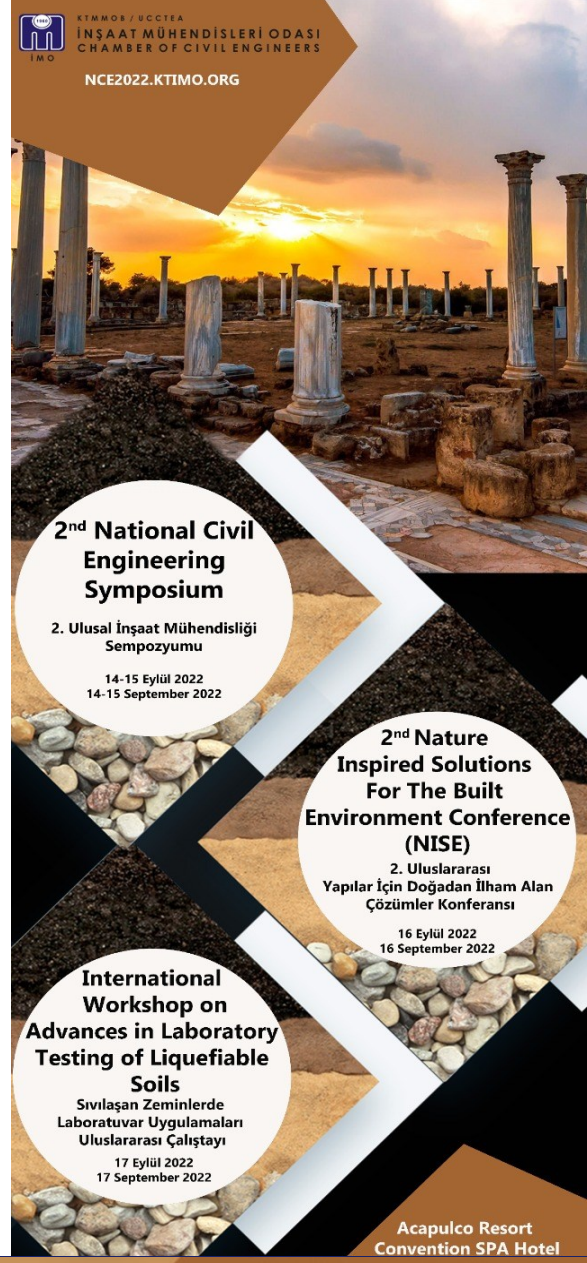
Flood Risk Analysis of İskele Long-Beach Area

Assist. Prof. Dr. Bertuğ Akıntuğ

Civil Engineering Program
Middle East Technical University – Northern Cyprus Campus



Outline

- **Study area**
- **Rainfall Analysis**
- **Hydrologic Modeling**
- **Hydraulic Modeling**
- **Flood Maps**
- **Conclusions**

İskele Long Beach Area


İskele
1990
Long Beach
Image Landsat / Copernicus
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İskele
1990
Long Beach
Image Landsat / Copernicus
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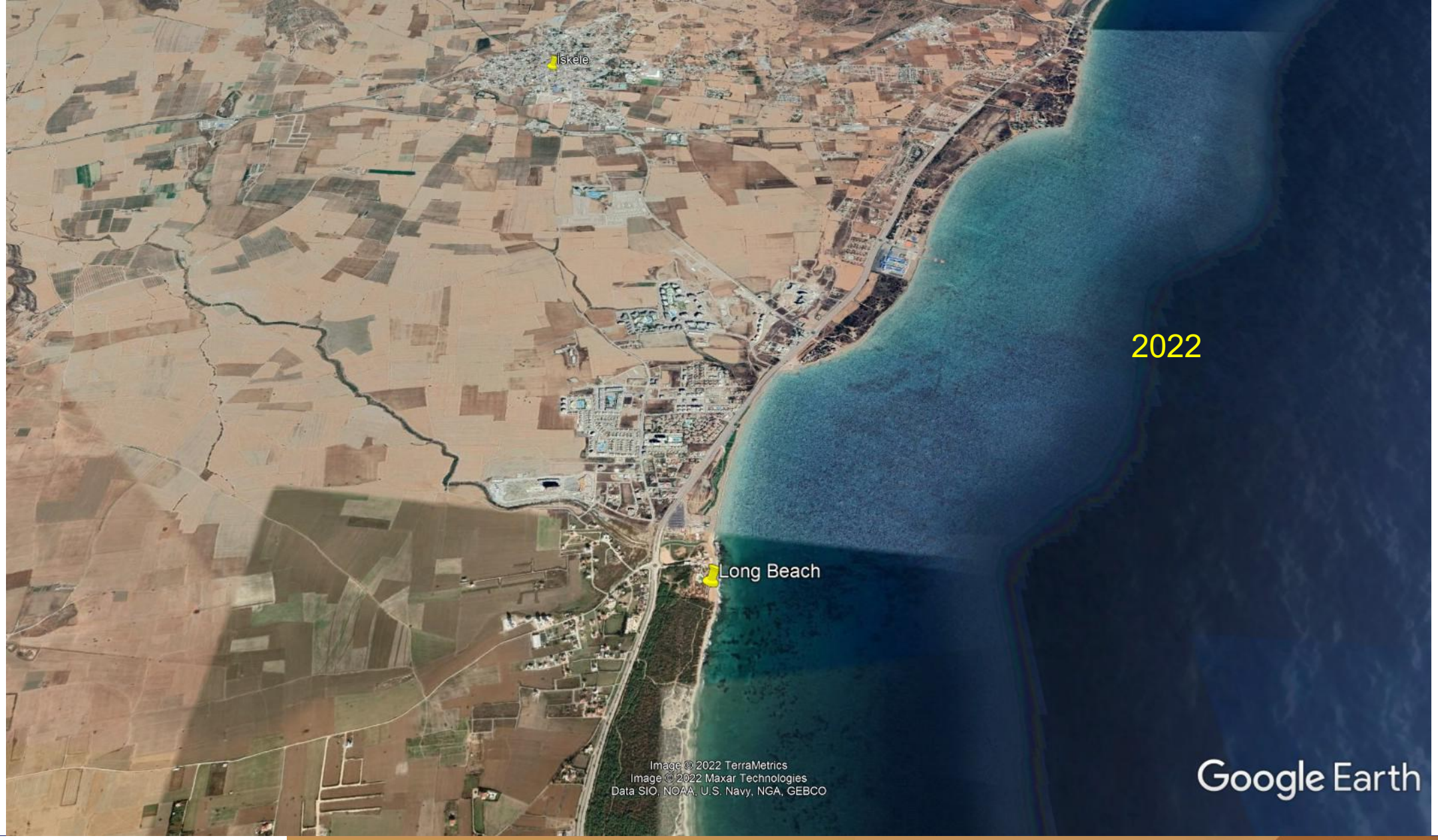
İskele
2022
Long Beach
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2022
Long Beach
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STOP

