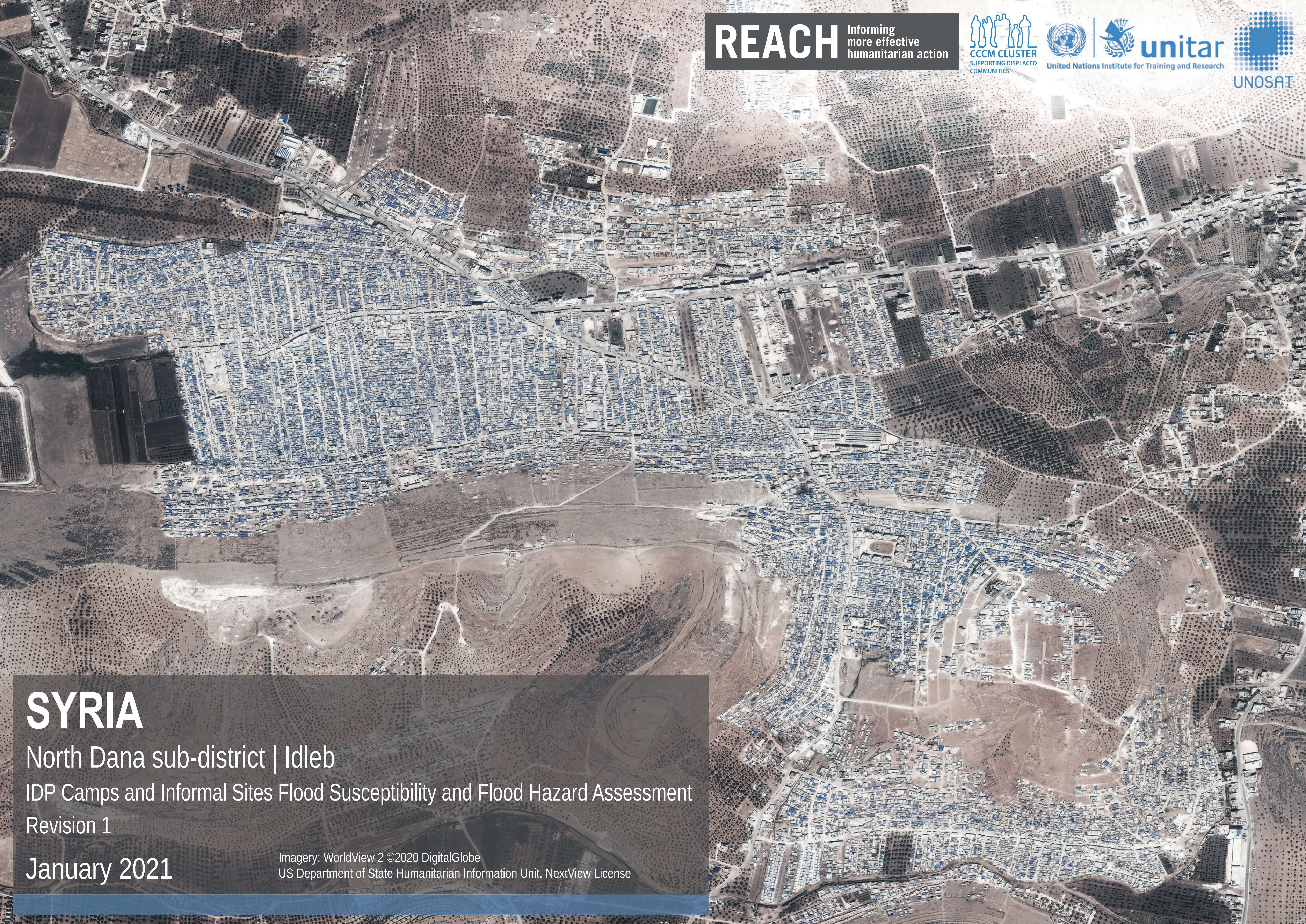

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North Dana sub-district | Idleb

IDP Camps and Informal Sites Flood Susceptibility and Flood Hazard Assessment

Revision 1

January 2021

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CONTENTS

CONTEXT

In northwest Syria winter storms have the potential to generate devastating floods which have a disproportionate effect on internally displaced persons (IDPs) living in camps and informal sites. Flooding within the IDP camps and sites throughout Idleb and western Aleppo has been widely reported over the last five years.

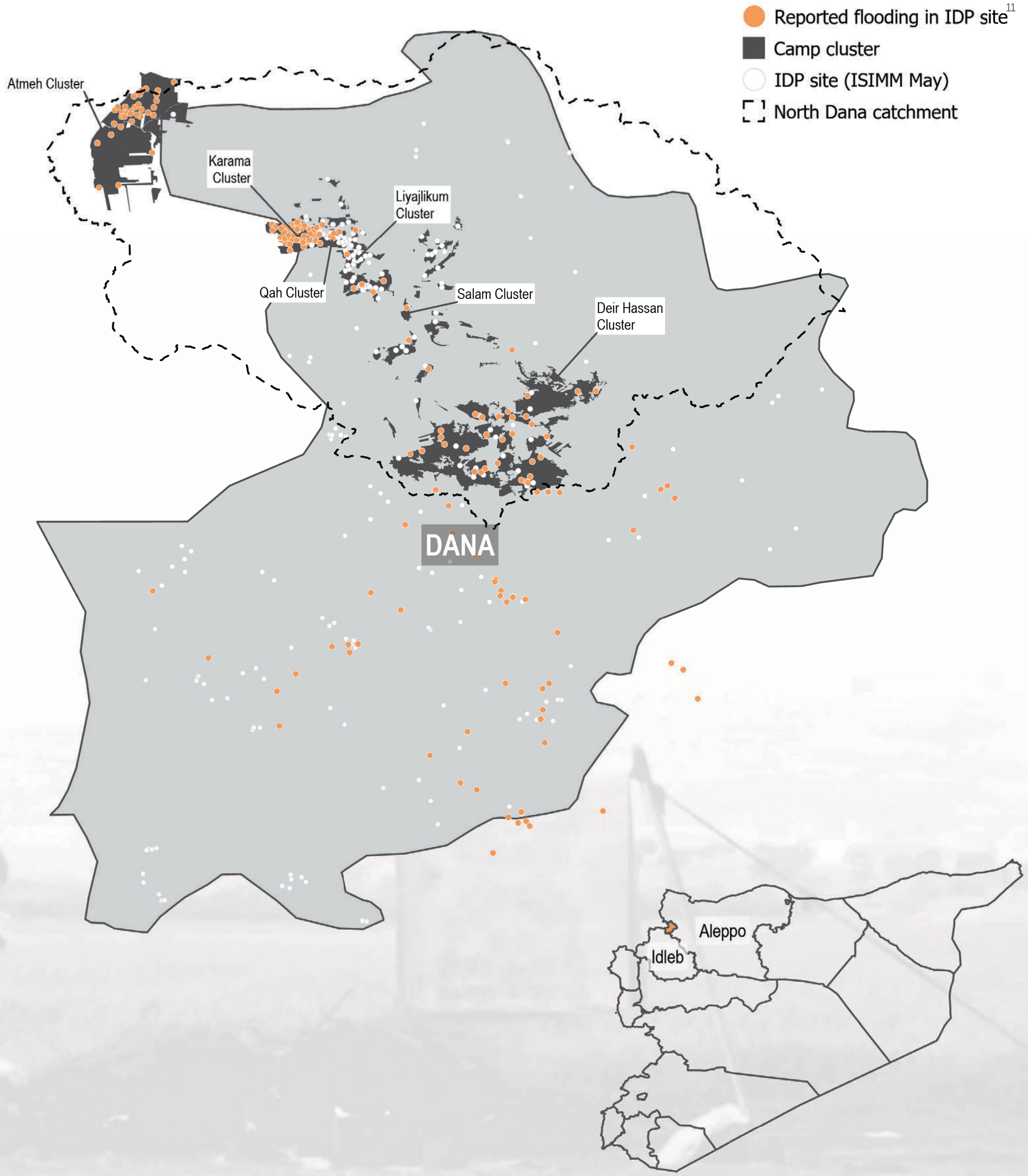
In November 2016 it was reported that 21 camps within the Atmeh and Karama camp clusters in Dana sub-district were affected by flooding which inundated tents and accessways, causing destruction of property and movement difficulties[1]. In December 2018 another severe storm resulted in widespread flooding throughout Idleb and western Aleppo[2]. Inundation of tents, damage to property and other problems associated with the flooding were reported in 43 camps within the Atmeh, Karama and Qah camp clusters[3]. Again, in late March 2019 heavy rainfall caused severe flash flooding throughout Idleb and western Aleppo. The floods reportedly swept away shelters, damaged road infrastructure and destroyed food stocks[4]. One hundred and fifteen camps in and around the Atmeh, Karama, Qah, Liyajlikum and Salam clusters reportedly experienced problems related to the flood event[5]. In June 2020 heavy rain in Ma'aret Tamsrin, south of Dana sub-district, caused severe flooding in 20 IDP sites resulting in the loss of three lives[6] and reportedly destroying hundreds of shelters and putting sanitation facilities out of service[7].

IDPs are among the population groups most vulnerable to the impacts of disasters associated with natural hazards for a number of reasons. The primary reasons are linked with the locations and living conditions of the sites where IDPs live. IDP sites and settlements are frequently located on land that has traditionally been considered uninhabitable due to environmental factors such as steep terrain, rocky or arid ground, or land that is known to be prone to seasonal flooding. The close proximity of IDP camps and informal sites to flood susceptible locations increases the exposure of IDPs to flood hazards. IDPs in camps and informal sites often live in densely populated environments, in shelters that are not designed to resist natural hazards, both of these factors exacerbate the risks natural hazards present for IDP populations[8]. In addition to the immediate hazard flash floods present to people and property, poor drainage and persistent standing water in and around shelters can lead to numerous health and sanitation problems in camps and informal sites extending the adverse effects of flooding beyond the event itself. Considering the current outbreak of COVID-19 and rising number of confirmed cases in northwest Syria[9], degraded sanitation conditions and overcrowding in camps and informal sites are of particular concern this winter.

Since the beginning of winter 2019 the number of IDPs living in Dana sub-district alone has increased by more than 35% from 617,000 IDPs in November 2019 to 845,000 in December 2020 following an escalation in conflict in early 2020[10]. Increased migration to areas with already high IDP populations is likely to result in IDPs living in increasingly dense living settings in locations considered less suitable for habitation and potentially more exposed to natural hazards like flooding.

This output presents the results of a flood hazard assessment undertaken by REACH with the aim of highlighting shelters located within IDP sites which may be most susceptible to flood hazards. The assessment focuses on the catchment of northern Dana sub-district which includes the densely populated Atmeh, Karama, Qah, Liyajlikum, Salam and Deir Hassan camp clusters which have reportedly experienced severe flooding on multiple occasions since 2016.

Sabreen Camp, Atmeh Cluster | January 2018

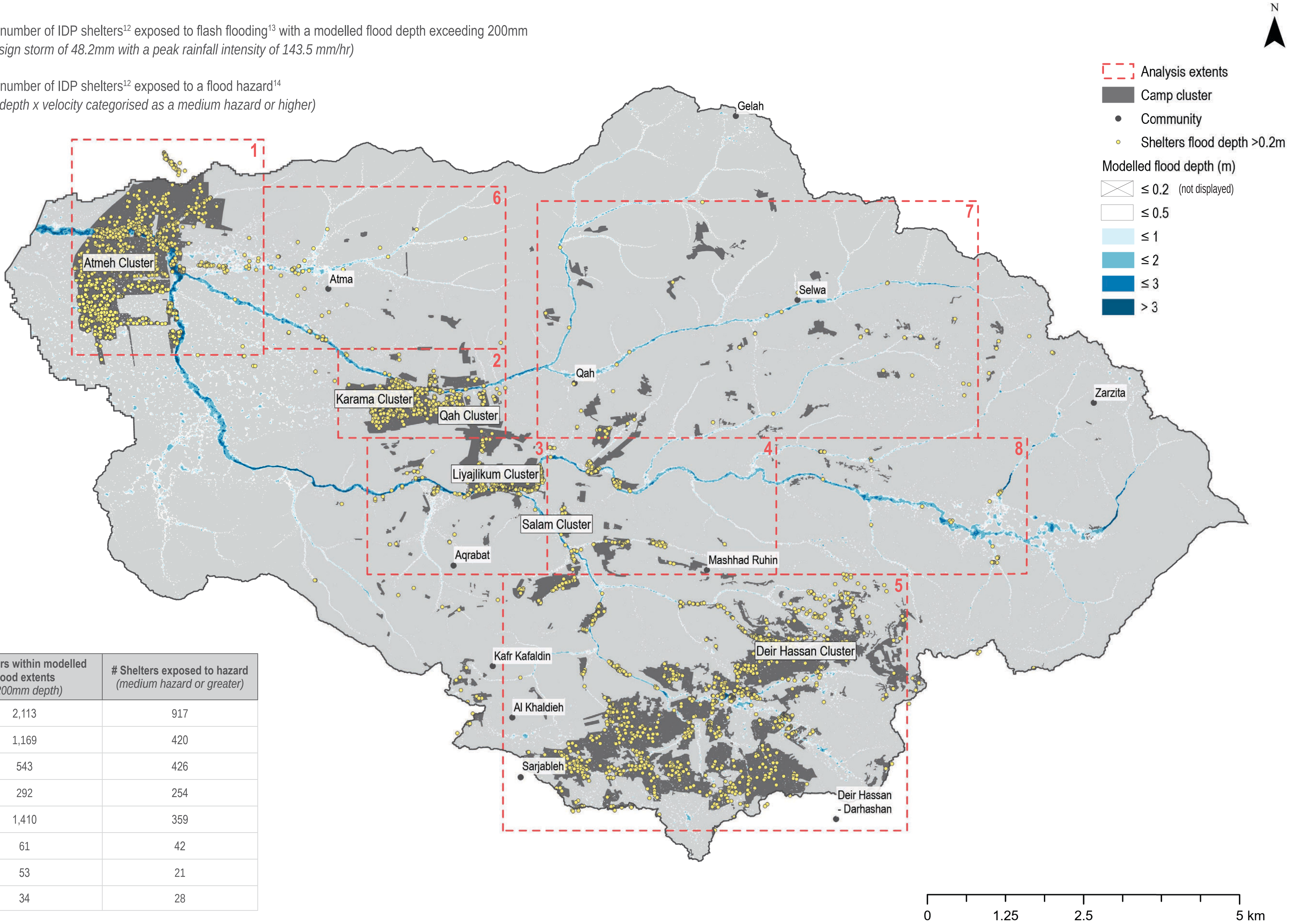


1 Assistance Coordination Unit (ACU) | Winter Needs In Northern Syria | November 2016
2 REACH | North-west Syria:Inter-sector Rapid Needs Assessment - Flood Impact | January 2019
3 ACU | Flash Report The Humanitarian Situation in the Northern Syrian Camps - Issue 02 | December 2018
4 International Organization for Migration (IOM) | Over 80,000 People Affected by Recent Floods in Northern Syria, IOM Partners Continue to Provide Relief | February 2019
5 ACU | Flash Report The Humanitarian Situation in Northern Syria Camps - Issue 03 | April 2019
6 Daily Sabah | UN calls for safer living conditions after storms kill 3 children in Syria's tent camps | June 2020
7 United Nations Office for the Coordination of Humanitarian Affairs (OCHA) | Situation Report No. 16 | June 2020
8 United Nations High Commissioner for Refugees (UNHCR) | Displacement and Disaster Risk Reduction
9 Médecins Sans Frontières (MSF) | Ten-fold increase in COVID-19 cases adds new challenges in northwest Syria | September 2020
10 Humanitarian Needs Assessment Program (HNAP) | Mobility needs monitoring | November 2019 & August 2020
11 Flood affected sites data provided by CCCM cluster

