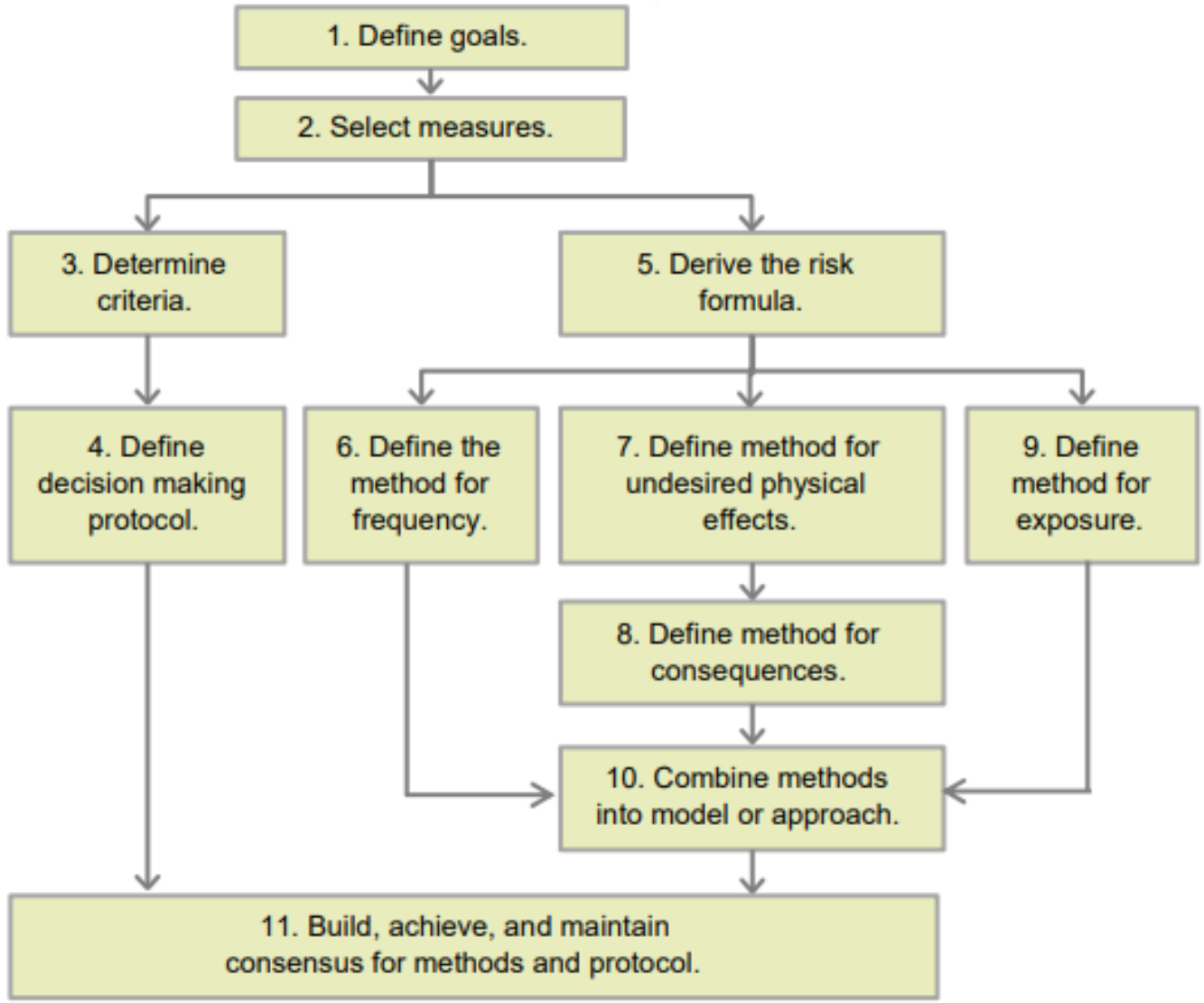
Siting in Norway

Description on how Norway sites and use Quantitative Risk Assessment

Ann Leni Fladvad

NDMA – Senior Engineer


1. Define goals.
2. Select measures.
3. Determine criteria.
5. Derive the risk formula.
4. Define decision making protocol.
6. Define the method for frequency.
7. Define method for undesired physical effects.
9. Define method for exposure.
8. Define method for consequences.
10. Combine methods into model or approach.
11. Build, achieve, and maintain consensus for methods and protocol.