K.T.M.M.O.B.
İNŞAAT MÜHENDİSLERİ ODASI
CHAMBER OF CIVIL ENGINEERS
İMO

North Cyprus

14 -17 Eylül 2022
14 - 17 September 2022


Long Beach
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ARE THERE ANY **FLOOD** RISK IN THIS AREA?


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Long Beach
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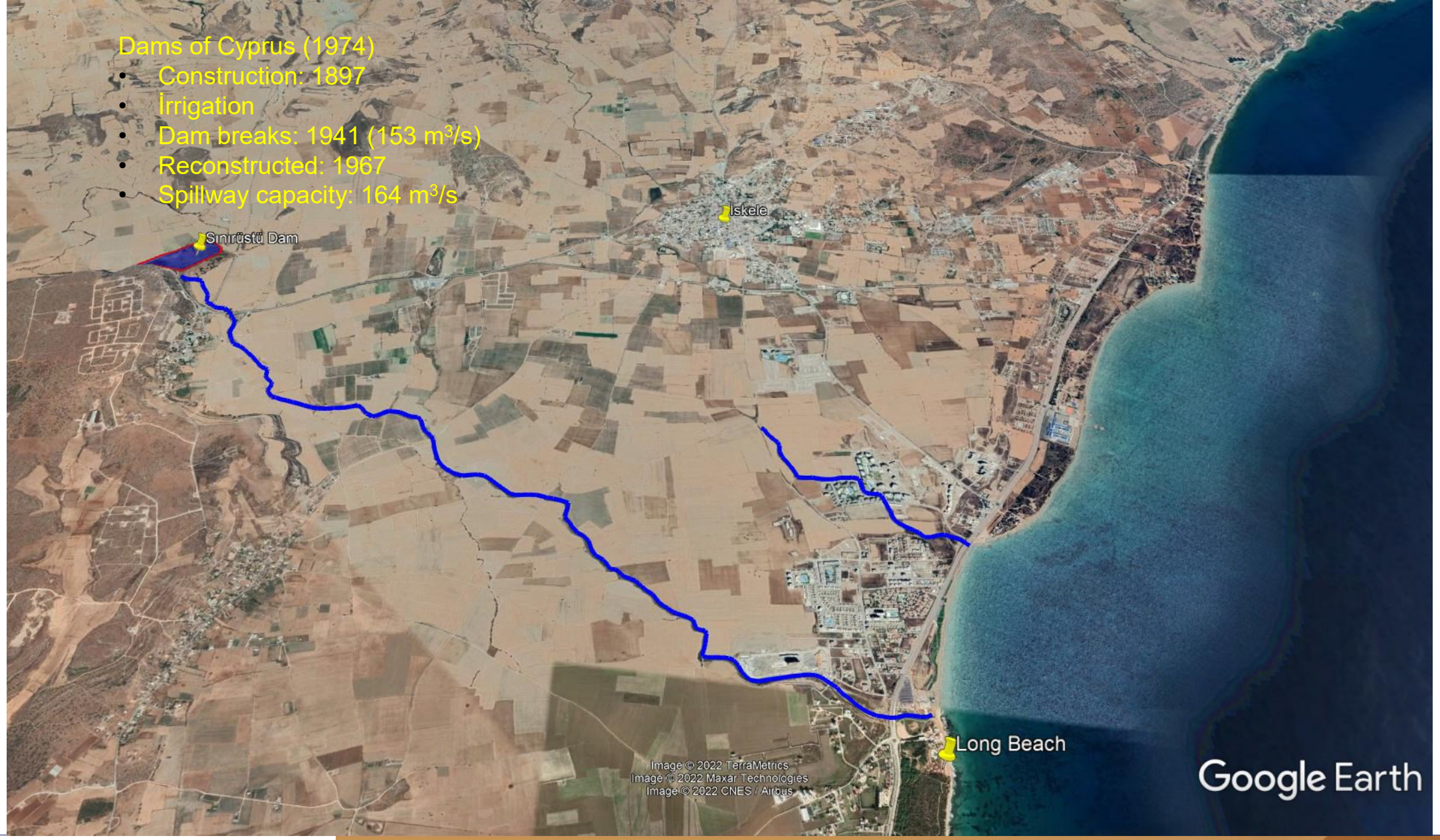
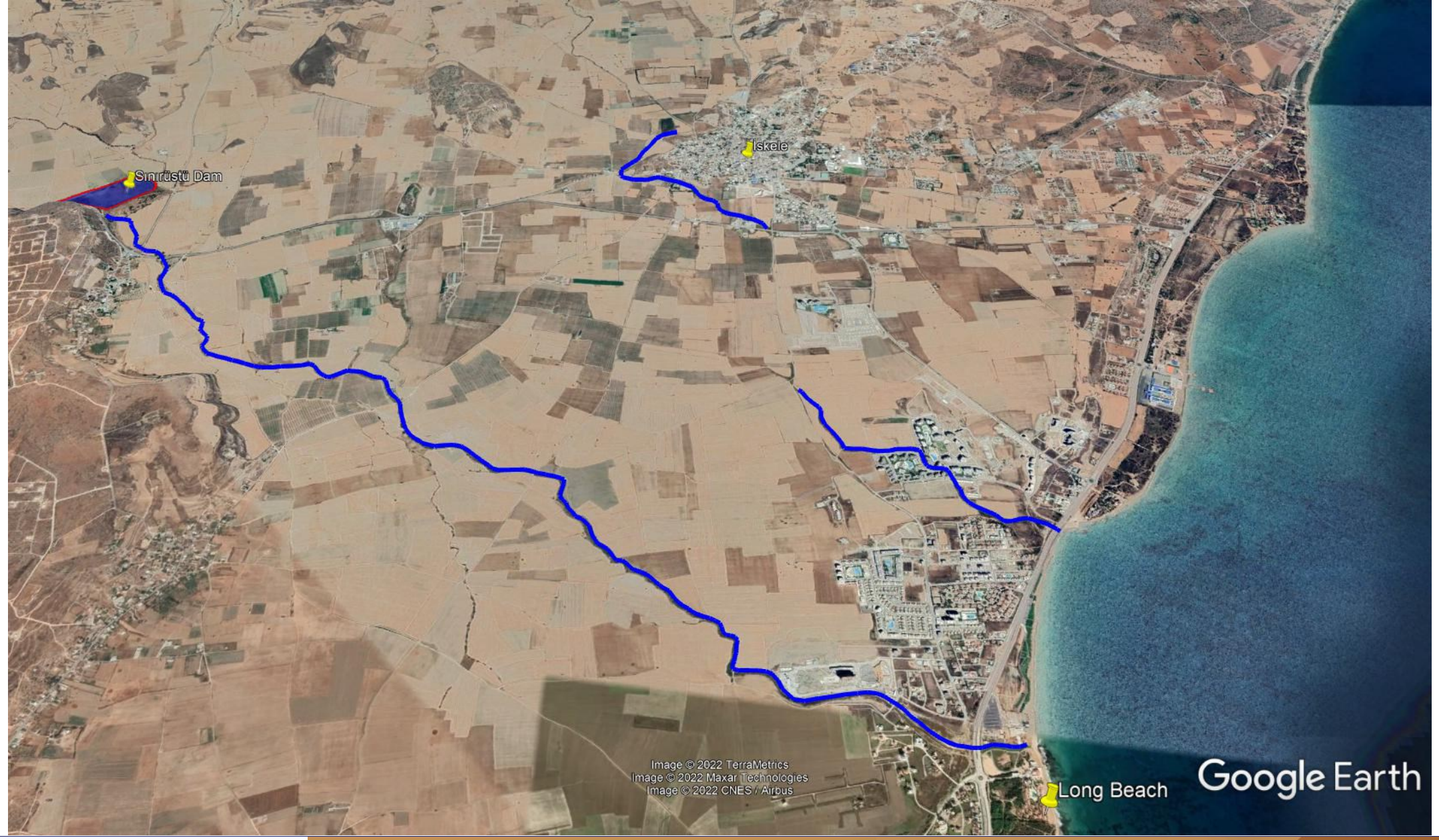
Dams of Cyprus (1974)

- Construction: 1897
- İrrigation
- Dam breaks: 1941 (153 m^3/s)
- Reconstructed: 1967
- Spillway capacity: 164 m^3/s