KEY FINDINGS

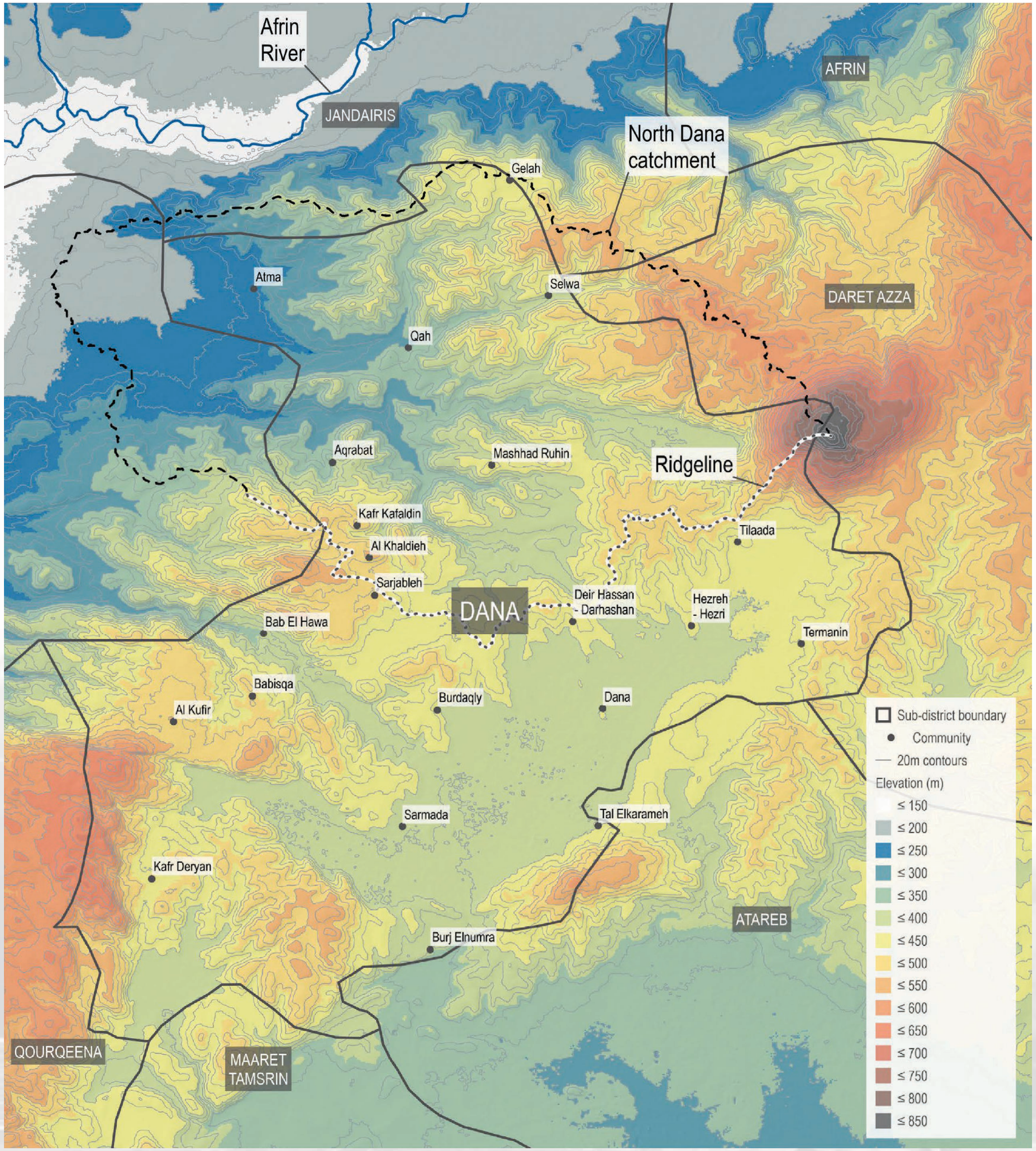
5,724 Estimated number of IDP shelters[12] exposed to flash flooding[13] with a modelled flood depth exceeding 200mm
(6-hour design storm of 48.2mm with a peak rainfall intensity of 143.5 mm/hr)

2,473 Estimated number of IDP shelters[12] exposed to a flood hazard[14]
(Modelled depth x velocity categorised as a medium hazard or higher)



Analysis Extent	Camp Cluster	# Shelters within modelled flood extents (>200mm depth)	# Shelters exposed to hazard (medium hazard or greater)
1	Atmeh Cluster	2,113	917
2	Karama/Qah Cluster	1,169	420
3	Liyajlikum Cluster	543	426
4	Salam Cluster	292	254
5	Deir Hassan Cluster	1,410	359
6	Atma Community	61	42
7	Qah Community	53	21
8	Mashhad Ruhin East	34	28

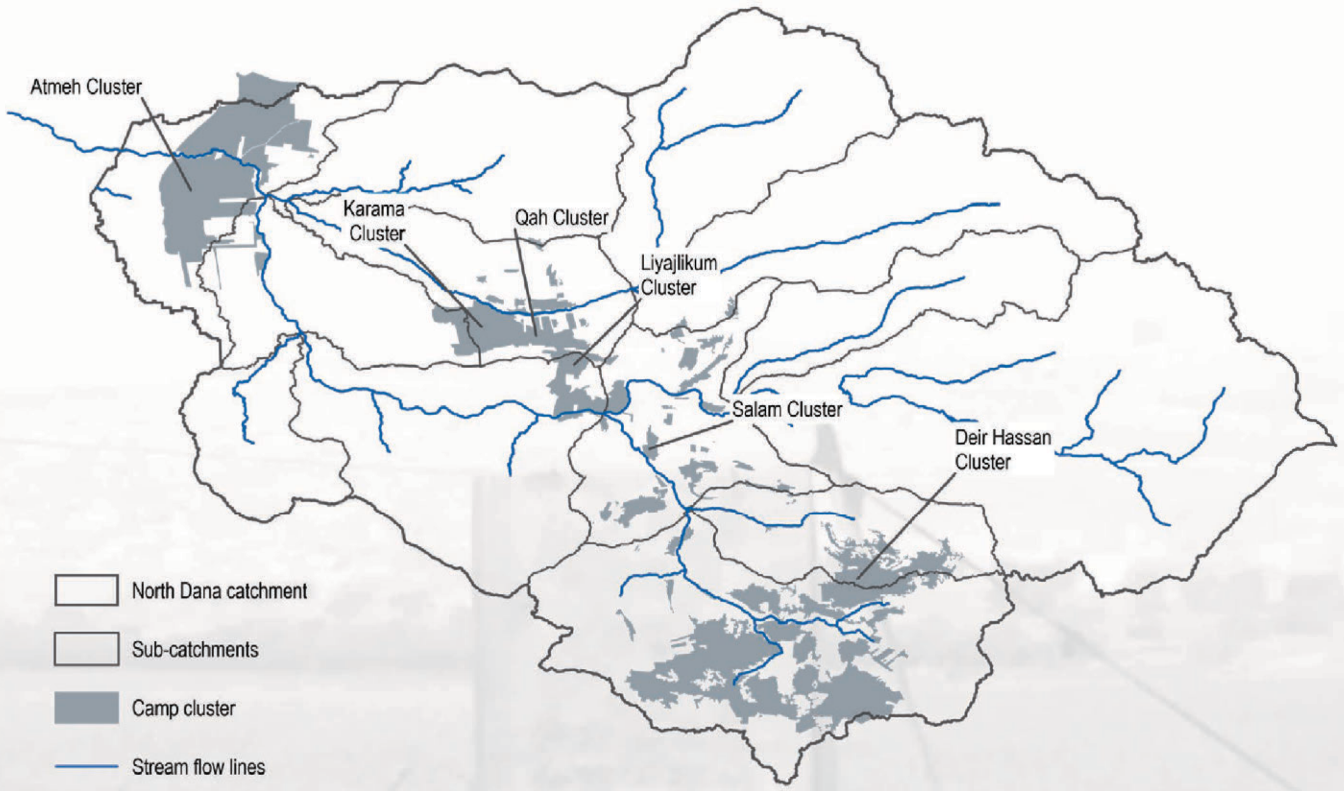
12 REACH | Satellite detected shelters/structures 26 February 2020
13 Flash flooding is generated by heavy rainfall over a short period of time. Flash floods are characterised as having relatively high peak discharges and short response times between rainfall and the onset of flooding, usually within 6 hours | World Meteorological Organization - No.577
14 A flood hazard is a product of both flood depth and flood velocity. This output utilises a flood hazard classification based on simplified D*V severity grid symbolisation categories published by the US Federal Emergency Management Agency (FEMA) | Guidance for Flood Risk Analysis and Mapping



CATCHMENT CHARACTERISTICS

Dana sub-district is divided roughly in half along the central ridgeline which runs east to west via the communities of Tilaada, Deir Hassan and Sarjableh. The southern catchment comprised of the Dana and Atareb plains is relatively flat, in contrast the northern catchment is mountainous and steeply sloped. The northern catchment is bounded to the east by al-Sheikh Barakat mountain with a maximum elevation 850m above sea level, a series of ridgelines projecting west of al-Sheikh Barakat separates the catchment from the neighbouring Afrin river catchment. A number of small streams flow through the northern Dana catchment, primarily forming in the highlands to the east of the catchment and converging just upstream of Atmeh camp cluster located along the western edge of the catchment along the Syria - Turkey border. The streams exit the catchment at an elevation approximately 220m above sea level and continue west into Turkey as tributaries of the Orontes River.

The extent of the north Dana catchment was delineated from a 2.5m resolution Digital Terrain Model (DTM) utilising SAGA terrain analysis - hydrology and channel tools (fill sinks Wang & Liu; catchment area; channel network; watershed basins). The result of these processes is shown below.

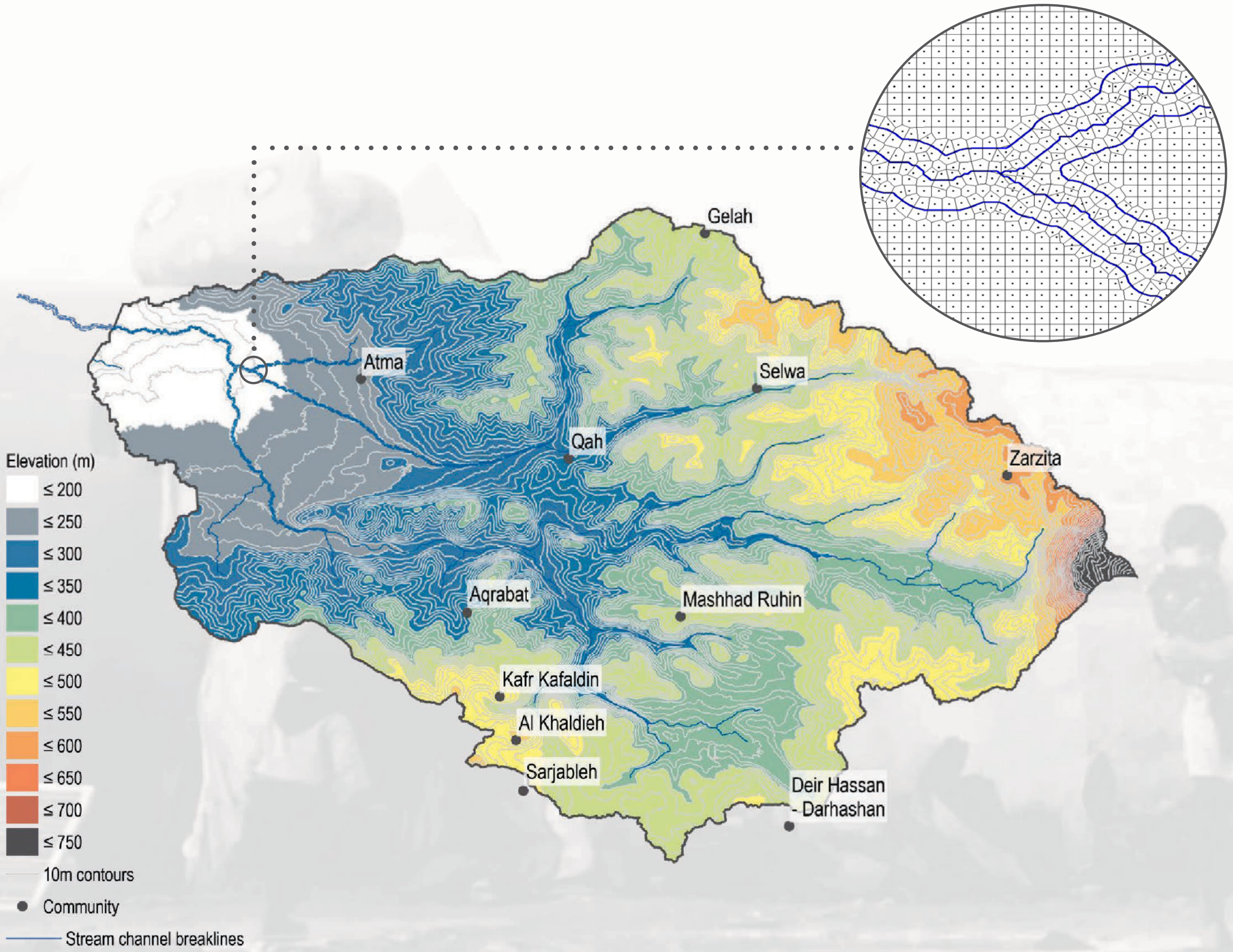


Rapid Flood Hazard Assessment

A direct precipitation two-dimensional (2D) hydraulic model was built using HEC-RAS in order to provide insights on flash flooding in northern Dana catchment during heavy rainfall events. This method of 2D flood modelling is often referred to as a Rapid Flood Hazard Assessment (RFHA). A RFHA can provide a high-level understanding of flood hazards on a catchment wide scale and helps to identify flood susceptible areas. The following section outlines the methodology utilised to obtain the flood extents and flood depth x velocity results presented in this output.

