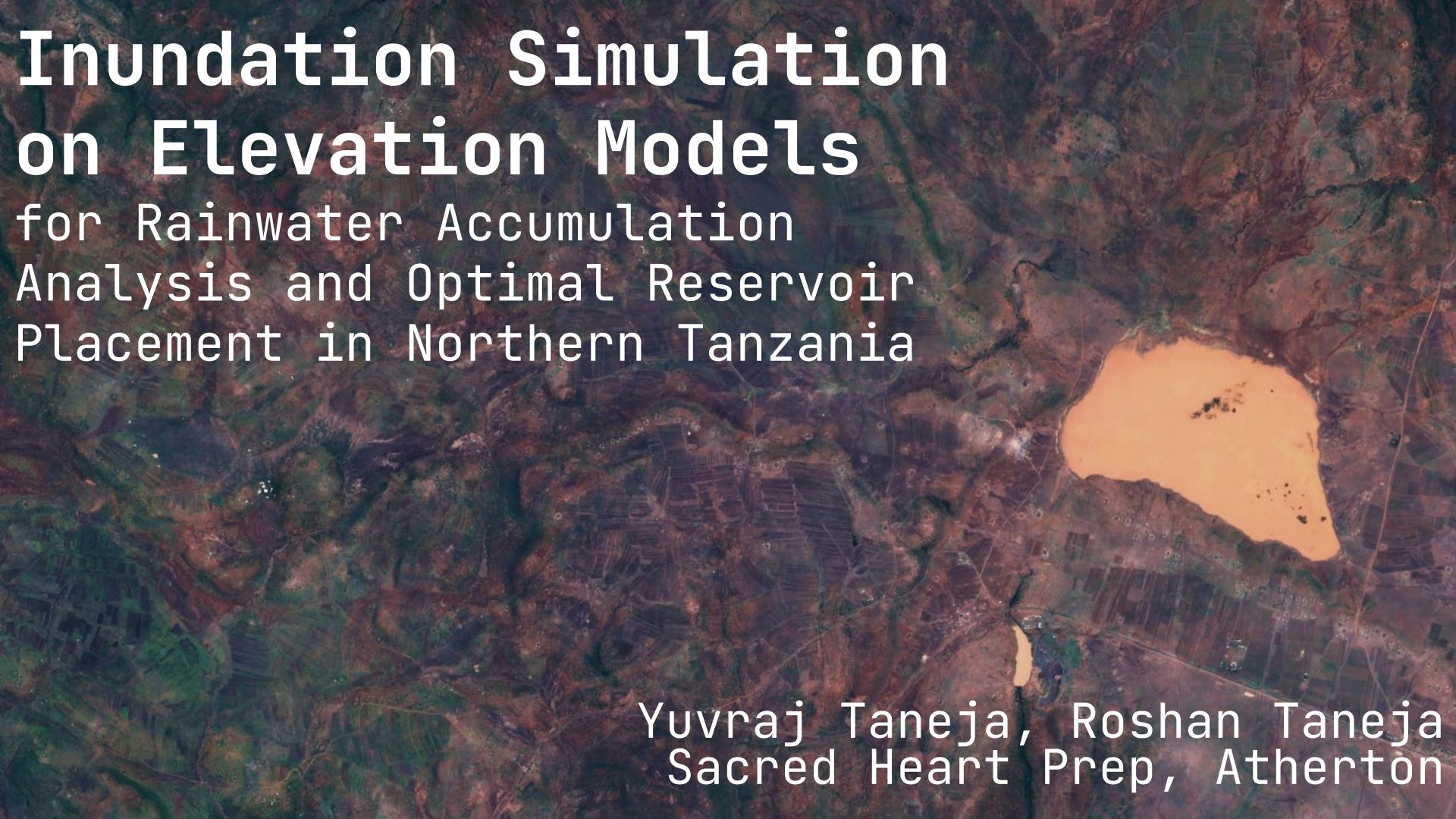


Inundation Simulation on Elevation Models

for Rainwater Accumulation
Analysis and Optimal Reservoir
Placement in Northern Tanzania

An aerial satellite image of a rural landscape in Northern Tanzania. The terrain is characterized by numerous small, rectangular agricultural plots in shades of green and brown. A large, irregularly shaped body of water, colored in a bright orange or yellow hue, is visible on the right side of the frame. The surrounding land appears dry and brownish in color.

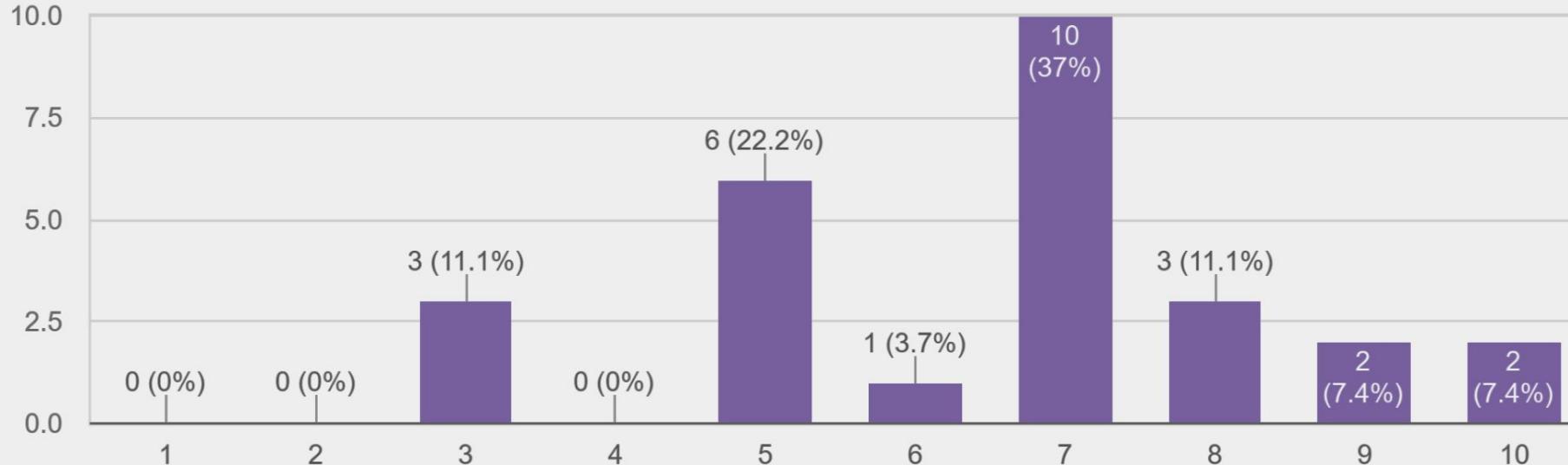
Yuvraj Taneja, Roshan Taneja
Sacred Heart Prep, Atherton



Situation in Monduli, Tanzania

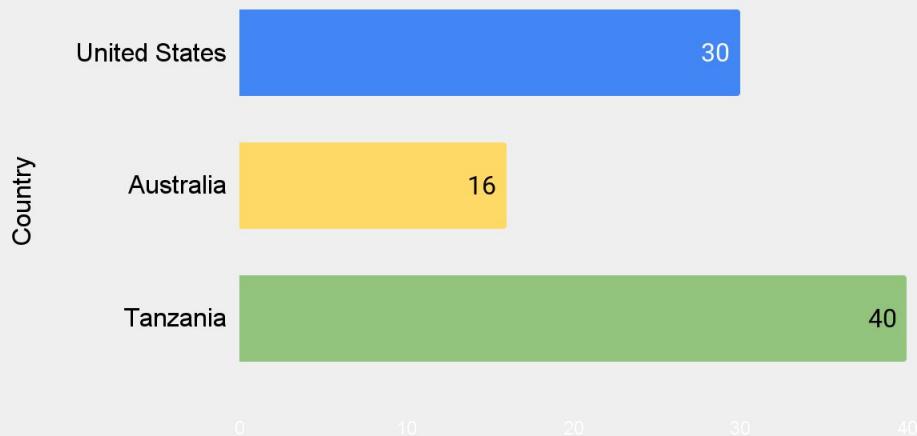


Time Spent walking for water (Hours)

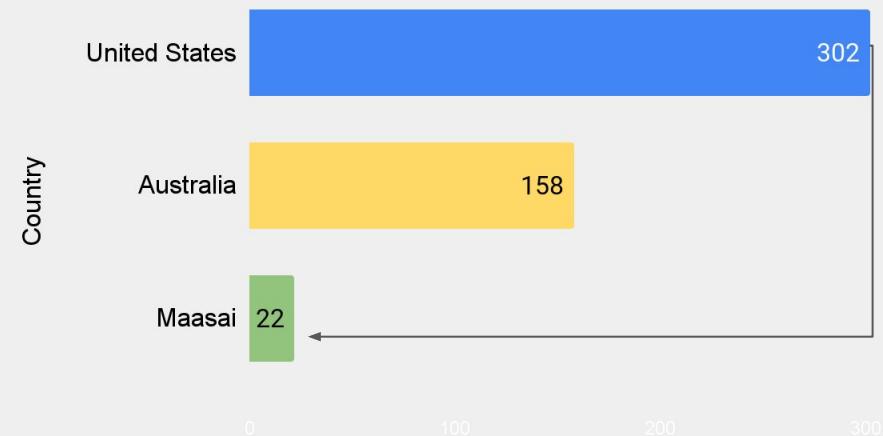


Amount of water is not the challenge; Collection is.

Annual Rainfall (in)

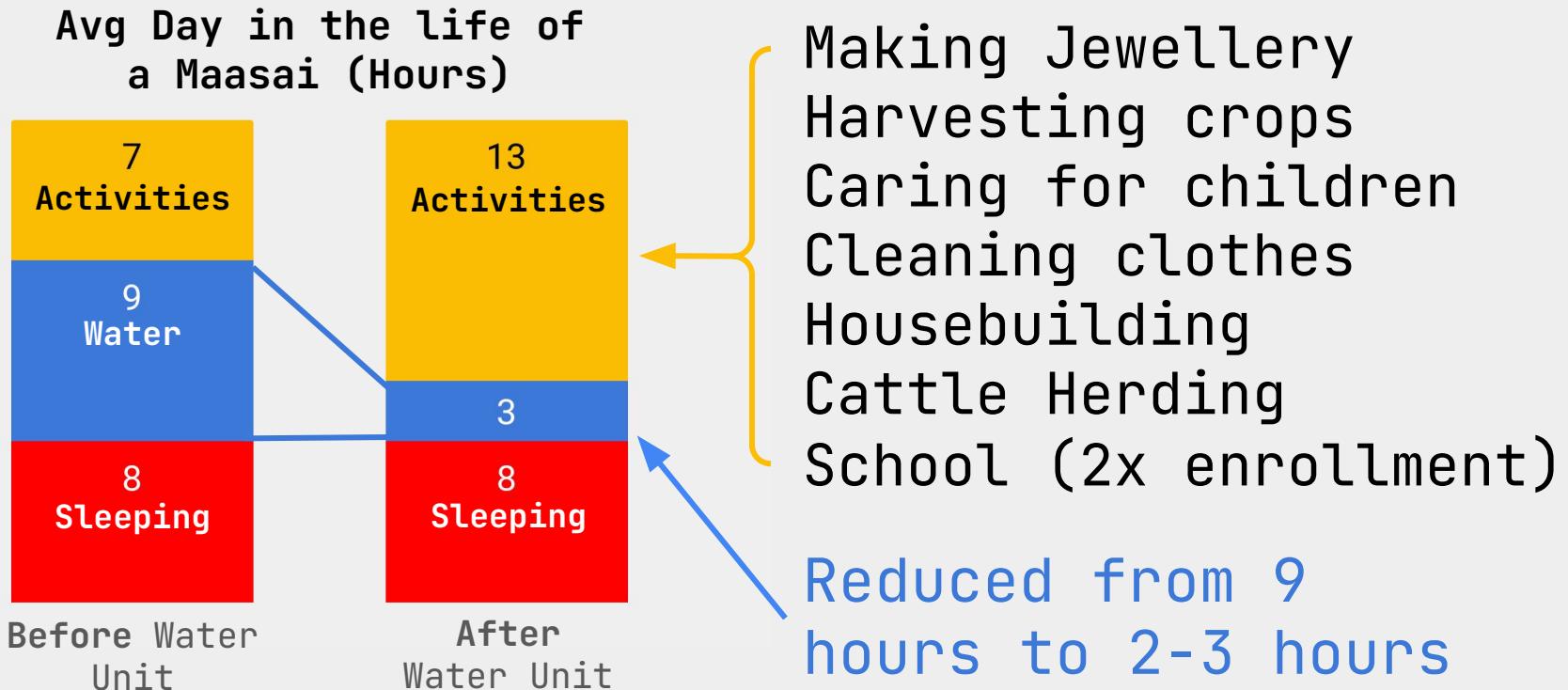


Water Consumption Per Capita Per Day (L)





Impact of Water Harvesting Unit

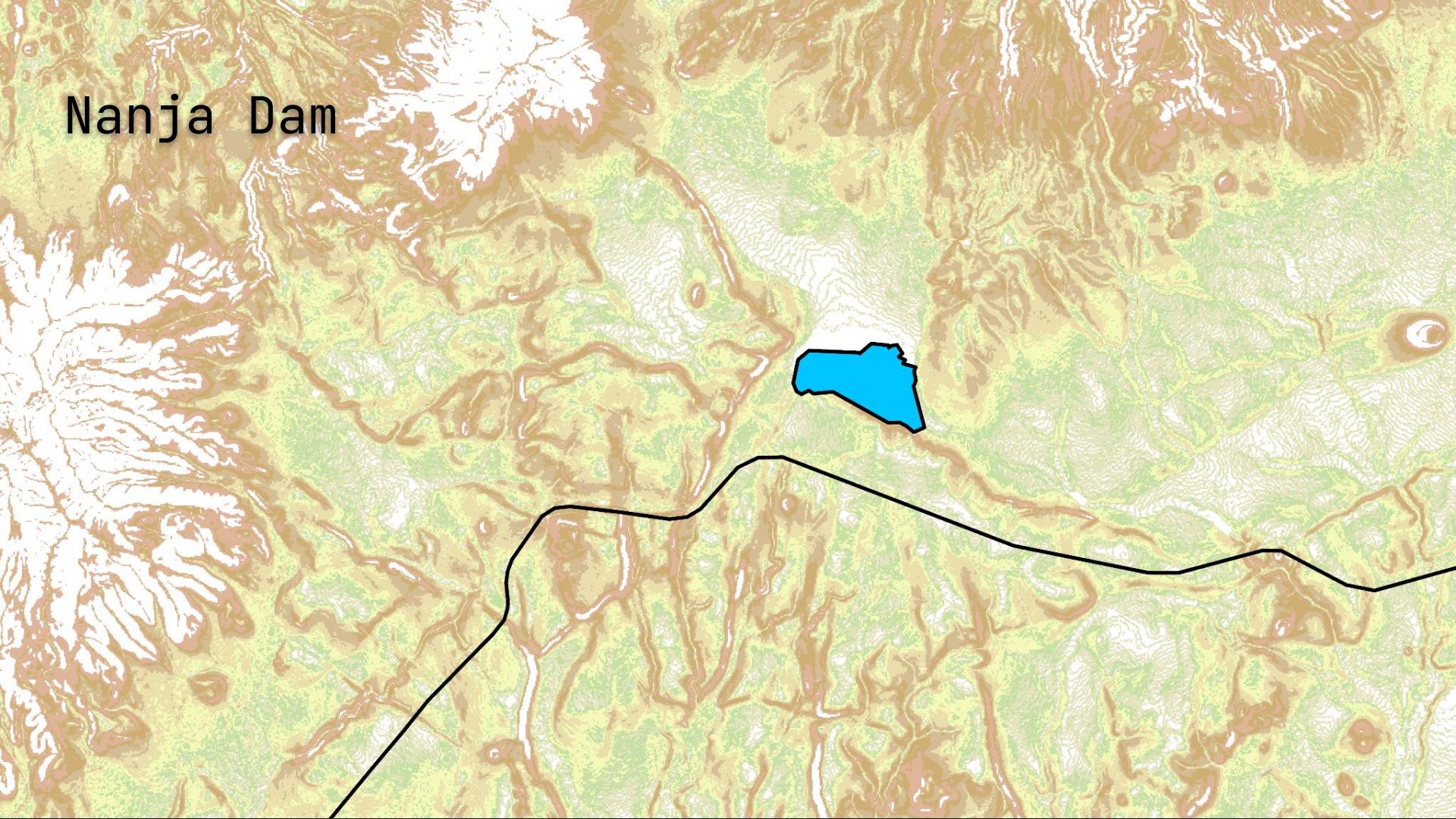


Source: Survey Representing 500+ Maasai members [40+ interviews]