Sınırüstü Dam
Iskele
Long Beach
Image © 2022 TerraMetrics
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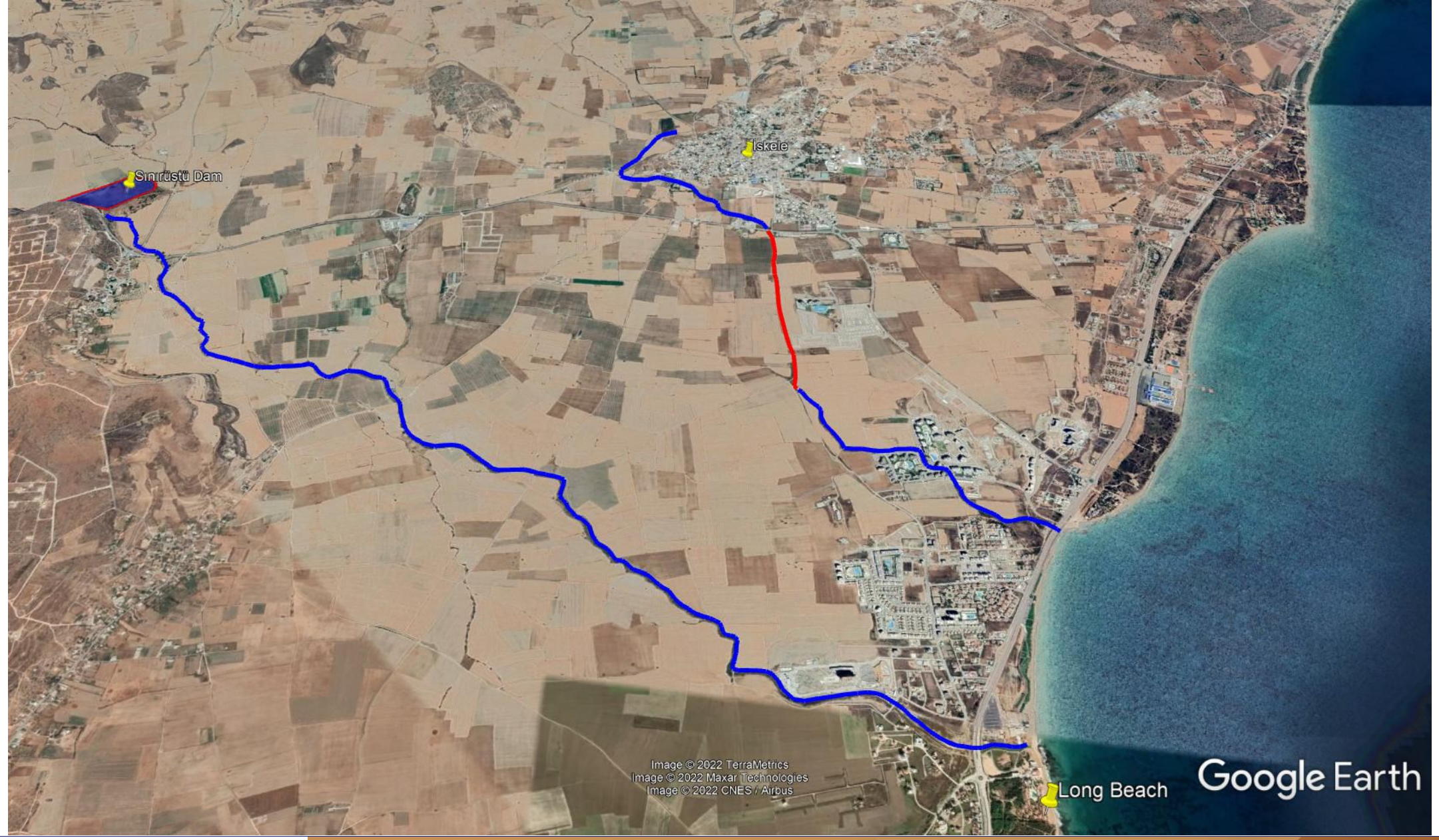
Google Earth


Sınırüstü Dam
Iskele
Long Beach
Image © 2022 TerraMetrics
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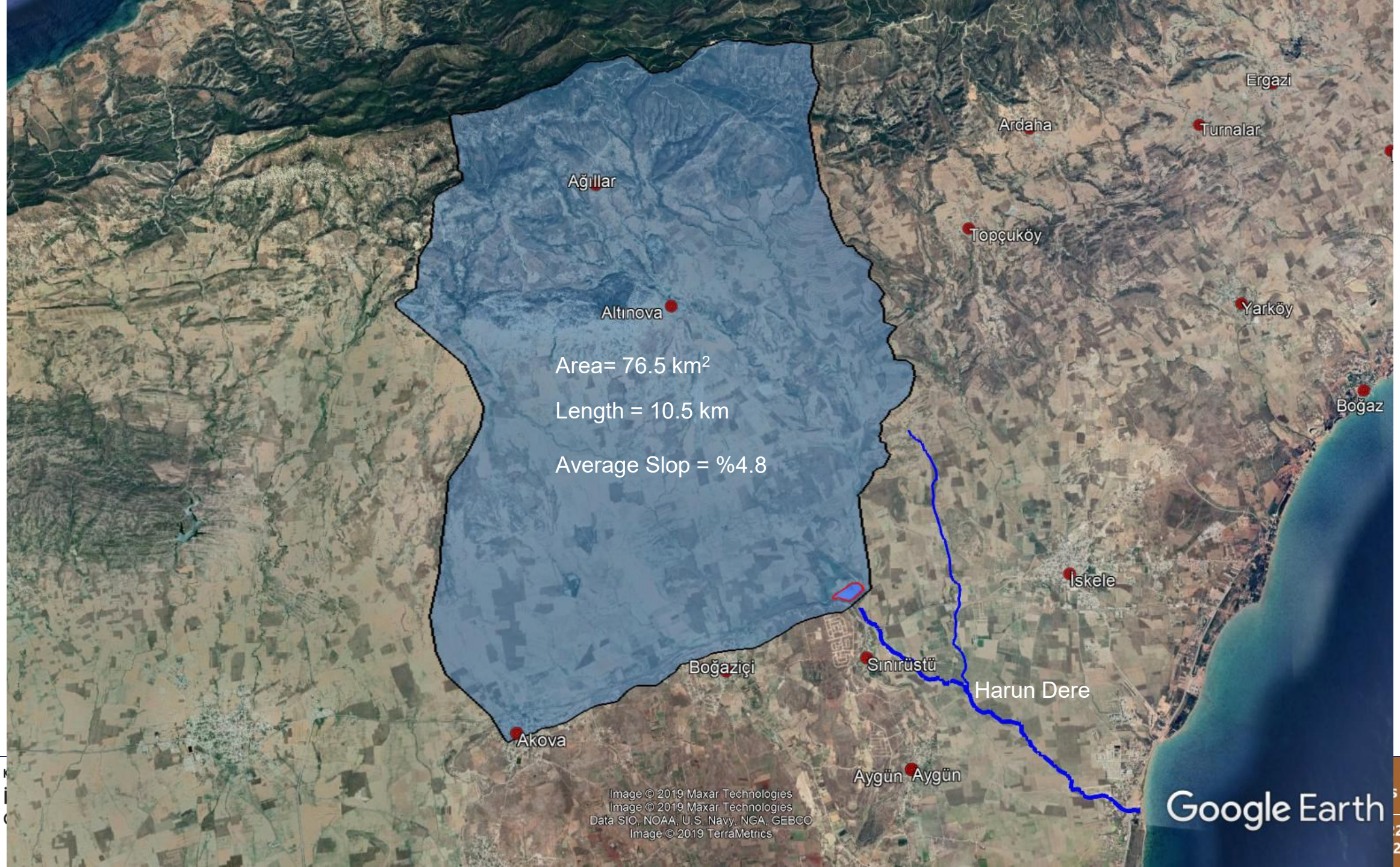
Ergazi
Ardaha
Turnalar
Ağıllar
Topçuköy
Altınova
Yarköy
Area= 76.5 km2
Length = 10.5 km
Average Slop = %4.8
Boğaz
İskele
Sınırüstü
Boğaziçi
Harun Dere
Akova
Aygün
Aygün
Image © 2019 Maxar Technologies
Image © 2019 Maxar Technologies
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2019 TerraMetrics
Google Earth