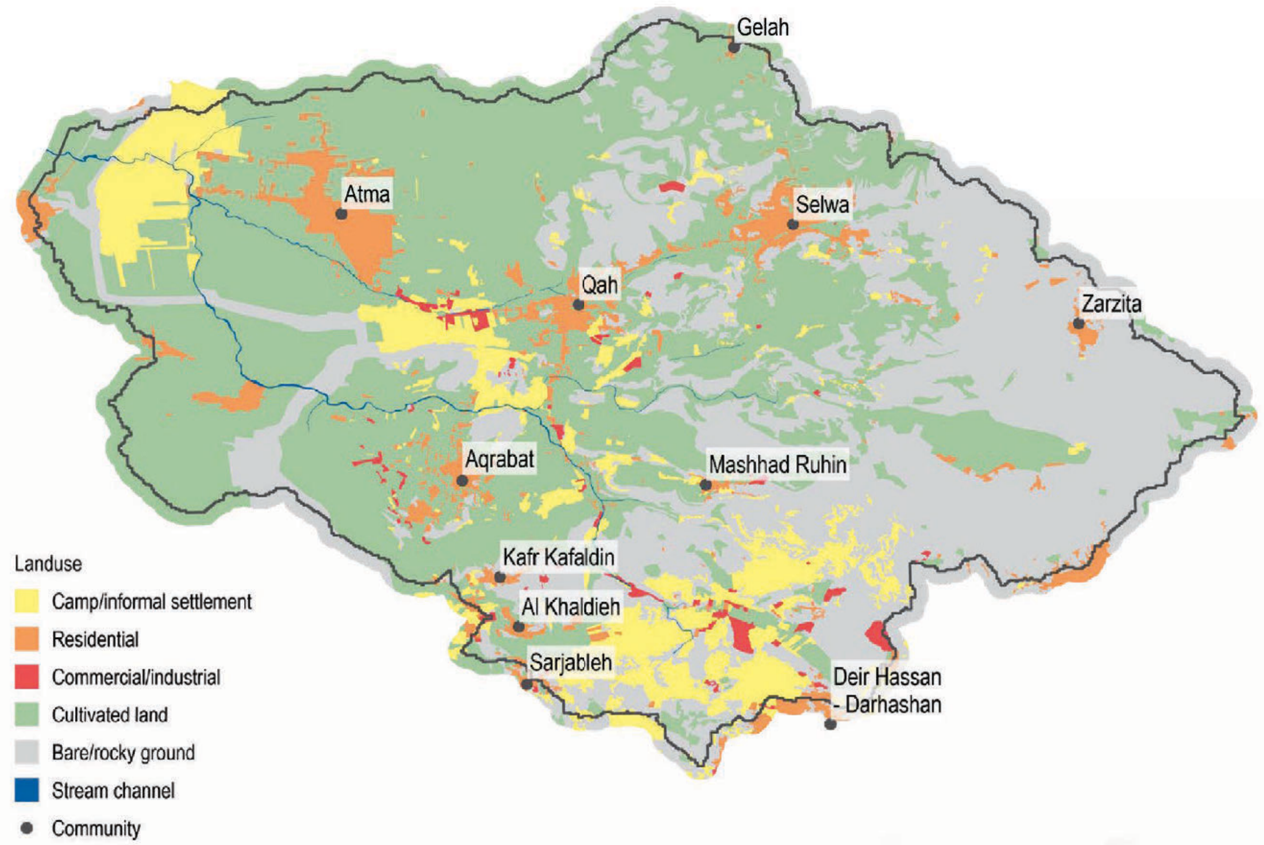
Model Inputs - Terrain/2D flow area

The terrain utilised for the HEC-RAS analysis is a 2.5m resolution DTM built utilising satellite imagery acquired by the Advanced Land Observing Satellite of the Japan Aerospace Exploration Agency (JAXA). The raw surface model has been processed to remove anomalies and adjusted to account for the presence of trees and structures[15]. The 2D flow area extents were defined in the HEC-RAS model environment and model computation points were generated at 10m intervals. Additional computation points were added along stream centrelines and along the stream banks of lower reaches to improve the resolution of the 2D flow area in these locations by enforcing breaklines. The 2D flow area contains a total of 1,343,820 cells and computation points.



Model Inputs - Landuse and roughness parameters

The north Dana catchment was delineated into 6 different landuse categories using satellite imagery as shown in the figure below. Each category was assigned a roughness coefficient (Manning's n) which was subsequently utilised as an input parameter for the HEC-RAS model.



The Manning's n values assigned to the different landuses are provided in the table below:[16]

Landuse Category	Manning's n value
Bare/rocky ground	0.035
Informal settlement/IDP site	0.1
Commercial/industrial area	0.1
Cultivated land/olive orchard	0.05
Residential area/community	0.1
Stream channel	0.045

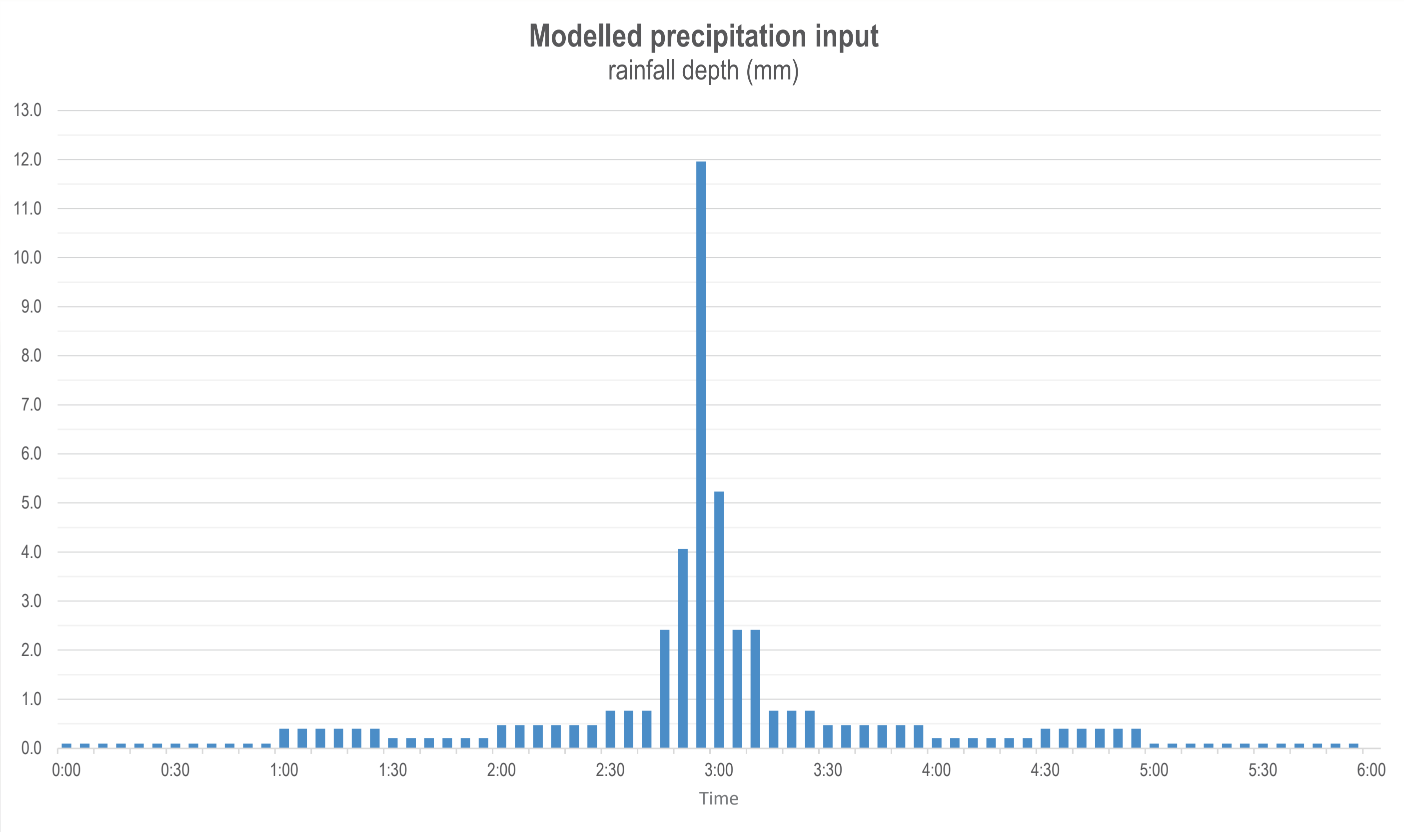
15 For more information on the digital terrain model utilised for the model build refer to AW3D product details | https://www.aw3d.jp/en/products/standard/
16 Manning's n values were based on reference tables for Manning's n values for Channels, Closed Conduits Flowing Partially Full, and Corrugated Metail Pipes (Chow, 1959) | http://www.fsl.orst.edu/geowater/FX3/help/8_Hydraulic_Reference/Mannings_n_Tables.htm

Boundary Conditions

A review of available regional precipitation data, rainfall gauge data and remote sensing datasets was undertaken in order to define appropriate rainfall inputs for the hydraulic model. In the absence of rainfall gauge data or associated statistical analysis of rainfall within northwest Syria, the precipitation data utilised as an input in the model was drawn from an intensity duration frequency (IDF) analysis undertaken for the city of Gaziantep[14] located in Turkey, approximately 100 km northeast of northern Dana. The precipitation input utilised in the model was derived from IDF curves using the alternating block method. Nine storms with a 25-year return period ranging in duration from 5 minutes to 6 hours were combined to synthesize the rainfall hyetograph shown below. The peak rainfall intensity is 143.5 mm/hr and the total storm depth is 48.2 mm.

As a second source of rainfall estimates, NASA's Global Precipitation Measurement (GPM) dataset was reviewed using Google Earth Engine in order to compare the synthesized design storm, with estimates of extreme rainfall inside Syria. Rainfall depths were extracted from the GPM dataset for dates of reported flooding in northwest Syria. Several large storm events in northwest Syria were identified including one rainfall event on 27 December 2018 centred just south of the study area in Atareb with an accumulated rainfall depth over 6 hours of 49mm, comparable to the accumulated total depth of the design storm.

A normal depth boundary was applied along the western edge of the 2D flow area approximately 2 km west of Atmeh camp cluster. The normal depth boundary was calculated based on a channel slope of 1.0%.



Unsteady Flow Analysis Parameters

An unsteady flow analysis was run in HEC-RAS with a simulation time window of 7 hours. The additional hour was added to the simulation at the end of the 6 hour precipiation input to ensure the receding limb of the runoff hydrograph was adequately captured despite the long lag time of the catchment. A computation timestep of 3 seconds was used for the simulation.

Hazard Classification

The severity of a flood hazard is a product of both the flood depth and flood velocity. Studies undertaken around the world aimed at classifying modelled depth x velocity results into flood severity categories have focused on identifying hazardous floodplain conditions for people attempting to wade through floodwater, vehicles moving through floodwater and buildings and structures located within the floodplain. The approach that has been adopted for this analysis is the simplified approach presented in the US Federal Emergency Management Agency guidance on Flood Depth and Analysis Grids[15]. The flood severity categories used to produce the hazard maps included in this output are provided below:

Flood severity category	Depth x Velocity Range (m^2/s)
Low	< 0.2
Medium	0.2 - 0.5
High	0.5 - 1.5
Very High	1.5 - 2.5
Extreme	> 2.5

Limitations

A RFHA is a simplified modelling approach which is suitable for obtaining a 'big picture' perspective of flooding over an assessed area, it is not intended to provide precise flood depths and extents. The results presented in this output should be considered as estimates, to be confirmed and validated with subsequent analysis at the individual site level.

The following should be considered when viewing the results presented in this output
- Hydraulic structures such as bridges and culverts, piped drainage networks, irrigation canals and open channels have not been included in the hydraulic model
- Obstructions to flow such as buildings, parked vehicles and vegetation are not included directly in the model. The effect of obstructions on the modelled flow regime are approximated by the selection of surface roughness parameters
- Precipitation is applied directly onto the 2D flow area generating runoff which does not account for losses due to soil infiltration or evapotranspiration
- The modelled terrain relies on satellite detected data with a vertical accuracy of +/- 5-7m

For questions or comments on the methodology please contact: mena.reach@impact-initiatives.org

17 Yuce, Mehmet & Deger, Ibrahim | Rainfall Intensity-Duration-Frequency Analysis for the City of Gaziantep | April 2019
18 FEMA | Guidance for Flood Risk Analysis and Mapping | February 2018

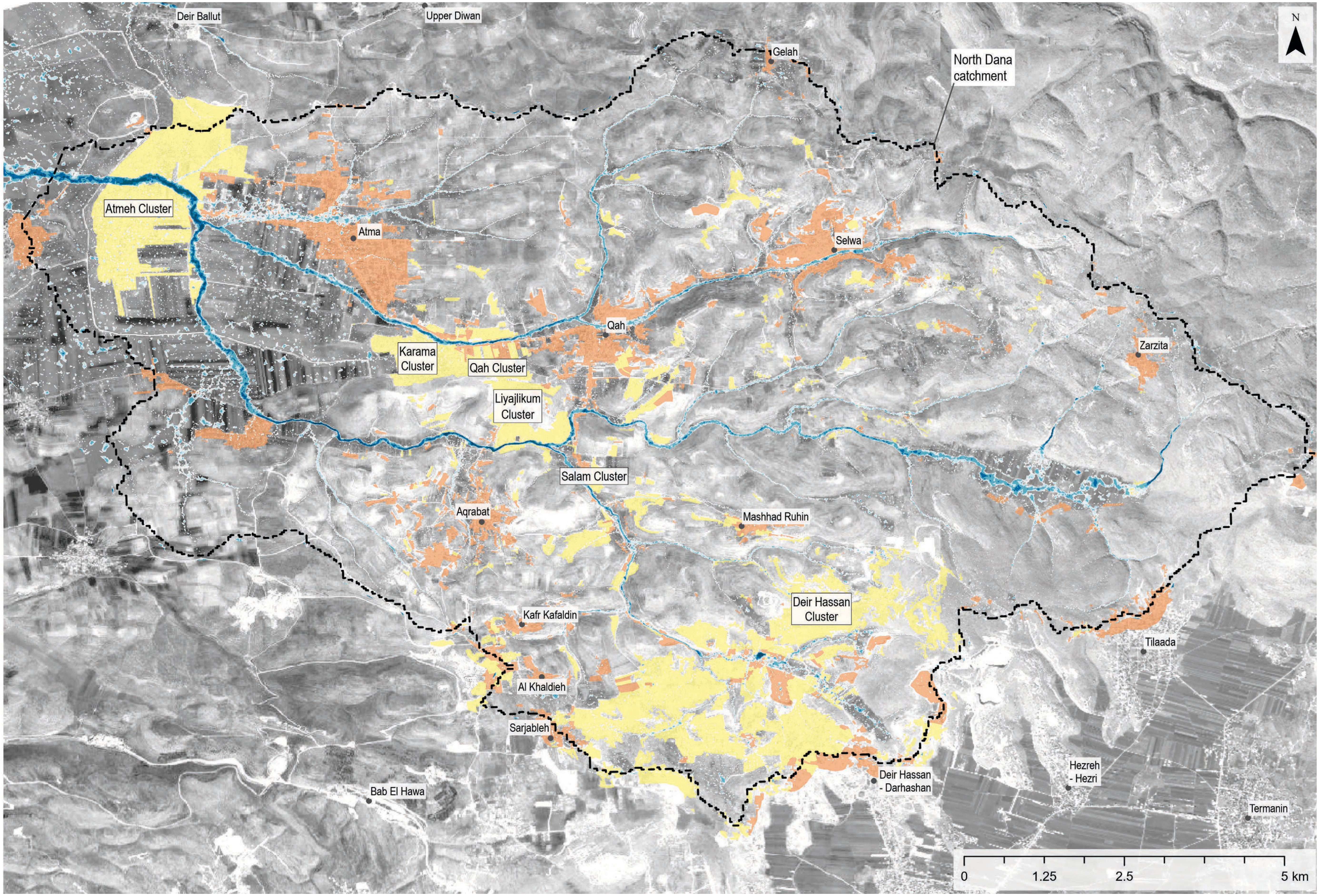
MODELLED FLOOD DEPTH RESULTS - CATCHMENT OVERVIEW

5,724

Shelters lie within the modelled flood extents. Where flood depth exceeds 200mm

Breakdown of shelters within modelled flood extents

0.2 - 0.5m	3,279
0.5 - 1.0m	1,051
1.0 - 3.0m	1,242
>3.0m	152



Populated areas

- IDP sites/settlements
- Community

Modelled flood depth (m)

- ≤ 0.2 (not displayed)
- ≤ 0.5
- ≤ 1
- ≤ 2
- ≤ 3
- > 3

Modelled flood extents calculated based on 25-year design storm derived from IDF curves for the city of Gaziantep, Turkey. Peak rainfall intensity is 143.5 mm/hr and the total storm depth is 48.2 mm over 6 hours.