Monduli, Tanzania



Nanja Dam



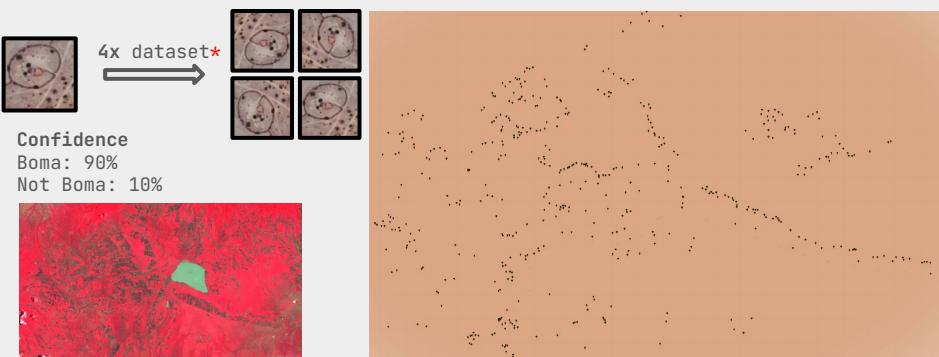
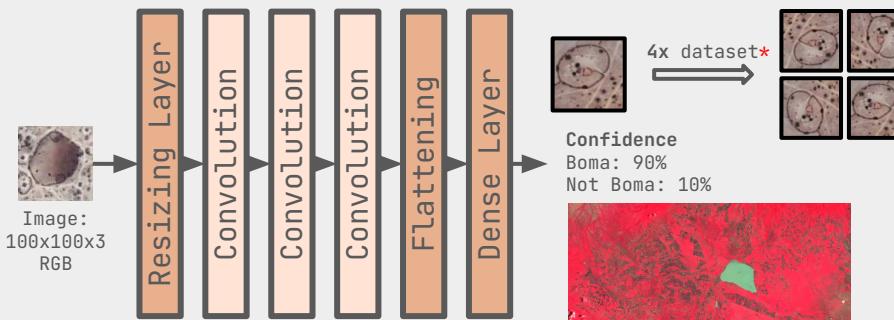
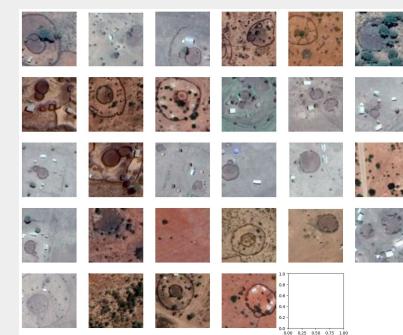
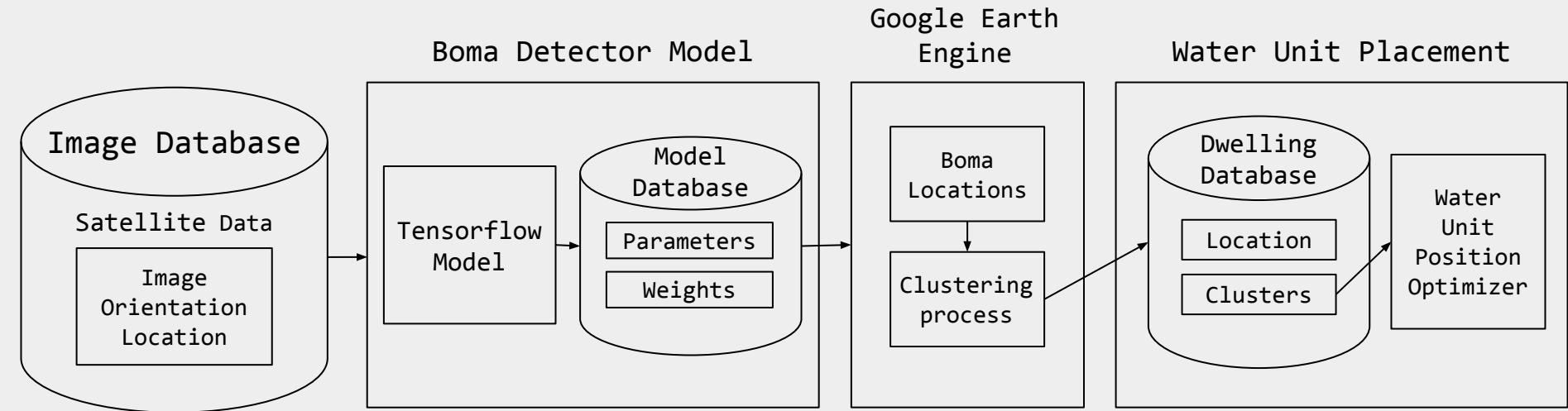
Our 100k-Liter RHU



