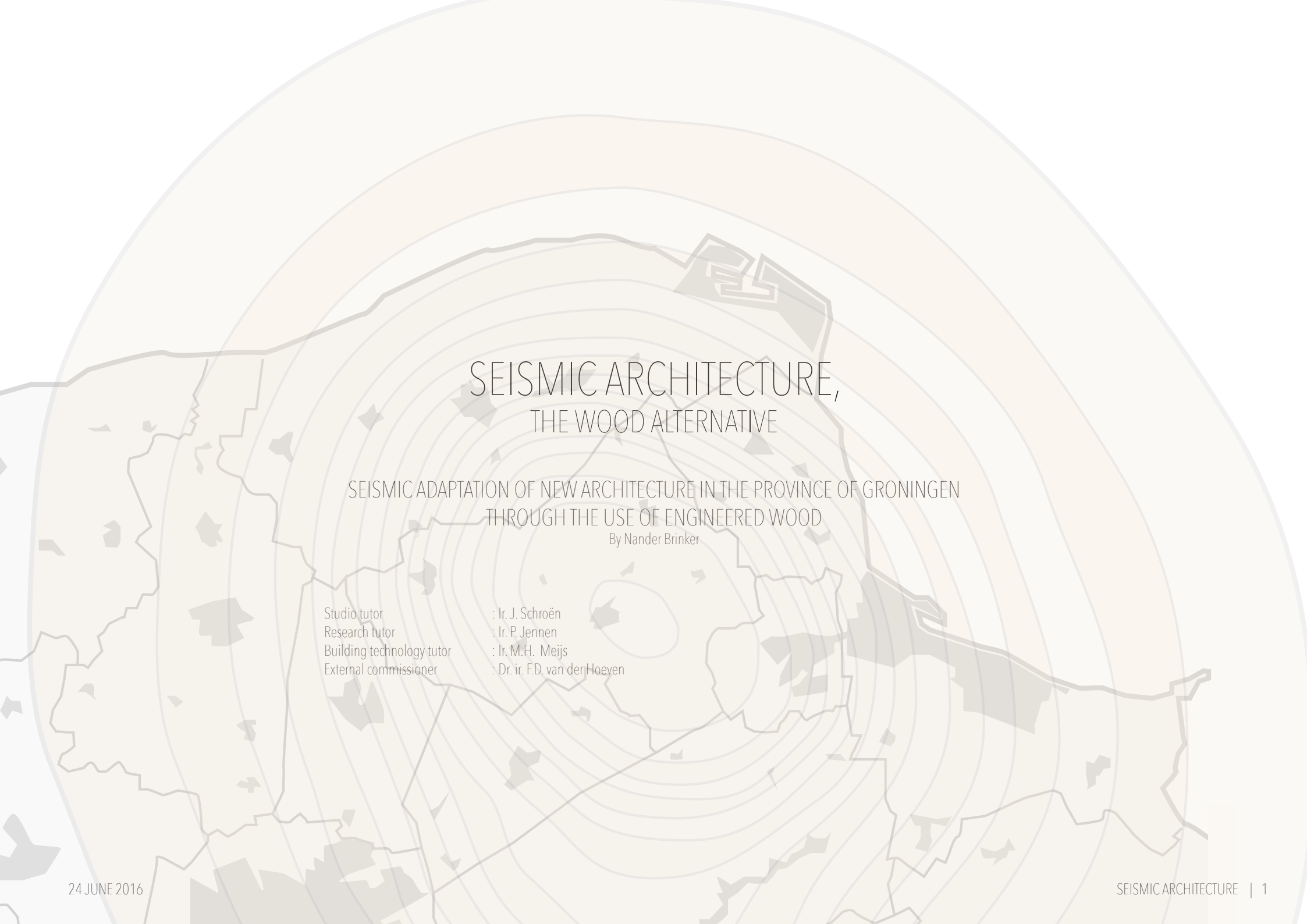

SEISMIC ARCHITECTURE,
THE WOOD ALTERNATIVE

SEISMIC ADAPTATION OF NEW ARCHITECTURE IN THE PROVINCE OF GRONINGEN
THROUGH THE USE OF ENGINEERED WOOD

By Nander Brinker

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Research tutor	: Ir. P. Jennen
Building technology tutor	: Ir. M.H. Meijs
External commissioner	: Dr. ir. F.D. van der Hoeven

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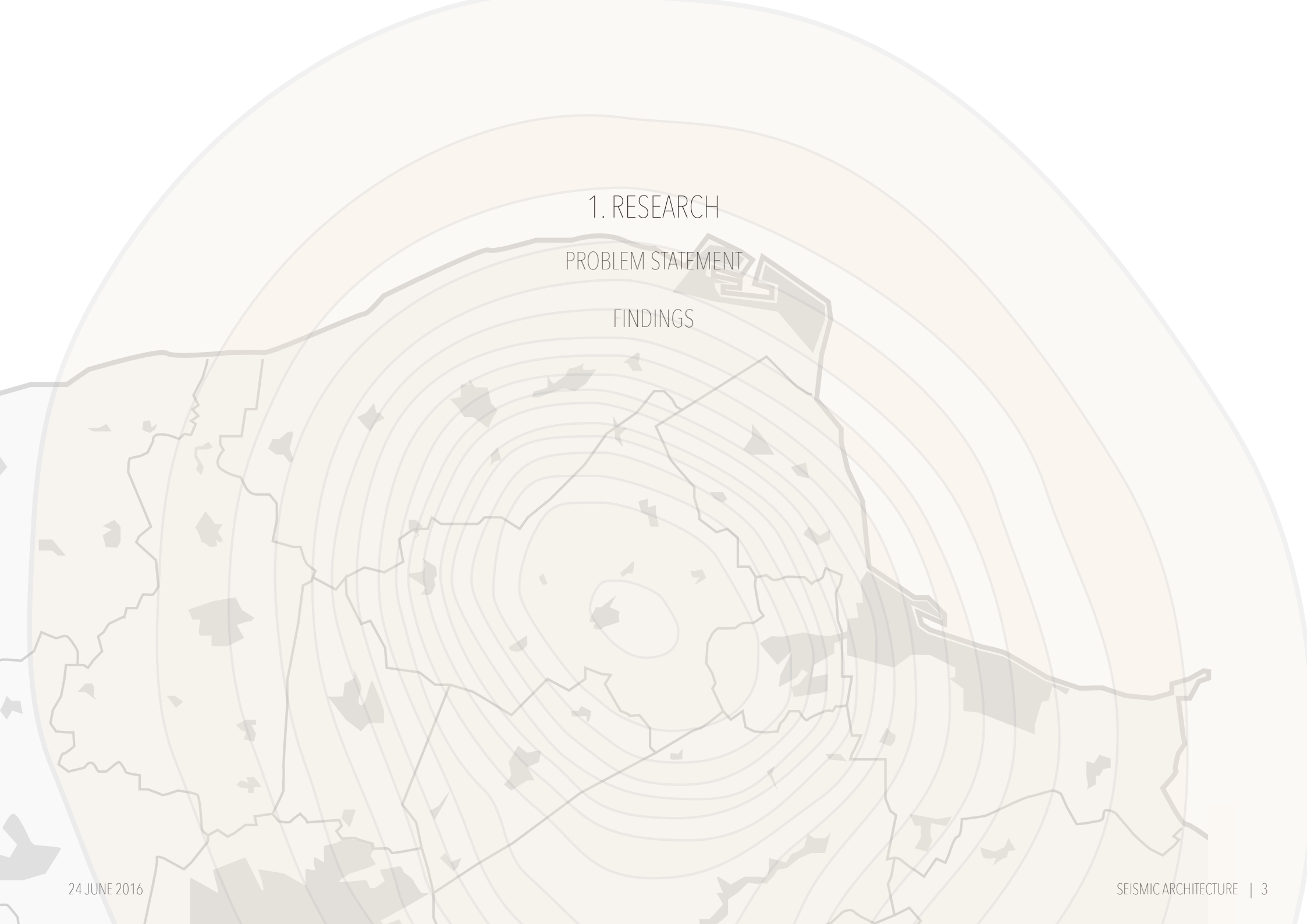
1. RESEARCH