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

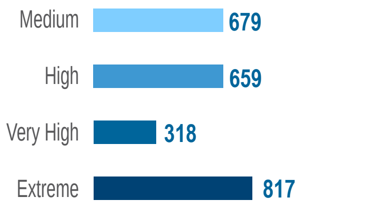
Source: US Department of State, Humanitarian Information Unit, NextView license

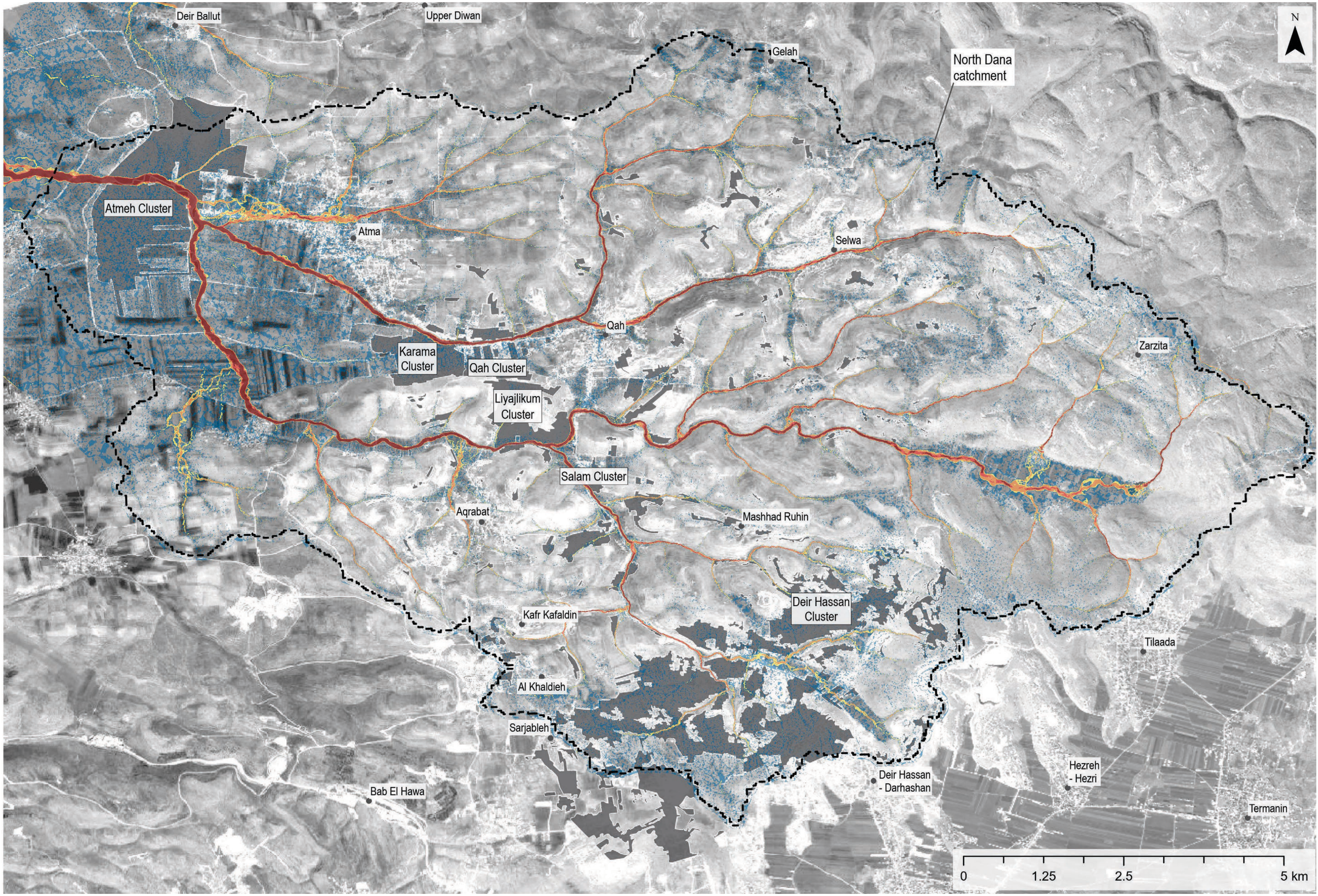
FLOOD HAZARD CLASSIFICATION - CATCHMENT OVERVIEW

2,473

Shelters are exposed to a flood hazard categorized as a medium severity hazard or higher based on modelled depth x velocity

Breakdown of shelter exposure to flood hazards





Camp cluster

Community

Flood hazard classification

- Low
- Medium
- High
- Very High
- Extreme

*Flood hazard classification based on simplified D*V severity grid symbolisation categories by FEMA : Guidance for Flood Risk Analysis and Mapping*

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license

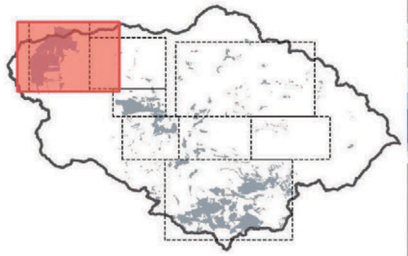
MODELLED FLOOD DEPTH RESULTS - ATMEH CLUSTER

2,113

Shelters lie within the modelled flood extents. Where flood depth exceeds 200mm

Breakdown of shelters within modelled flood extents

0.2 - 0.5m	1,143
0.5 - 1.0m	357
1.0 - 3.0m	490
>3.0m	123



- Shelters flood depth >0.2m
- Shelters (August 2020)
- Camp cluster
- Community

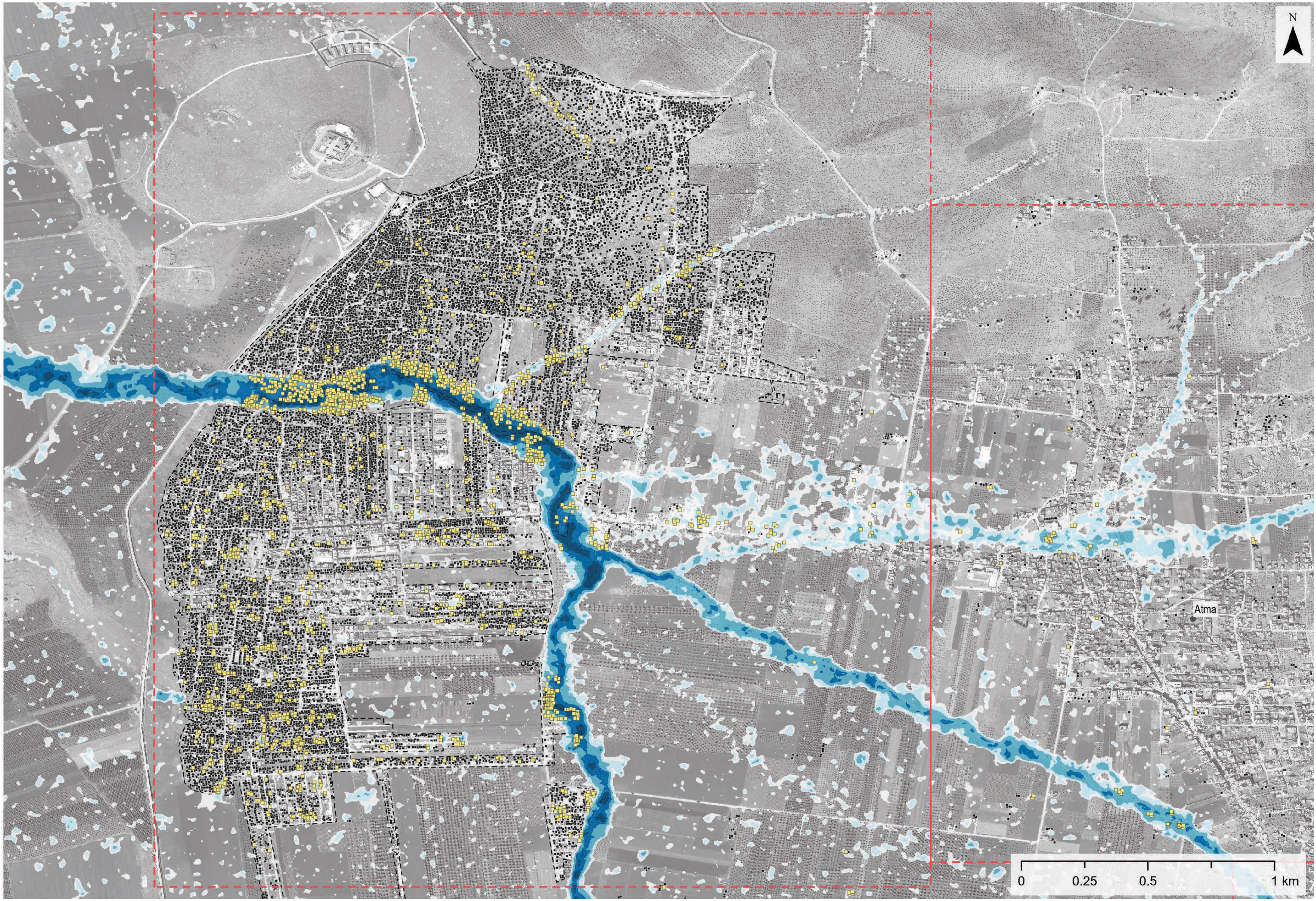
Modelled flood depth (m)

- ≤ 0.2 (not displayed)
- ≤ 0.5
- ≤ 1
- ≤ 2
- ≤ 3
- > 3
- Analysis extent

Modelled flood extents calculated based on 25-year design storm derived from IDF curves for the city of Gaziantep, Turkey. Peak rainfall intensity is 143.5 mm/hr and the total storm depth is 48.2 mm over 6 hours.

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license



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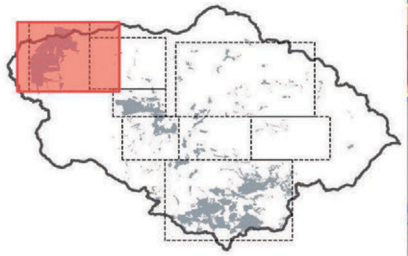
FLOOD HAZARD CLASSIFICATION - ATMEH CLUSTER

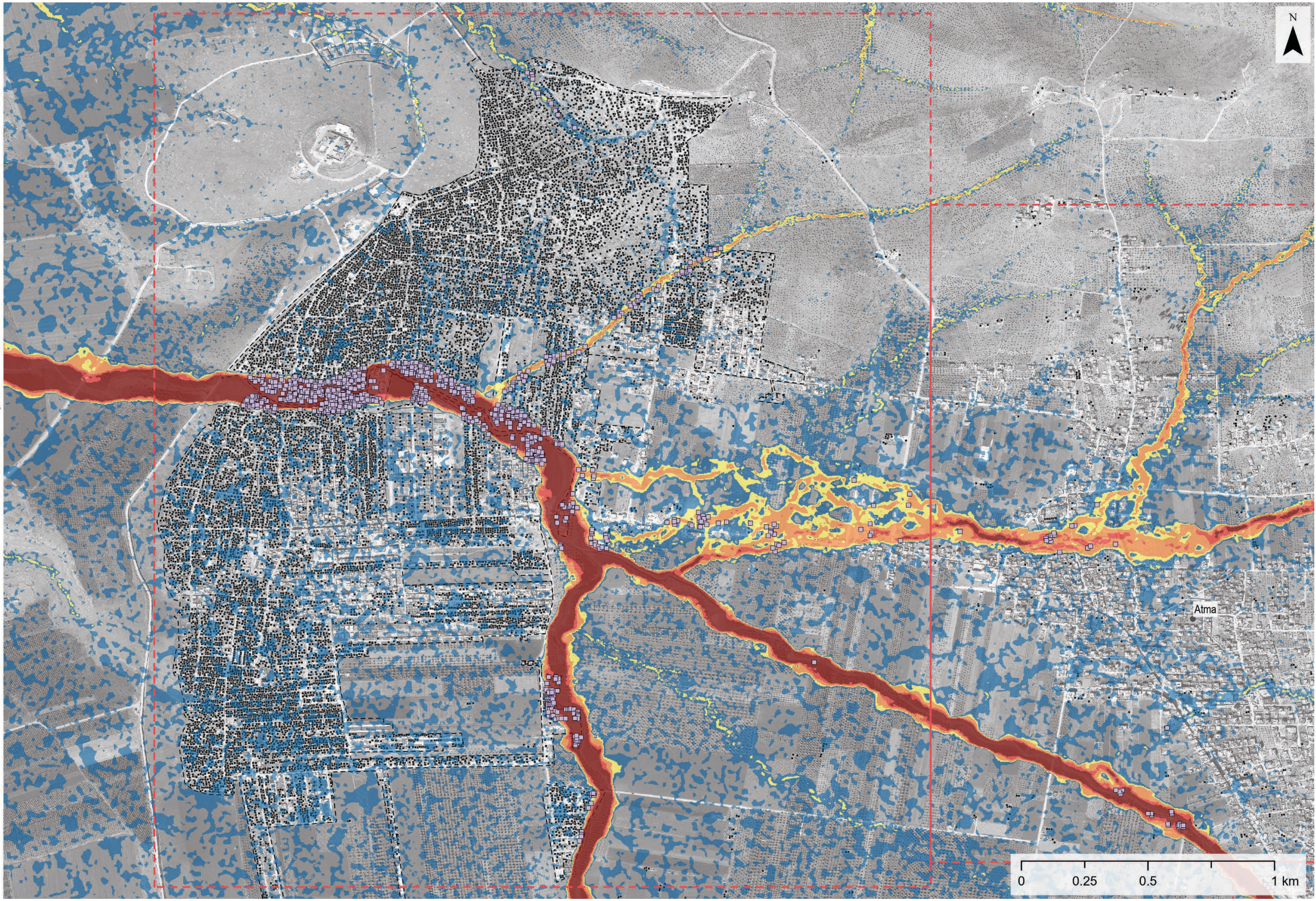
917

Shelters are exposed to a flood hazard categorized as a medium severity hazard or higher based on modelled depth x velocity

Breakdown of shelter exposure to flood hazards

Medium	186
High	217
Very High	117
Extreme	397





Shelters exposed to flood hazard (medium hazard or greater)
Shelters (August 2020)
Camp cluster
Community
Analysis extent

Flood hazard classification
Low
Medium
High
Very High
Extreme

*Flood hazard classification based on simplified D*V severity grid symbolisation categories by FEMA : Guidance for Flood Risk Analysis and Mapping*

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020
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Source: US Department of State, Humanitarian Information Unit, NextView license

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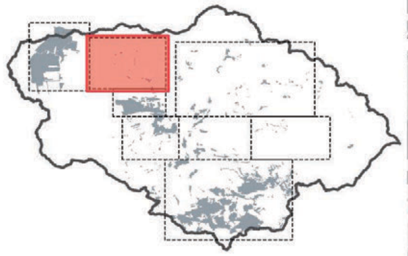
MODELLED FLOOD DEPTH RESULTS - ATMA COMMUNITY