Department of defence and our role

STORTINGET

The Norwegian Parliament

DET KONGELIGE FORSVARSDEPARTEMENT

The Ministry of Defence

Norwegian Armed Forces

Norwegian Defence Materiel Agency

Norwegian Defence Research Agency

Norwegian Defence Estate Agency

Norwegian National Security Autority

Background

- Systems used to Site in Norway
  - HER
  - AMRISK
  - AMSYS
  - SAP

HER - Comprehensive Property Register

- List from the Norwegian Defence Estate Agency
  - NDEA owns the data and keep it up to date.
- Contains all estate and buildingdata (Size, use, owner)
  - All buildings have an unique number related to location
- List is uploaded in AMSYS
  - NDMA updates AMSYS and use the data in that system

AMSYS

Oracle database

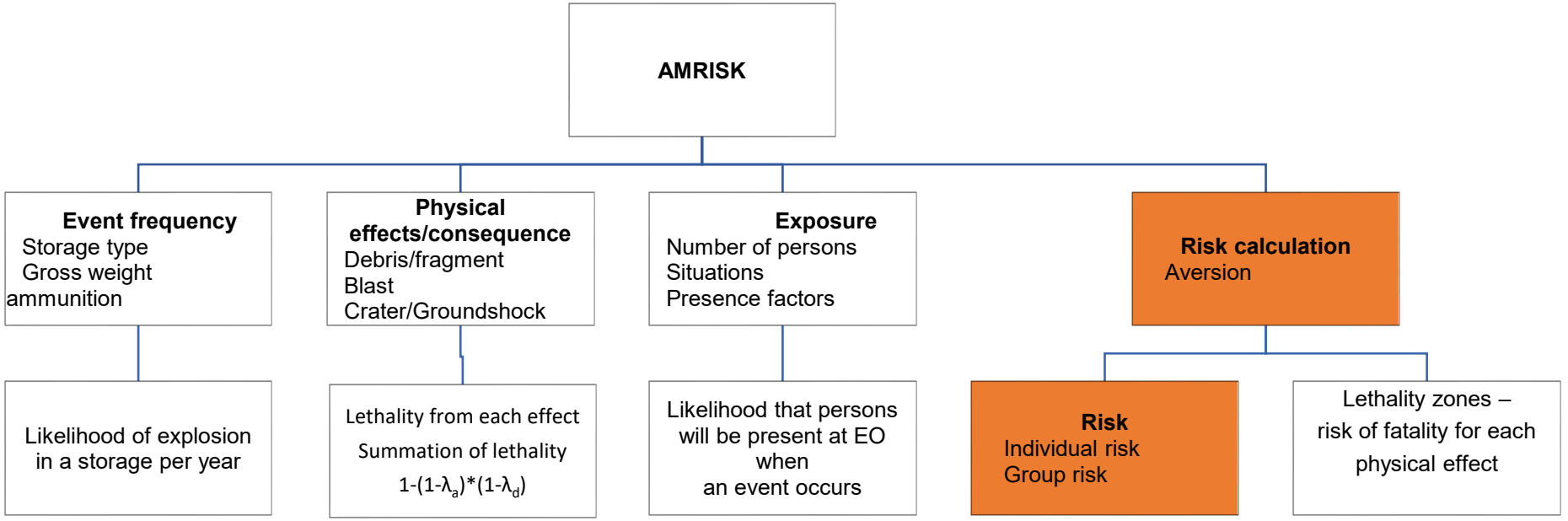
- AMSYS is strongly attached to SAP
- Used to manage inventory (both storage and ammunition lots)
  - munition article data and quantity in each magazine
- AMSYS is a more detailed database and draws out necessary information from SAP basic data
- Input from the estate agency on all buildings on defence sector estate

- Input: HER, SAP and AMRISK data
- Output: Approval and Sertificate (Safety & security)