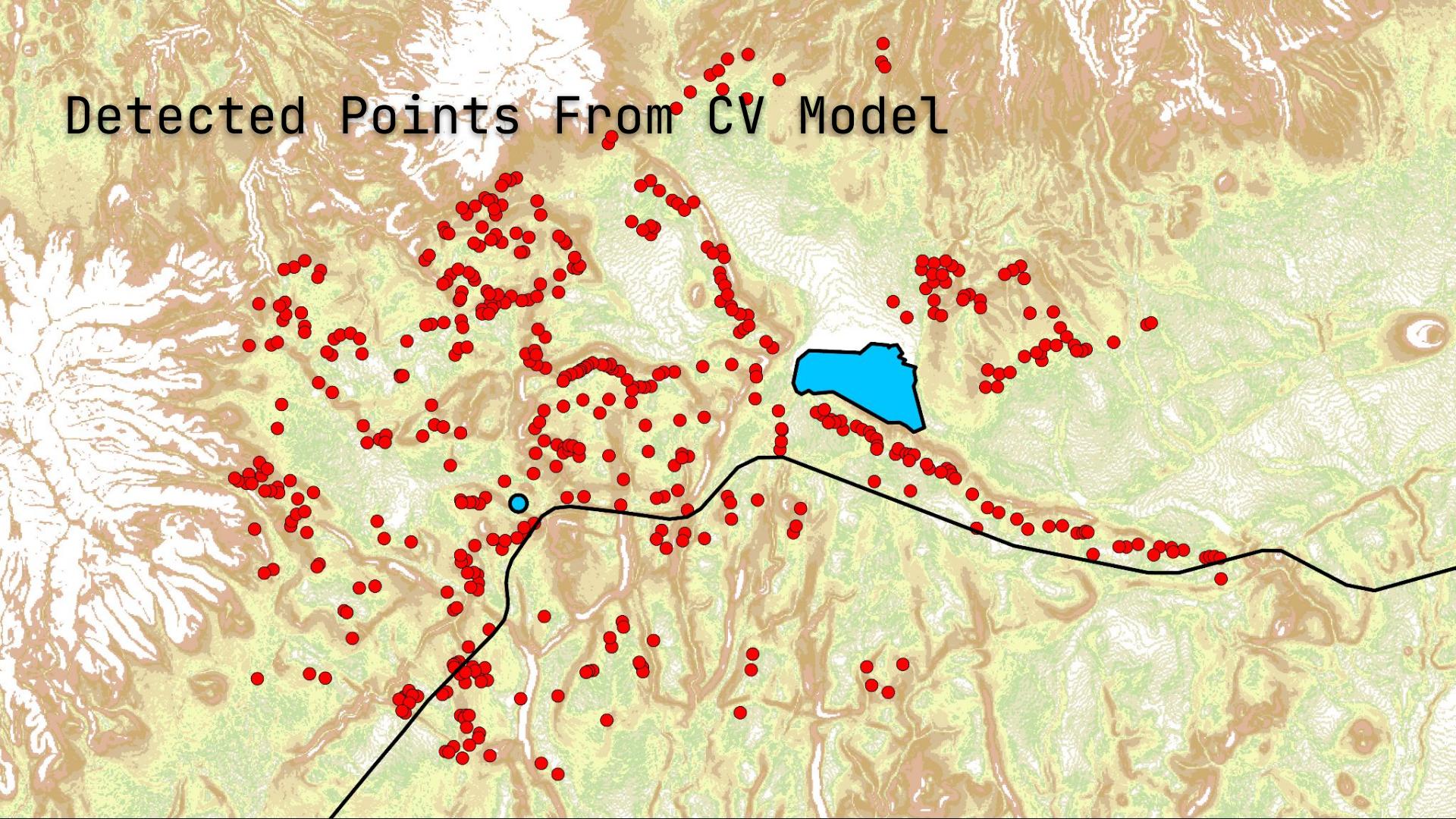
Model In Practice

250
Square
Miles

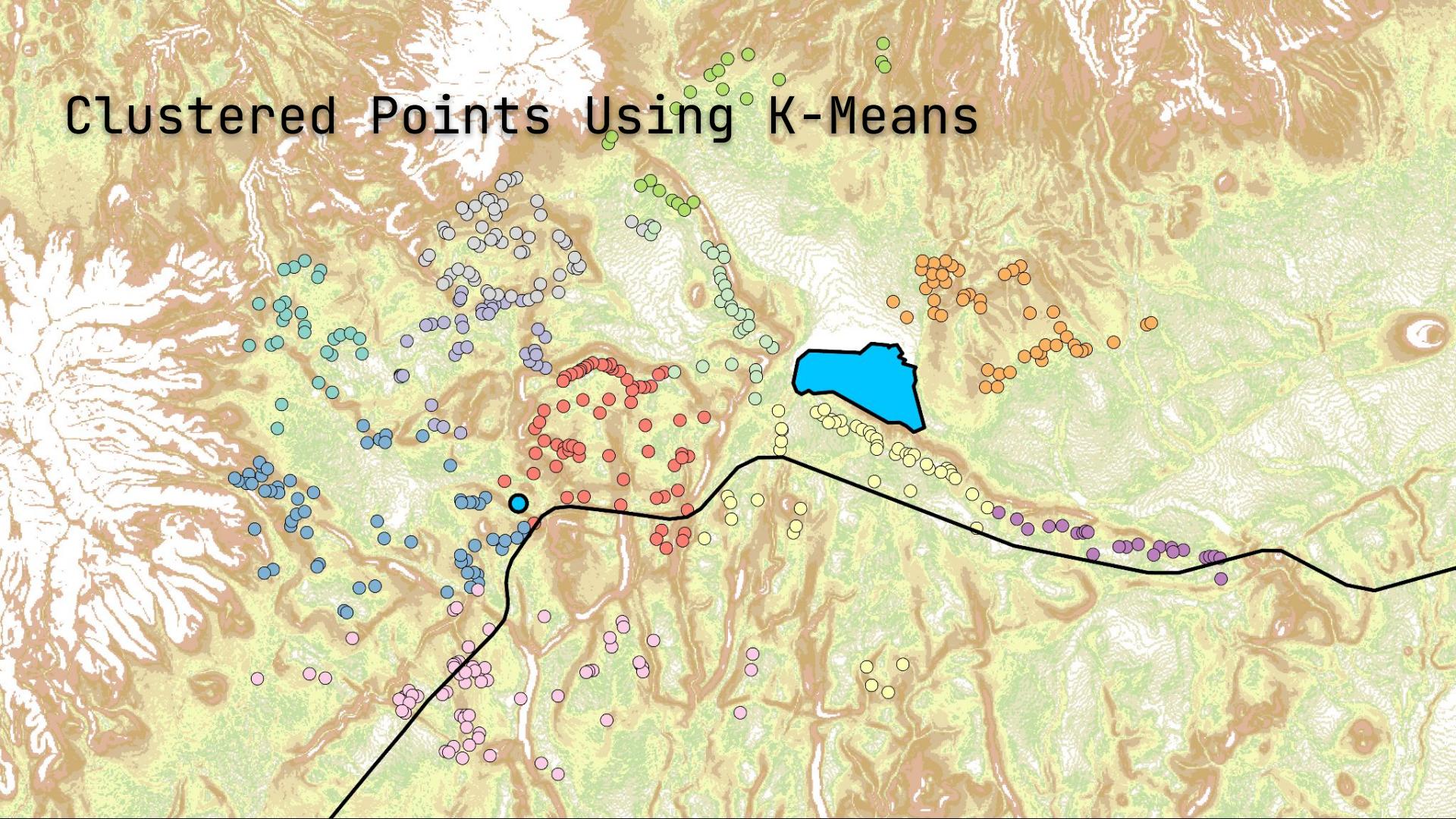
Image Processing Pipeline



Detected Points From CV Model



Clustered Points Using K-Means



Criteria for Placing a Reservoir

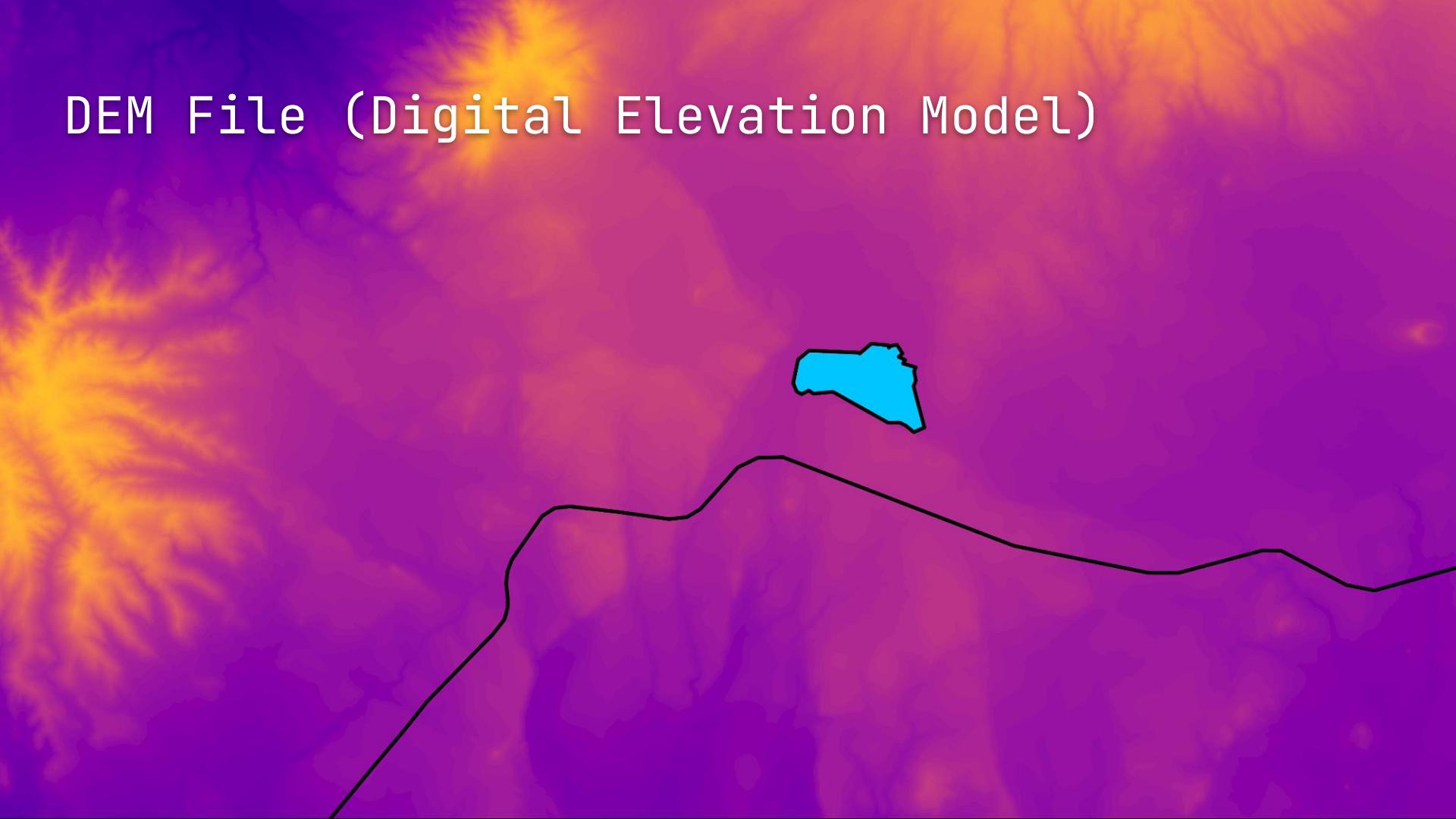
1. High Rainwater Accumulation (40%)

2. Close to the General Population (40%)

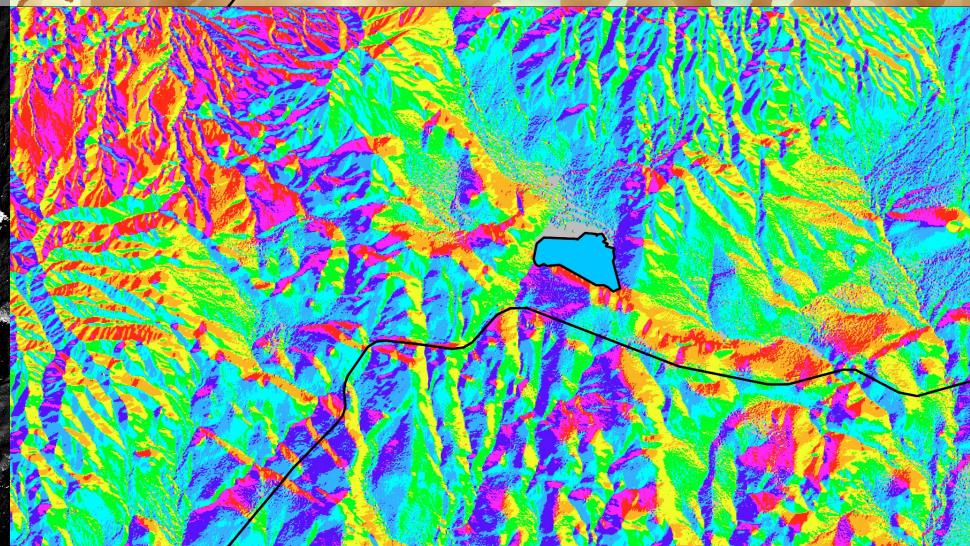
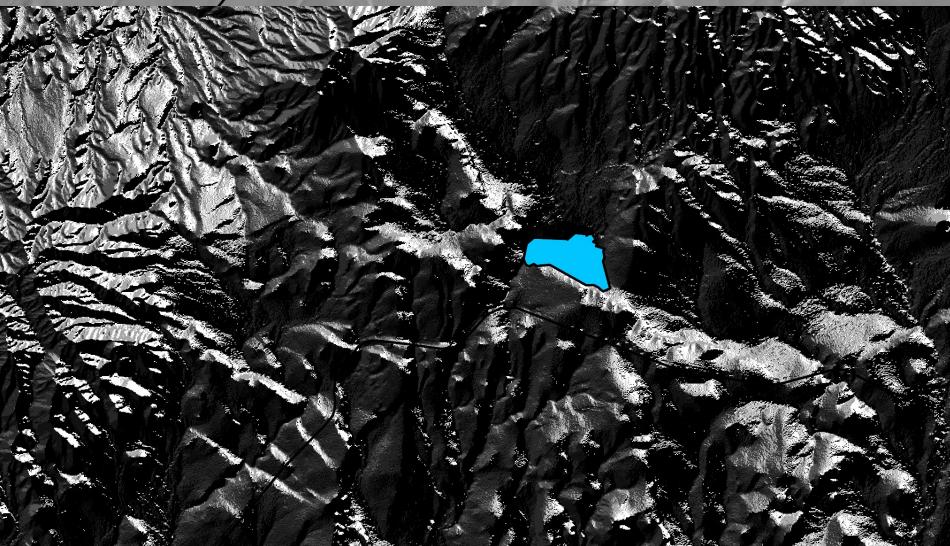
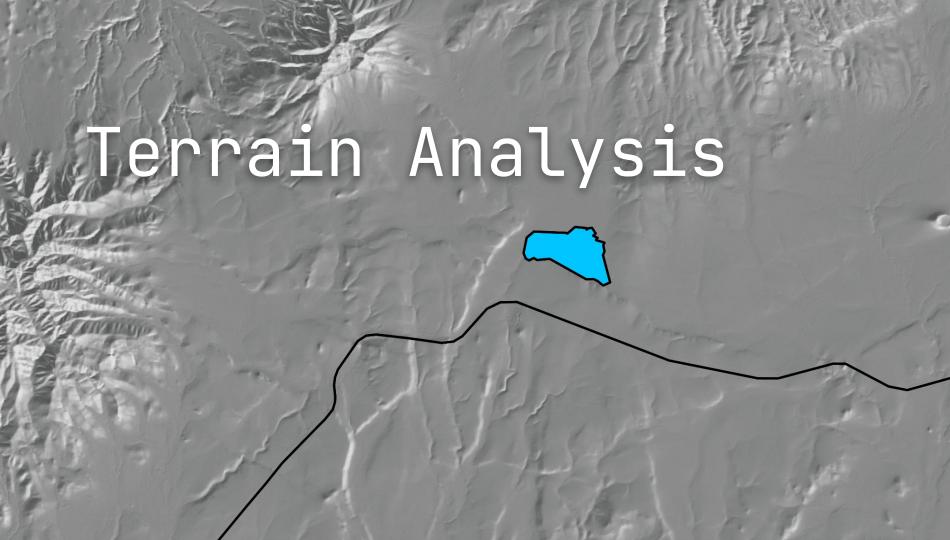
3. Far from Highway (10%)

4. Far from Other Water Bodies (10%)

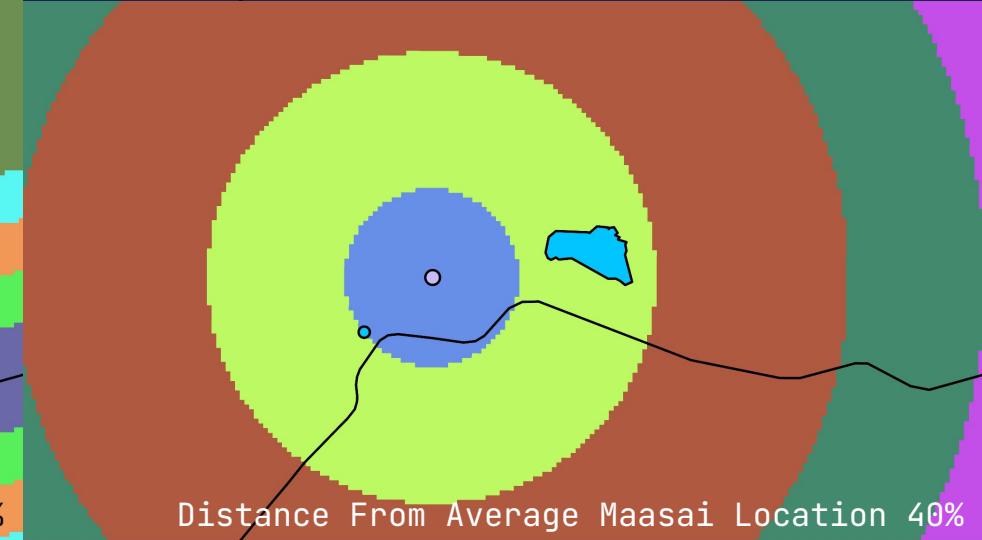
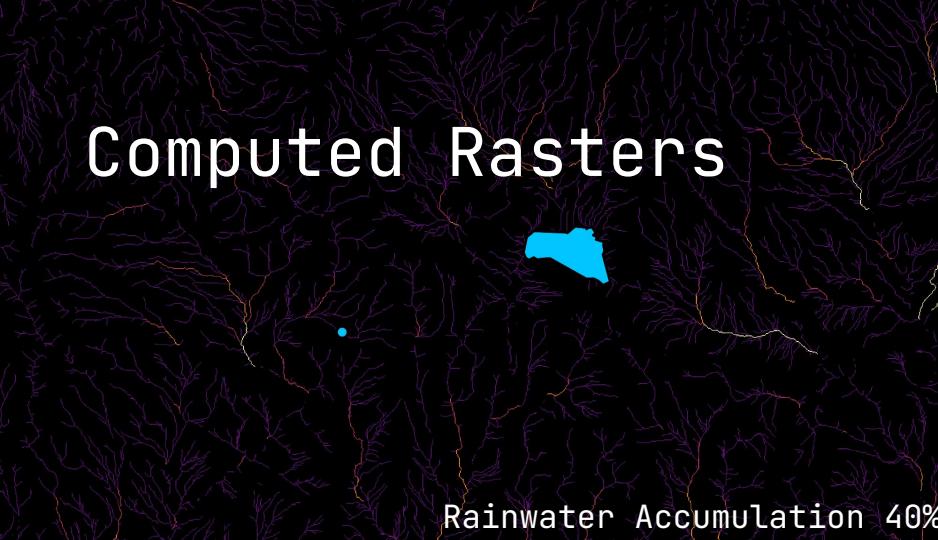
DEM File (Digital Elevation Model)