61

Shelters lie within the modelled flood extents. Where flood depth exceeds 200mm

Breakdown of shelters within modelled flood extents

0.2 - 0.5m	26
0.5 - 1.0m	9
1.0 - 3.0m	26
>3.0m	0

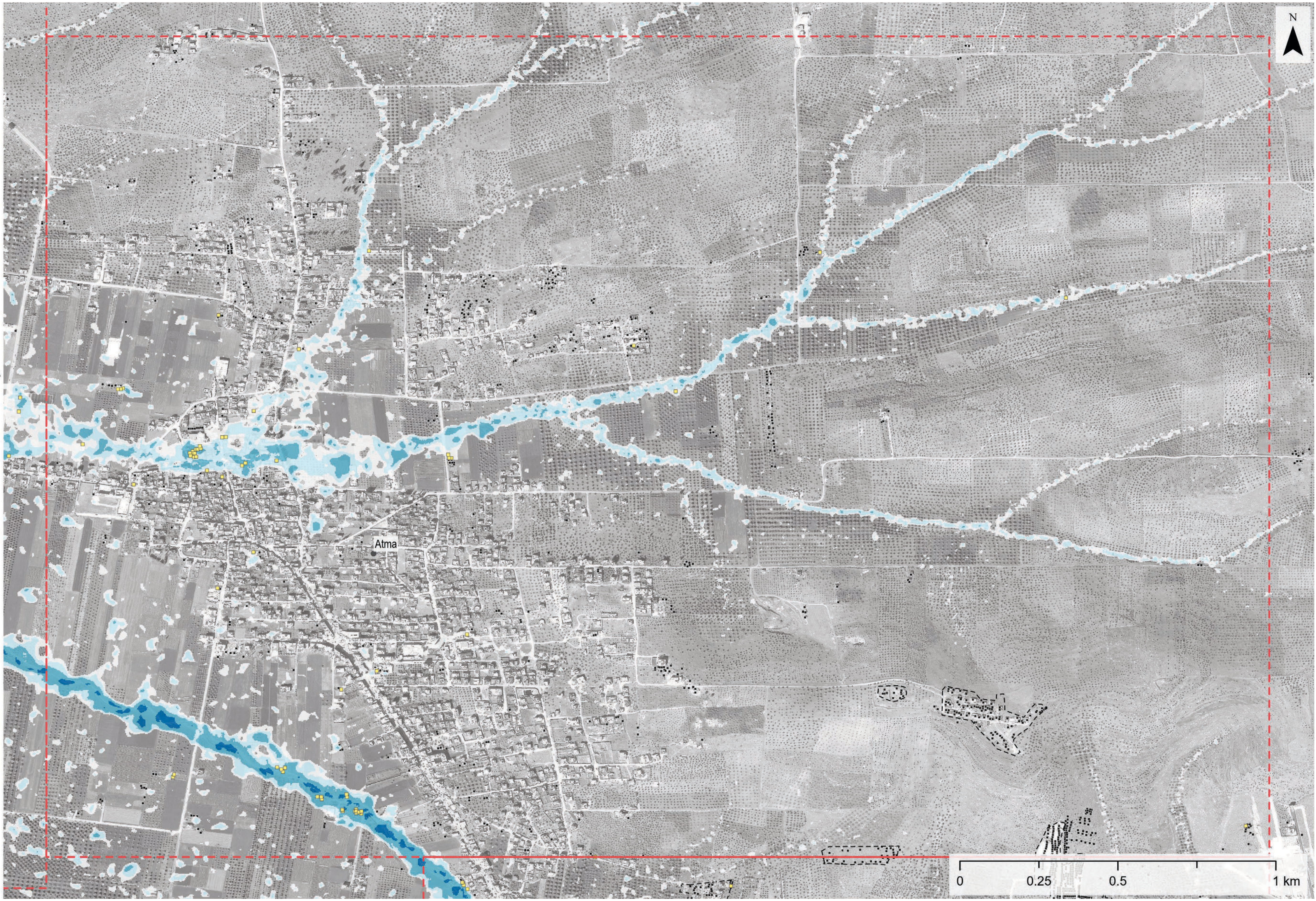


Shelters flood depth >0.2m
Shelters (August 2020)
Camp cluster
Community
Modelled flood depth (m)
≤ 0.2 (not displayed)
≤ 0.5
≤ 1
≤ 2
≤ 3
> 3
Analysis extent

Modelled flood extents calculated based on 25-year design storm derived from IDF curves for the city of Gaziantep, Turkey. Peak rainfall intensity is 143.5 mm/hr and the total storm depth is 48.2 mm over 6 hours.

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license

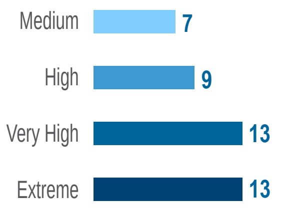


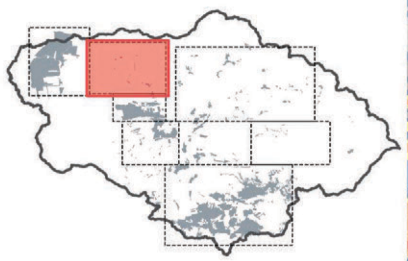
FLOOD HAZARD CLASSIFICATION - ATMA COMMUNITY

42

Shelters are exposed to a flood hazard categorized as a medium severity hazard or higher based on modelled depth x velocity

Breakdown of shelter exposure to flood hazards



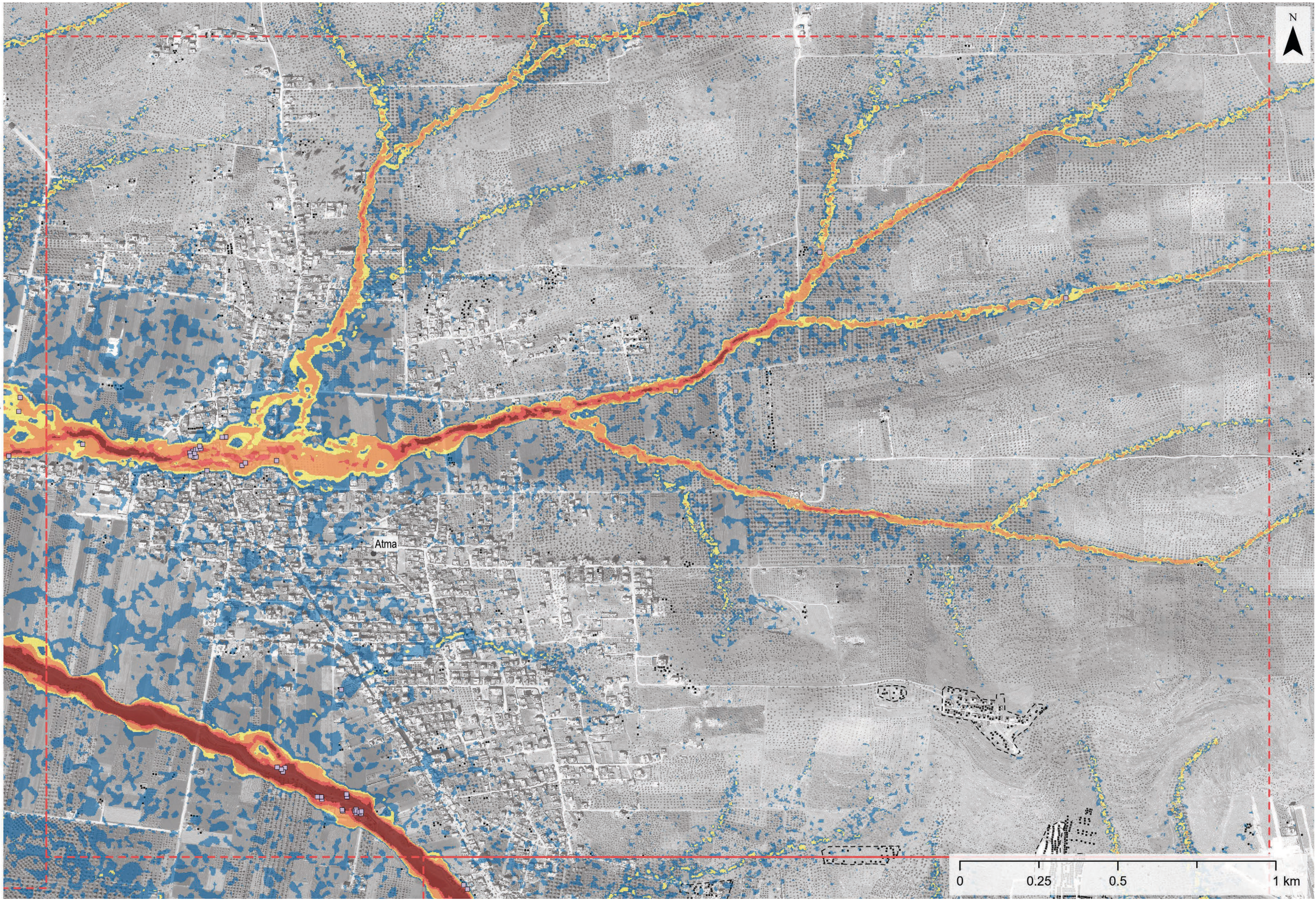


Shelters exposed to flood hazard (medium hazard or greater)
Shelters (August 2020)
Camp cluster
Community
Analysis extent
Flood hazard classification
Low
Medium
High
Very High
Extreme

*Flood hazard classification based on simplified D*V severity grid symbolisation categories by FEMA : [Guidance for Flood Risk Analysis and Mapping]*

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license



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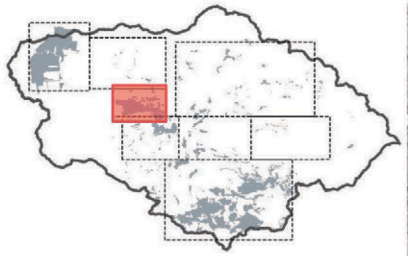
MODELLED FLOOD DEPTH RESULTS - KARAMA/QAH CLUSTERS

1,169

Shelters lie within the modelled flood extents. Where flood depth exceeds 200mm

Breakdown of shelters within modelled flood extents

0.2 - 0.5m	720
0.5 - 1.0m	174
1.0 - 3.0m	268
>3.0m	7

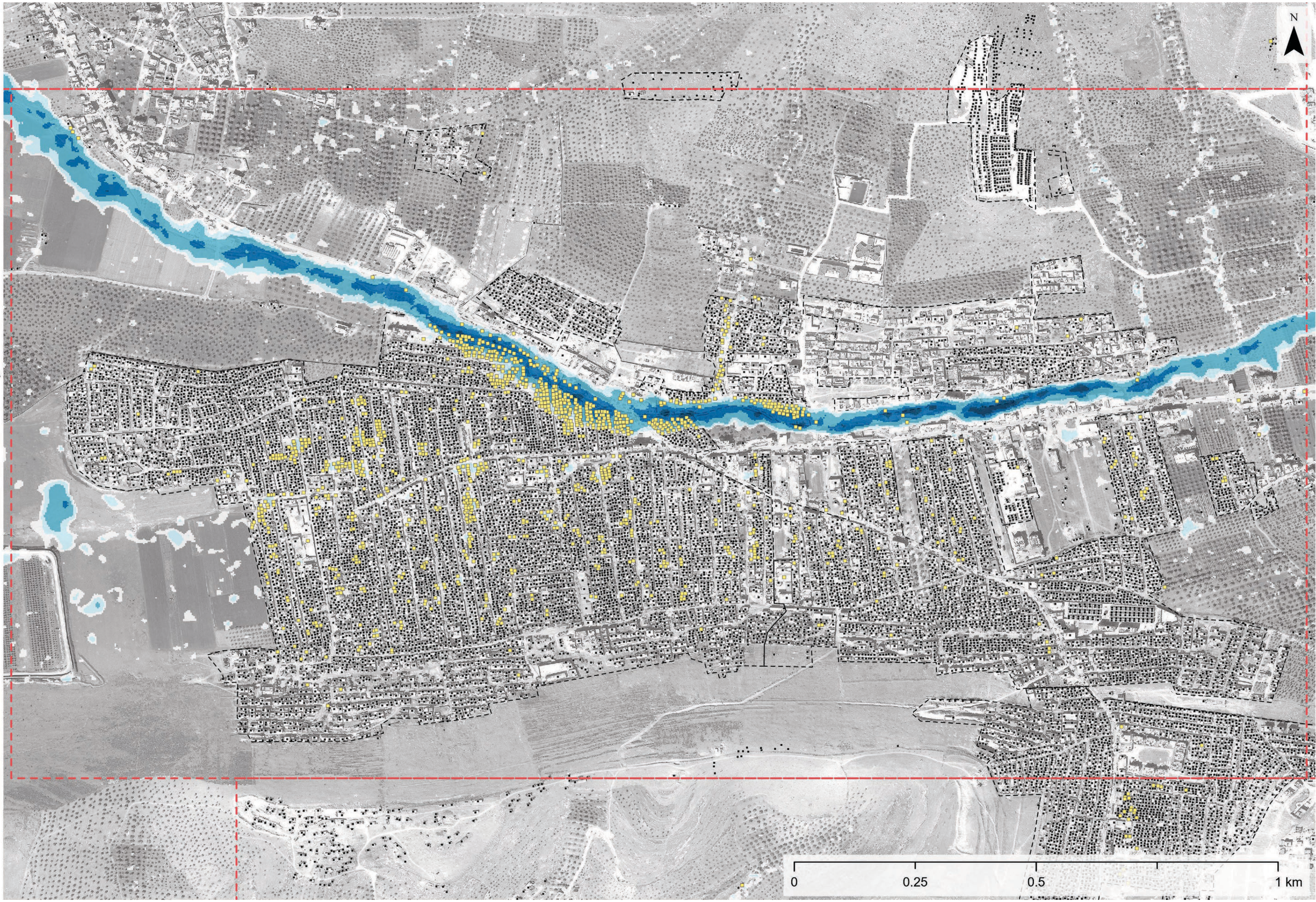


Shelters flood depth >0.2m
Shelters (August 2020)
Camp cluster
Community
Modelled flood depth (m)
≤ 0.2 (not displayed)
≤ 0.5
≤ 1
≤ 2
≤ 3
> 3
Analysis extent

Modelled flood extents calculated based on 25-year design storm derived from IDF curves for the city of Gaziantep, Turkey. Peak rainfall intensity is 143.5 mm/hr and the total storm depth is 48.2 mm over 6 hours.

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license



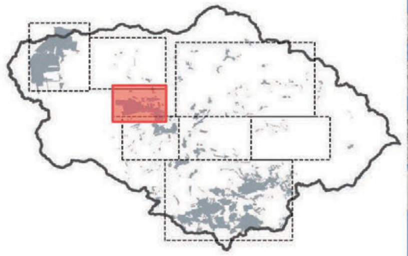
FLOOD HAZARD CLASSIFICATION - KARAMA/QAH CLUSTERS

420

Shelters are exposed to a flood hazard categorized as a medium severity hazard or higher based on modelled depth x velocity

Breakdown of shelter exposure to flood hazards

Medium	70
High	102
Very High	51
Extreme	197



- Shelters exposed to flood hazard (medium hazard or greater)
- Shelters (August 2020)
- Camp cluster
- Community
- Analysis extent

Flood hazard classification
- Low
- Medium
- High
- Very High
- Extreme

*Flood hazard classification based on simplified D*V severity grid symbolisation categories by FEMA : [Guidance for Flood Risk Analysis and Mapping]*

