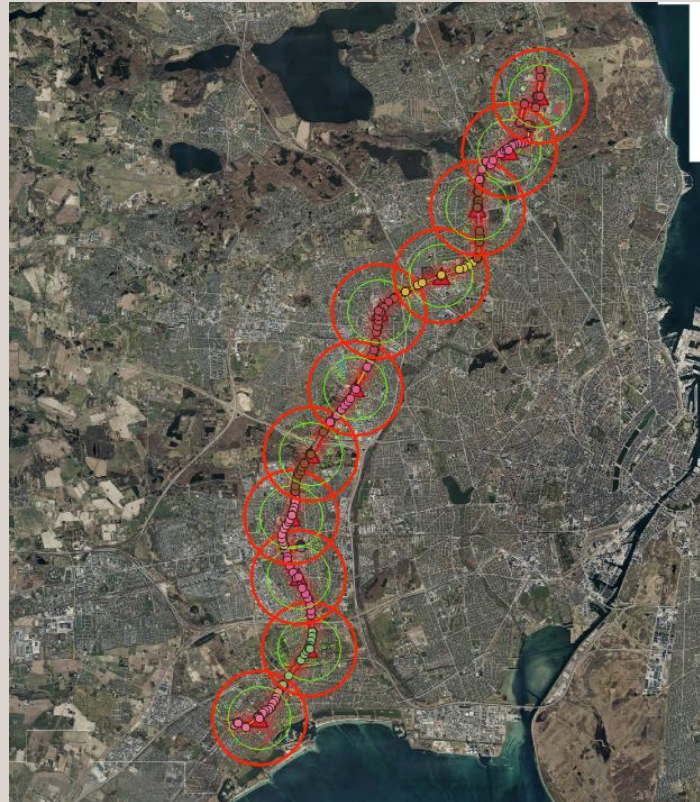


Dataindsamling

Drone pentakamera - Istar

Drone

- 28km trace
- 62km flight track
- 10 flyvninger
- 120m flyvehøjde
- 20000 24mpix billeder
- 4000 kamera stationer
- GSD 17mm



I-star

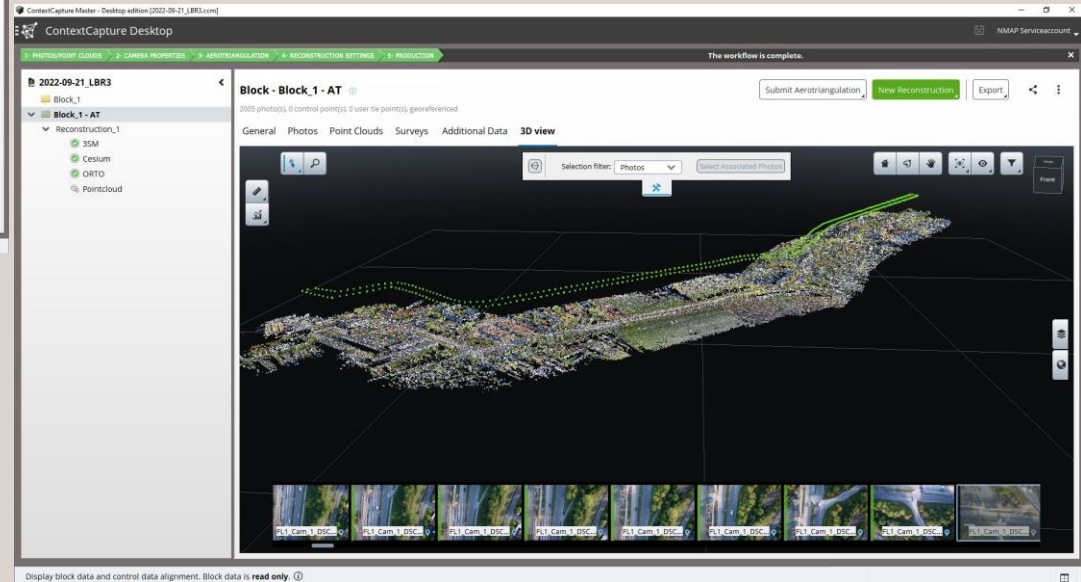
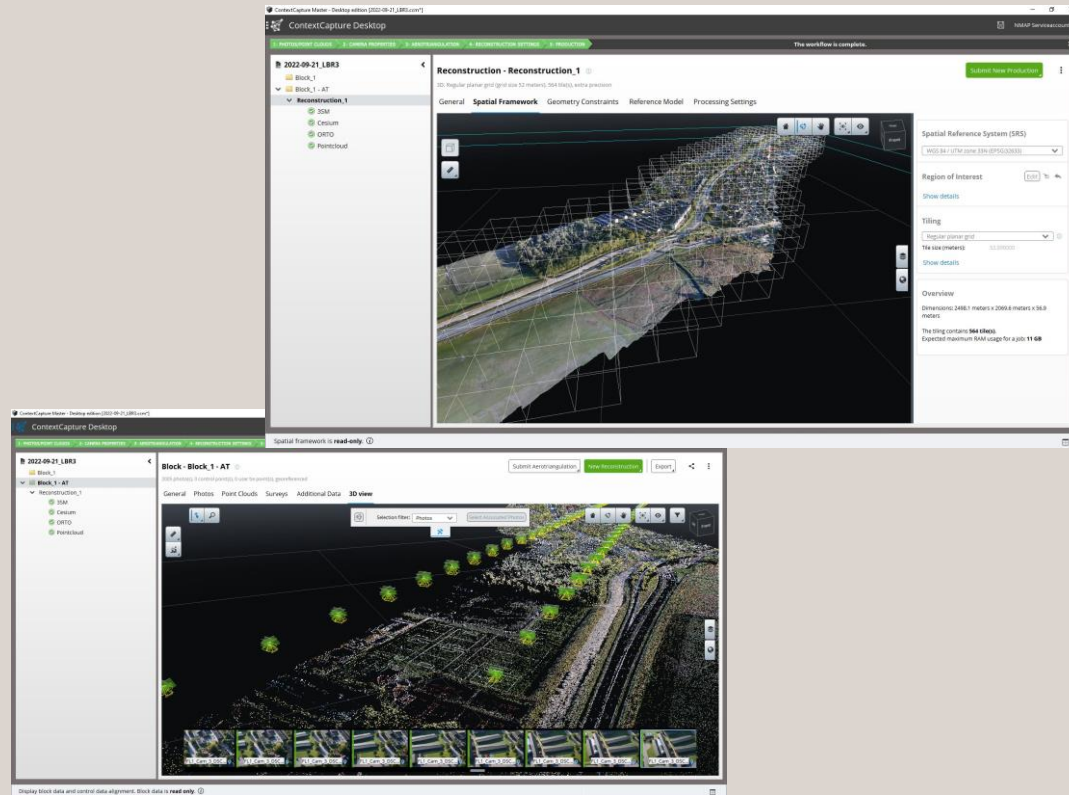
- 360 grader billeder
- 7000 kamera stationer