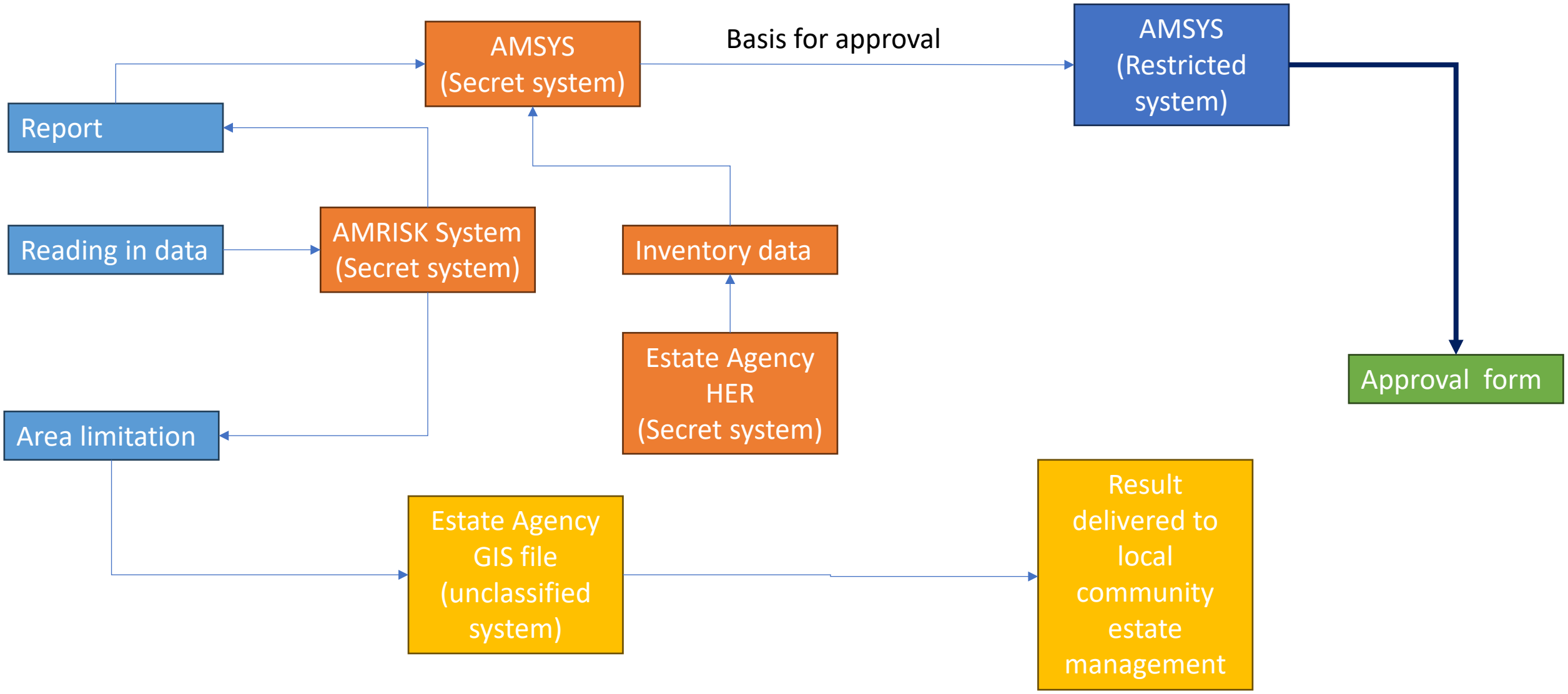
AMRISK

- AMRISK is a Risk-based method (RBM) tool
- AMRISK 2.5 was released in 2021
  - Changed programming code to C#
  - Visual solution that make use of GIS files
  - Based on application from Switzerland, 1987
- Cooperation between Norway and Sweden since 2001
- Work on version 3.0 has started
  - AASTP-4 is basis for updating most effect and response models