*Satellite imagery:
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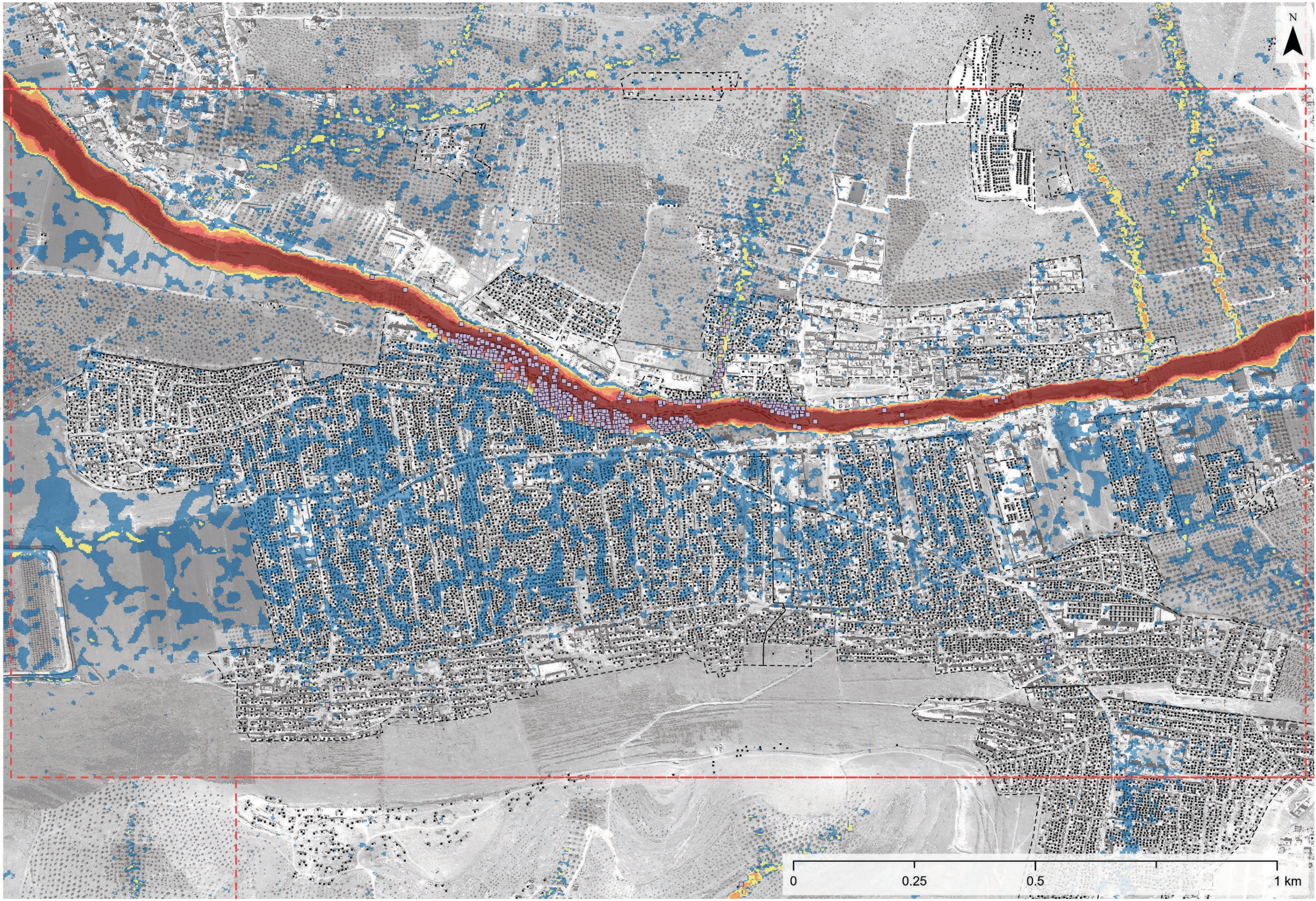

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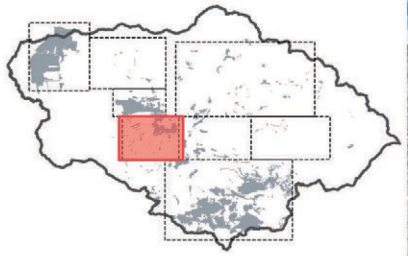
MODELLED FLOOD DEPTH RESULTS - LIYAJLIKUM CLUSTER

543

Shelters lie within the modelled flood extents. Where flood depth exceeds 200mm

Breakdown of shelters within modelled flood extents

0.2 - 0.5m	164
0.5 - 1.0m	112
1.0 - 3.0m	249
>3.0m	18



- Shelters flood depth >0.2m
- Shelters (August 2020)
- Camp cluster
- Community

Modelled flood depth (m)

- ≤ 0.2 (not displayed)
- ≤ 0.5
- ≤ 1
- ≤ 2
- ≤ 3
- > 3
- Analysis extent

Modelled flood extents calculated based on 25-year design storm derived from IDF curves for the city of Gaziantep, Turkey. Peak rainfall intensity is 143.5 mm/hr and the total storm depth is 48.2 mm over 6 hours.

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license

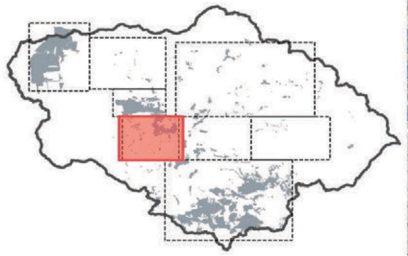
FLOOD HAZARD CLASSIFICATION - LIYAJLIKUM CLUSTER

426

Shelters are exposed to a flood hazard categorized as a medium severity hazard or higher based on modelled depth x velocity

Breakdown of shelter exposure to flood hazards

Hazard	Shelters
Medium	95
High	118
Very High	75
Extreme	138



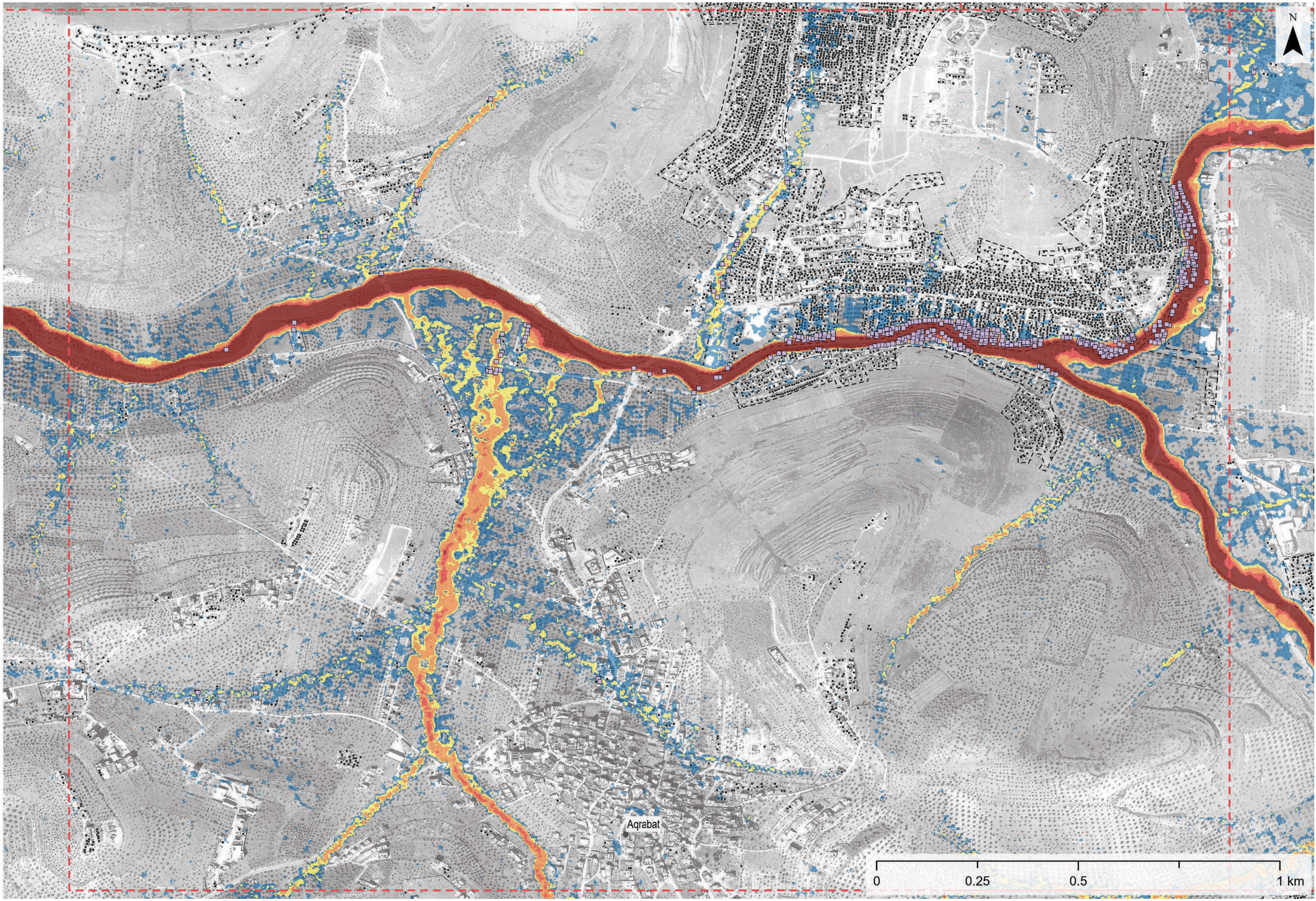
Shelters exposed to flood hazard (medium hazard or greater)
Shelters (August 2020)
Camp cluster
Community
Analysis extent

Flood hazard classification
- Low
- Medium
- High
- Very High
- Extreme

*Flood hazard classification based on simplified D*V severity grid symbolisation categories by FEMA : [Guidance for Flood Risk Analysis and Mapping]*

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license



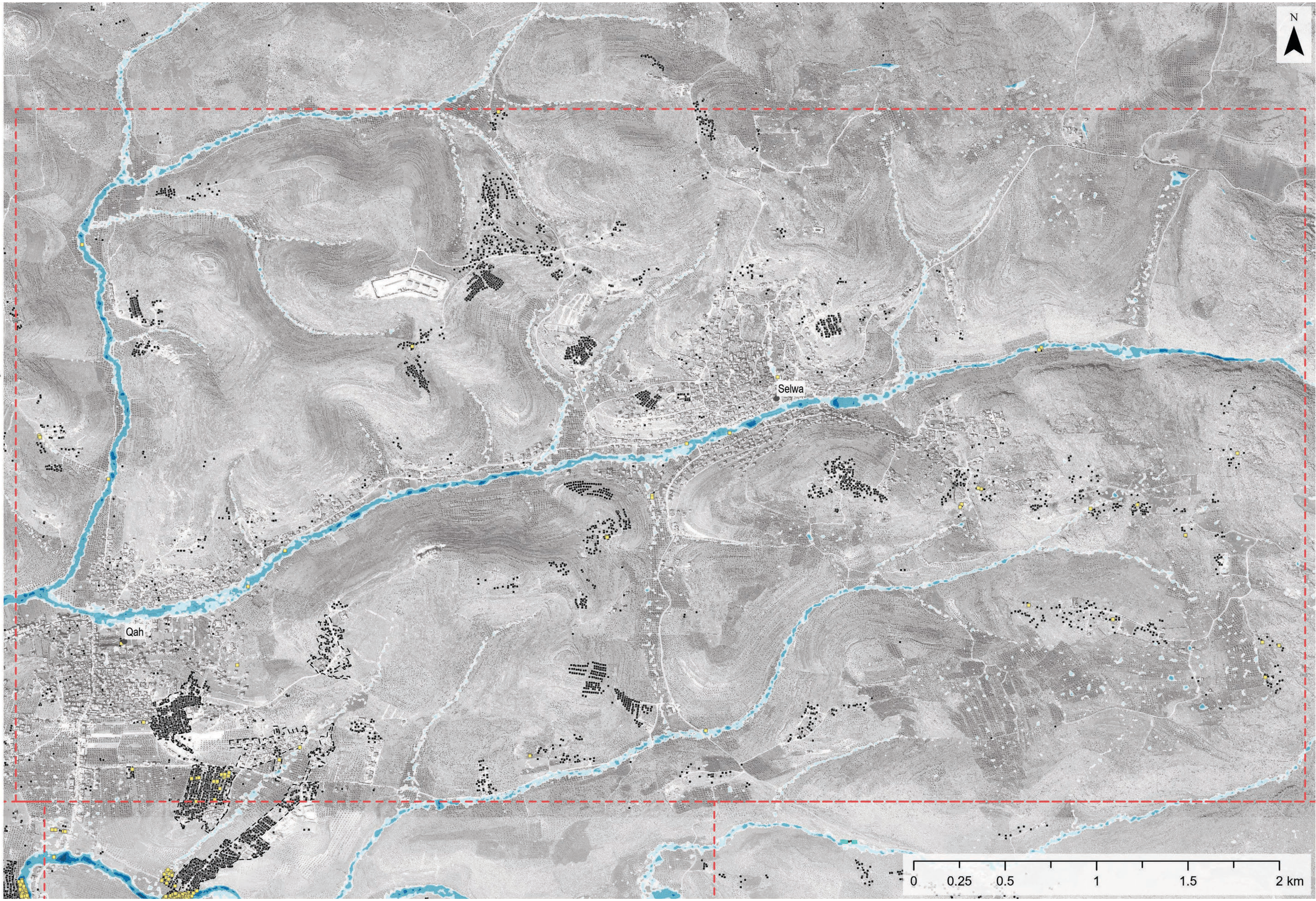
MODELLED FLOOD DEPTH RESULTS - QAH/SELWA COMMUNITY

53

Shelters lie within the modelled flood extents. Where flood depth exceeds 200mm

Breakdown of shelters within modelled flood extents

0.2 - 0.5m	40
0.5 - 1.0m	10
1.0 - 3.0m	3
>3.0m	0



Shelters flood depth >0.2m
Shelters (August 2020)
Camp cluster
Community
Modelled flood depth (m)
≤ 0.2 (not displayed)
≤ 0.5
≤ 1
≤ 2
≤ 3
> 3
Analysis extent

Modelled flood extents calculated based on 25-year design storm derived from IDF curves for the city of Gaziantep, Turkey. Peak rainfall intensity is 143.5 mm/hr and the total storm depth is 48.2 mm over 6 hours.

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020
Copyright: © 2020 DigitalGlobe
Source: US Department of State, Humanitarian Information Unit, NextView license

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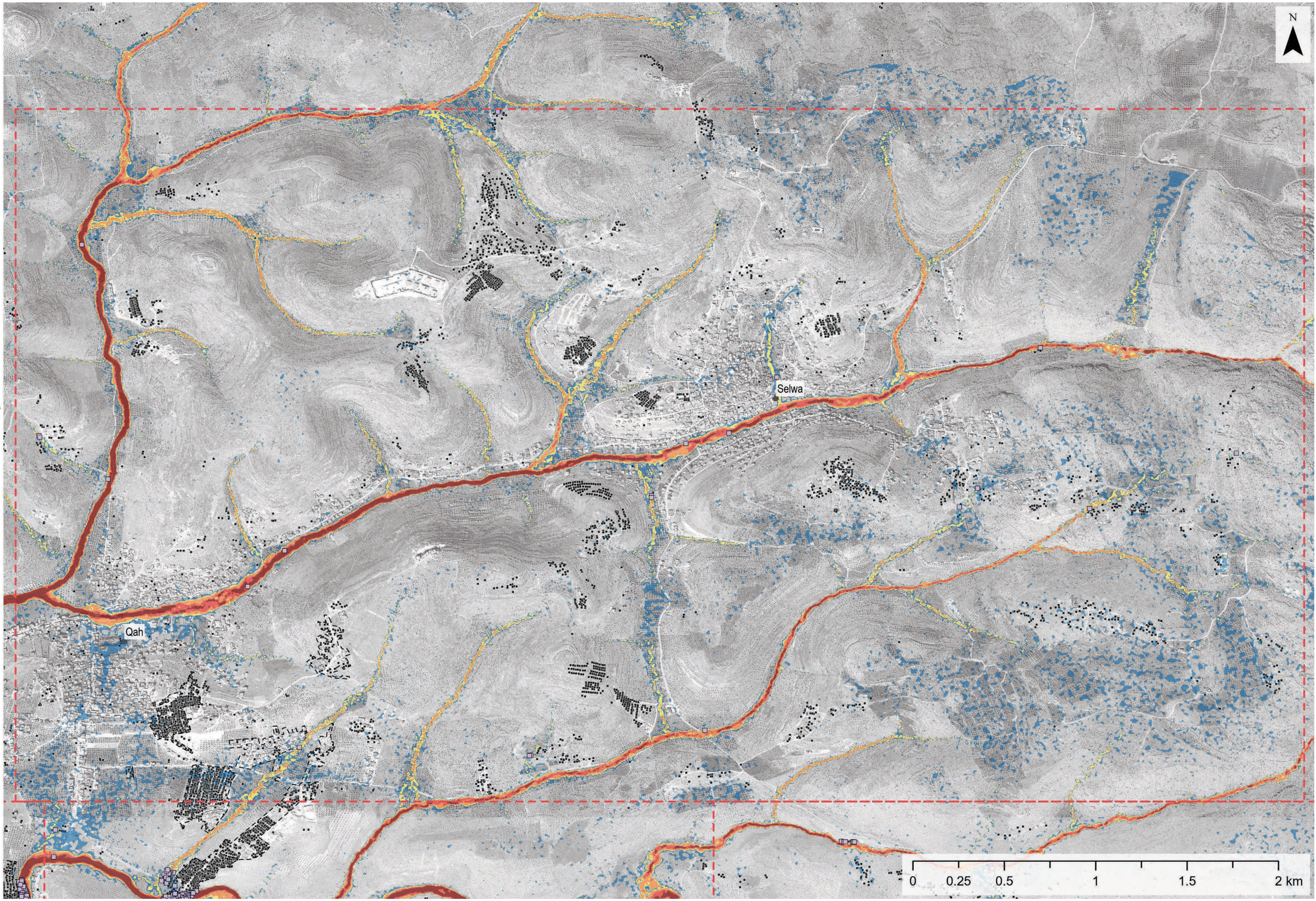
FLOOD HAZARD CLASSIFICATION - QAH/SELWA COMMUNITY