Processing

Her har man virkeligt brug for en cluster løsning! 😊 og mange graffikkort

- Contextcapture

- CapturingReality
- Metashape
- Pix4D Mapper



Display block data and control data alignment. Block data is read only.



Dataleverancer

Ortofoto/GIS

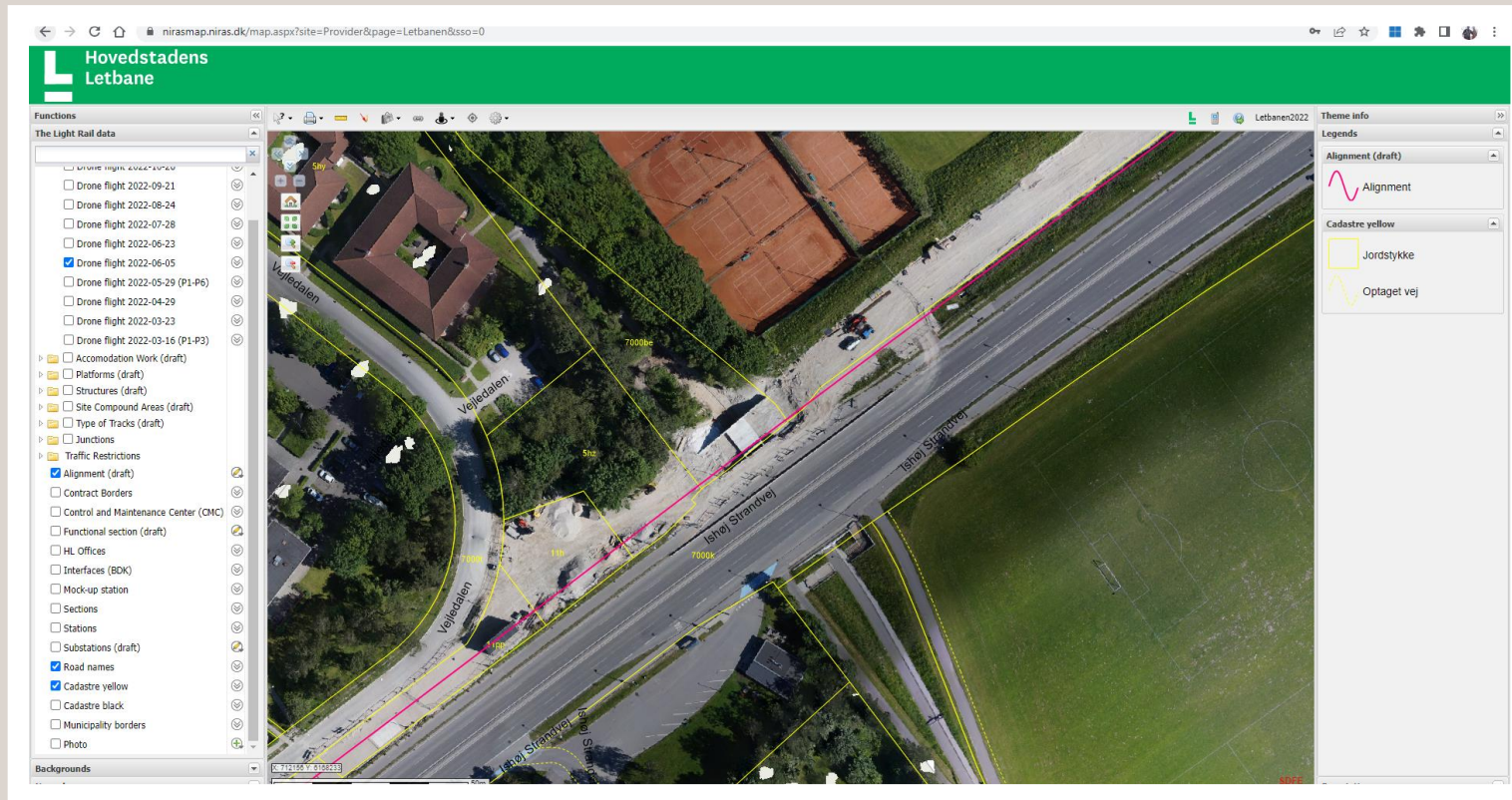
Skråbilleder

Punktsky

360 graders billeder

Data udstilling

Hvordan udnytter vi bedst data?