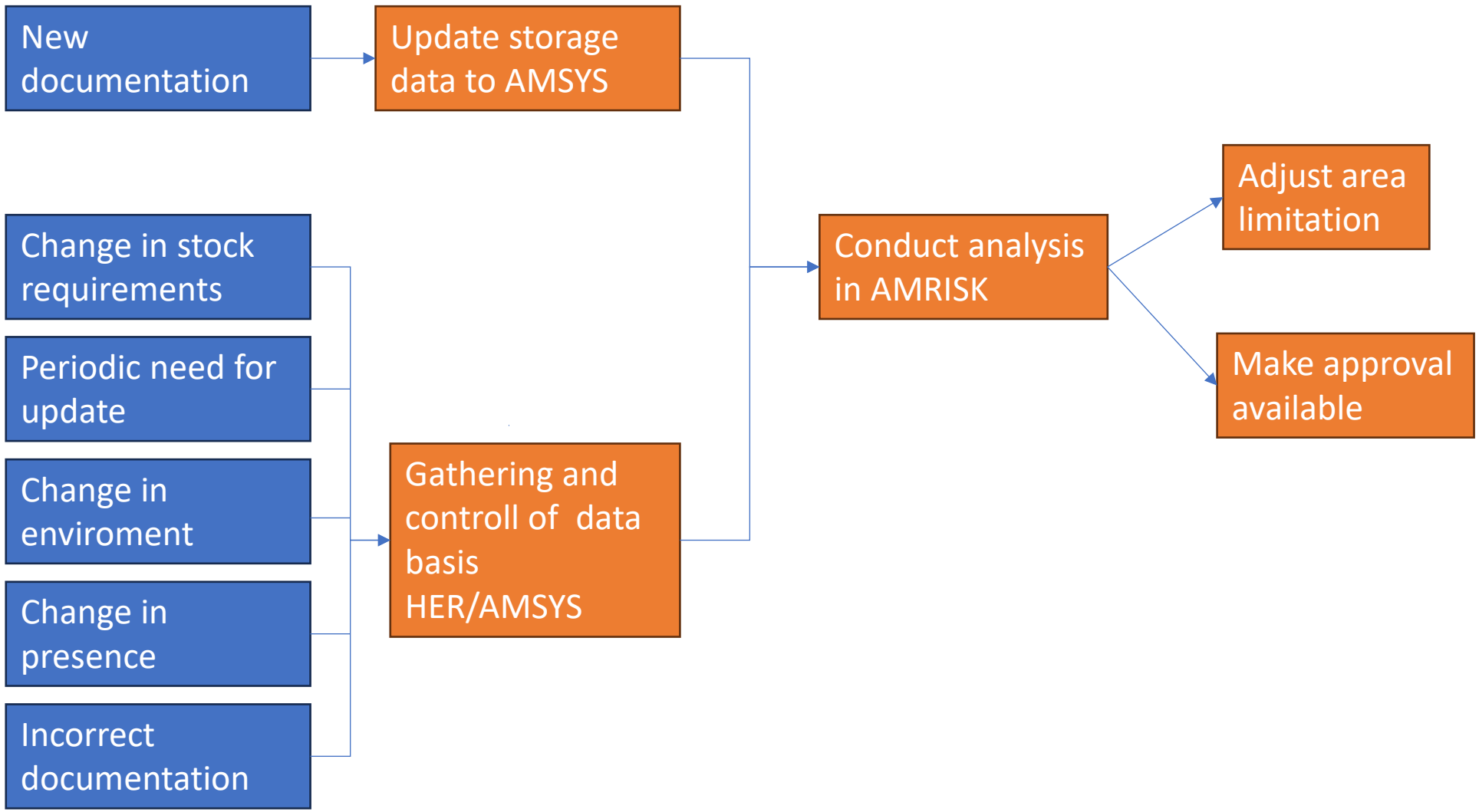
Risk analysis with AMRISK



Documentation system



Work flow chart



Approval generated from HER AMSYS and AMRISK data

Norway site:

- Supply ammunition storage
- Department storage (kasun with small amounts will not be risk assessed. 65kg 1.2.2 and 1.3.2)
- Shelter and parking site for plane
- Harbor
- loading unloading space
- Magazine on vessel (do not use AMRISK, but evacuation plan in case of fire)

FORSVARSMATERIELL

Godkjenning
For lagring av ammunisjon/eksplosiver

Fagmyndighet

FORSVARSMATERIELL/
LANDKAPASITETER

Bruker/Fartøynavn	Lageromrade/Fartøyklasse	Etab.nr/AVA-id nr

Brukstype	Anleggstype
AVDELINGSLAGER	IGLO
Byggnr/pennentnr	Romnr/"spant" osv
0071	0001

Merknad til innhold på lageret

Lagring av avd/øv amm. Forenlighetsgruppe H skal lagres kun i forbindelse med skyting.