PROBLEM STATEMENT

FINDINGS



1. RESEARCH

PROBLEM STATEMENT

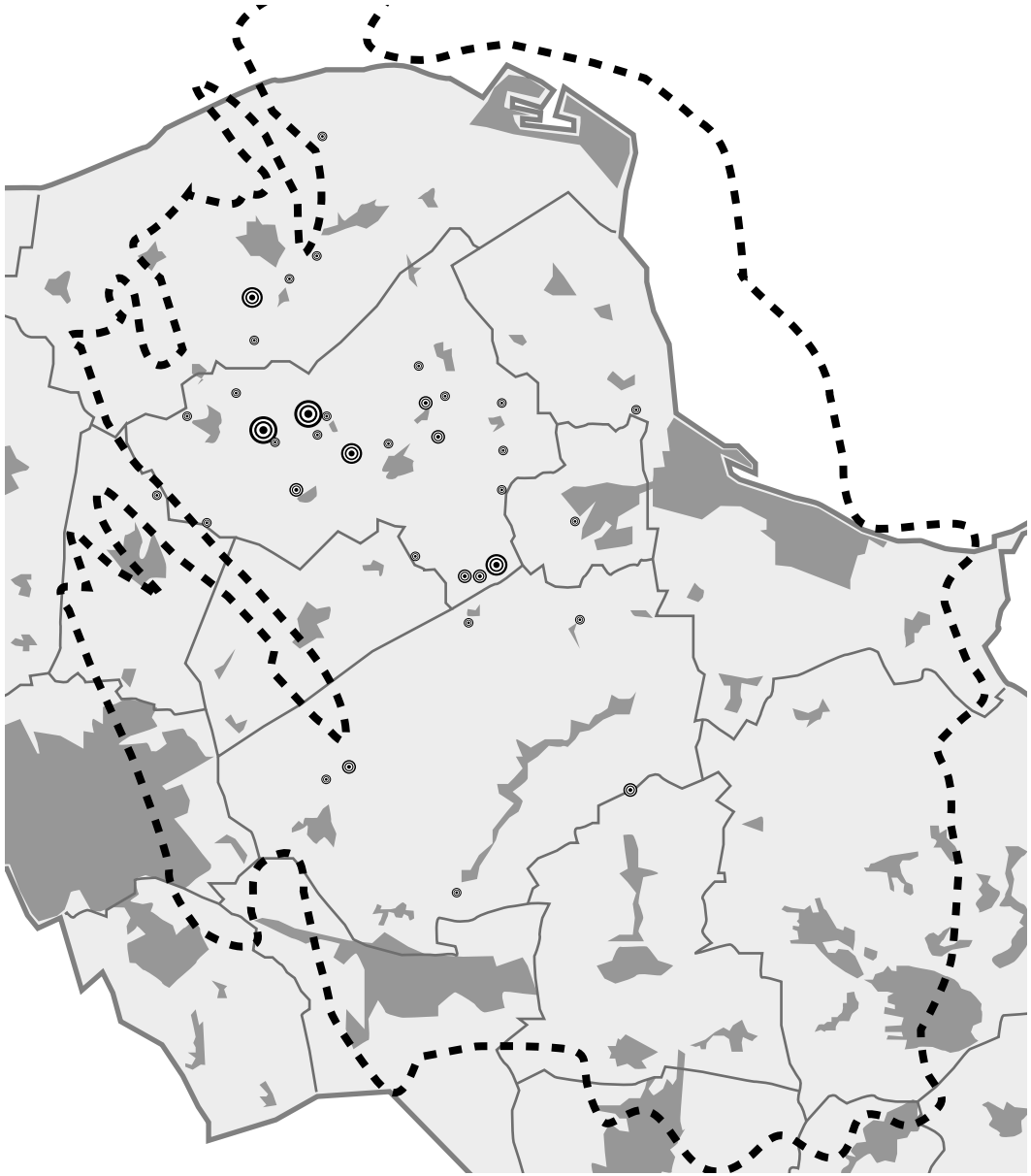
FINDINGS

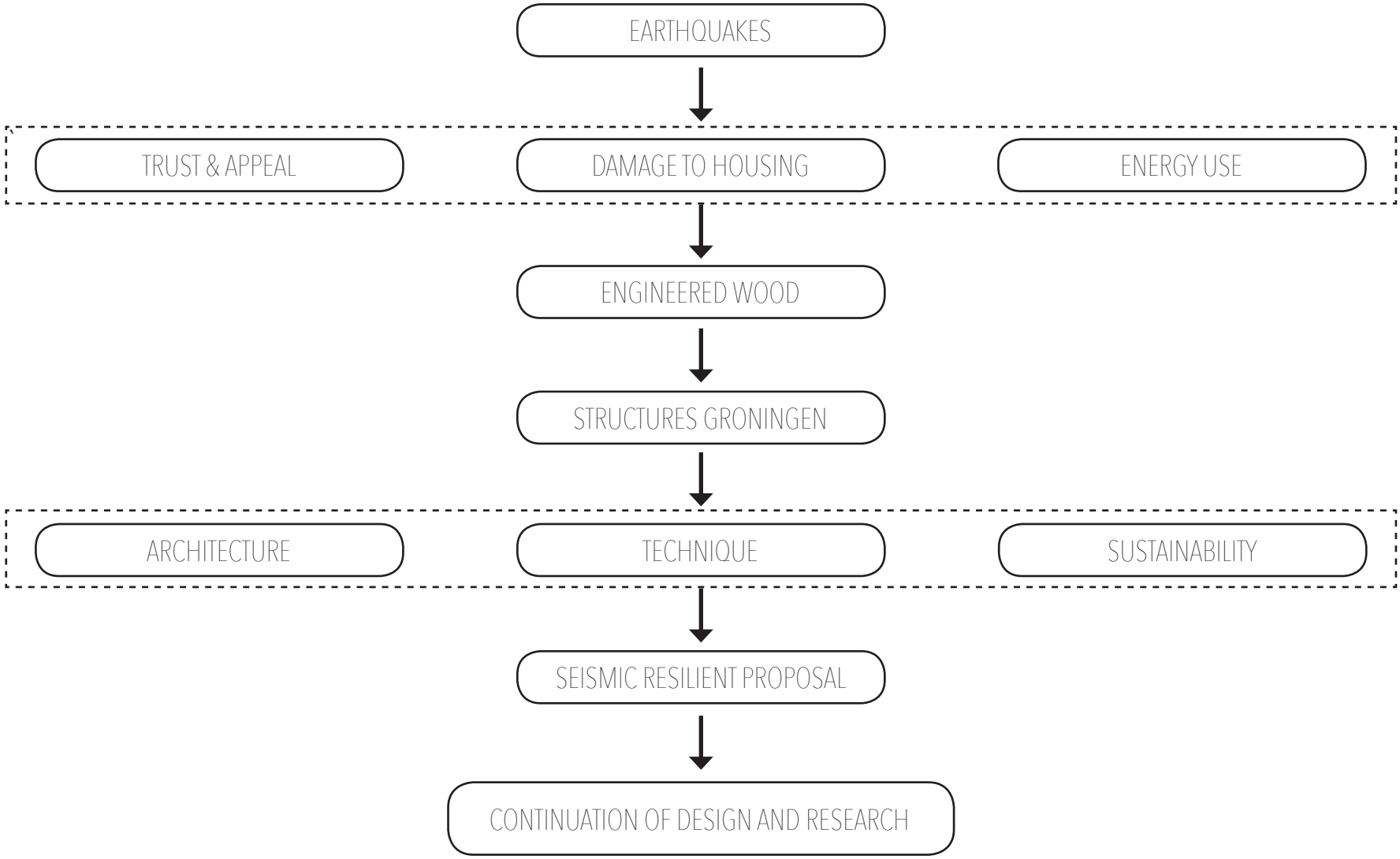
The earthquakes are induced due to the gas extraction that is taking place within the province and this comes with a lot of risks and problems.

First of, the province and its structures are not prepared for earthquakes.

Second, there is little to no knowledge about earthquake-proof building in The Netherlands.

Third, next to the fact that new developments need to be earthquake-proof, they also need to suffice according to the latest sustainability legislations.




EARTHQUAKES
TRUST & APPEAL
DAMAGE TO HOUSING
ENERGY USE
ENGINEERED WOOD
STRUCTURES GRONINGEN
ARCHITECTURE
TECHNIQUE
SUSTAINABILITY
SEISMIC RESILIENT PROPOSAL
CONTINUATION OF DESIGN AND RESEARCH

1. RESEARCH

PROBLEM STATEMENT

FINDINGS

ARCHITECTURE

GREAT ARCHITECTURAL POTENTIAL IN ENGINEERED WOOD

GRONINGEN PROVIDES ENOUGH REFERENCES

ENOUGH ARCHITECTURAL POTENTIAL IN RISK STRUCTURES

TECHNIQUE

GOOD DUCTILITY & LIGHTNESS (F=MxA)