WebGis / Kortinfo
Bentley Orbit

Data udstilling

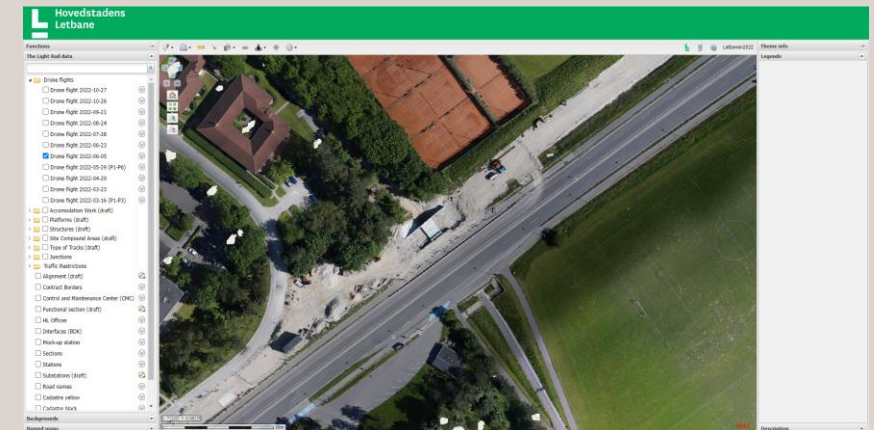
- Rådata