Utsatt objekt	Avstand (m)	Risikoverdi	Merknad til rommet
			Iglo 2. Lengst nord
Grupperisiko			

Tillatt NEI (Separat lagring)

FGR	NEI kg	FUGR	NEI kg	FUGR	NEI kg	FUGR	NEI kg	FUGR	NEI kg
1.1	50000	**1.2.1**	80000	**1.2.2**	80000	**1.3.1**	80000	**1.3.2**	80000

Blanding av faregrupper/- undergrupper

Følgende FORENLIGHETSGRUPPER tillates blandet B-C-D-E-F-G-H

Fagmyndighetens påtegning
Forenlighetsgruppe B lagres i tennmiddelrom

Godkjenning gis på grunnlag av utstedende avdelings opplysninger

Godkjenningen omfatter ikke innbrudds- sikkerhetsforhold

Sted og dato

Raufoss, 08 Mars 2022

Godkjenningen er gyldig i 10 år fra godkjenningsdato hvis ingen forhold er endret

Ansvarlig saksbehandler

DHOKSTAD

AVA – Attractive Veapons and Ammunition

- The Attractive Weapons and ammunition articles (AVA) certificate is given if the site is found safe enough. intrusion time versus response time
- For weapons only AVA certificate is needed
- To store ammunition, you need both of this documents.
  - Without the AVA certificate you need guard 24h a day.

FORSVARSMATERIELL

AVA-SERTIFIKAT

Forsvarsmateriell bekrefter at

Etablissement:	190119
Byggnr:	0002
AVA Id-nr:	0403
Romnr:	0105

Har et sikkerhetssystem i henhold til kravene i:
Bestemmelse for sikring av attraktive våpen og ammunisjonsartikler

Våpen [X]

Ammunisjon [X] NEI-godkjenning

Sertifiseringen vil være gjenstand for verifisering.

Lageret vil for en periode på 10 år være sertifisert såfremt bruks- og sikkerhetsbetingelsene ikke endres.
Bruker plikter å melde avvik til utsteder.

Merknader:

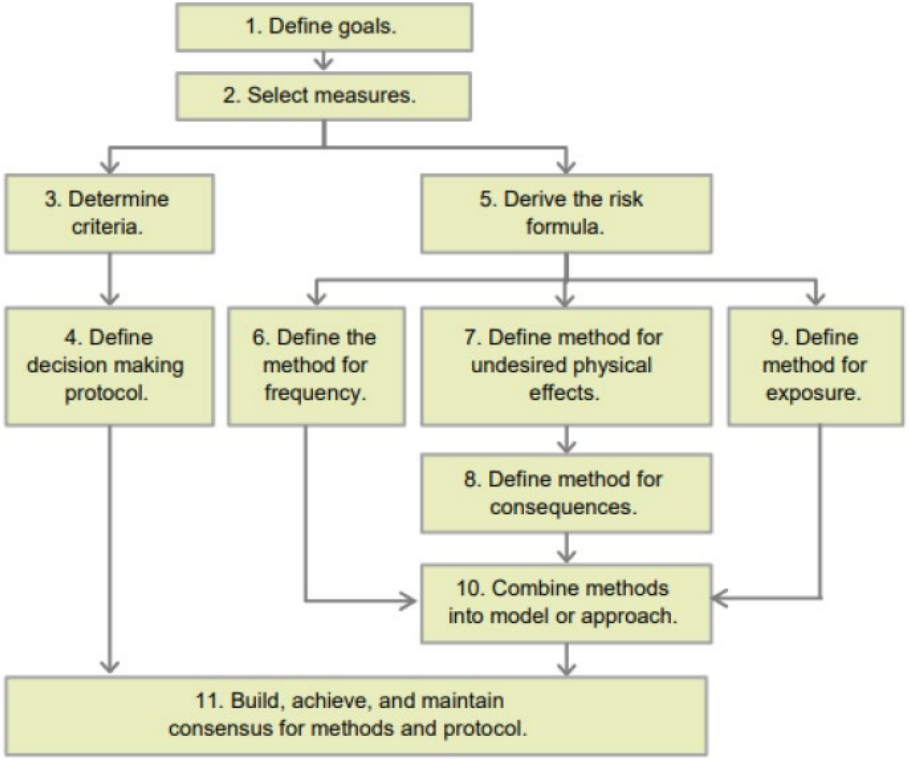
Raufoss den 31.01.2024

Etter fullmakt

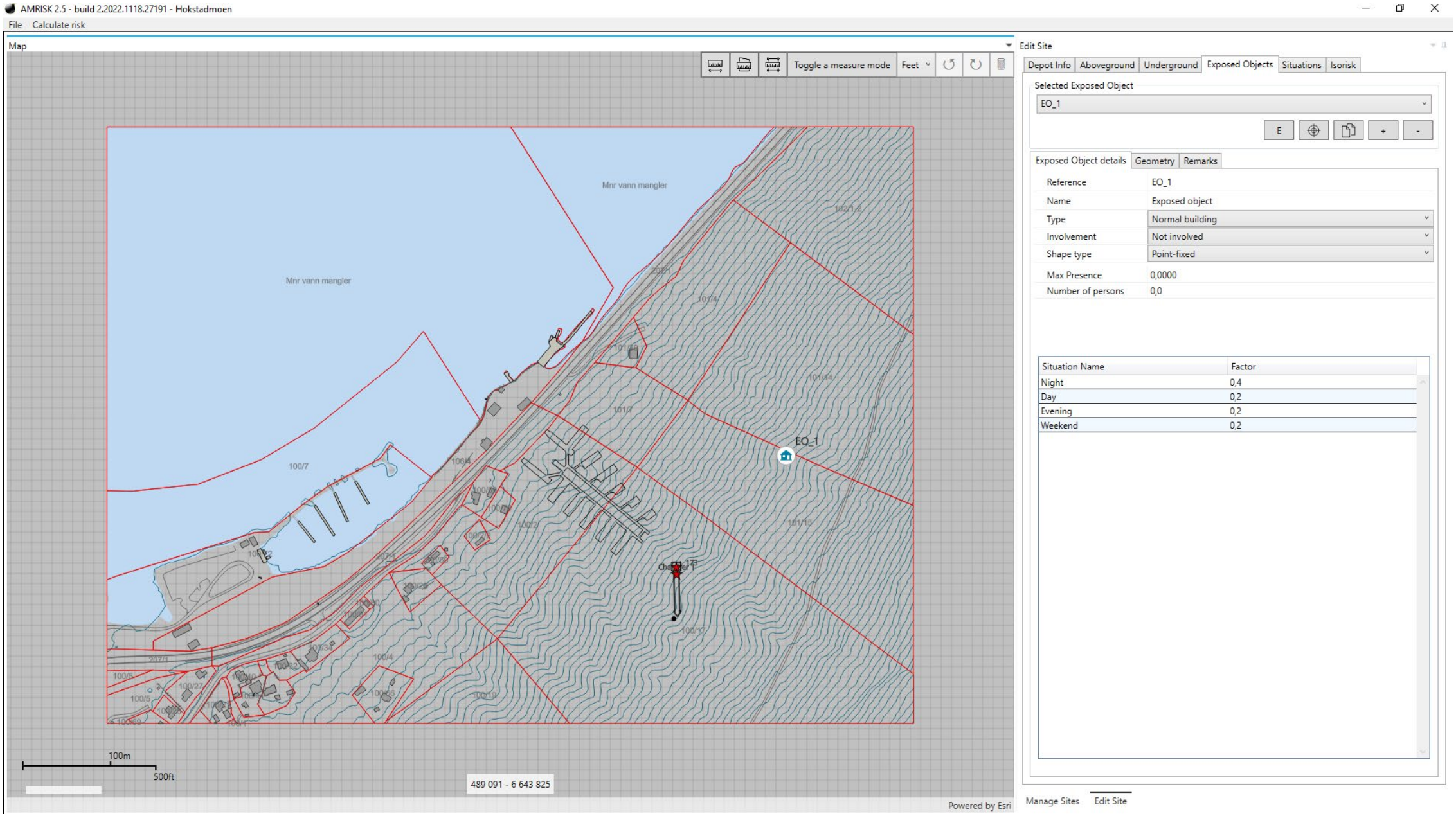
Håkon Kjellberg Skjenken
Senioringeniør
Ava-Sikkerhetskoordinator