COMPATIBLE WITH STANDARD EARTHQUAKE MEASURES

SUSTAINABILITY

GOOD THERMAL, ACOUSTIC AND VISUAL PROPERTIES

LENDS ITSELF FOR SUSTAINABLE DESIGNS

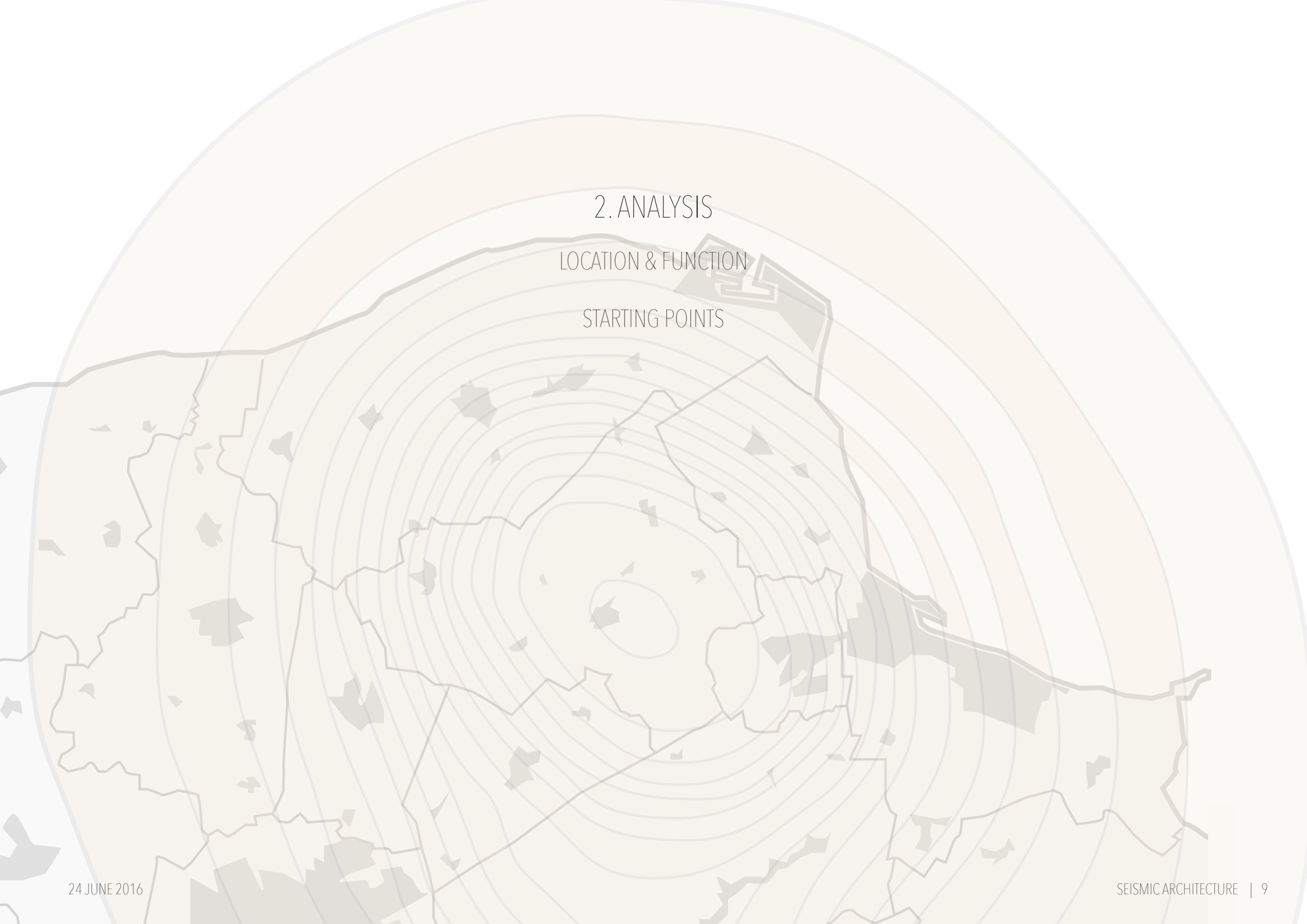
SUSTAINABLE IN PRODUCTION PROCESS

CAN BE RE-USED AFTER NO LONGER FUNCTIONS AS INTENDED

2. ANALYSIS

LOCATION & FUNCTION

STARTING POINTS



2. ANALYSIS

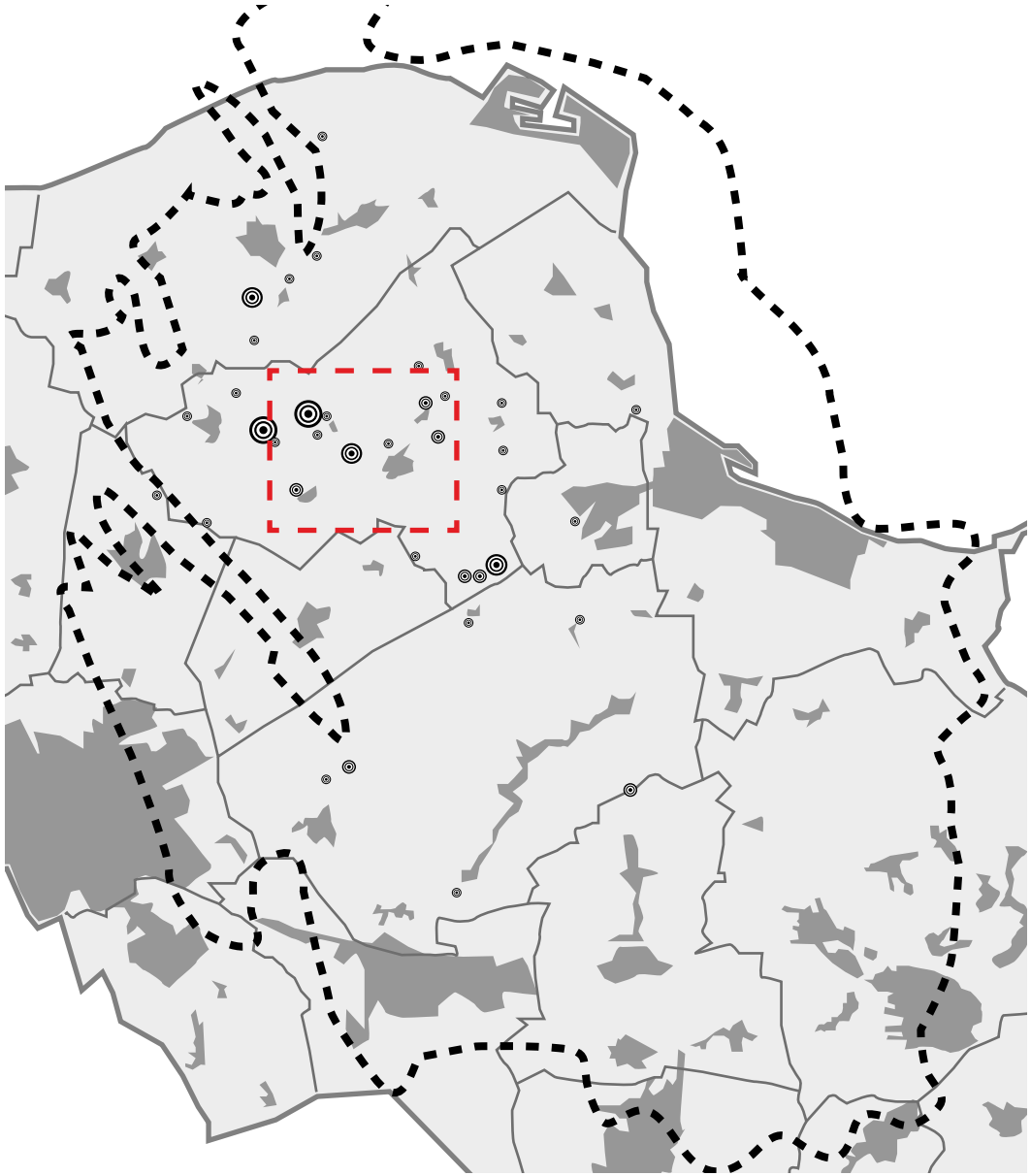
LOCATION & FUNCTION

STARTING POINTS

The province of Groningen is a aging area with villages like Loppersum in particular.

Loppersum is the earthquake epicentre.

Although it is a northern village, the facilities are quite good next to the location regarding Groningen city and Delftzijl.



Hospice is a place where one stays when home is no longer an option. The homely surroundings should soften the pain and offer a high quality of living in the last period of life.

Nowadays there is a higher demand regarding hospice facilities in the Netherlands.

Groningen is the only province that does not facilitate the high-care hospice buildings in contrast to the near-home facilities.

Hospice fits the environment that Loppersum offers with its green surroundings and good facilities.