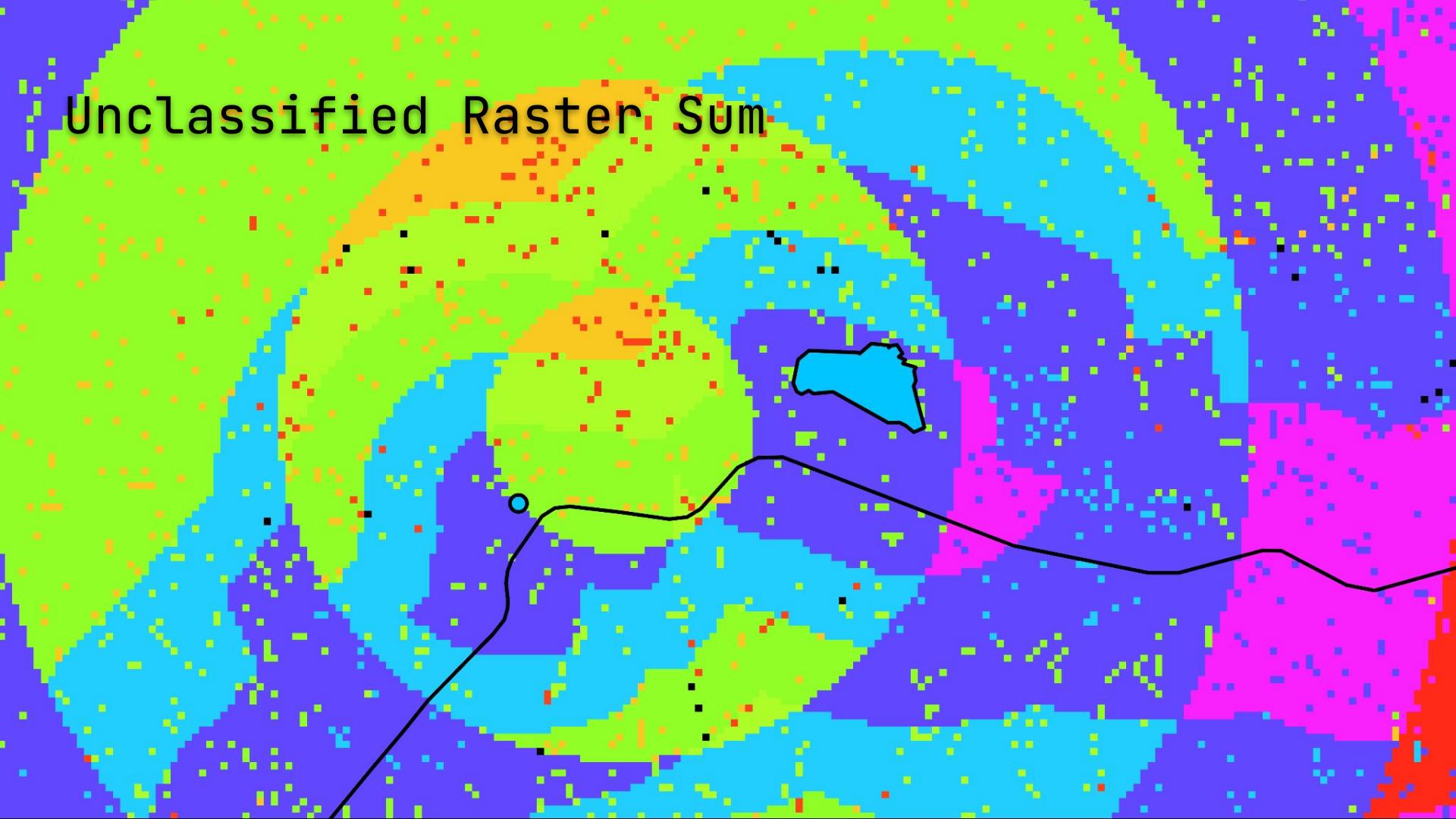
Terrain Analysis



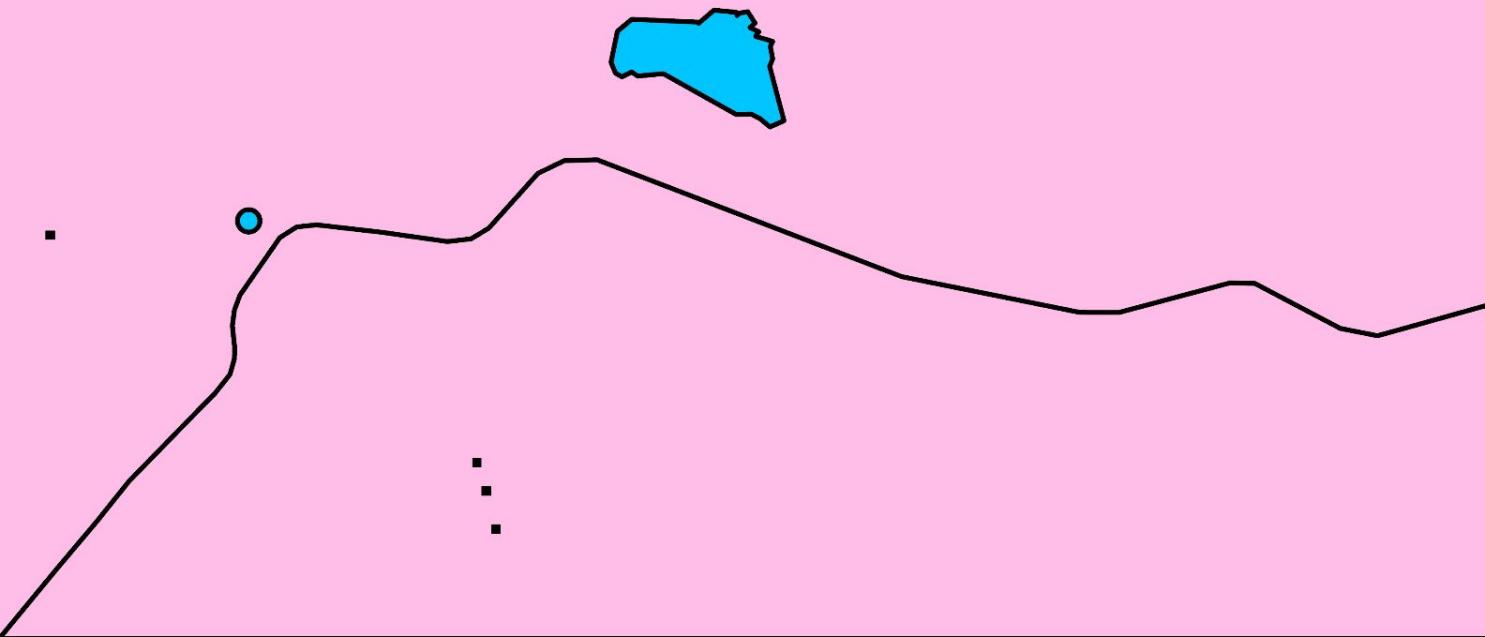
Computed Rasters



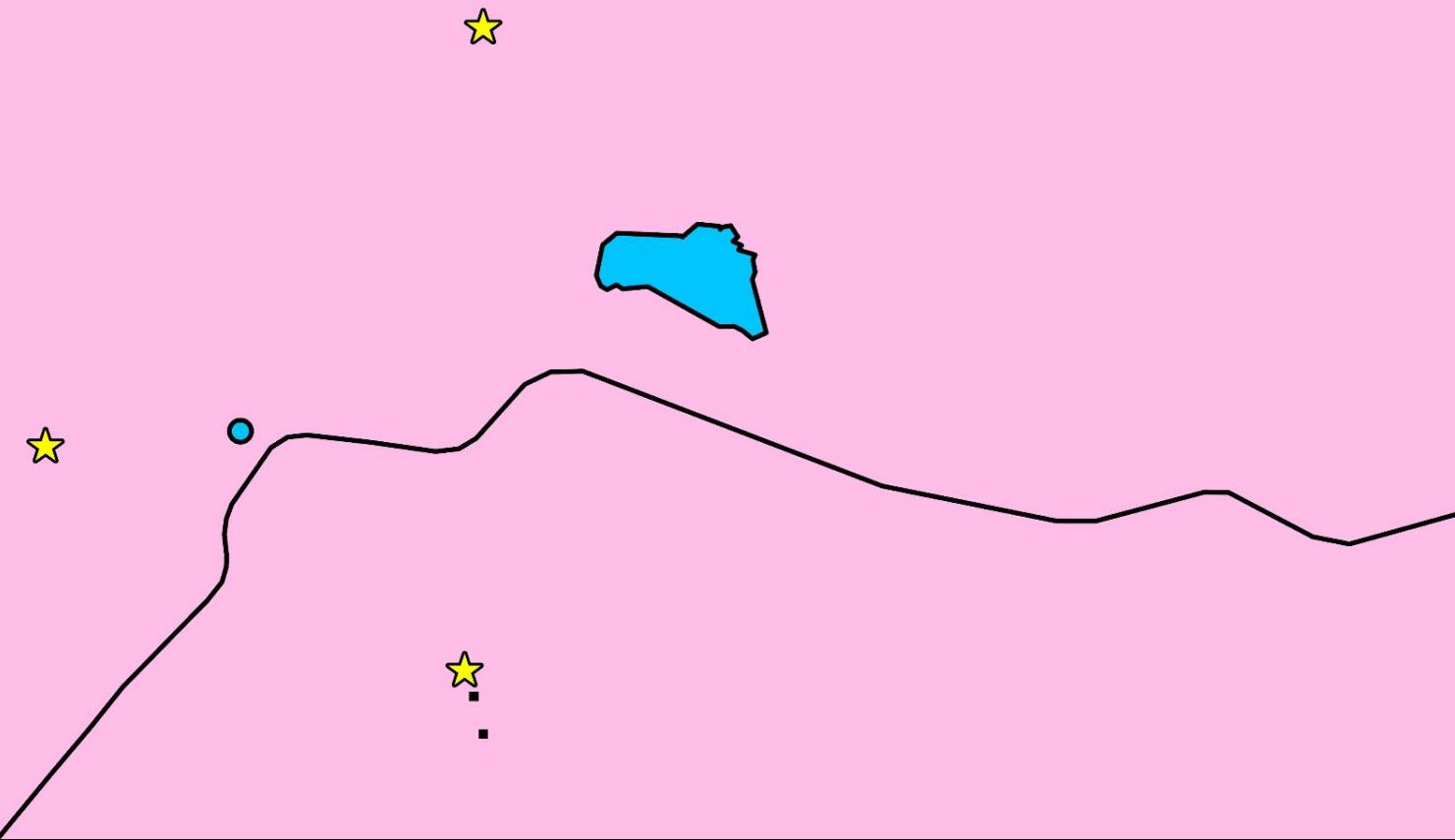
Unclassified Raster Sum

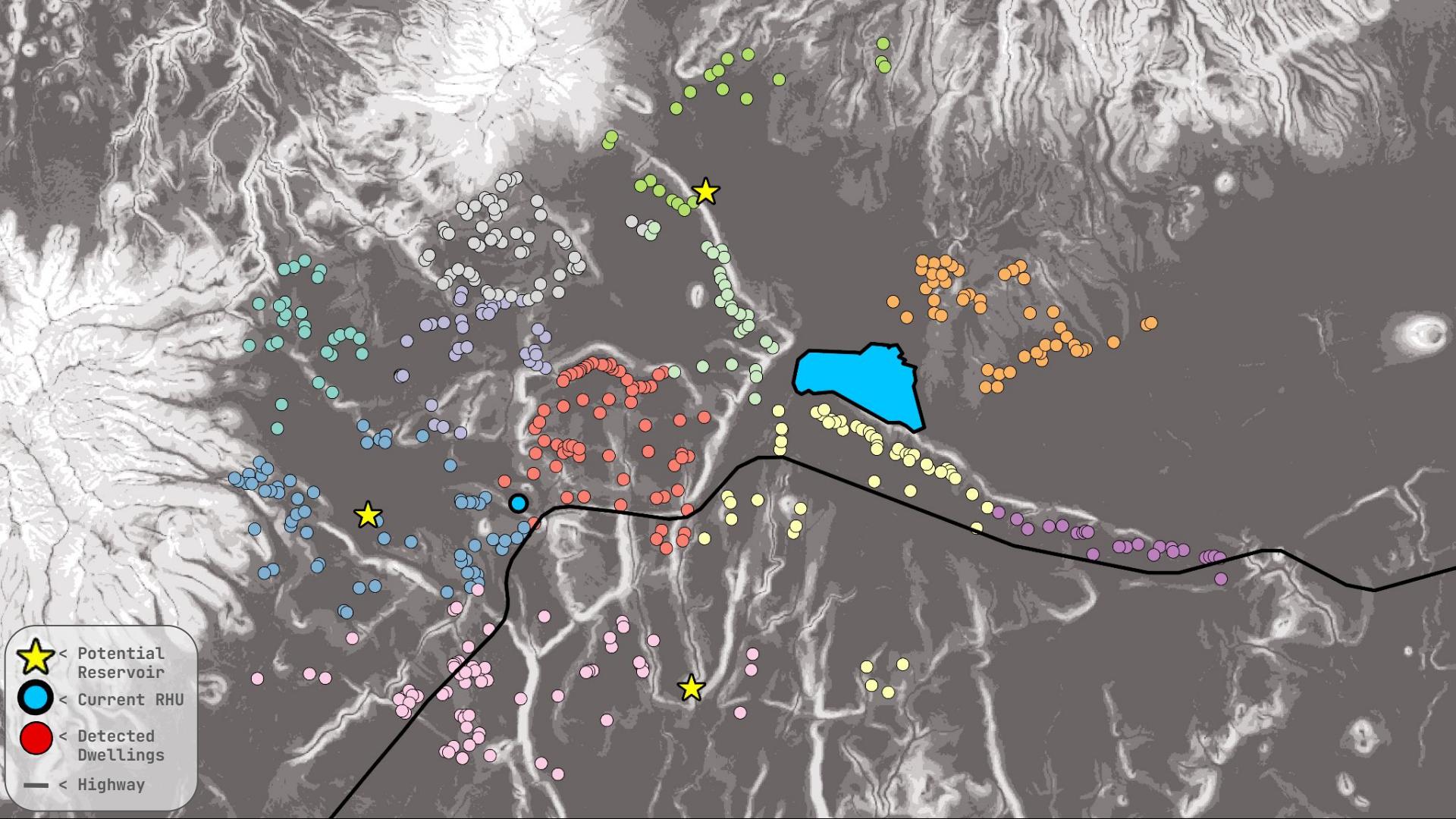


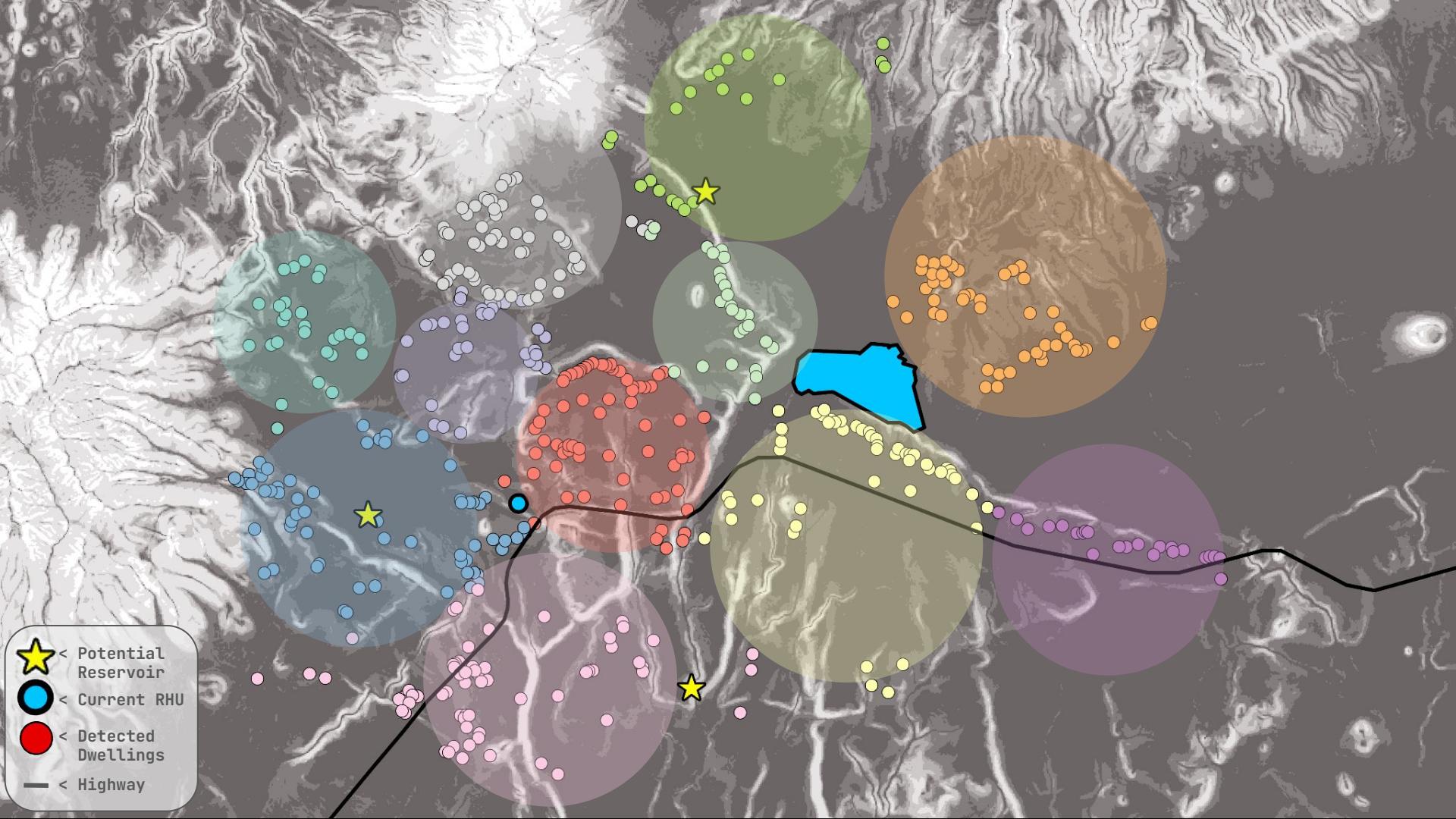
Classified Raster Sum



Identified Points of Interest







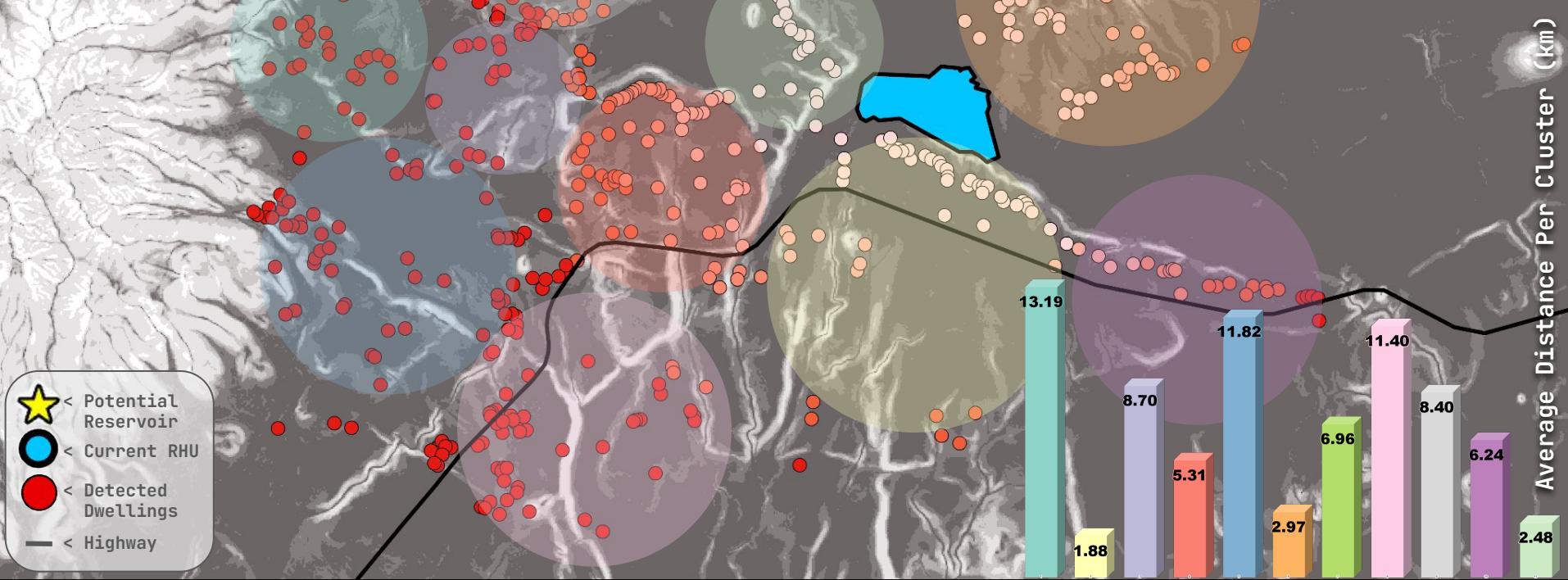
Nanja Dam

7.46

Nanja Dam

Dam, RHU	4.40
Dam, RHU, R1	4.25
Dam, RHU, R2	3.98
Dam, RHU, R3	4.01
Dam, RHU, All	3.44

Average Walking
Distance (km)



Nanja Dam

7.46

Current Situation