Ergazi
Tuzluca
Ardaha
Turnalar
Kurtuluş
Ağıllar
Area= 25.3 km²
Topçuköy
Length = 11.3 km
Kalecik
Average Slope = %4.3
Altınova
Yarköy
Boğaz
Karakum Deresi
İskele
Boğaziçi
Sınırüstü
Sazlıca Deresi
Akova
Image © 2019 Maxar Technologies
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2019 TerraMetrics
Aygün
Aygün
Google Earth

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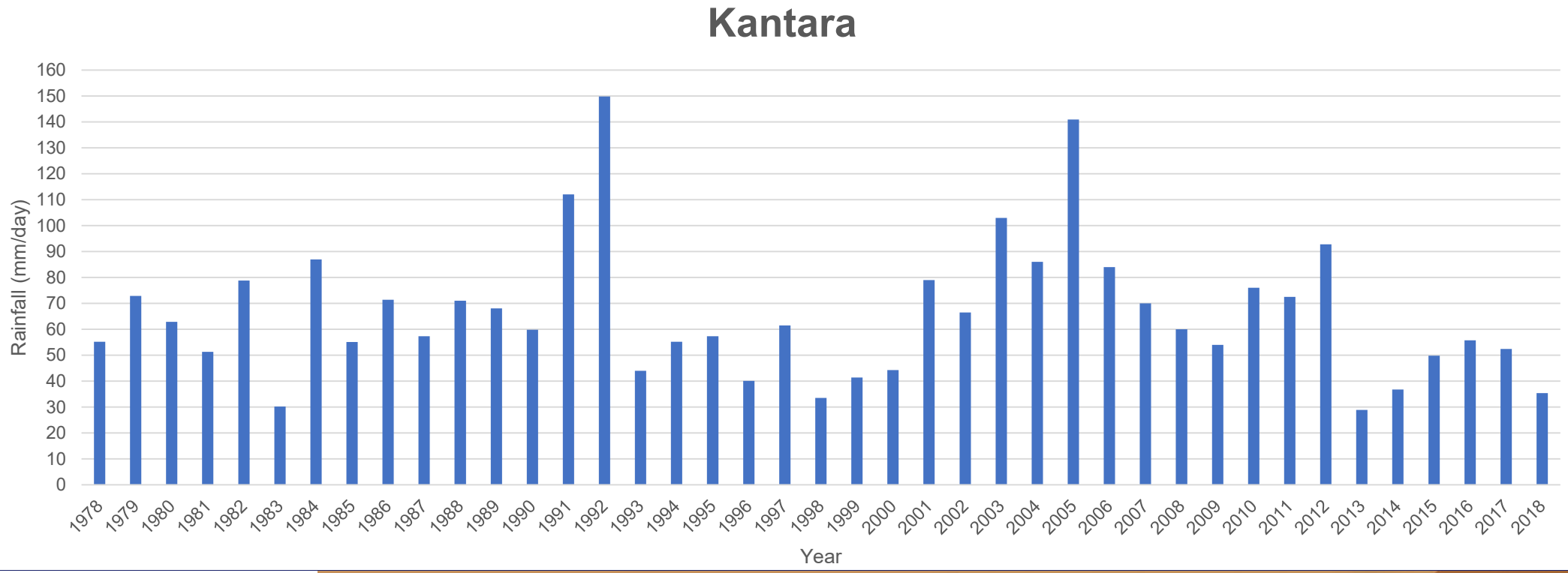
Rainfall Analysis