2. ANALYSIS

LOCATION & FUNCTION

STARTING POINTS

ARCHITECTURE

THERAPEUTIC SELF-SEARCH

ALMOST LIKE HOME

ATTACHMENT WITH EXISTING

SOCIAL ASPECT

CONNECTION WITH GREEN

CHANGE IN ATMOSPHERE

TECHNIQUE

EARTHQUAKE RESILIENT

CLT STRUCTURE

NOT AFRAID TO SHOW

DAMAGE LIMITATION

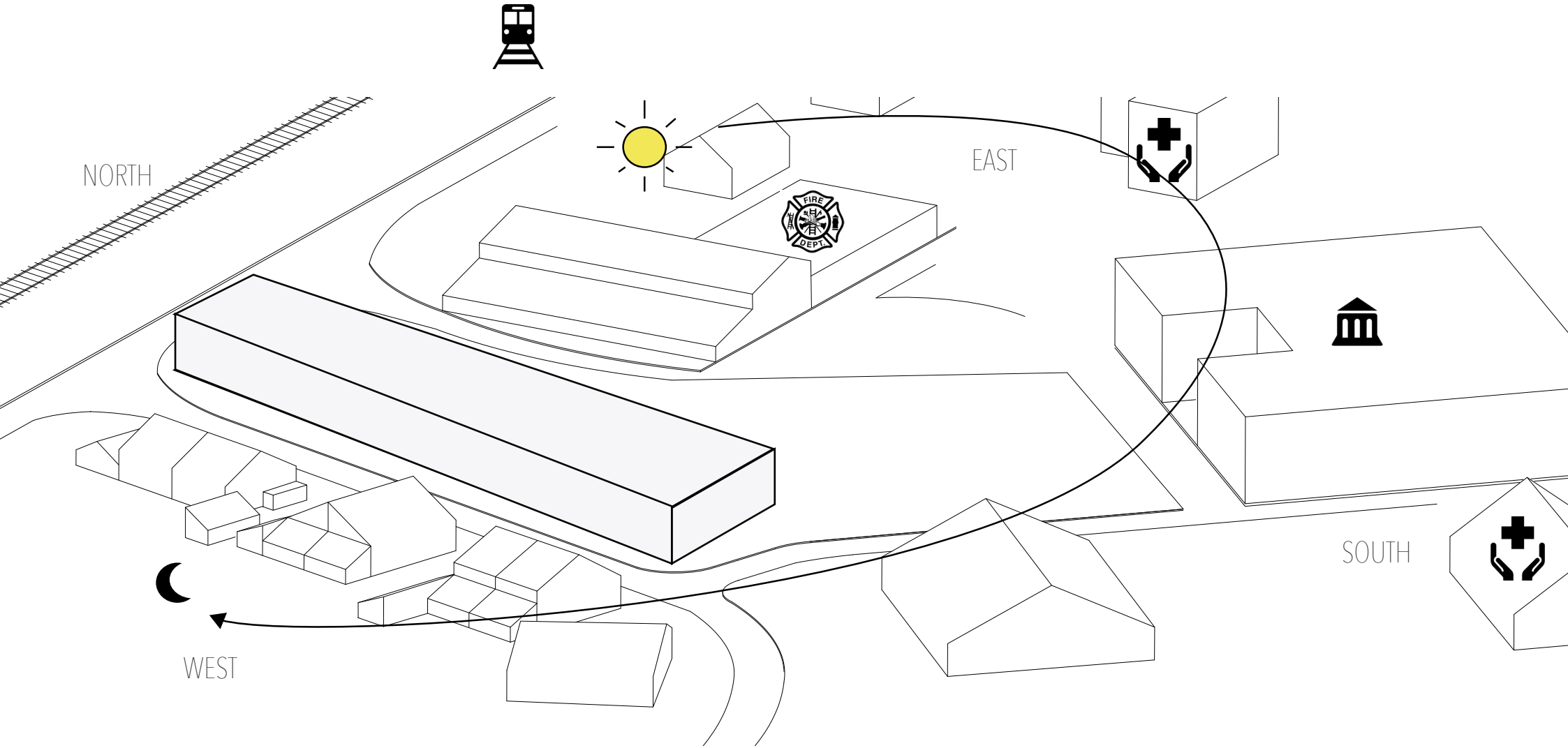
SUSTAINABILITY

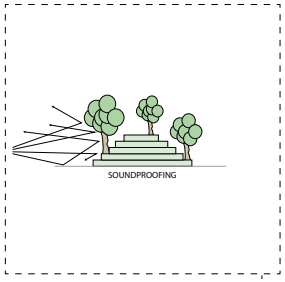
USE OF RENEWABLE MATERIALS

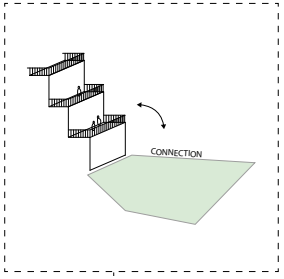
RAINWATER RE-USE

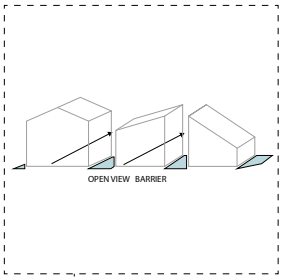
ENERGY GENERATION

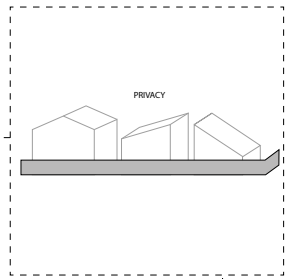
HEALTHY ENVIRONMENT

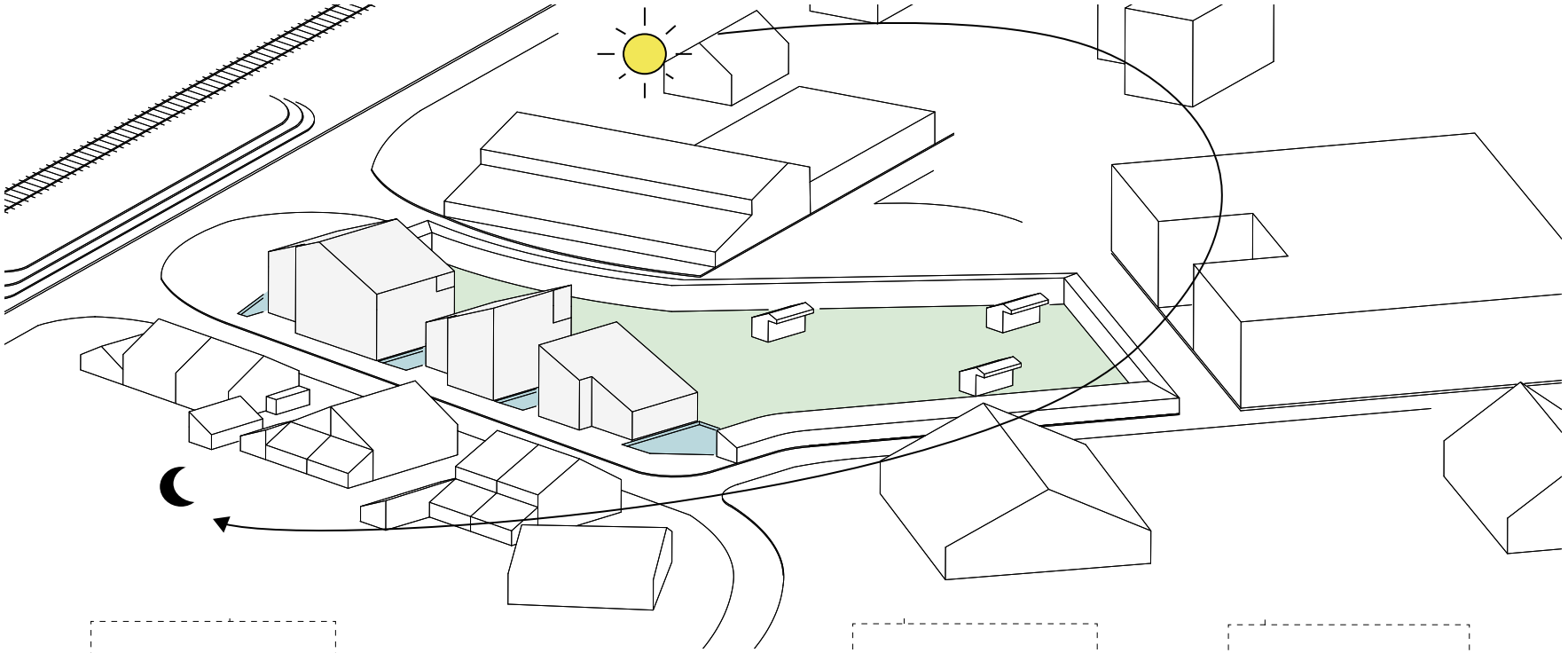

NORTH
EAST
SOUTH
WEST
FIRE
DEPT.