Dam, RHU

4.40

Dam, RHU, R1

4.25

Dam, RHU, R2

3.98

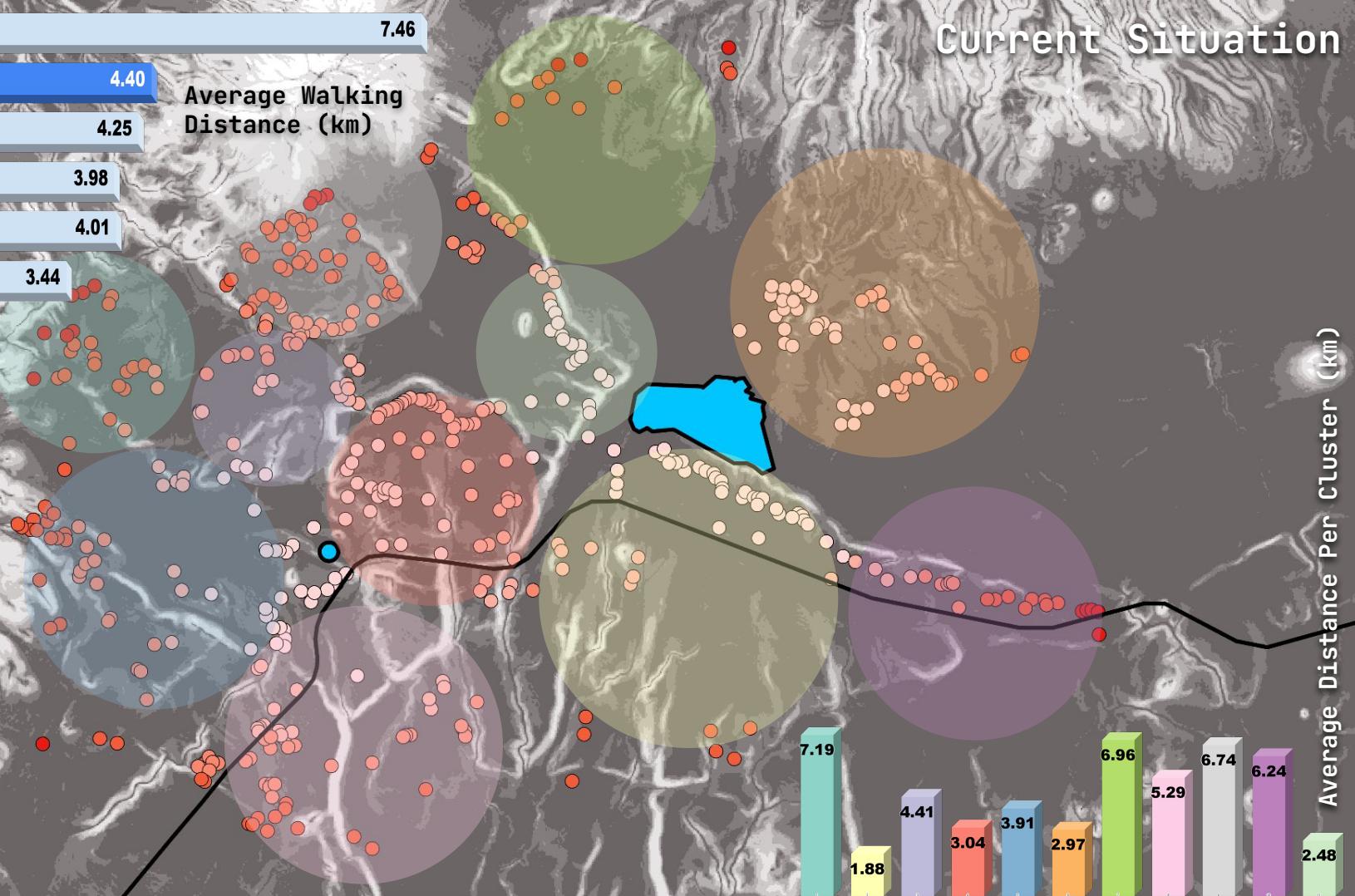
Dam, RHU, R3

4.01

Dam, RHU, All

3.44

Average Walking
Distance (km)



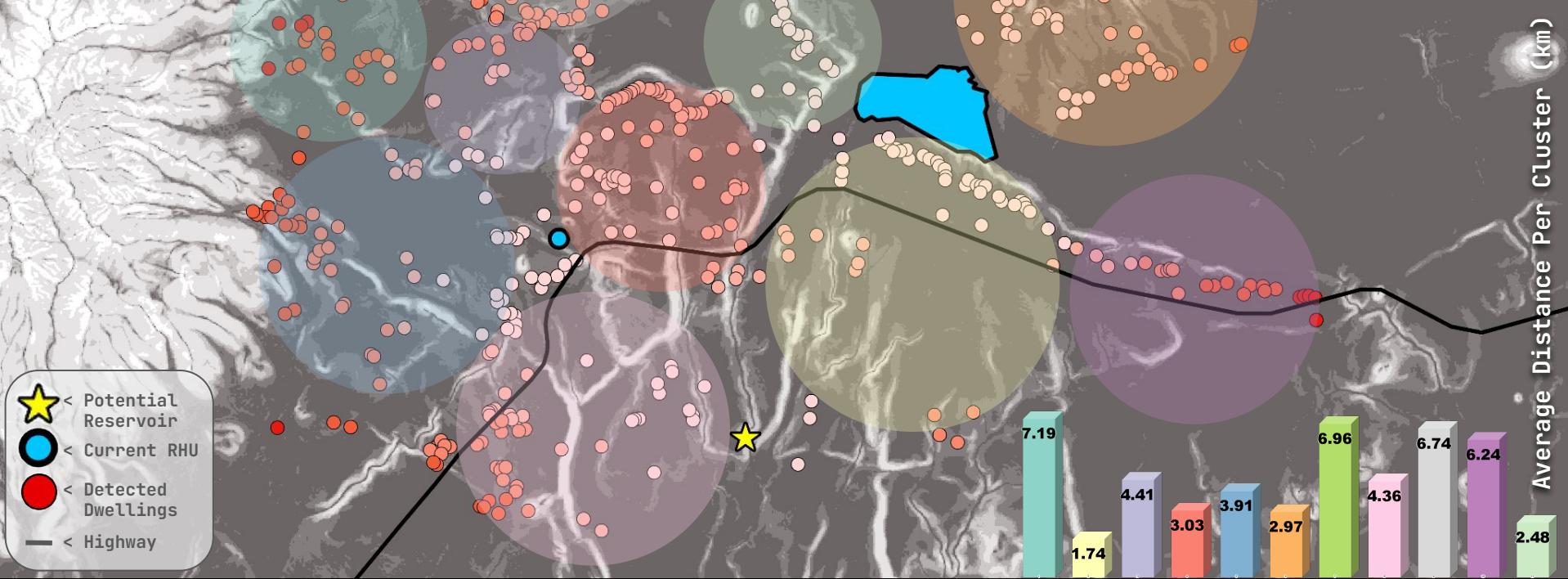
Nanja Dam

7.46

Reservoir 1

Dam, RHU	4.40
Dam, RHU, R1	4.25
Dam, RHU, R2	3.98
Dam, RHU, R3	4.01
Dam, RHU, All	3.44

Average Walking
Distance (km)



Nanja Dam

7.46

Reservoir 2

Dam, RHU

4.40

Dam, RHU, R1

4.25

Dam, RHU, R2

3.98

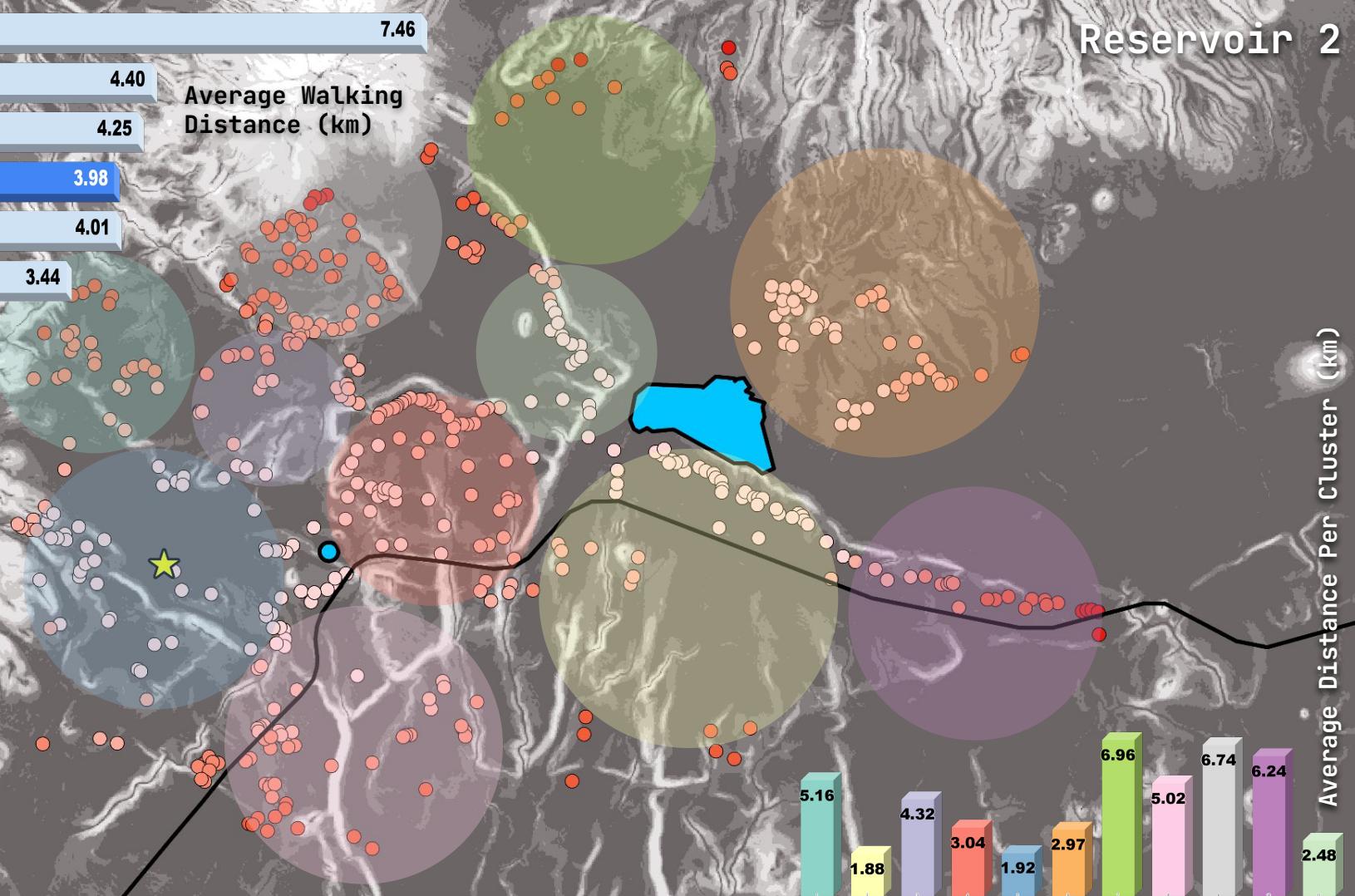
Dam, RHU, R3

4.01

Dam, RHU, All

3.44

Average Walking
Distance (km)