Risk Analysis Framework

- Purpose
  - Make decisions to ensure proper management of storage
- Quantitative methods – AMRISK (AASTP-4)
  - Good adaption to the situation – Cost effective considering measures
  - Could be more skill-intensive
  - faulty application / unqualified use could lead to higher risk in worst case
  - Critical if some of the 11 steps fails or is forgotten
- Qualitative methods– QD (AASTP-1)
  - Fast decision – Clear requirements
  - Can be used without that much competence
  - Varying possibilities to adapt to situations
  - Could be extensive requirements to volume/distances
  - Expensive, poorly targeted mitigation measures.
  - Voluminous tables also have to be supported by tool. (Who supports the tool- on which terms)



AMRISK 2.5


AMRISK 2.5 - build 2.2022.1118.27191 - Hokstadmoen
File
Calculate risk
Map
Toggle a measure mode
Feet
Mnr vann mangler
Mnr vann mangler
EO_1
100m
500ft
489 091 - 6 643 825
Powered by Esri
Edit Site
Depot Info
Aboveground
Underground
Exposed Objects
Situations
Isorisk
Selected Exposed Object
EO_1
E
+
-
Exposed Object details
Geometry
Remarks
Reference
EO_1
Name
Exposed object
Type
Normal building
Involvement
Not involved
Shape type
Point-fixed
Max Presence
0,0000
Number of persons
0,0
Situation Name
Factor
Night
0,4
Day
0,2
Evening
0,2
Weekend
0,2
Manage Sites
Edit Site

Calculated Risk

Lethality | OKZ | OO | OE | R.g.risk | P.g.risk | Ind.risk | Criterion: 1,00E-005

	Cmb 'Chamber 1' - C1	Cmb 'Chamber 1' - C2	Cmb 'Chamber 1' - C3	Sum
Charge	2,00E-001	5,00E-001	2,00E+000	
EO_1 - Bak - 10m	2,83E-007	6,22E-007	9,55E-007	9,55E-007
EO_1 - Bak - 30m	1,34E-008	9,13E-008	5,02E-007	5,02E-007
EO_1 - Bak - 50m	5,75E-010	8,88E-009	1,50E-007	1,50E-007
EO_1 - Bak - 100m	6,35E-011	2,10E-010	3,95E-009	3,95E-009
EO_1 - Bak - 150m	1,41E-011	5,14E-011	3,17E-010	3,17E-010
EO_1 - Bak - 200m	4,33E-012	1,70E-011	1,16E-010	1,16E-010
EO_1 - Bak - 250m	1,62E-012	6,75E-012	5,01E-011	5,01E-011
EO_1 - Bak - 300m	6,98E-013	3,05E-012	2,42E-011	2,42E-011
EO_1 - Bak - 350m	3,33E-013	1,52E-012	1,28E-011	1,28E-011
EO_1 - Bak - 400m	1,71E-013	8,12E-013	7,23E-012	7,23E-012
EO_1 - Bak - 450m	0,00E+000	4,61E-013	4,31E-012	4,31E-012
EO_1 - Bak - 500m	0,00E+000	2,74E-013	2,68E-012	2,68E-012