- Orbit



- WebGis



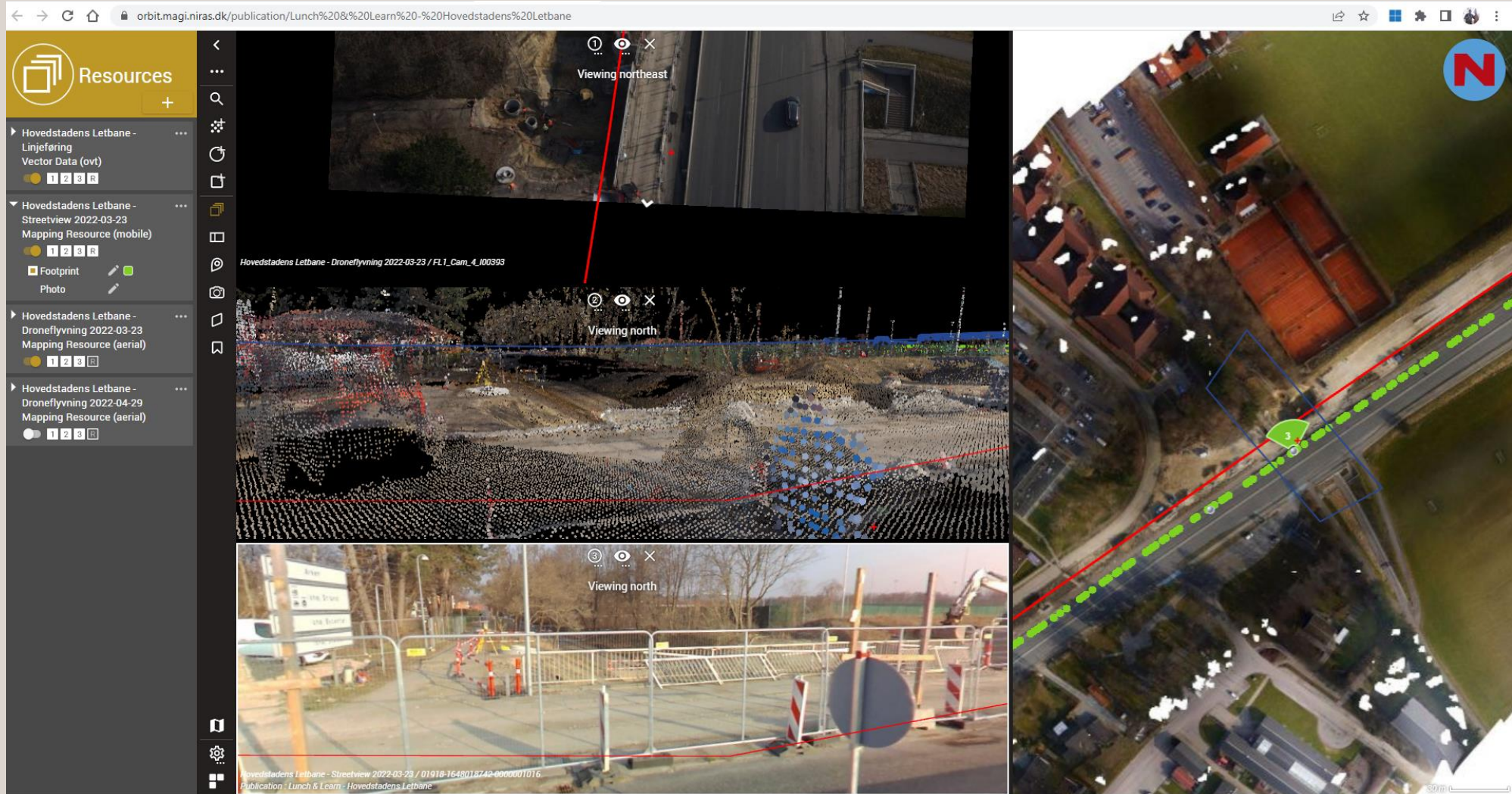
Rådata