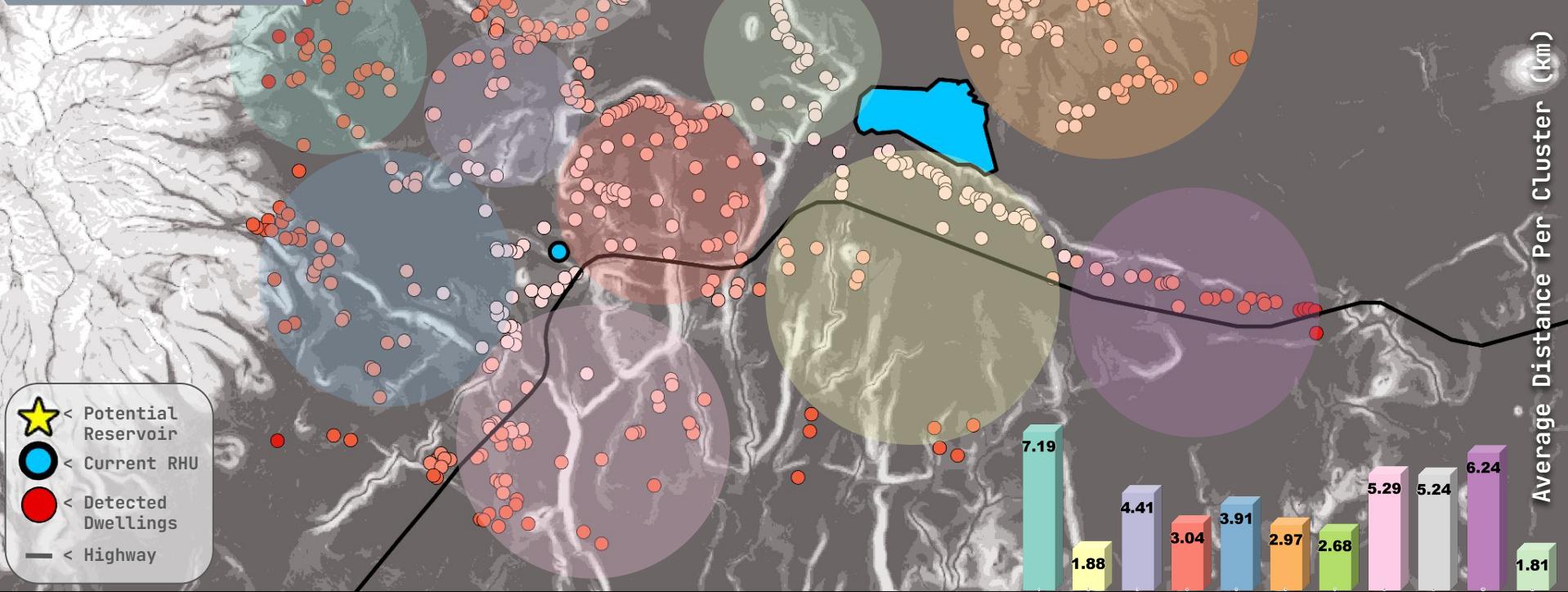
Nanja Dam

7.46

Reservoir 3

Dam, RHU	4.40
Dam, RHU, R1	4.25
Dam, RHU, R2	3.98
Dam, RHU, R3	4.01
Dam, RHU, All	3.44

Average Walking
Distance (km)



Nanja Dam

7.46

Dam, RHU

4.40

Dam, RHU, R1

4.25

Dam, RHU, R2

3.98

Dam, RHU, R3

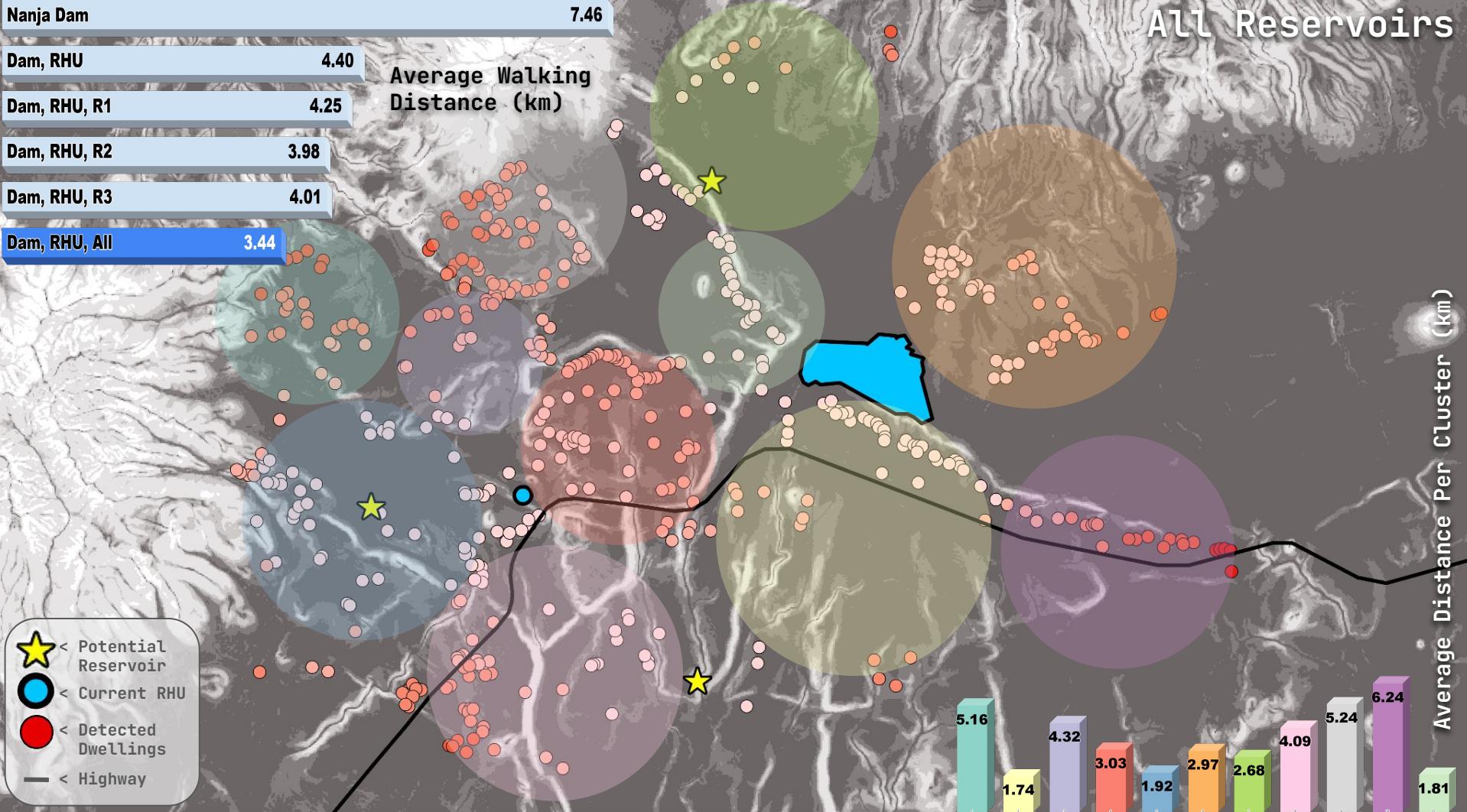
4.01

Dam, RHU, All

3.44

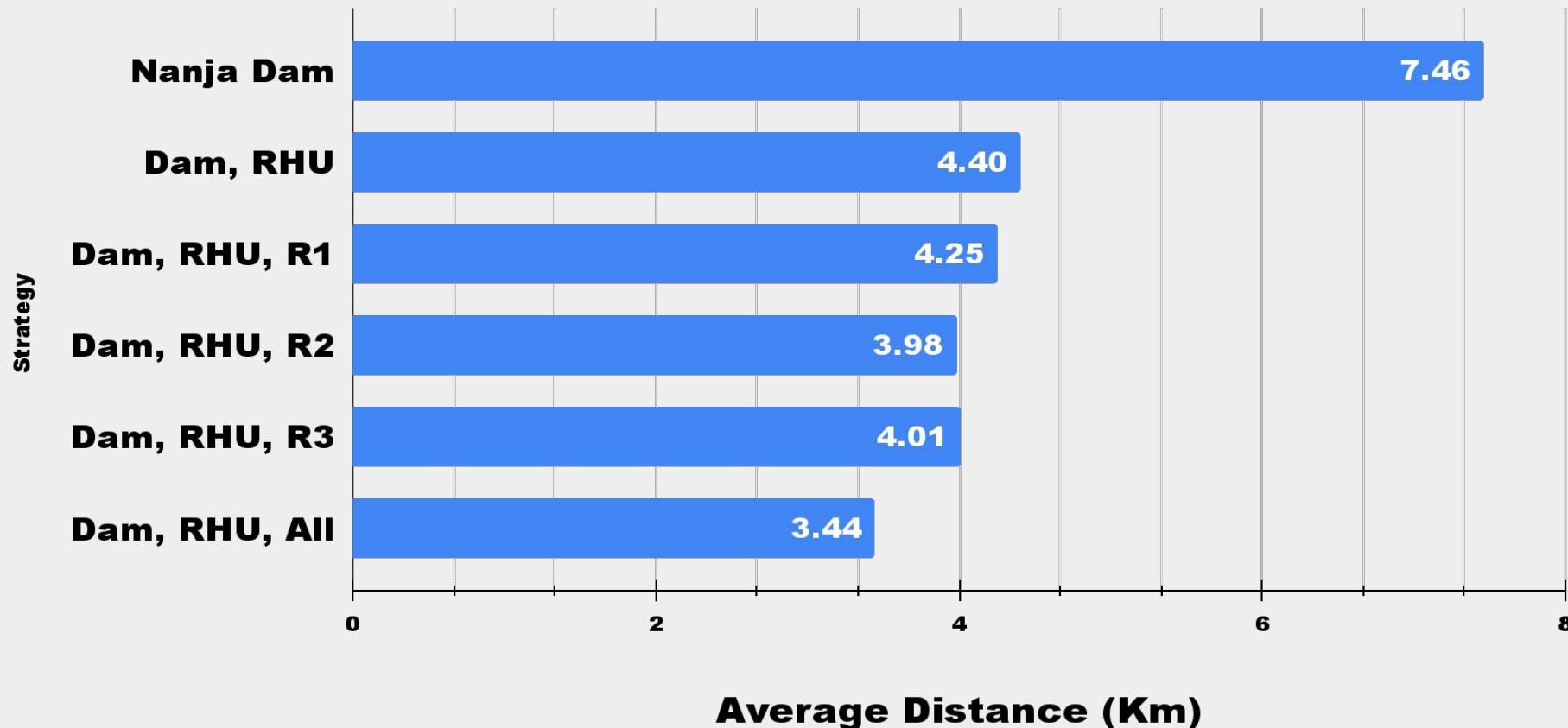
Average Walking
Distance (km)

All Reservoirs



Strategy Type Vs Average Distance to Water Sources

Based on 488 detected dwellings in Monduli



Thank You!

Thank You!

Any Questions?



Yuvraj: yuvrostan@gmail.com

Roshan: rytaneja@gmail.com



Family	Zone (A,B,C,D,I)	Part of which Phase			GPS Latitude,	Tank number in Phc	Photo taken?	Questionnaire Complete
		Phase 0 = Pre Oct 2024	Phase 1 = October	Phase 2 = November				
1 Kalanga Mbayan	A	Yes	Yes	Yes	Phase 1	-3.37,36.19	Yes	Yes
2 Timotheo Lengima	G	Yes	Yes	Yes	Phase 1	-3.41,36.24	Yes	Yes
4 Labikye Nooi	G	Yes	Yes	Yes	Phase 1	-3.41,36.22	Yes	Yes
5 Mwenyekiti Kipara	G	Yes	Yes	Yes	Phase 1	-3.40,36.22	Yes	Yes
6 Baba Kipara	G	Yes	Yes	Yes	Phase 1	-3.39,36.22	Yes	Yes
9 Stephano Meyasi	F	Yes	Yes	Yes	Phase 1	-3.46,36.18	Yes	Yes
10 Sayore Silanga	J	Yes	Yes	Yes	Phase 1	-3.42,36.21	Yes	Yes
11 Lais Andrea	F	Yes	Yes	Yes	Phase 1	-3.42,36.21	Yes	Yes
12 Lomitu Mulani	G	Yes	Yes	Yes	Phase 1	-3.42,36.22	Yes	Yes
15 Loishiye Moikan	J	Yes	Yes	Yes	Phase 1	3.45,36.19	Yes	Yes
19 Noonguiti Soipei	G	Yes	Yes	Yes	Phase 1	-3.40,36.22	Yes	Yes
20 Mbayan Labikie	G	Yes	Yes	Yes	Phase 1	-3.41,36.22	Yes	Yes
21 Ndugu Lemomo	G	Yes	Yes	Yes	Phase 1	-3.41,36.22	Yes	Yes
22 Miruti Labikie	G	Yes	Yes	Yes	Phase 1	-3.40,36.22	Yes	Yes
23 Lais Masaai	F	Yes	Yes	Yes	Phase 1	-3.41,36.15	Yes	Yes
25 Loishiro Lengai	G	Yes	Yes	Yes	Phase 1	-3.40,36.22	Yes	Yes
32 Lucas lenjaake	J	Yes	Yes	Yes	Phase 1	-3.41,36.20	Yes	Yes
35 Mainga Metui	F	Yes	Yes	Yes	Phase 1	-3.39,36.13	Yes	Yes
36 Emanuel Mulani	G	Yes	Yes	Yes	Phase 1	-3.40,36.22	Yes	Yes
37 Noah Olchakai	G	Yes	Yes	Yes	Phase 1	-3.39,36.22	Yes	Yes
43 Petro Daudi	J	Yes	Yes	Yes	Phase 1	-3.42,36.18	Yes	Yes
47 Kaay Ndoika	G	No	Yes	Yes	Phase 1	-3.41,36.23	Yes	Yes
49 Daniel Lojiloji	G	Yes	Yes	Yes	Phase 1	-3.41,36.23	Yes	Yes
53 Nengakui Lalaito	J	Yes	Yes	Yes	Phase 1	-3.41,36.20	Yes	Yes
55 Njur Loirita	J	Yes	Yes	Yes	Phase 1	-3.41,36.21	Yes	Yes
60 Lucy Mulani	G	Yes	Yes	Yes	Phase 1	-3.41,36.23	Yes	Yes
63 Joseph Andrea Kipi	F	Yes	Yes	Yes	Phase 1	-3.44,36.20	Yes	Yes
66 Justine Letion	F	Yes	Yes	Yes	Phase 1	-3.43,36.15	Yes	Yes
68 Kidoko Medutiekki	A	Yes	Yes	Yes	Phase 1	-3.41,36.23	Yes	Yes
75 Loishiye Sanare	B	Yes	Yes	Yes	Phase 1	-3.41,36.20	Yes	Yes
76 Komeshha Saikon	B	Yes	Yes	Yes	Phase 1	-3.41,36.23	Yes	Yes
77 Seuri Saning'o	A	Yes	Yes	Yes	Phase 1	-3.40,36.26	Yes	Yes
78 Saiguran Moikan	A	Yes	Yes	Yes	Phase 1	-3.44,36.19	Yes	Yes
81 Lourey Mbayan	A	Yes	Yes	Yes	Phase 1	-3.41,36.23	Yes	Yes
83 Bahati Saikon	B	Yes	Yes	Yes	Phase 1	-3.29,36.24	Yes	Yes
Kipara Lais	G	Yes	Yes	Yes	Phase 1	-3.40,36.22	Yes	Yes
Nulu Saning'o	B	Yes	Yes	Yes	Phase 1	-3.38,36.22	Yes	Yes
Nooi	G	Yes	Yes	Yes	Phase 1	-3.41,36.23	Yes	Yes