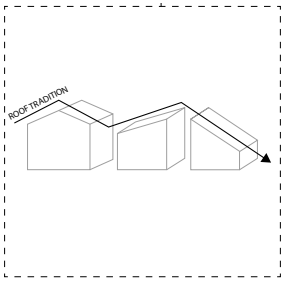

SOUNDPROOFING

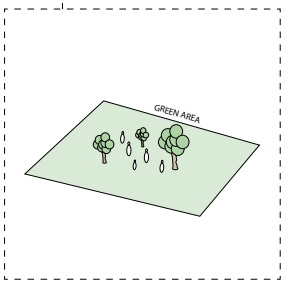

CONNECTION

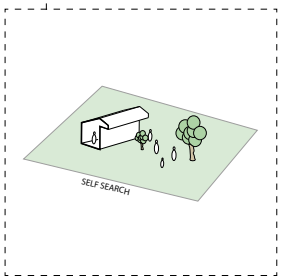

OPEN VIEW BARRIER


PRIVACY




ROOF TRADITION


GREEN AREA


SELF SEARCH

3. DESIGN HIGHLIGHTS

USE

MATERIALISATION

BALCONIES

GARDEN AREA

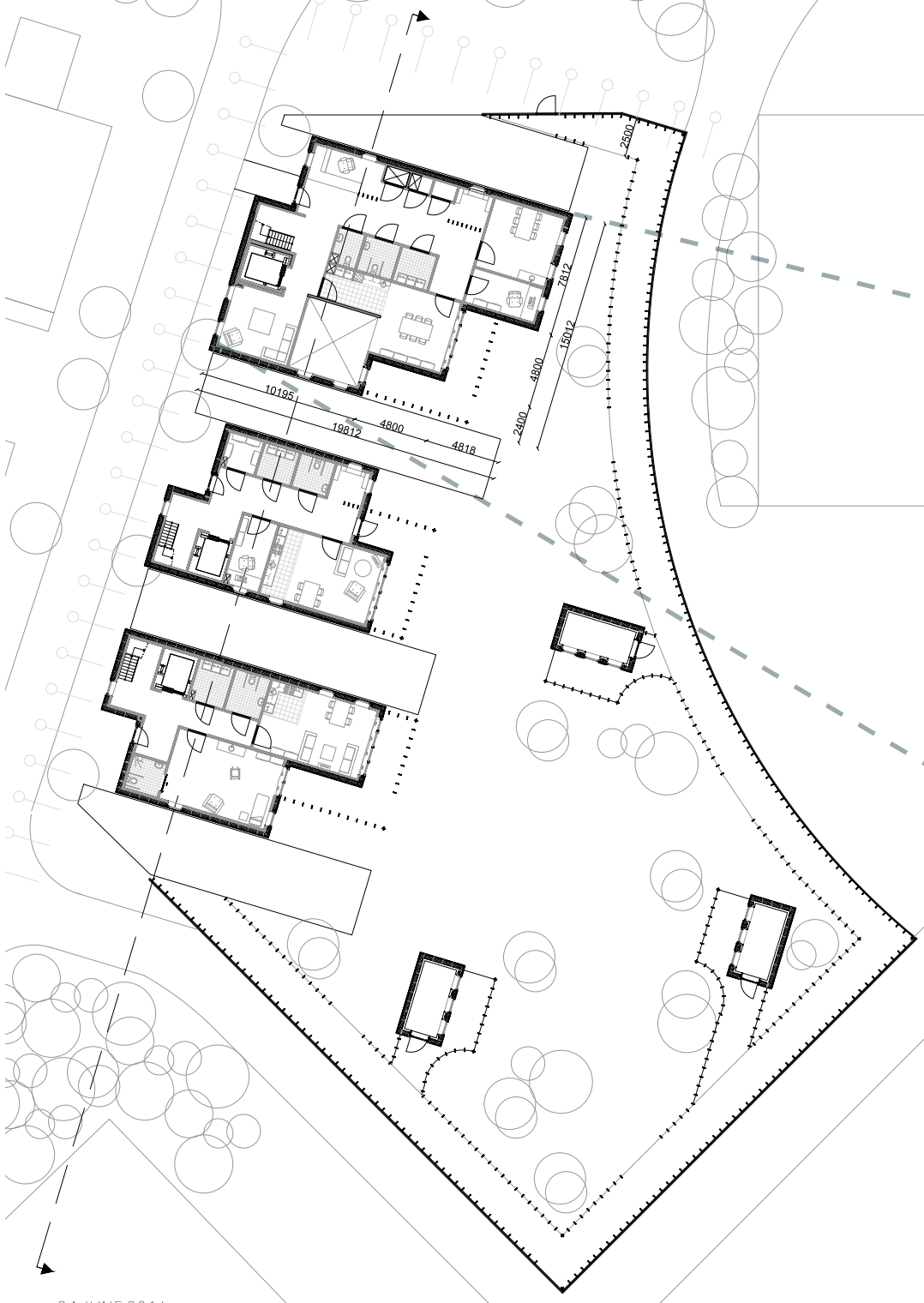
3. DESIGN HIGHLIGHTS

USE

MATERIALISATION

BALCONIES

GARDEN AREA



GROUND FLOOR

FIRST FLOOR

SECOND FLOOR

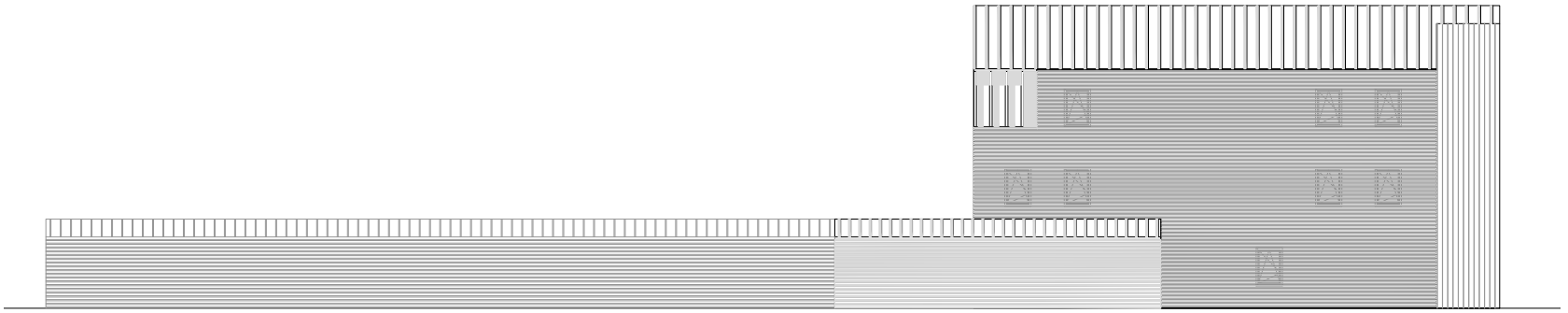
3. DESIGN HIGHLIGHTS

USE

MATERIALISATION

BALCONIES

GARDEN AREA



3. DESIGN HIGHLIGHTS

USE

MATERIALISATION

BALCONIES

GARDEN AREA

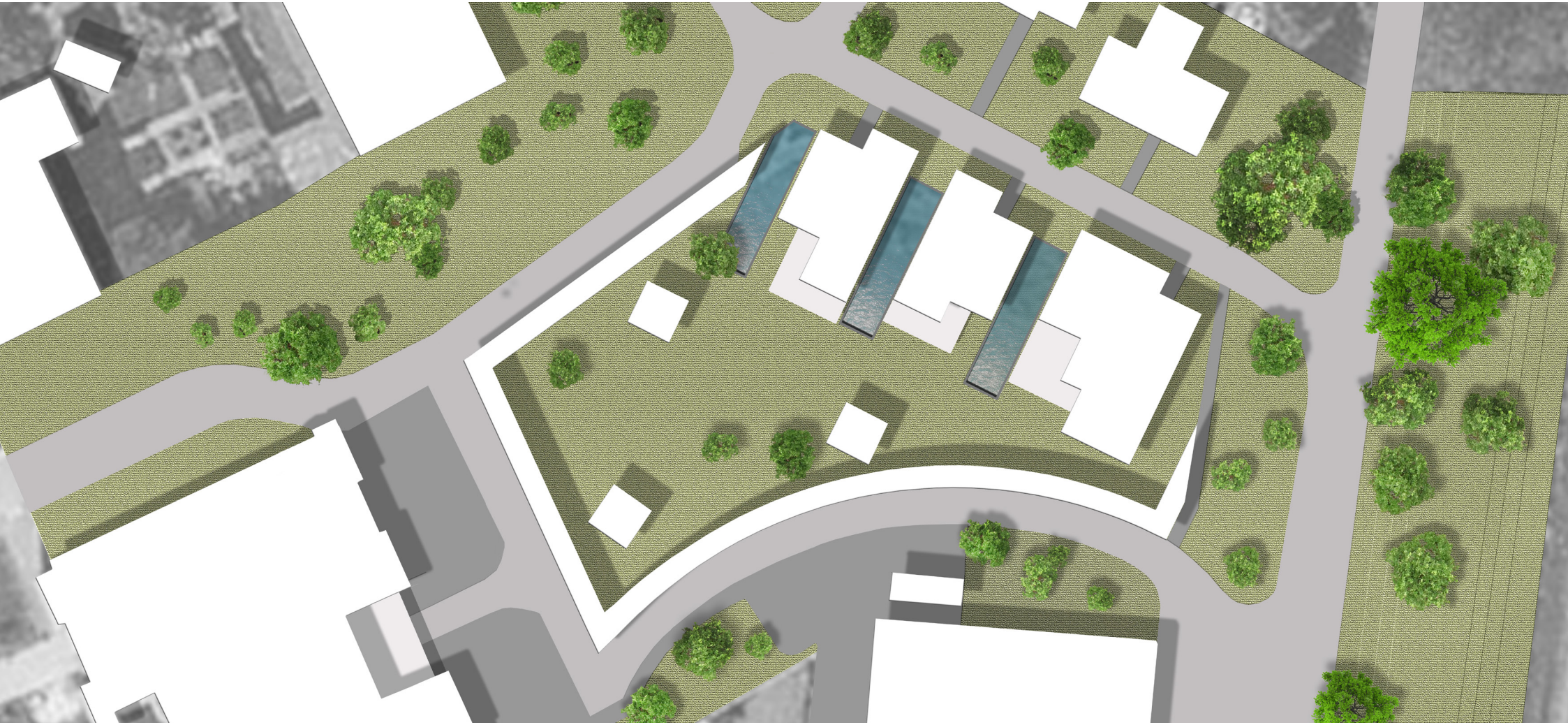
3. DESIGN HIGHLIGHTS

USE

MATERIALISATION

BALCONIES

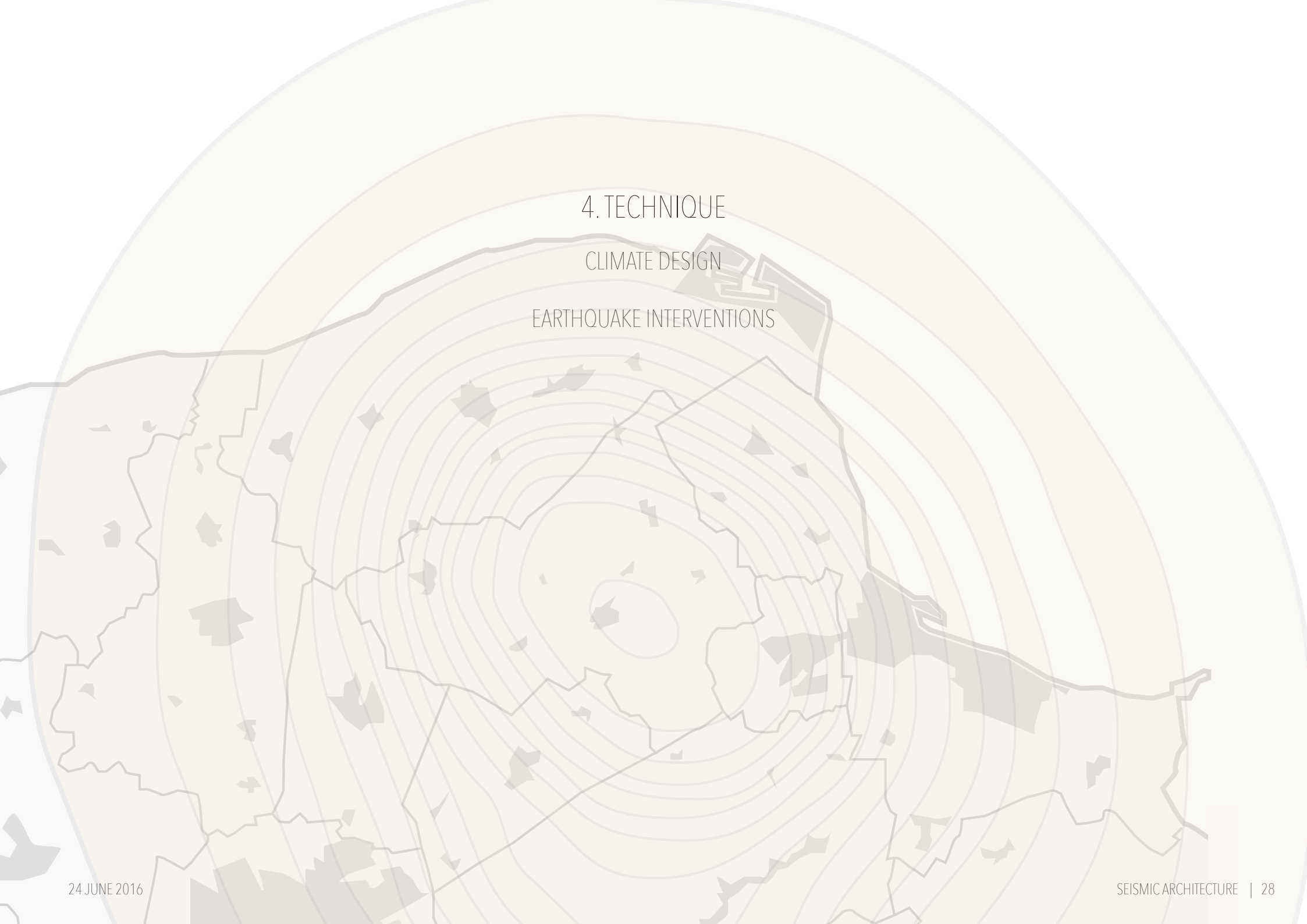