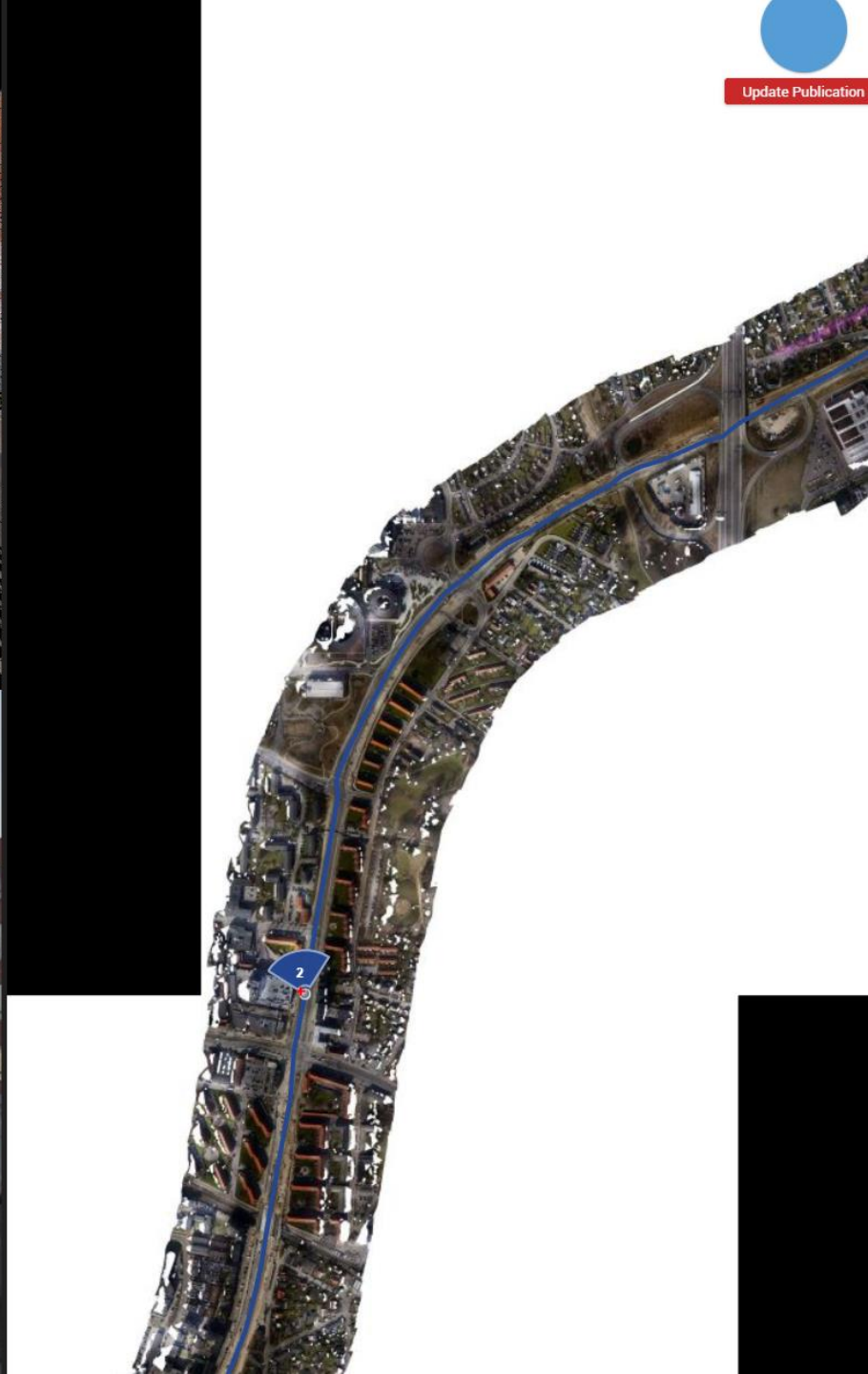
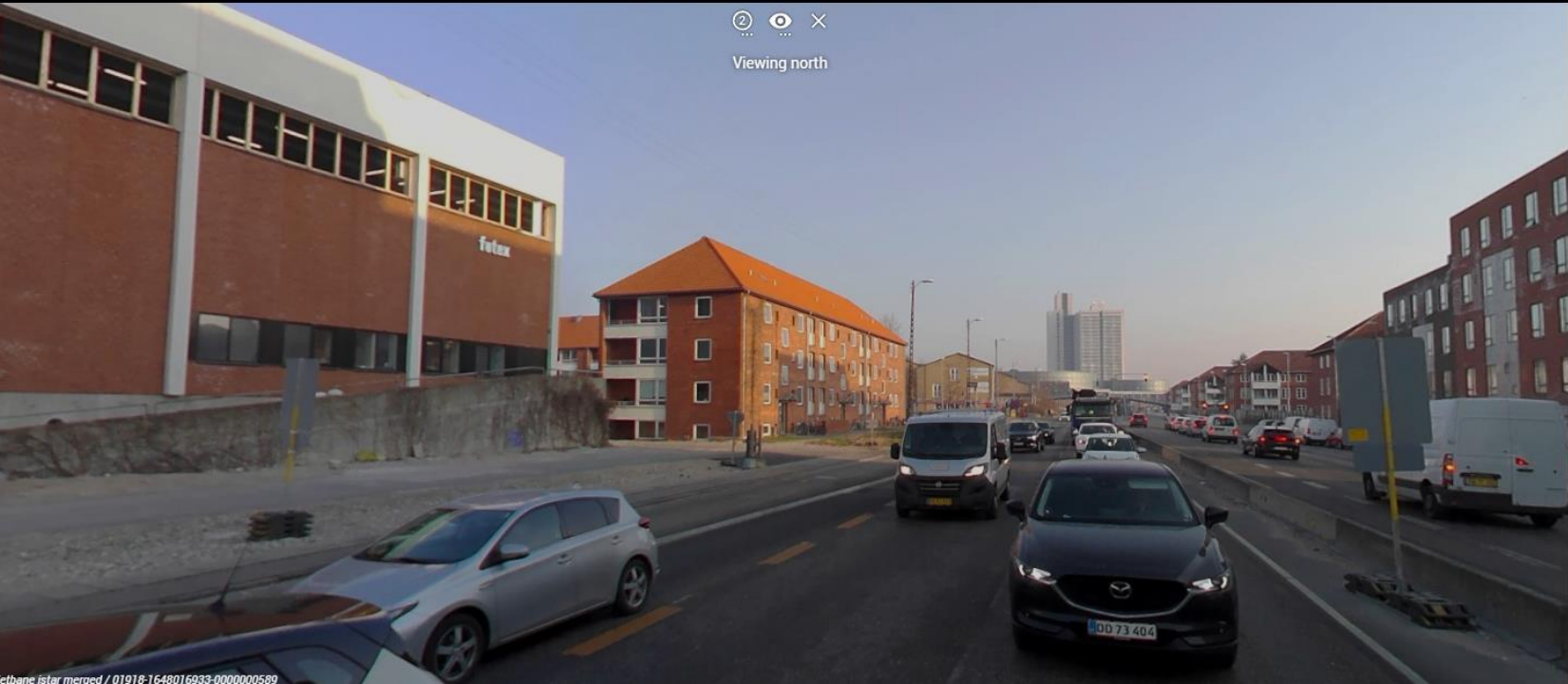
Nemt men ikke altid overskueligt