Phase 2 Water Harvesting Units : July'22 – Feb'23



Filtration Unit



Irrigation Unit



40k Liter Unit

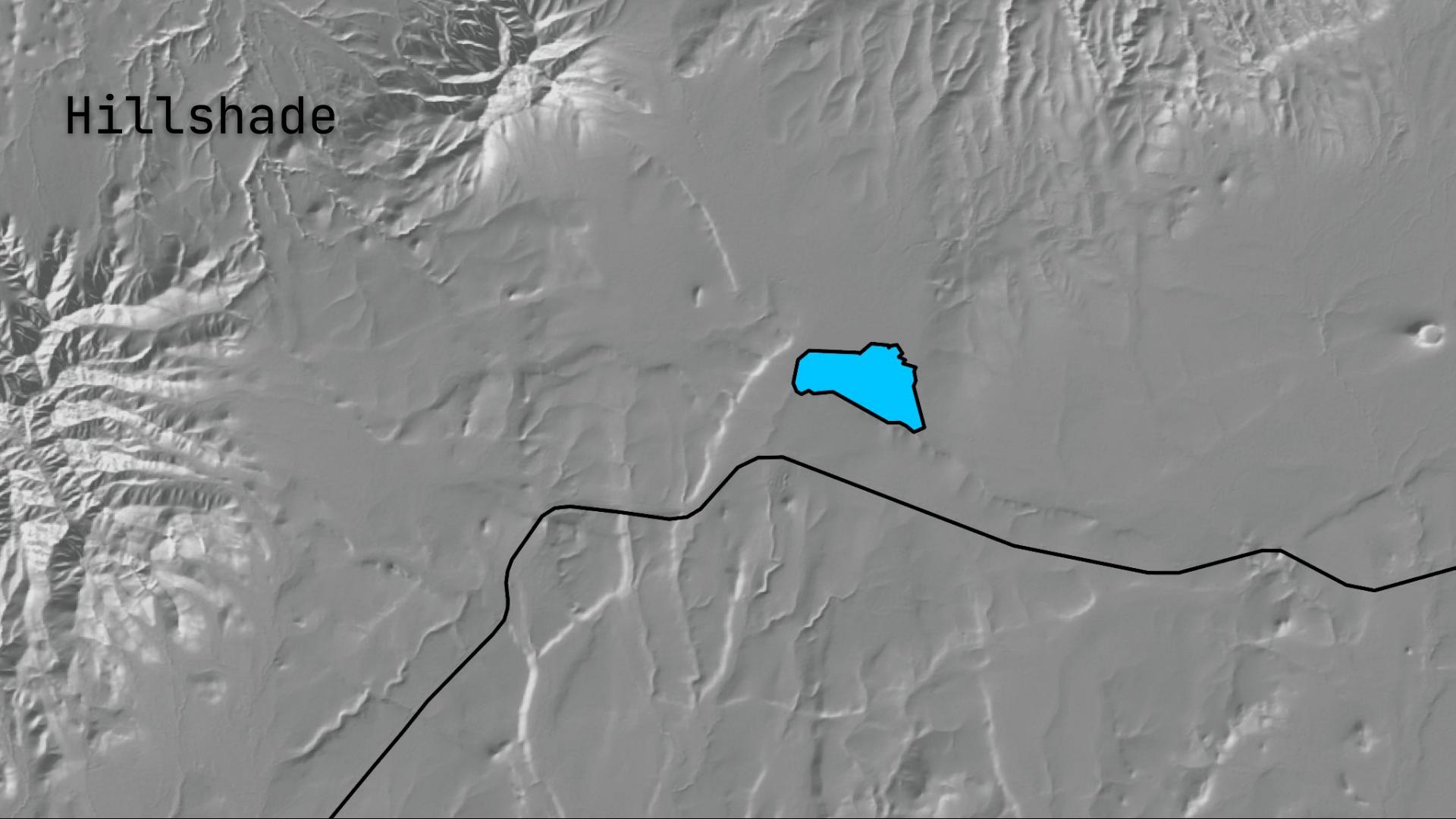
Next Steps

1. Validate the output
 - a. across historical/temporal data
 - b. with on-ground support of local community
2. Use new techniques used for ground water detection or hydrological mapping using climate data/satellite imagery if we find other solutions
3. Fundraise, plan, and deploy multiple water solns in zones F, A, and B
4. Expand use to other needs like agriculture and health

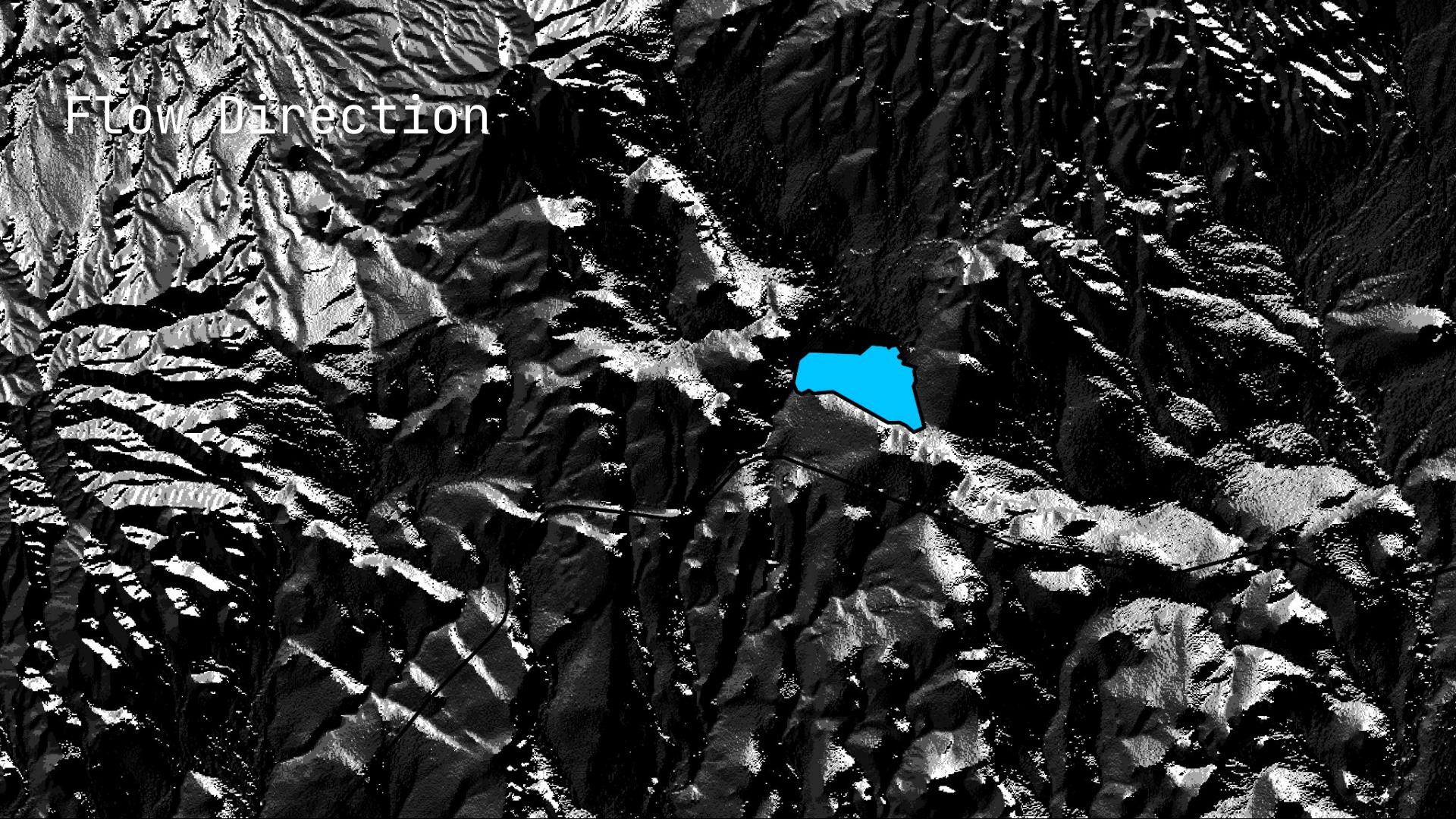
Approach Used

1. Collect images of living units [Bomas]
2. Use Object Detection to identify the living units [Bomas] from satellite imagery
3. Segment the distribution of the population density into zones
4. Plan the placement of water solutions in locations of highest need zones