GARDEN AREA



4. TECHNIQUE

CLIMATE DESIGN

EARTHQUAKE INTERVENTIONS



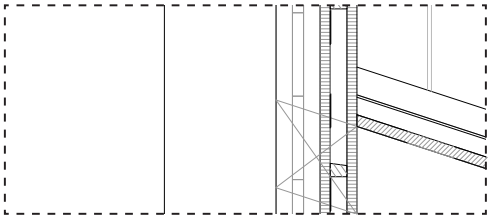
4. TECHNIQUE

CLIMATE DESIGN & TECHNIQUE

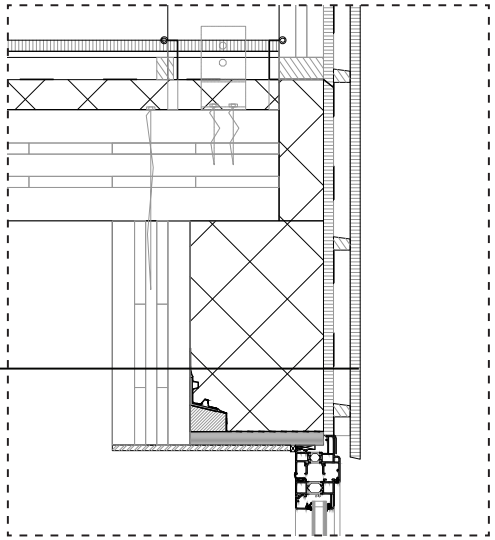
EARTHQUAKE INTERVENTIONS

FACADE ASSEMBLY - LEFT TO RIGHT

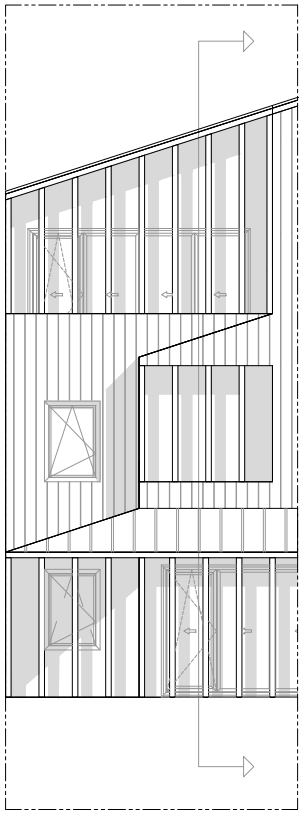
CLT bearing wall 140mm
Wood viber insolation 240mm
OSB plating 15mm
Water resistant layer
Facade mount battening 30mm
Western red ceder cladding 18mm

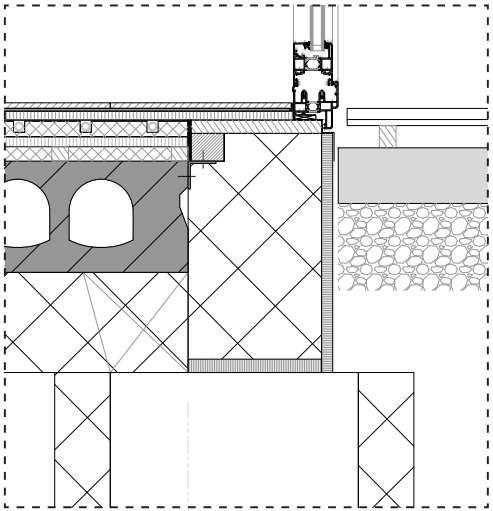


SUN SCREEN ROOF DETAIL



BALCONY DETAIL





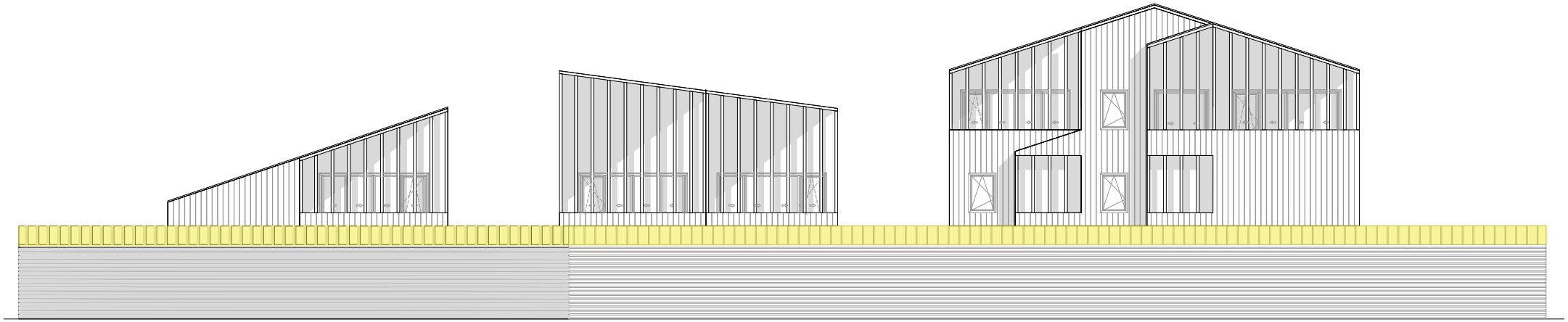
GROUND LEVEL DETAIL

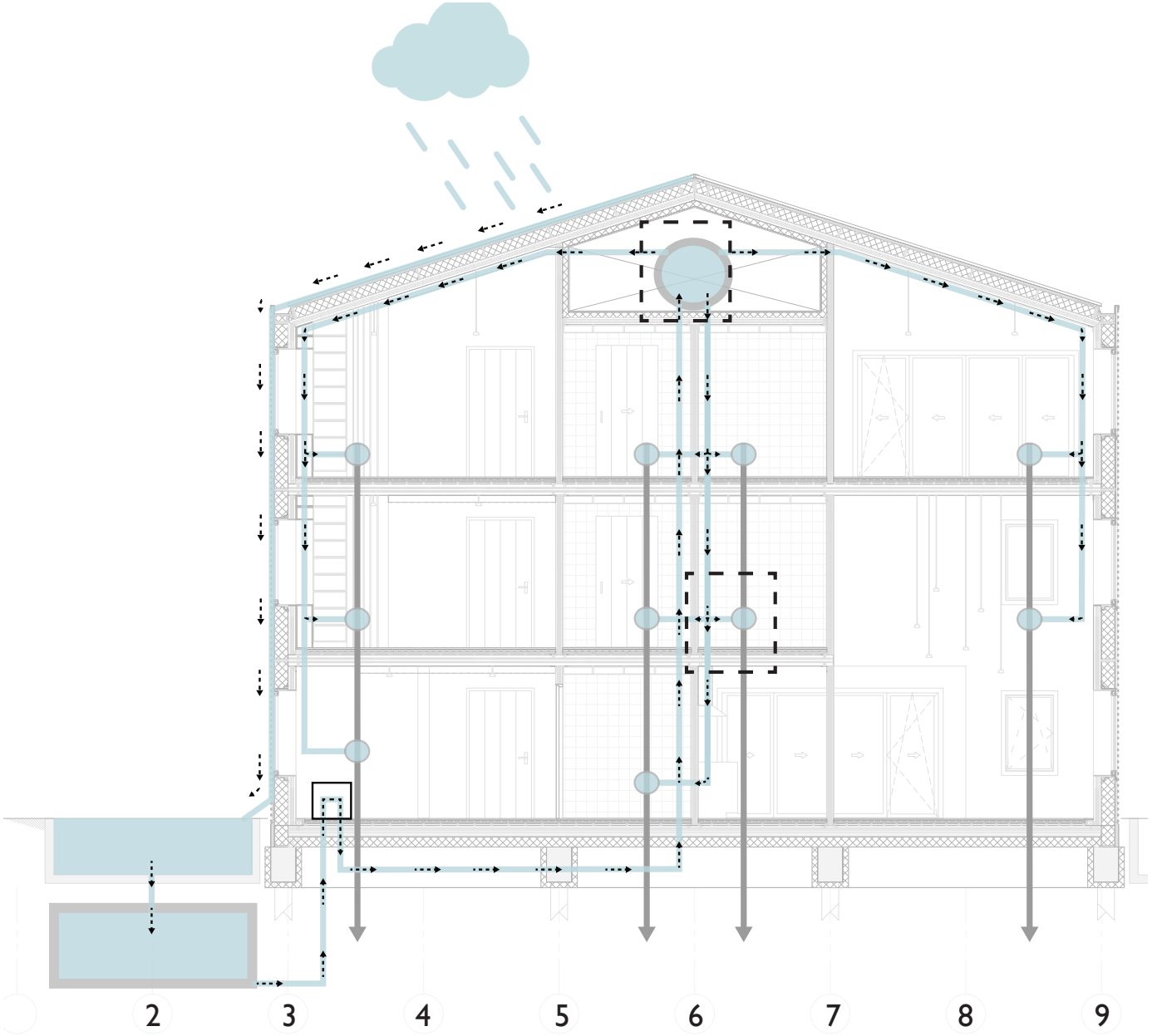
It can take up to 10 hours for the sun to penetrate the outer wall. Which means that the nights are warm and the days are cool.