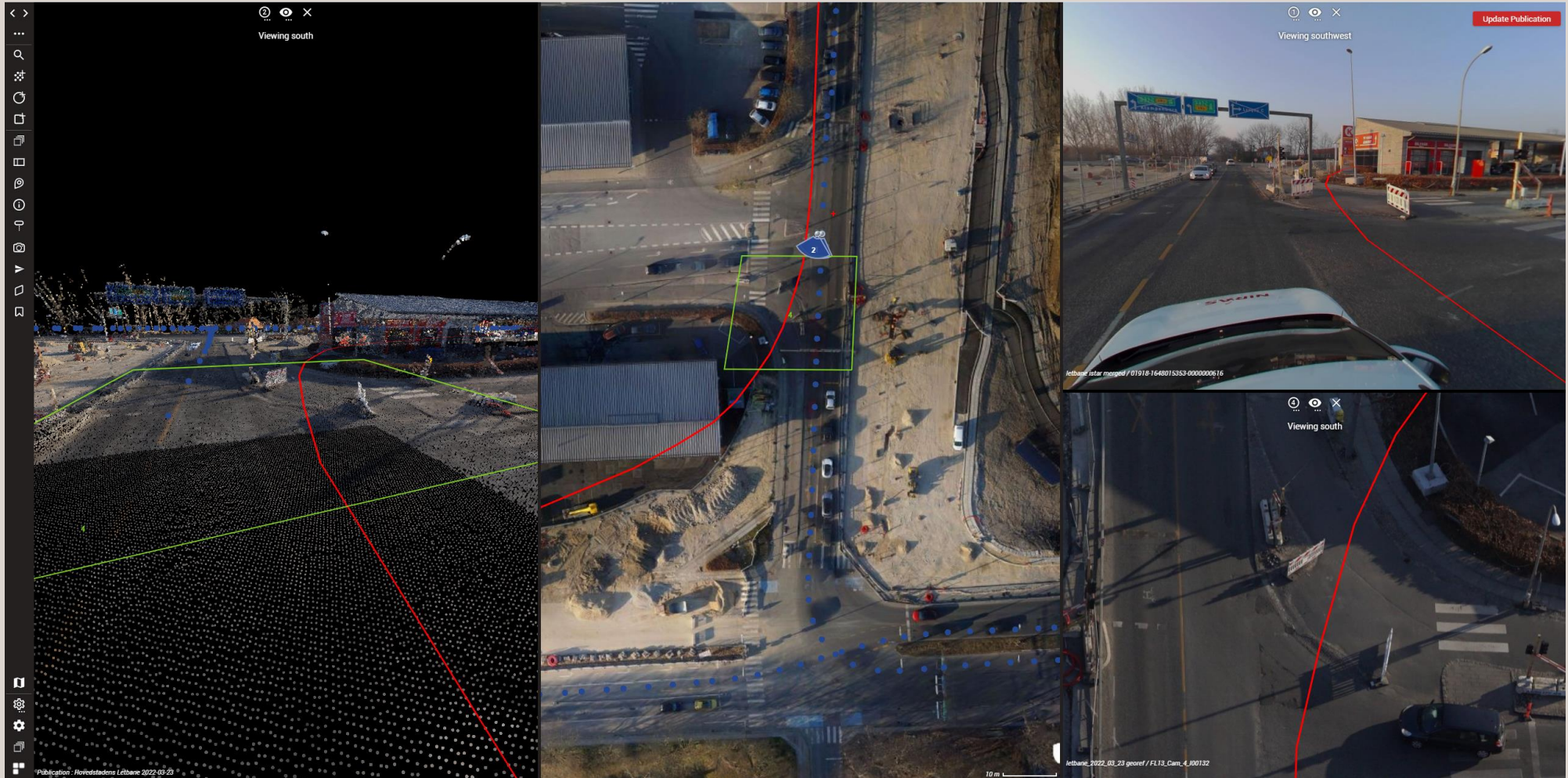


Bentley Orbit





Bentley Orbit





Ortofoto

Geoserver
KortInfo / Webgis

WebGis - KortInfo

Opgavestyring - PL...

Hovedstadens Letbane

Functions

The Light Rail data

- Drone flight 2022-08-24
- Drone flight 2022-07-28
- Drone flight 2022-06-23
- Drone flight 2022-06-05
- Drone flight 2022-05-29 (P1-P6)
- Drone flight 2022-04-29
- Drone flight 2022-03-23
- Drone flight 2022-03-16 (P1-P3)
- Accomodation Work (draft)
- Platforms (draft)
- Structures (draft)
- Site Compound Areas (draft)
- Type of Tracks (draft)
- Junctions
- Traffic Restrictions
- Alignment (draft)
- Contract Borders
- Control and Maintenance Center (CMC)
- Functional section (draft)
- HL Offices
- Interfaces (BDK)
- Mock-up station
- Sections
- Stations
- Substations (draft)
- Road names
- Cadastre yellow
- Cadastre black
- Municipality borders
- Photo