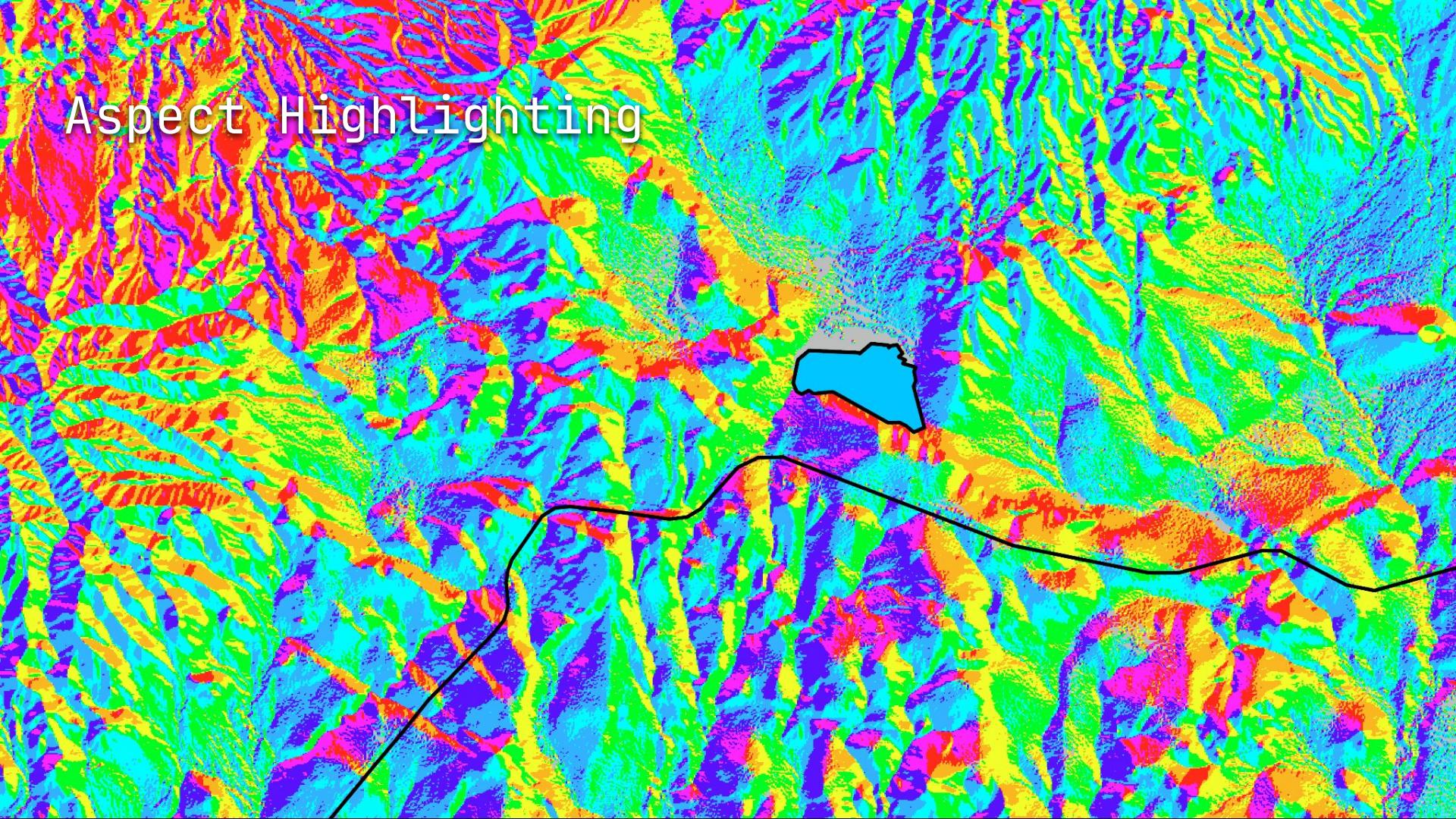
Hillshade



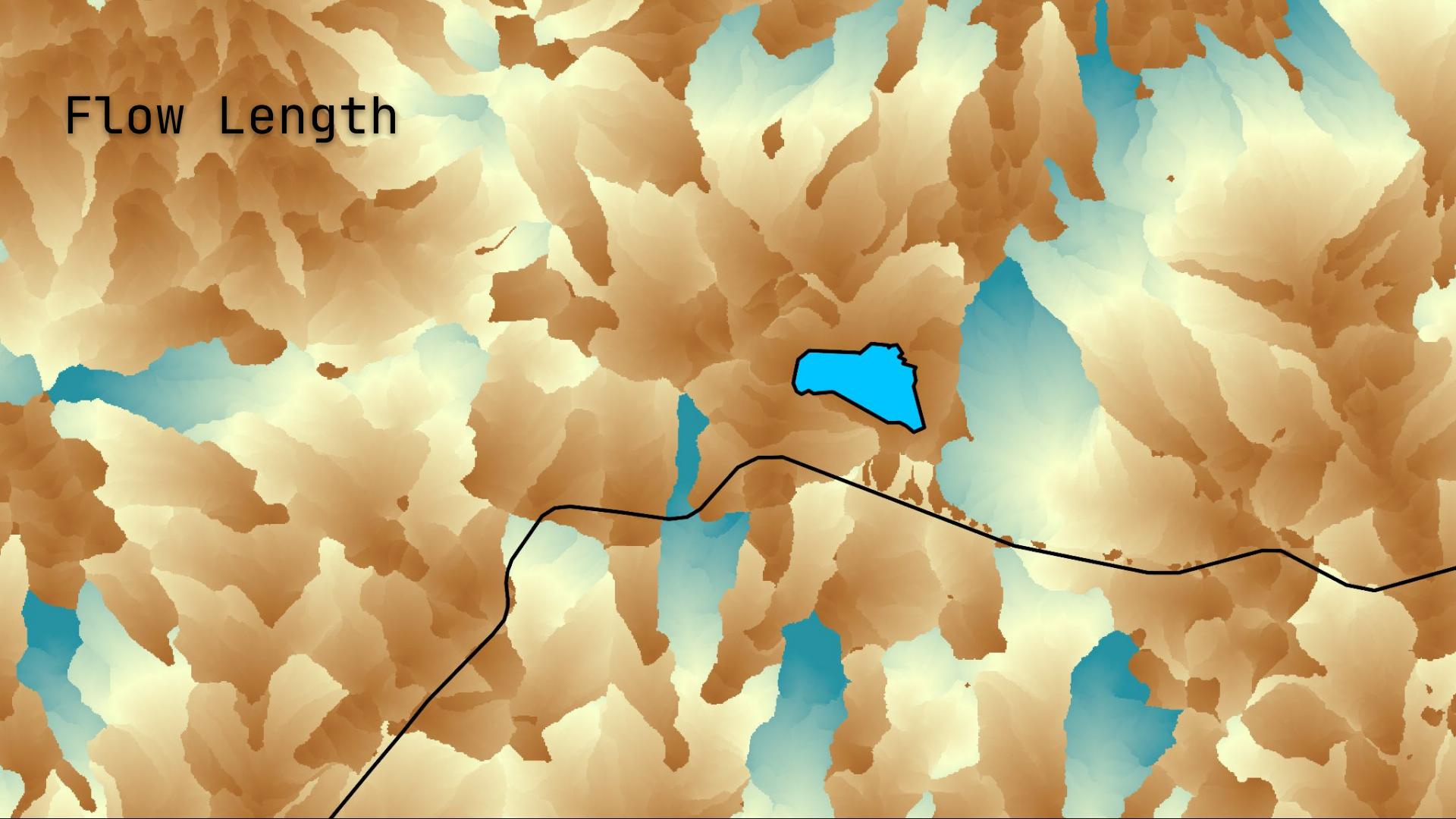
Flow Direction



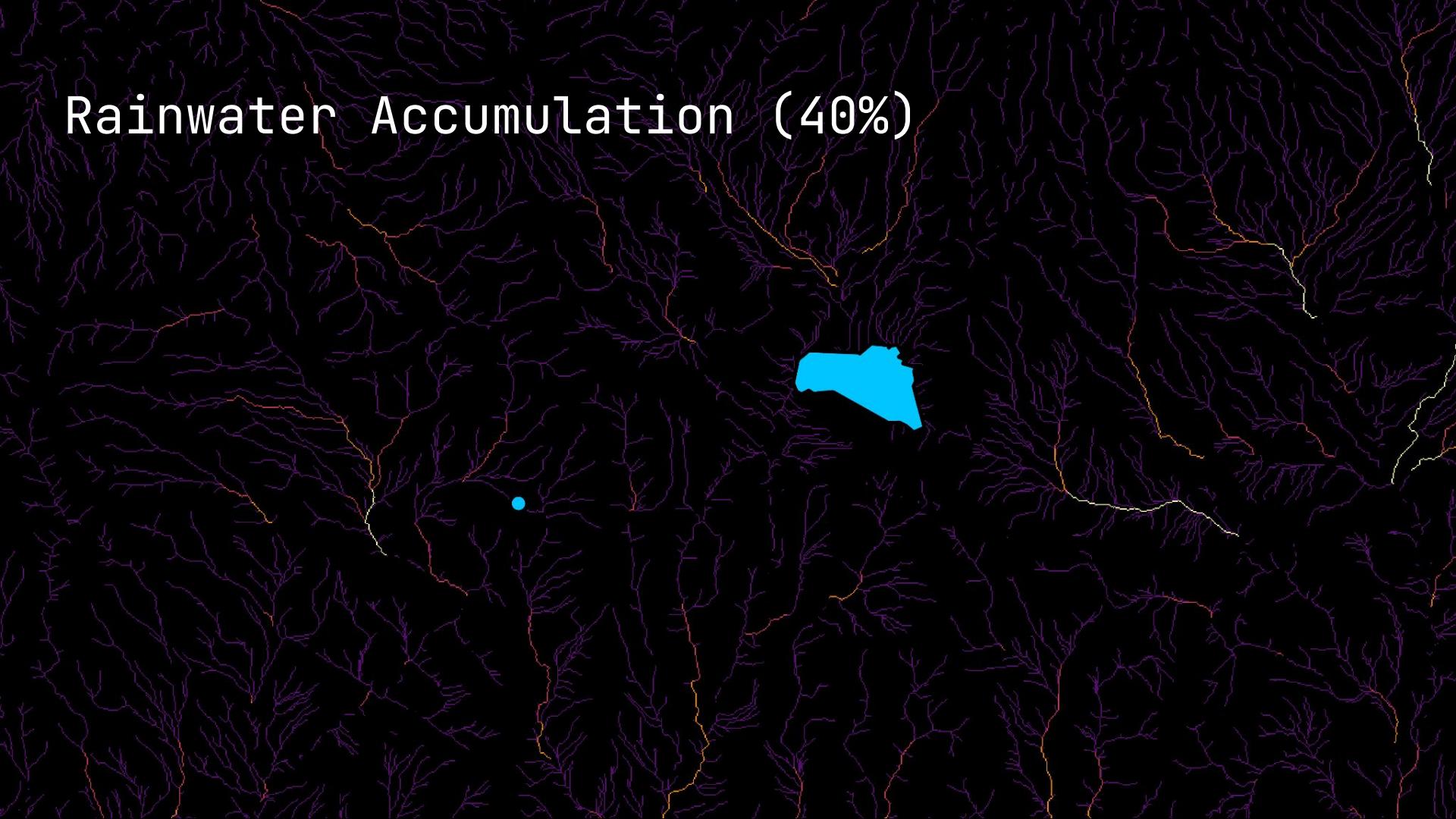
Aspect Highlighting



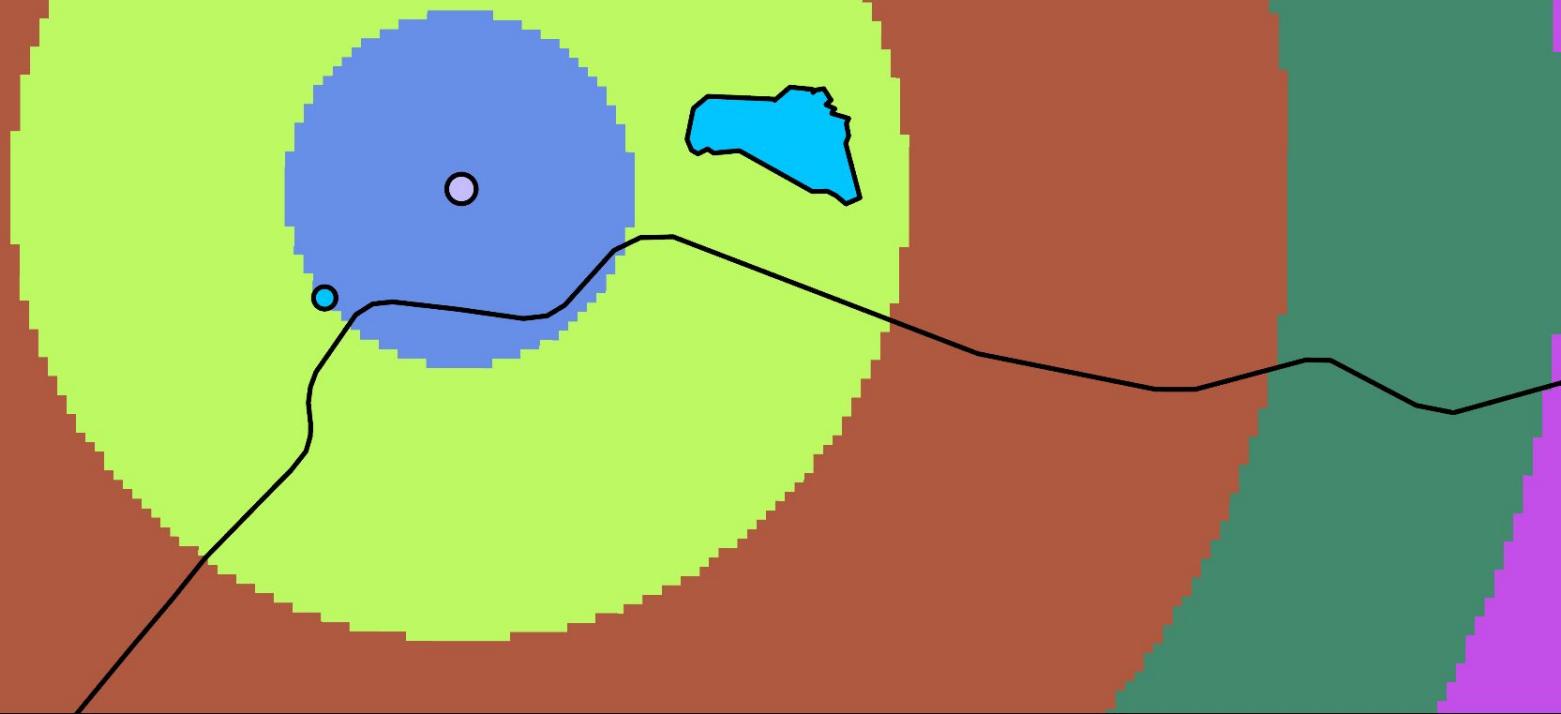
Flow Length



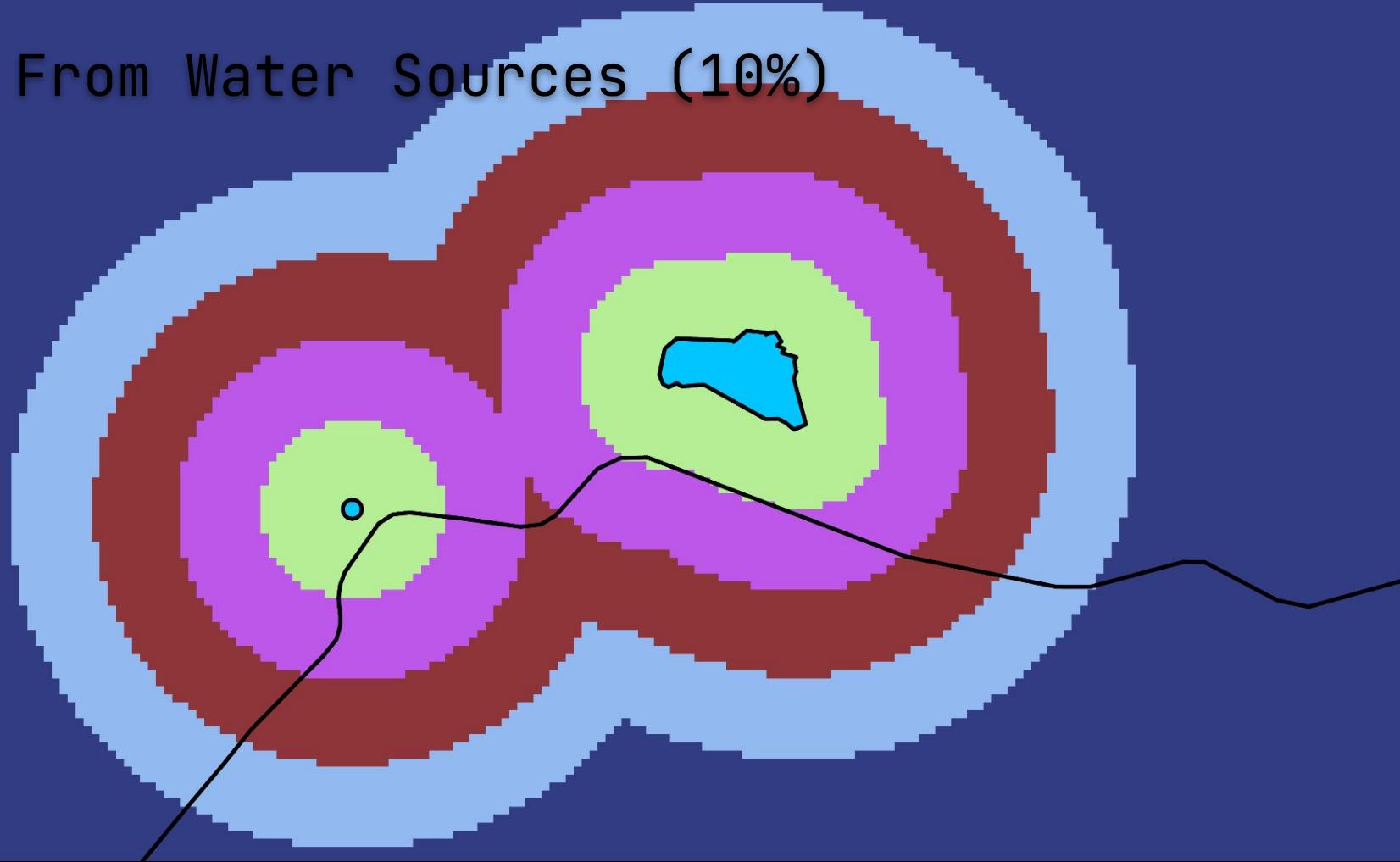
Rainwater Accumulation (40%)



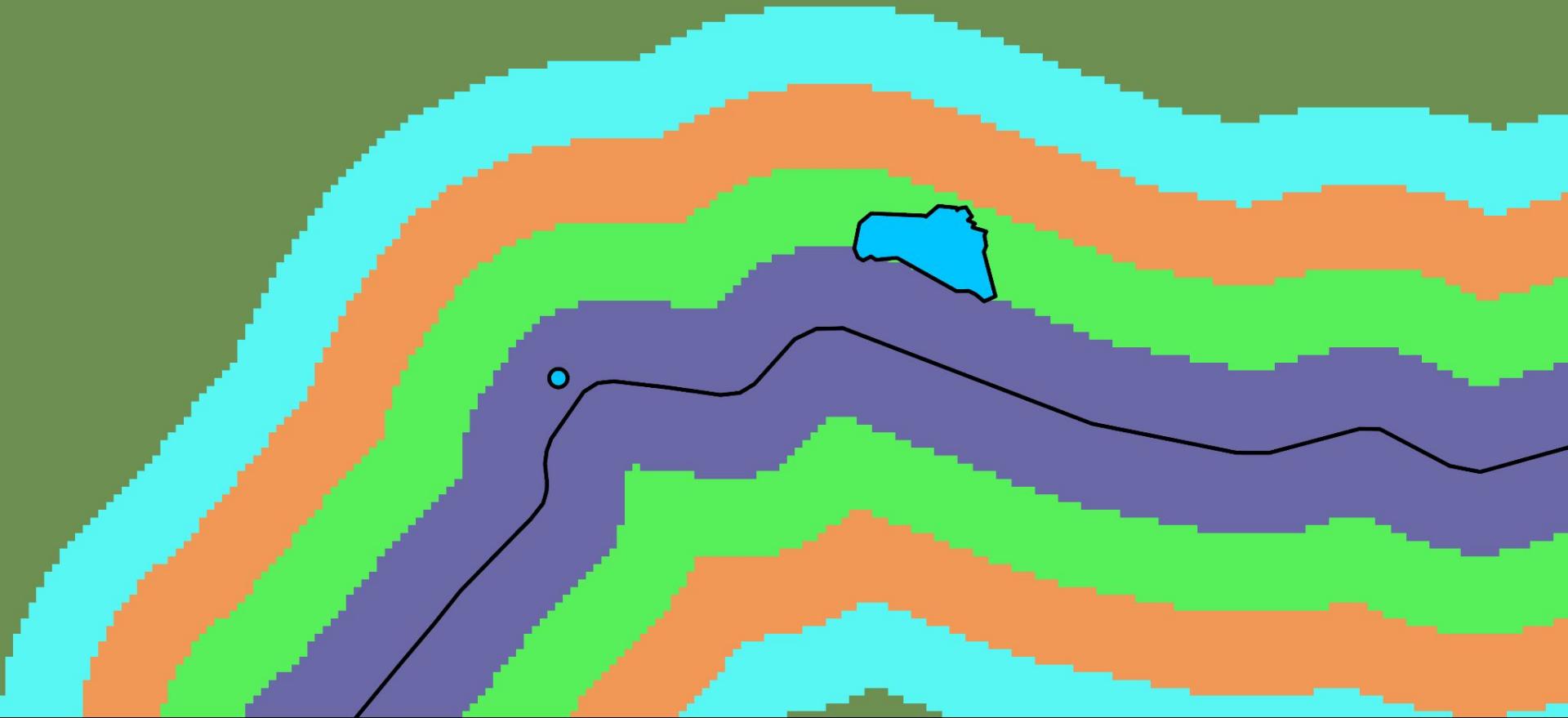
Dist from Avg of Dwellings (40%)



Dist From Water Sources (10%)



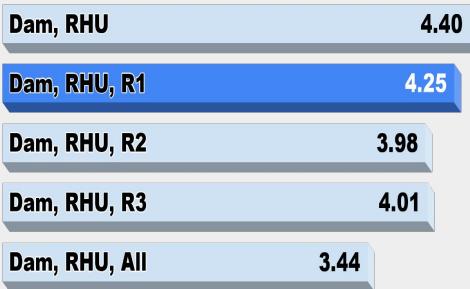
Dist From Highway (10%)



Nanja Dam

7.46

Nanja Dam



Average Walking
Distance (km)