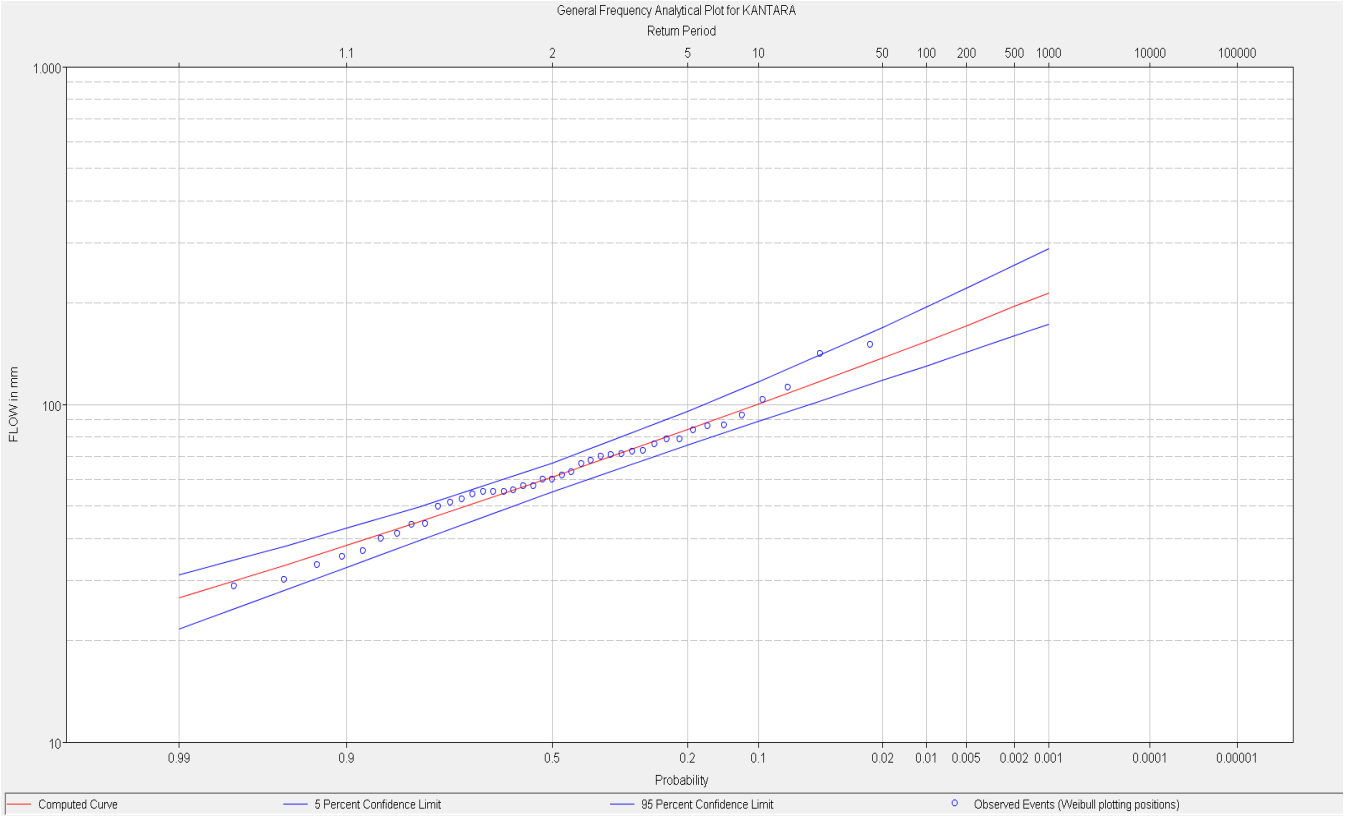
- Meteorological Station: Kantara (1978-2018)
  - Observed max. daily rainfall in a year.



RAINFALL FREQUENCY ANALYSIS

- Kantara Station
  - Log-Pearson Tip III

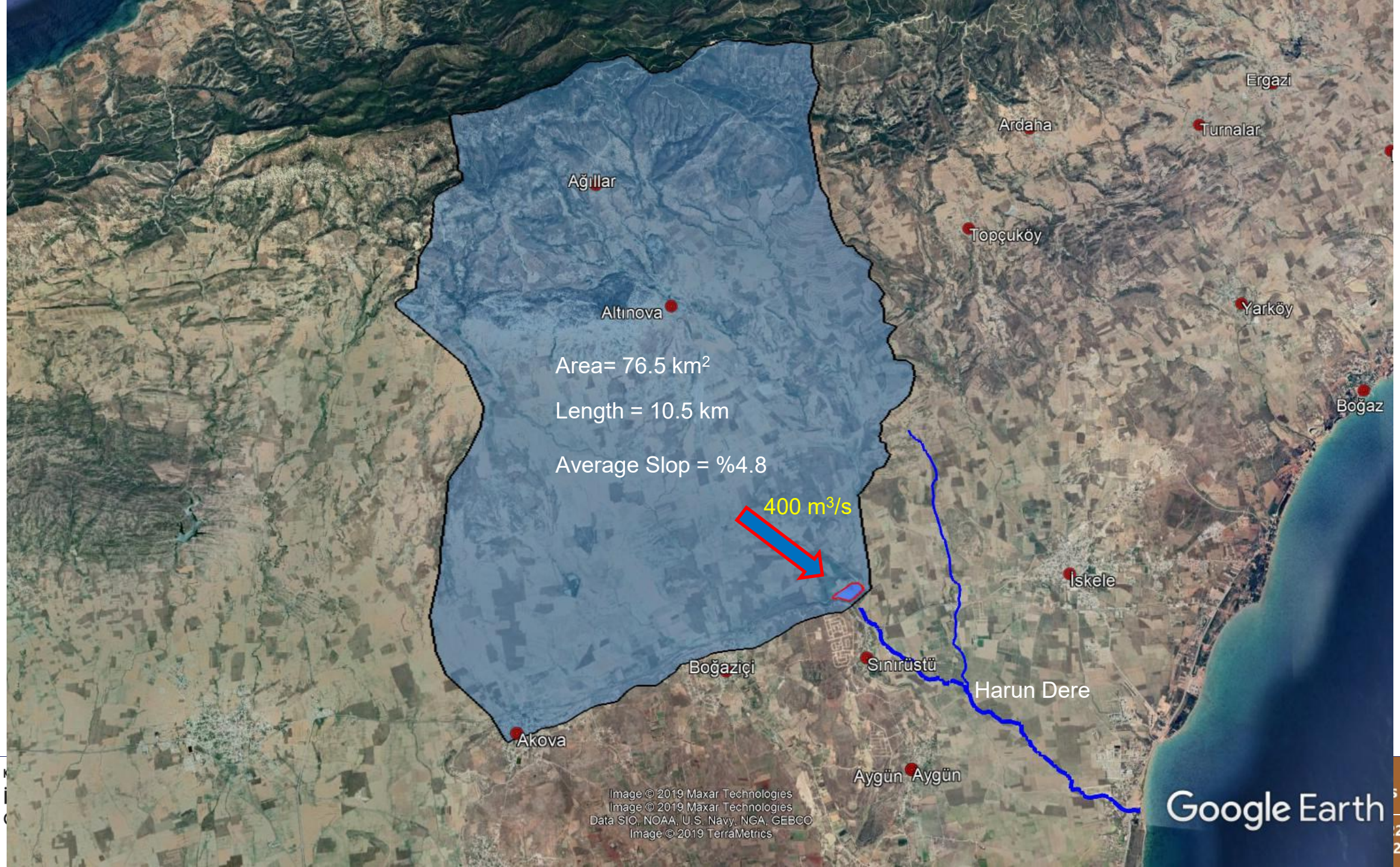
Max. Daily Rainfall P (mm)	Return Period T (yıl)	Exceedance Probability p = 1 / T (%)
194	500	0.2
171	200	0.5
154	100	1.0