Backgrounds

Named maps

Letbanen2022

Theme info

Legends

Stations

- Stations

v/Akademivej Vest

Platforms

v/Anker Engeldsvej

Platforms

v/Bækkeskovvej

Platforms

v/Buddinge Station

Platforms

v/Buddingecentret

Platforms

v/Delta Park

Platforms

v/DTU Rævehøjvej

Platforms

v/Dynamovej

Platforms

Description

St. v / Glostrup Hospital Rigshospitalet

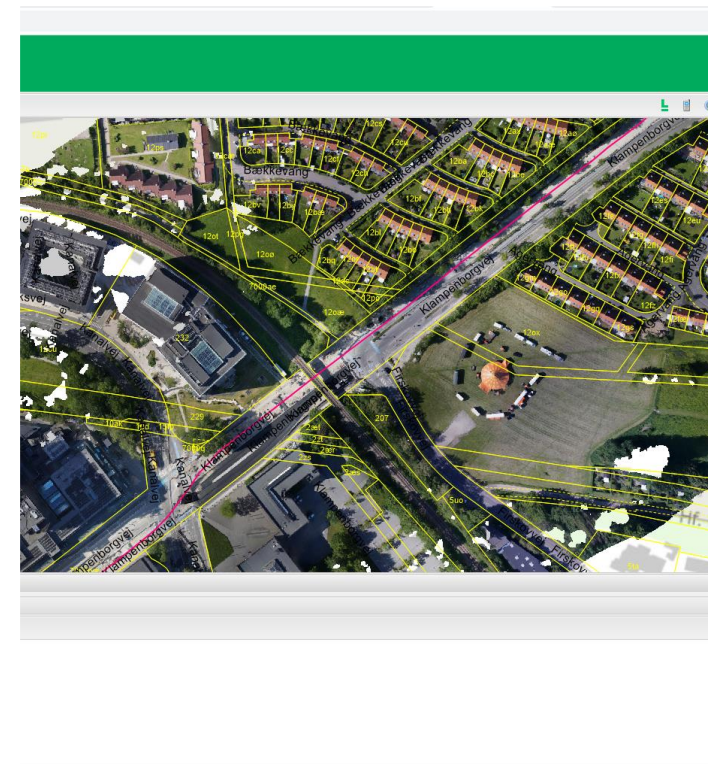
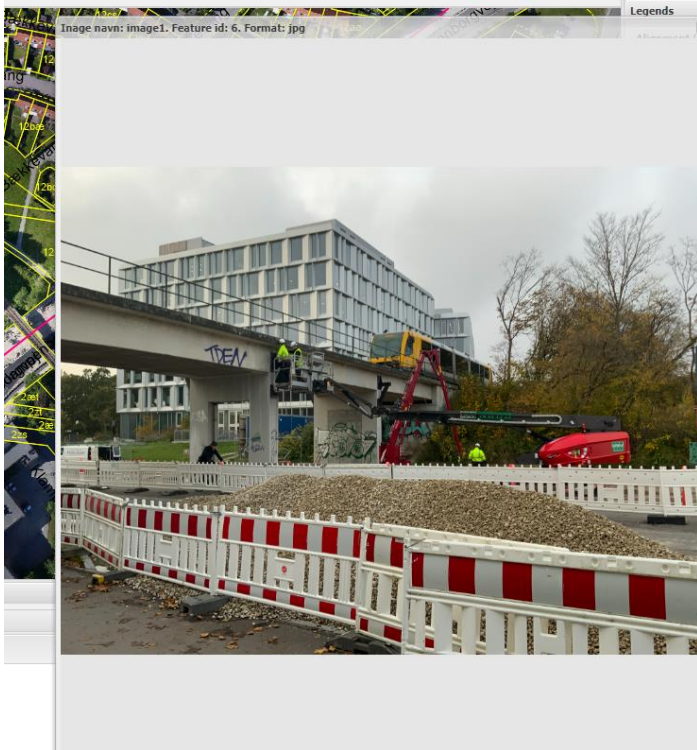
7000n

SDFE



WebGis - KortInfo

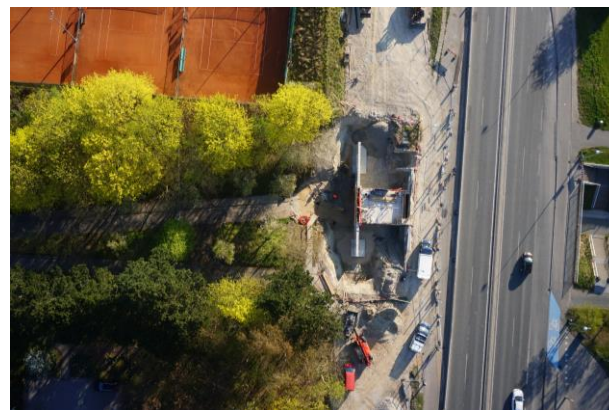
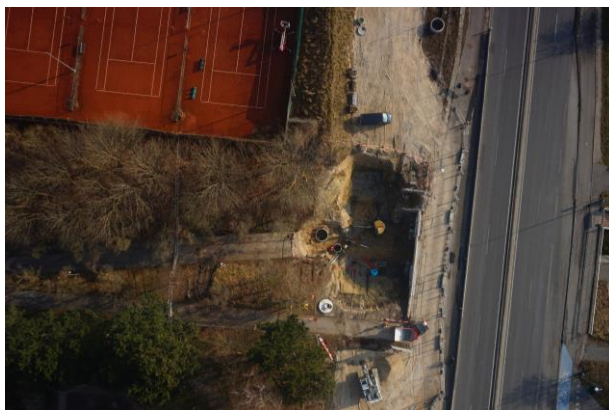
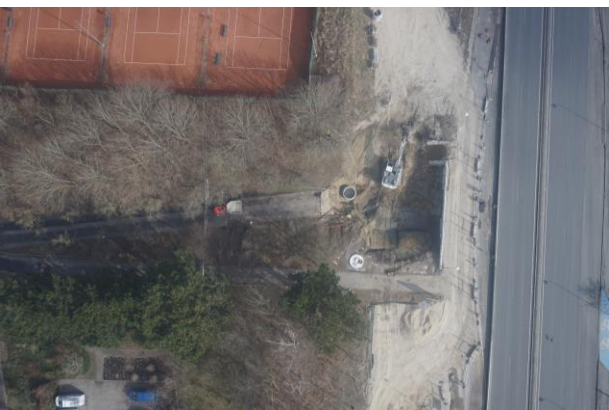
Dataindsamling i felten