Details

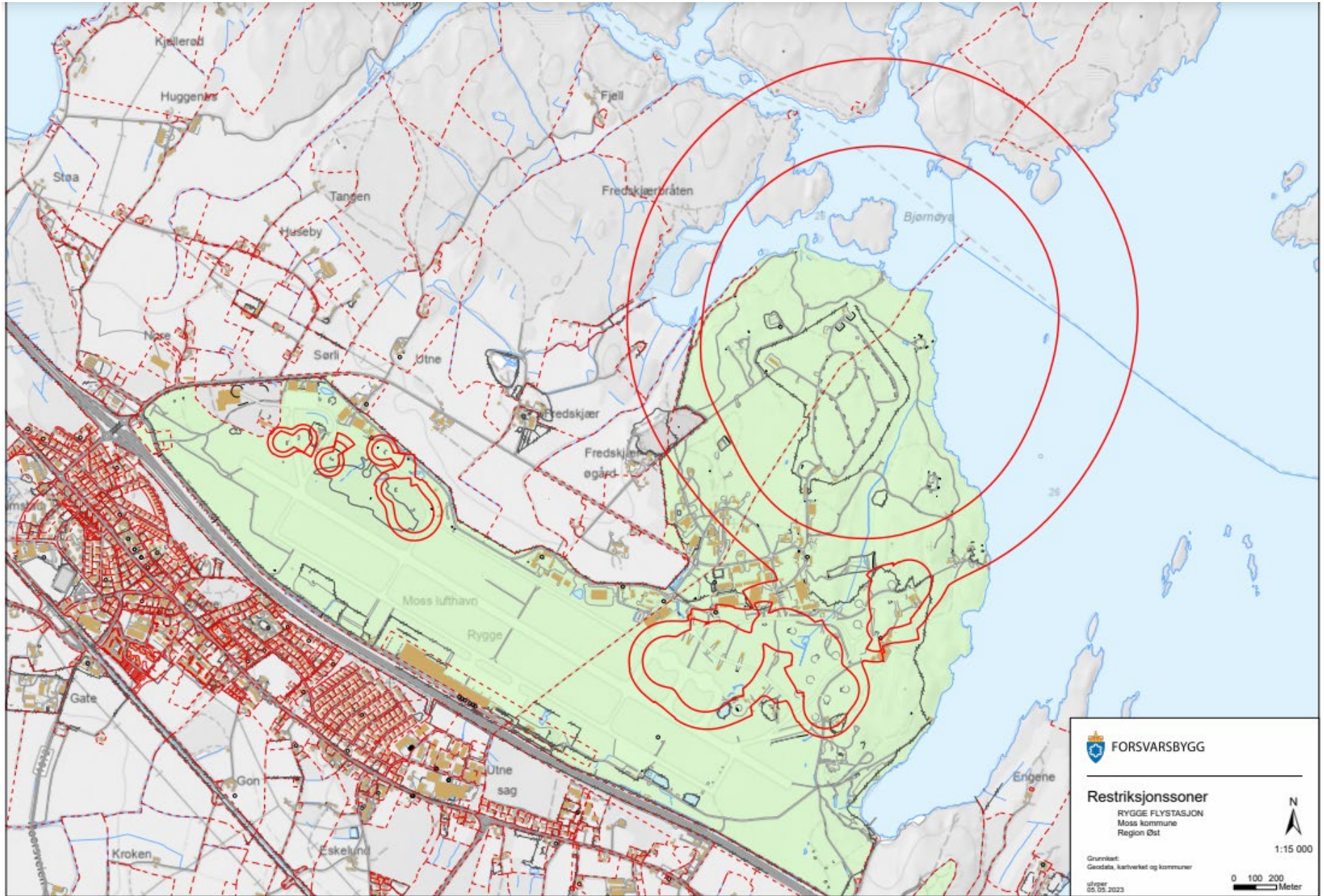
Angle With Magazine...	0,00000000
Crater debris lethality	0,00000942
Crater debris specific d...	44,73637723
Crater distance (m)	46,13861594
Crater impulse (bar^5/...	1,97187948
Crater impulse lethality	0,00000000
Crater peak pressure (...	0,16572425
Crater peak pressure l...	0,01340392
EO Name	EO_1 - Bak - 30m
EO Shape	PointFix
EO Type	NormalBuilding
Ground shock lethality	0,00000033
Ground shock specific...	131,62030820
Involvement	NotInvolved

Tunnel details

	Dist (m)	Ps (bar)	Let.Ps	Impulse	Let I	Axis d	Axis ang	Let debr
1	50,00	2,593E-002	8,676E-006	2,529E+001	0,000E+000	1,157E+002	180,64	0,000E+000

Export tunnel calc | Export to AMSYS | Export to Excel | Recalculate | Close

Isorik contour



Way forward

- Develop AMRISK 3.0
- Keep models updated
- Consider several event scenarios.
  - Where each scenario have a range of mass detonation, thermal effect and progressive events
  - Each scenario have its probability of event
  - Inspired by how private AP producers in US consider likely events
  - Discussed in joint risk workshop with subgroup A, B and c in Grenada, Spain, September 2018