21

Shelters are exposed to a flood hazard categorized as a medium severity hazard or higher based on modelled depth x velocity

Breakdown of shelter exposure to flood hazards

Medium	12
High	4
Very High	2
Extreme	3



Shelters exposed to flood hazard (medium hazard or greater)
Shelters (August 2020)
Camp cluster
Community
Analysis extent
Flood hazard classification
Low
Medium
High
Very High
Extreme

*Flood hazard classification based on simplified D*V severity grid symbolisation categories by FEMA : [Guidance for Flood Risk Analysis and Mapping]*

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license

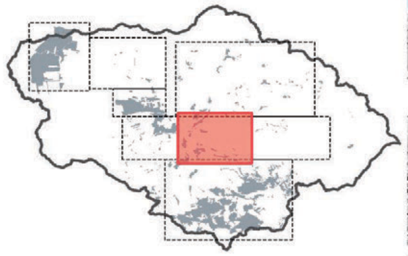
MODELLED FLOOD DEPTH RESULTS - SALAM CLUSTER

292

Shelters lie within the modelled flood extents. Where flood depth exceeds 200mm

Breakdown of shelters within modelled flood extents

0.2 - 0.5m	100
0.5 - 1.0m	82
1.0 - 3.0m	109
>3.0m	1



- Shelters flood depth >0.2m
- Shelters (August 2020)
- Camp cluster
- Community

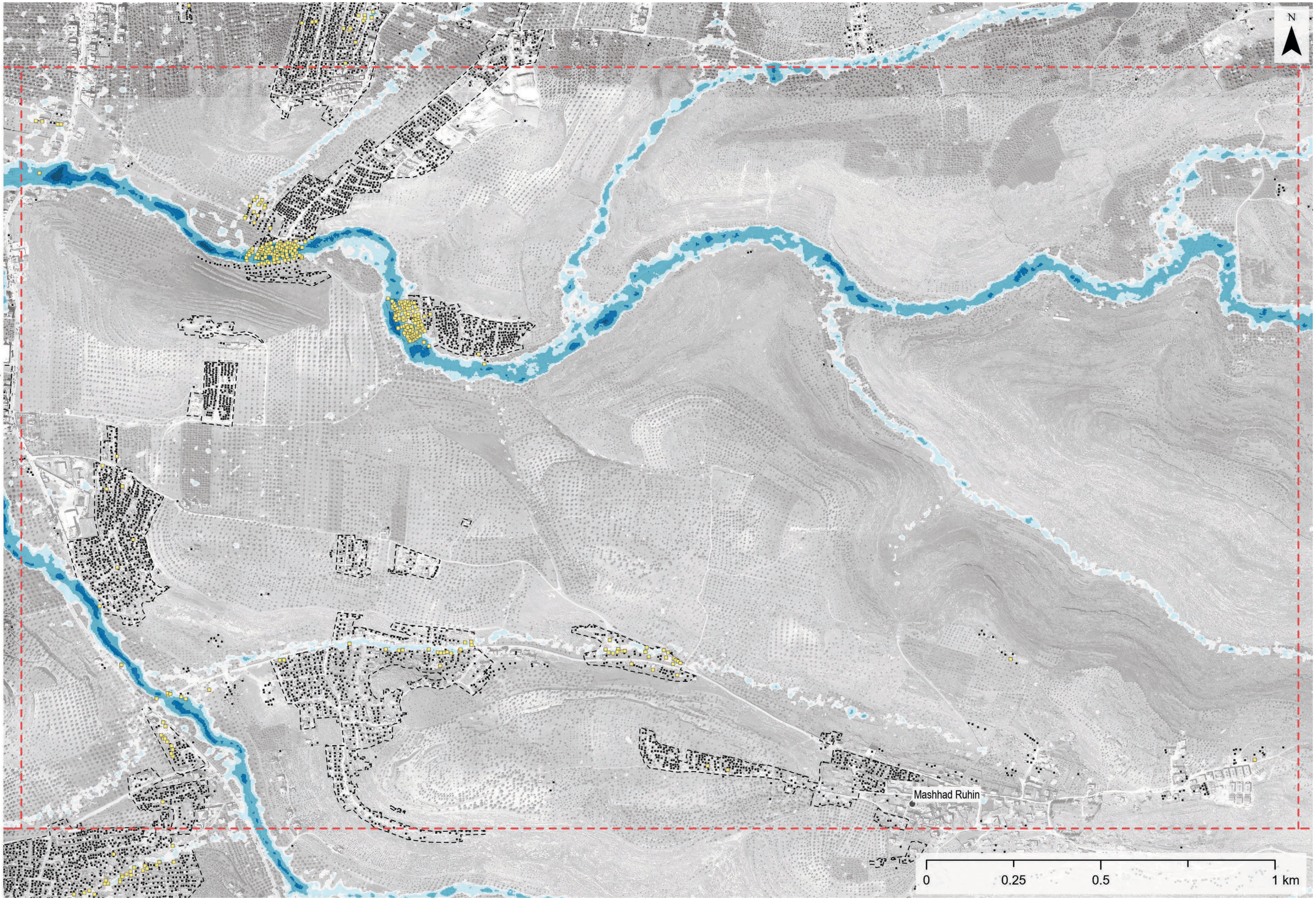
Modelled flood depth (m)

- ≤ 0.2 (not displayed)
- ≤ 0.5
- ≤ 1
- ≤ 2
- ≤ 3
- > 3
- Analysis extent

Modelled flood extents calculated based on 25-year design storm derived from IDF curves for the city of Gaziantep, Turkey. Peak rainfall intensity is 143.5 mm/hr and the total storm depth is 48.2 mm over 6 hours.

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license



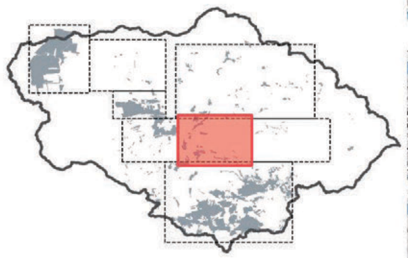
FLOOD HAZARD CLASSIFICATION - SALAM CLUSTER

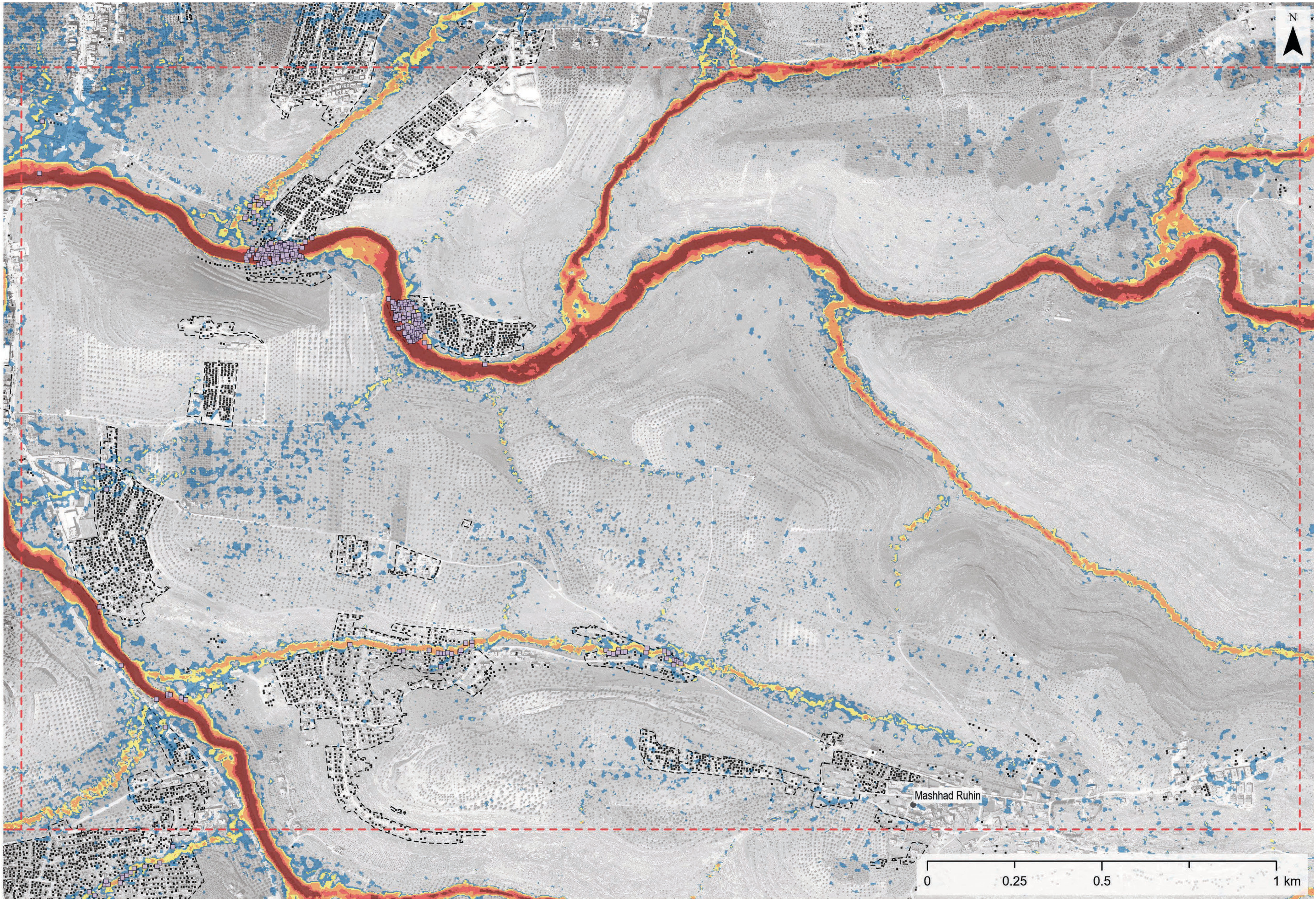
254

Shelters are exposed to a flood hazard categorized as a medium severity hazard or higher based on modelled depth x velocity

Breakdown of shelter exposure to flood hazards

Medium	60
High	91
Very High	38
Extreme	65





- Shelters exposed to flood hazard (medium hazard or greater)
- Shelters (August 2020)
- Camp cluster
- Community
- Analysis extent

Flood hazard classification

- Low
- Medium
- High
- Very High
- Extreme

*Flood hazard classification based on simplified D*V severity grid symbolisation categories by FEMA : Guidance for Flood Risk Analysis and Mapping*

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license

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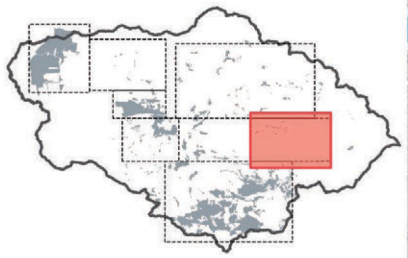
MODELLED FLOOD DEPTH RESULTS - MASHHAD RUHIN EAST

34

Shelters lie within the modelled flood extents. Where flood depth exceeds 200mm

Breakdown of shelters within modelled flood extents

0.2 - 0.5m	20
0.5 - 1.0m	5
1.0 - 3.0m	9
>3.0m	0

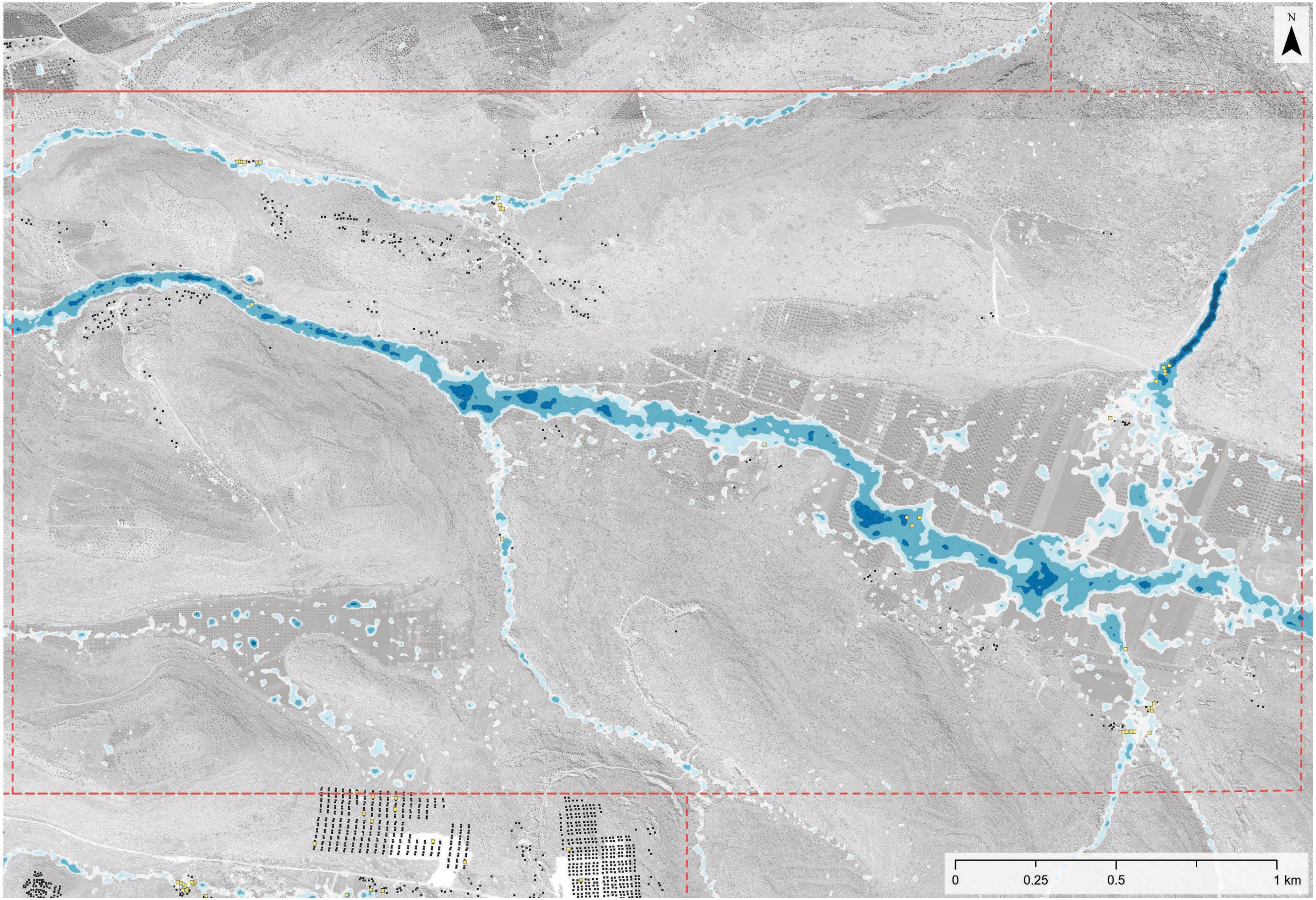


Shelters flood depth >0.2m
Shelters (August 2020)
Camp cluster
Community
Modelled flood depth (m)
≤ 0.2 (not displayed)
≤ 0.5
≤ 1
≤ 2
≤ 3
> 3
Analysis extent

Modelled flood extents calculated based on 25-year design storm derived from IDF curves for the city of Gaziantep, Turkey. Peak rainfall intensity is 143.5 mm/hr and the total storm depth is 48.2 mm over 6 hours.