Hydrologic Modelling (Rainfall-Runoff)

- Kantara meteorological station

Max. Daily Rainfall P (mm)	Return Period T (year)	Exceedance Probability p = 1 / T (%)	Harun Stream Peak Flow (m^3/s)	Karakum Stream Peak Flow (m^3/s)
154	100	1.0	400	126


Ergazi
Ardaha
Turnalar
Ağıllar
Topçuköy
Altınova
Yarköy
Area= 76.5 km2
Length = 10.5 km
Average Slop = %4.8
Boğaz
400 m3/s
İskele
Sınırüstü
Boğaziçi
Harun Dere
Akova
Aygün
Aygün
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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2019 TerraMetrics
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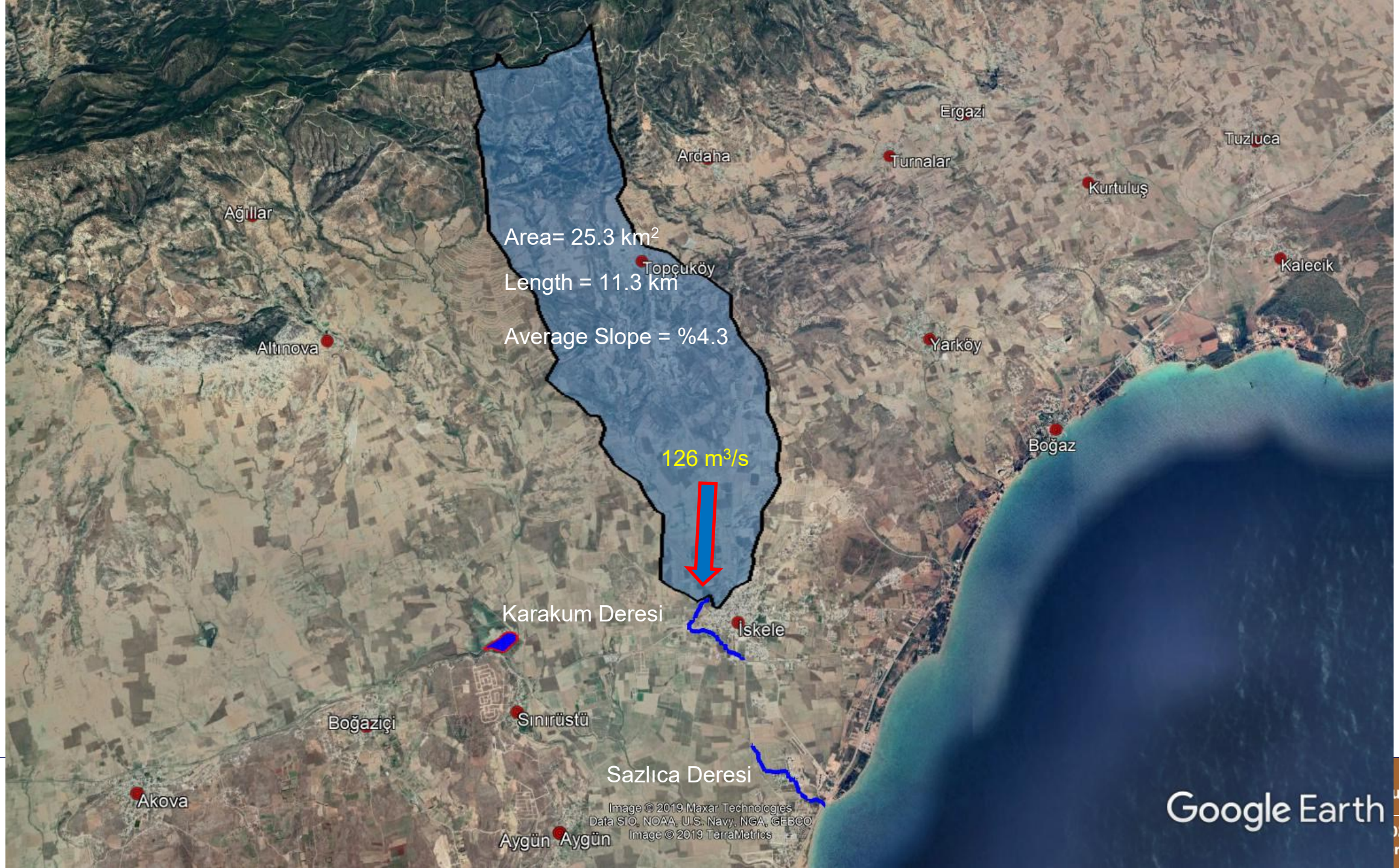
Ergazi
Tuzluca
Ardaha
Turnalar
Kurtuluş
Ağıllar
Area= 25.3 km²
Topçuköy
Length = 11.3 km
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Average Slope = %4.3
Altınova
Yarköy
Boğaz
126 m³/s
Karakum Deresi
İskele
Boğaziçi
Sınırüstü
Sazlıca Deresi
Akova
Image © 2019 Maxar Technologies
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Image © 2019 TerraMetrics
Aygün
Aygün
Google Earth