This combines well with the moist open build method.

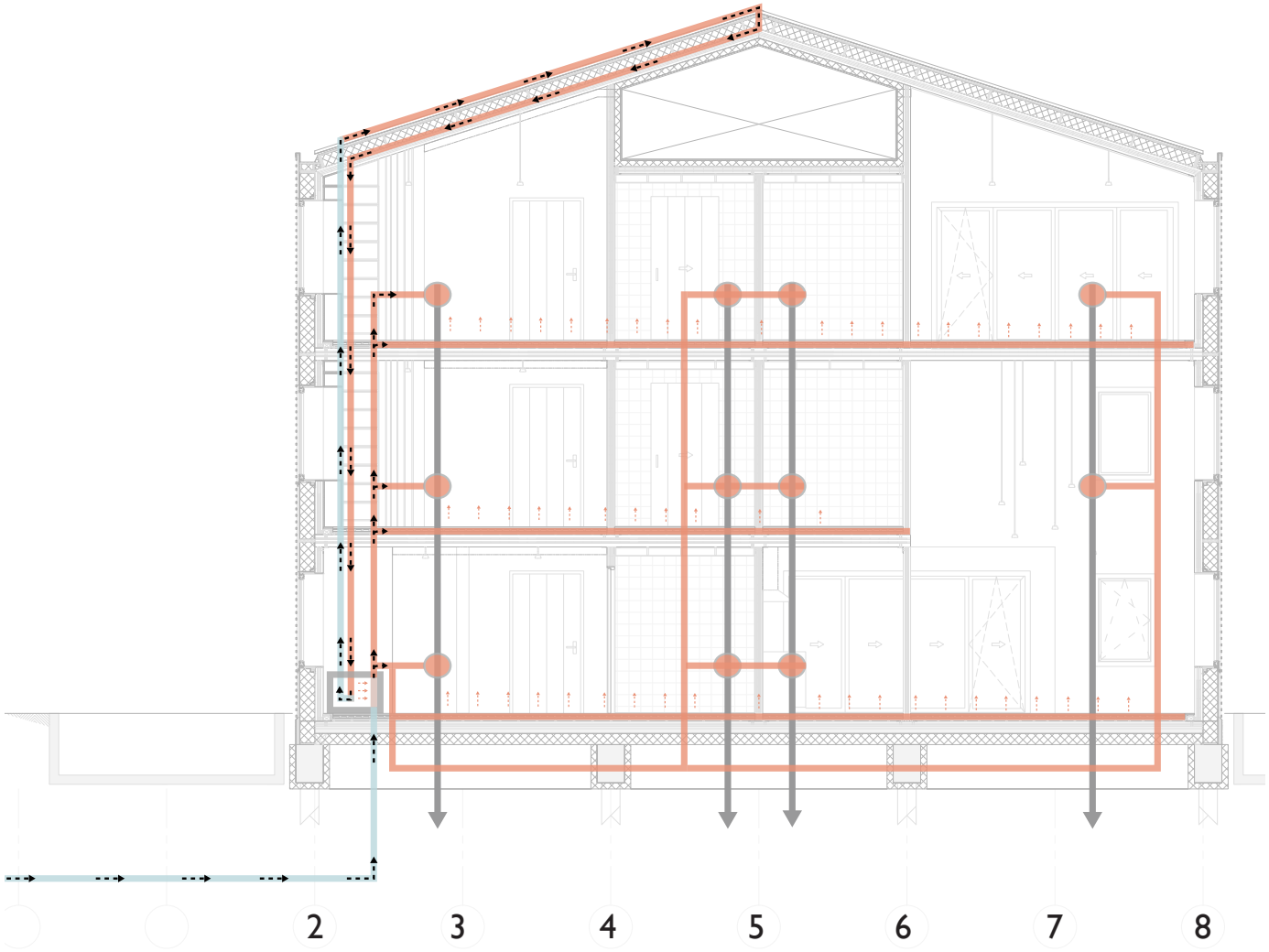
The balconies provide shade through the roofs and the dimensions of the wood columns .

Almost 300m2 of solar panels are mounted on the monastry wall in order to provide electricity.