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license

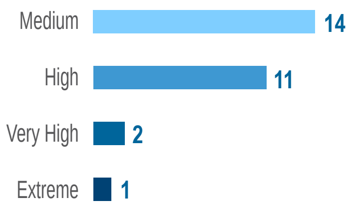


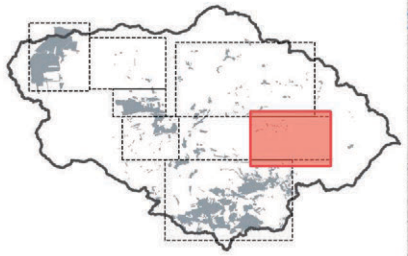
FLOOD HAZARD CLASSIFICATION - MASHHAD RUHIN EAST

28

Shelters are exposed to a flood hazard categorized as a medium severity hazard or higher based on modelled depth x velocity

Breakdown of shelter exposure to flood hazards





- Shelters exposed to flood hazard (medium hazard or greater)
- Shelters (August 2020)
- Camp cluster
- Community
- Analysis extent

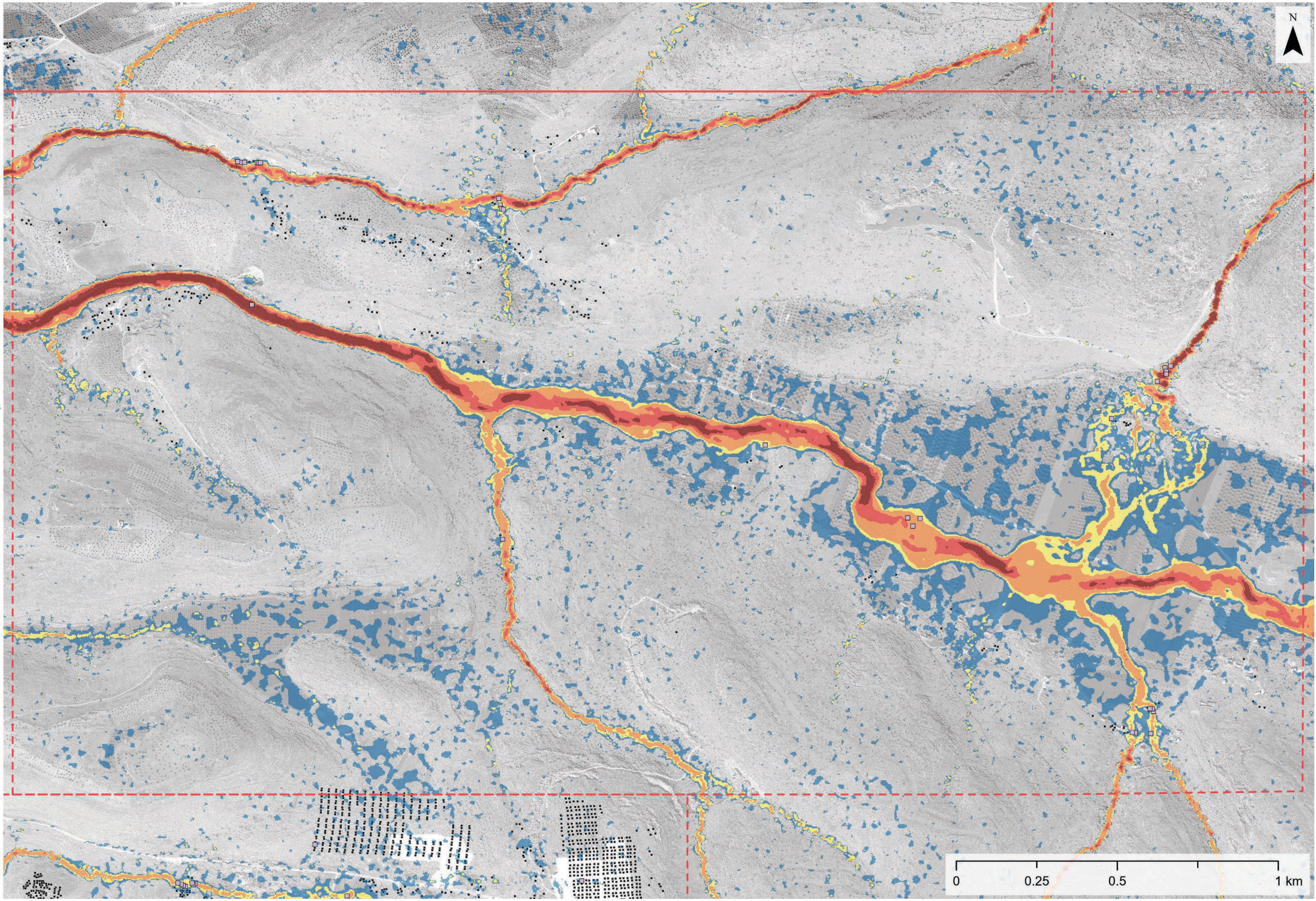
Flood hazard classification

- Low
- Medium
- High
- Very High
- Extreme

*Flood hazard classification based on simplified D*V severity grid symbolisation categories by FEMA : [Guidance for Flood Risk Analysis and Mapping]*

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license



MODELLED FLOOD DEPTH RESULTS - DEIR HASSAN CLUSTER

1,410

Shelters lie within the modelled flood extents. Where flood depth exceeds 200mm

Breakdown of shelters within modelled flood extents

0.2 - 0.5m	1024
0.5 - 1.0m	298
1.0 - 3.0m	85
>3.0m	3

- Shelters flood depth >0.2m
- Shelters (August 2020)
- Camp cluster
- Community

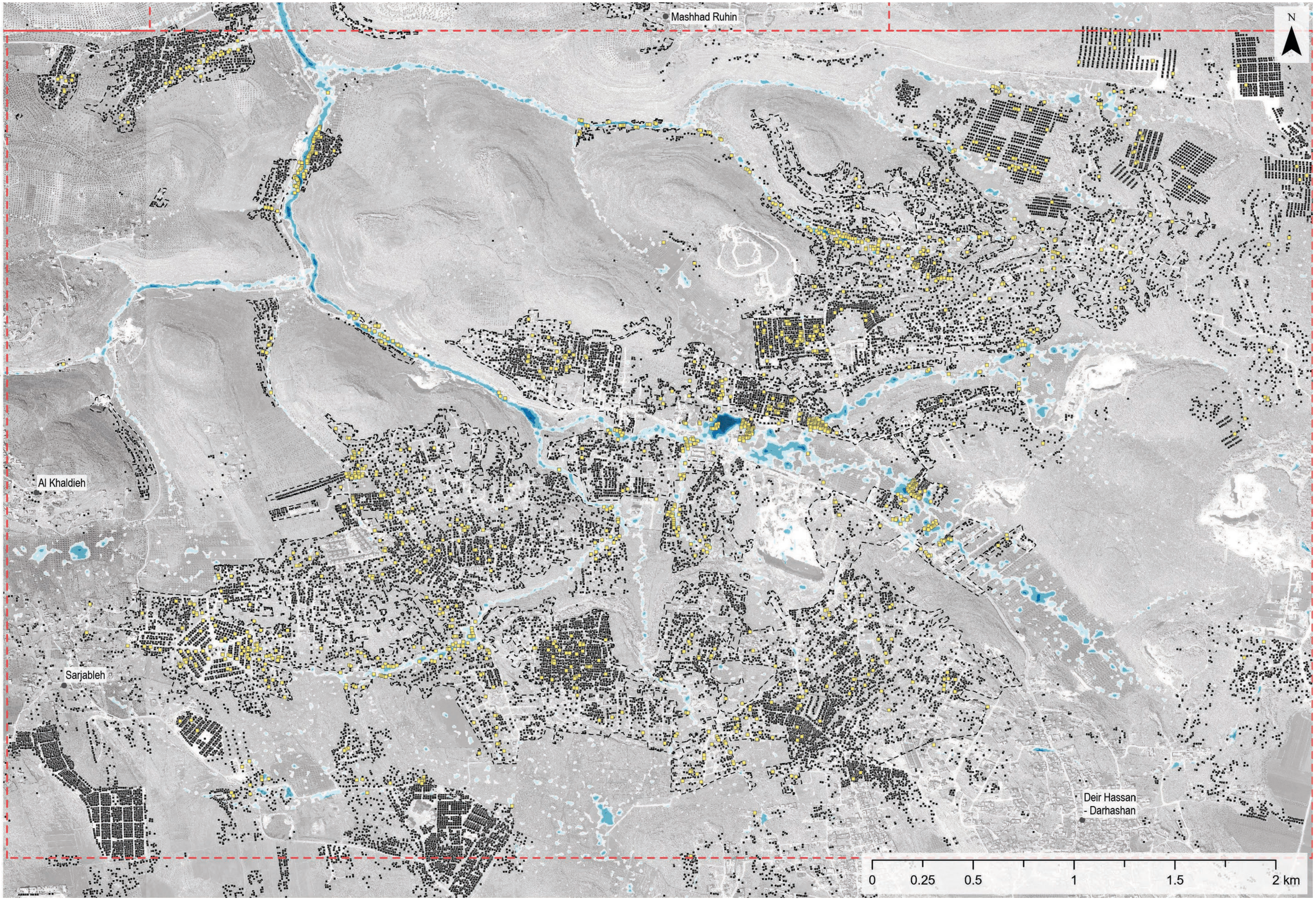
Modelled flood depth (m)

- ≤ 0.2 (not displayed)
- ≤ 0.5
- ≤ 1
- ≤ 2
- ≤ 3
- > 3
- Analysis extent

Modelled flood extents calculated based on 25-year design storm derived from IDF curves for the city of Gaziantep, Turkey. Peak rainfall intensity is 143.5 mm/hr and the total storm depth is 48.2 mm over 6 hours.

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license



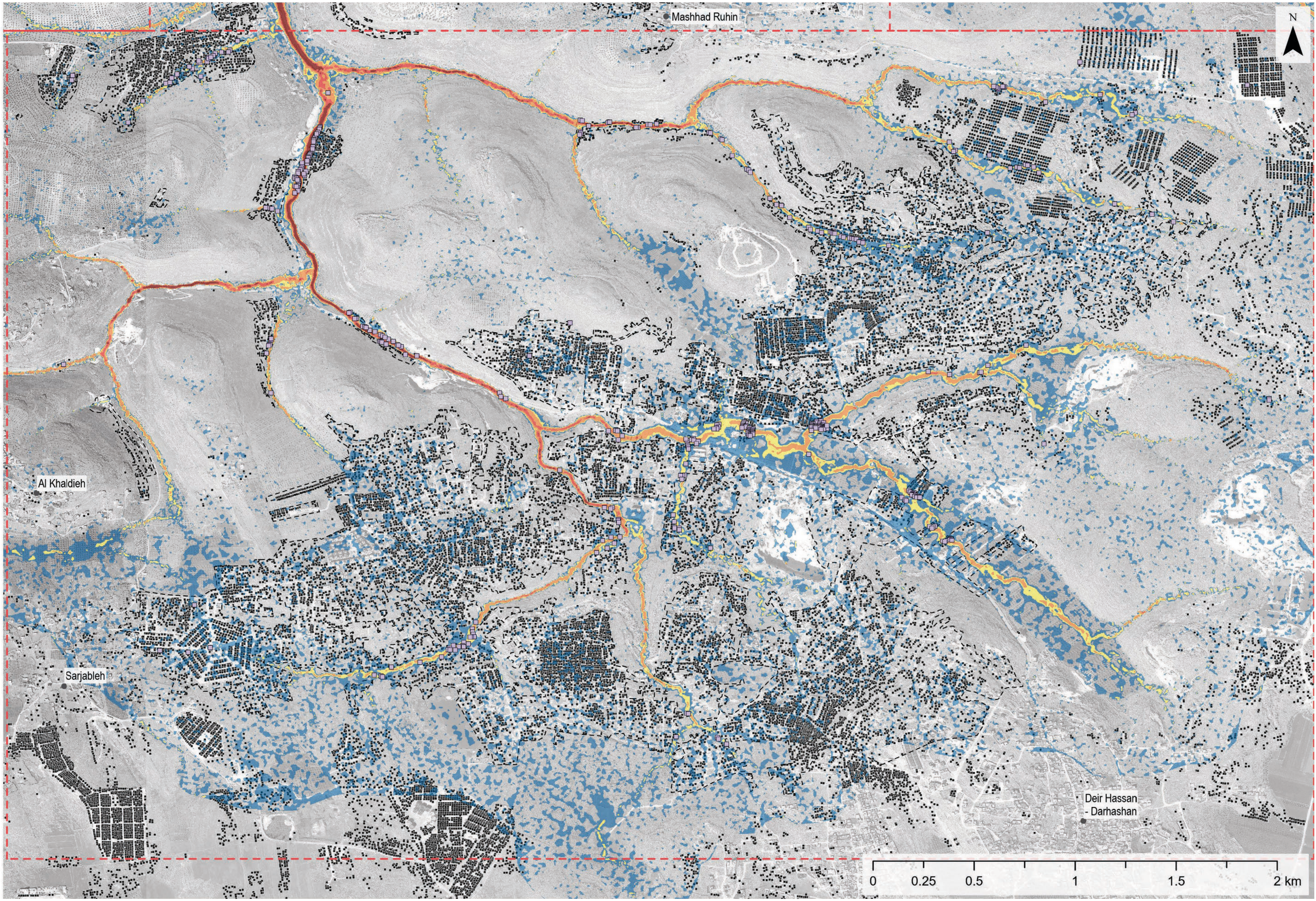
FLOOD HAZARD CLASSIFICATION - DEIR HASSAN CLUSTER

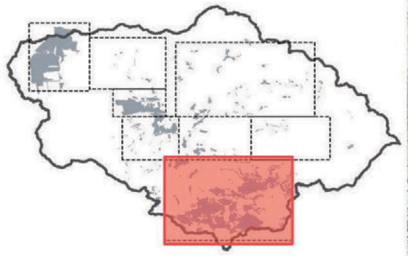
359

Shelters are exposed to a flood hazard categorized as a medium severity hazard or higher based on modelled depth x velocity

Breakdown of shelter exposure to flood hazards

Medium	229
High	107
Very High	20
Extreme	3





Shelters exposed to flood hazard (medium hazard or greater)

Shelters (August 2020)

Camp cluster

Community

Analysis extent

Flood hazard classification

Low

Medium

High

Very High

Extreme

*Flood hazard classification based on simplified D*V severity grid symbolisation categories by FEMA : Guidance for Flood Risk Analysis and Mapping*

Satellite imagery:
WV01 from 26 February 2020
GE01 from 8 March 2020

Source: US Department of State, Humanitarian Information Unit, NextView license