- Billeder fra telefon

iStar

360 graders billeder



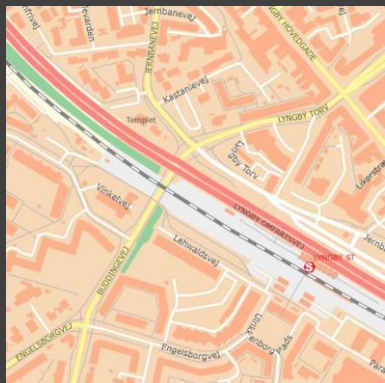


iStar - fra bil

billede for hver 10. meter



iStar – til fods

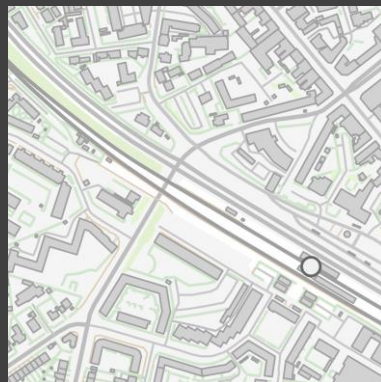
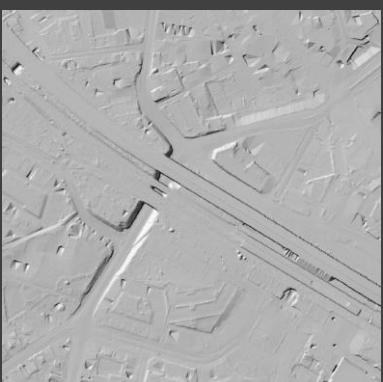
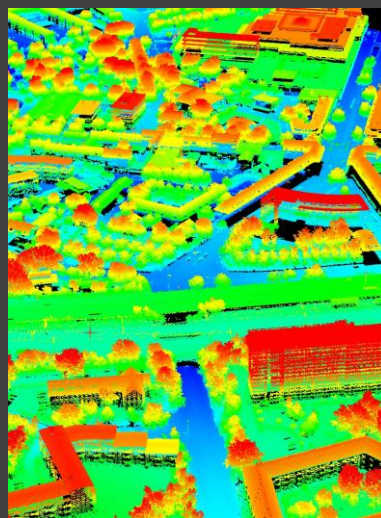
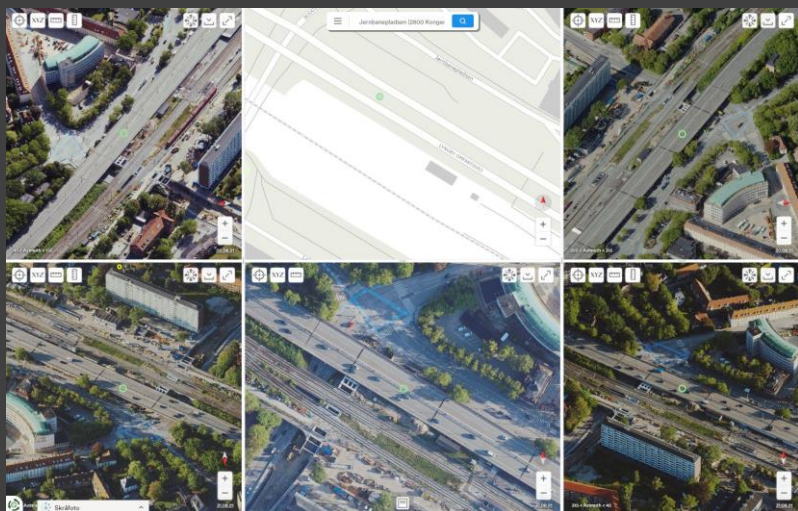


Supplerende data...

Offentligt tilgængelige datakilder

- Ortofotos, GeoDanmark (flyves hvert forår)
- Baggrundskort (skærmkort, OpenStreetMap, topografisk kort m.fl.)
- Skråfotos (2017/18 + 2021)
- Matrikelkort
- Geodanmark, vektordata
- Punktsky (seneste 2021)
- Terrænmodel (DTM)
- Overflademodel (DSM)

... og mange flere ...



Tak for i dag