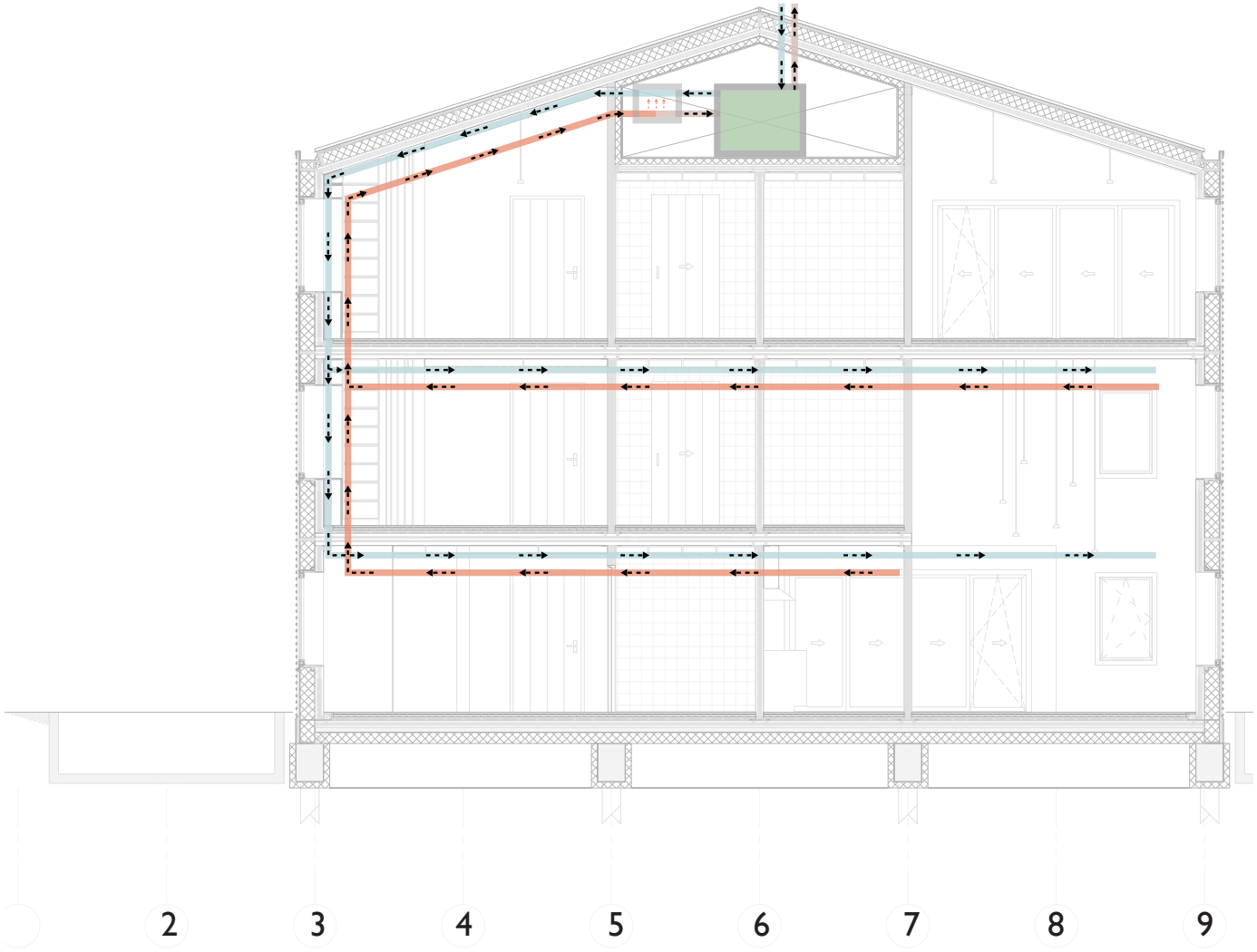




RAINWATER RE-USE



SOLAR ROOF & FLOOR HEATING



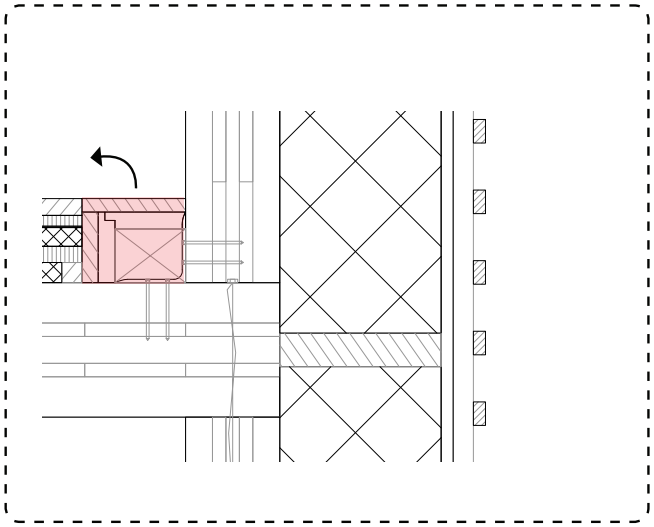
VENTILATION SYSTEM

4. TECHNIQUE

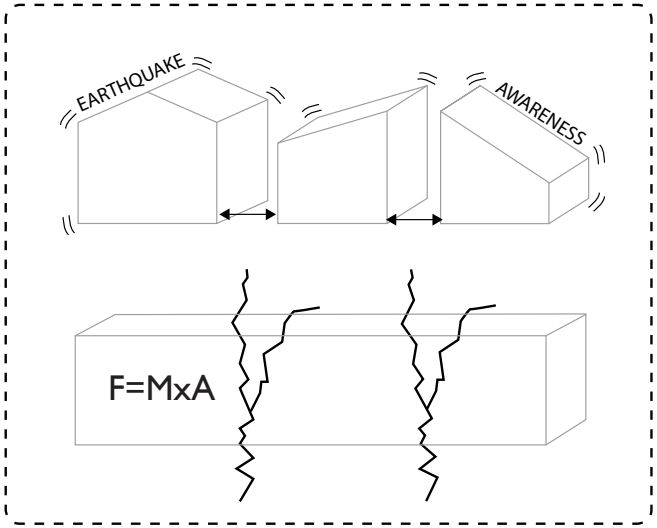
CLIMATE DESIGN & TECHNIQUE

EARTHQUAKE INTERVENTIONS

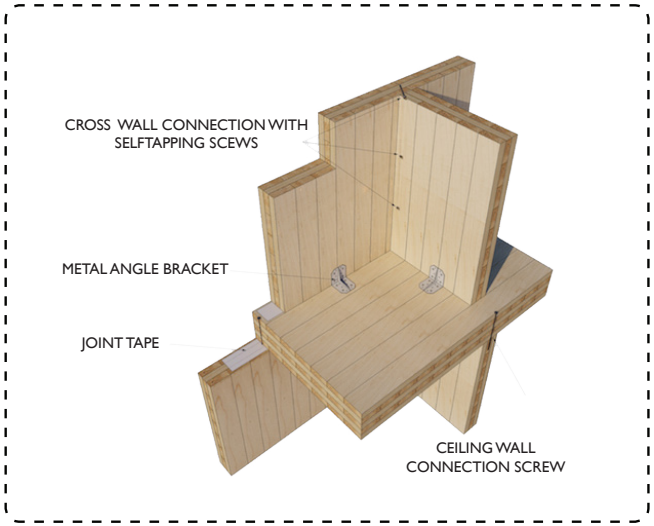
LIGHT MATERIALS



VERIFIABLE WALL CONNECTION

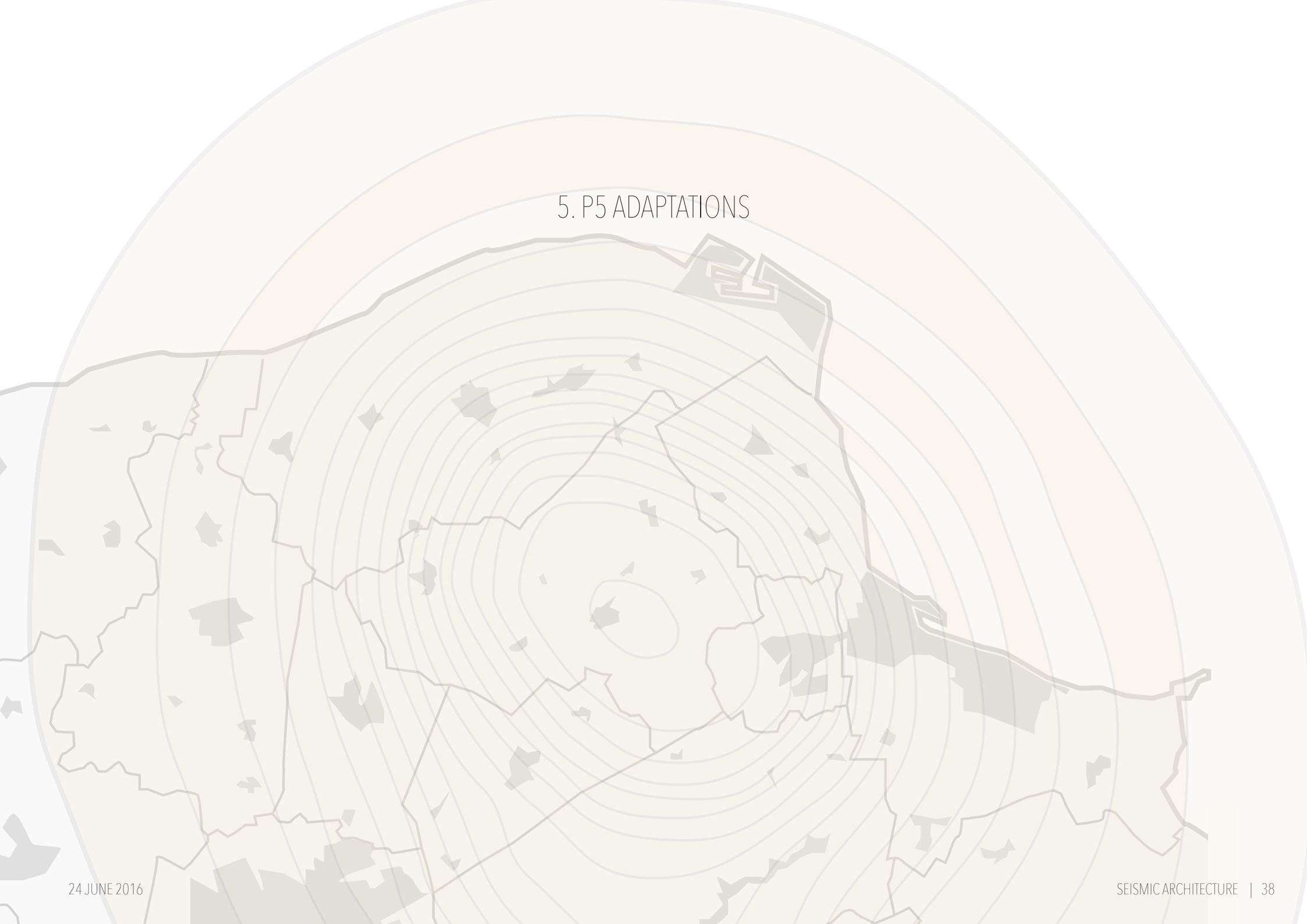


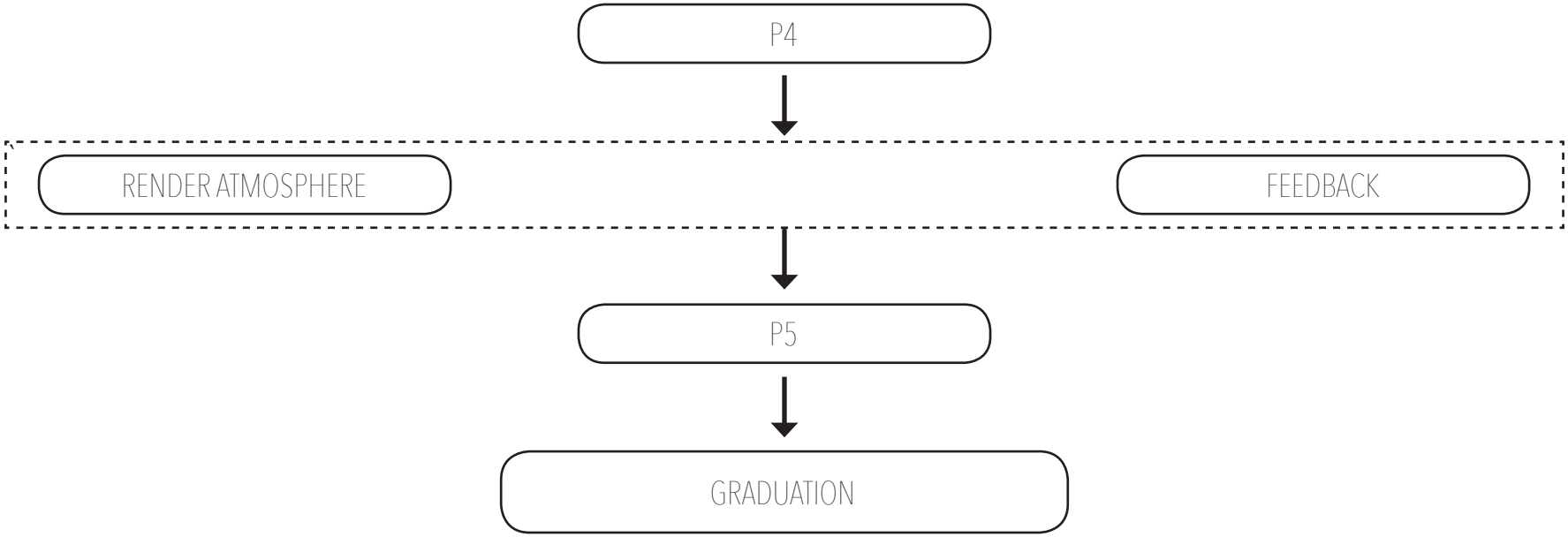
SHAPE DIVISION



BUILDING METHOD

5. P5 ADAPTATIONS




P4
RENDER ATMOSPHERE
FEEDBACK
P5
GRADUATION