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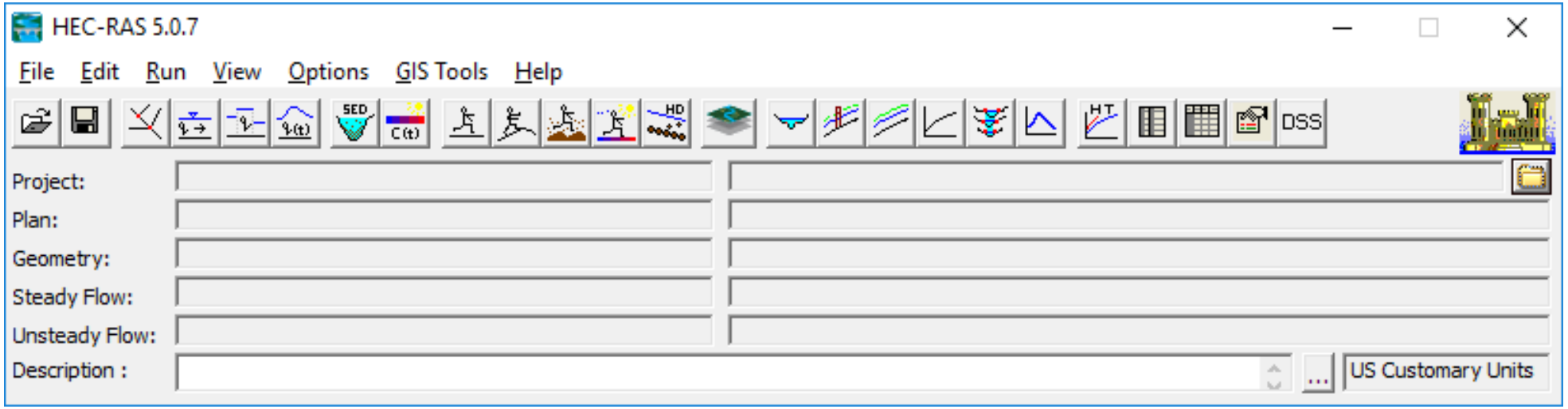
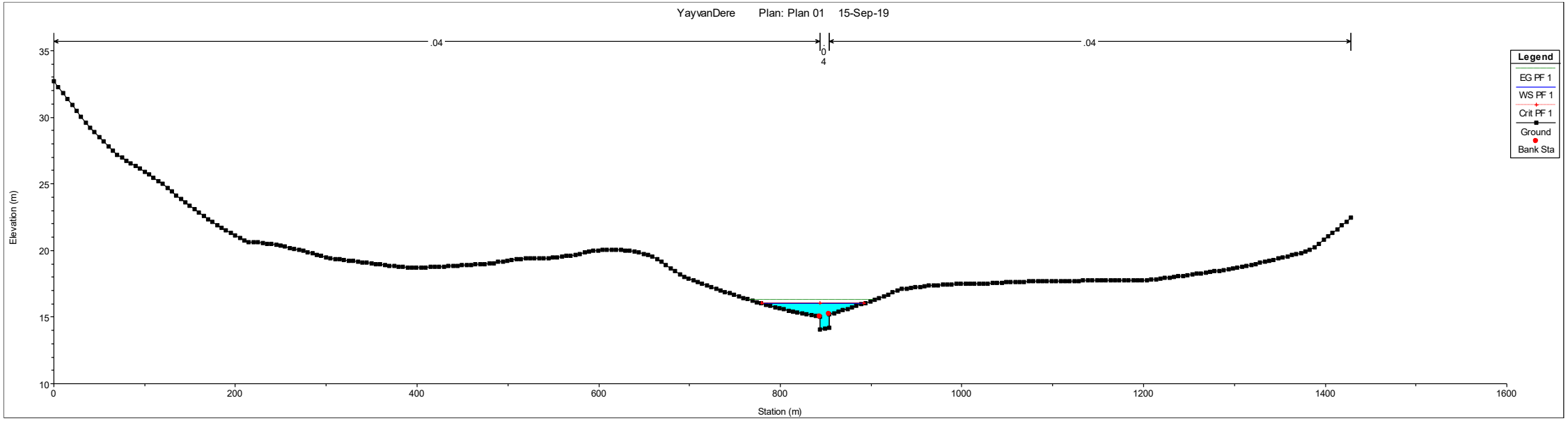
Hydraulic Modeling
HEC-RAS




YayvanDere Plan: Plan 01 15-Sep-19
.04
.04
Legend
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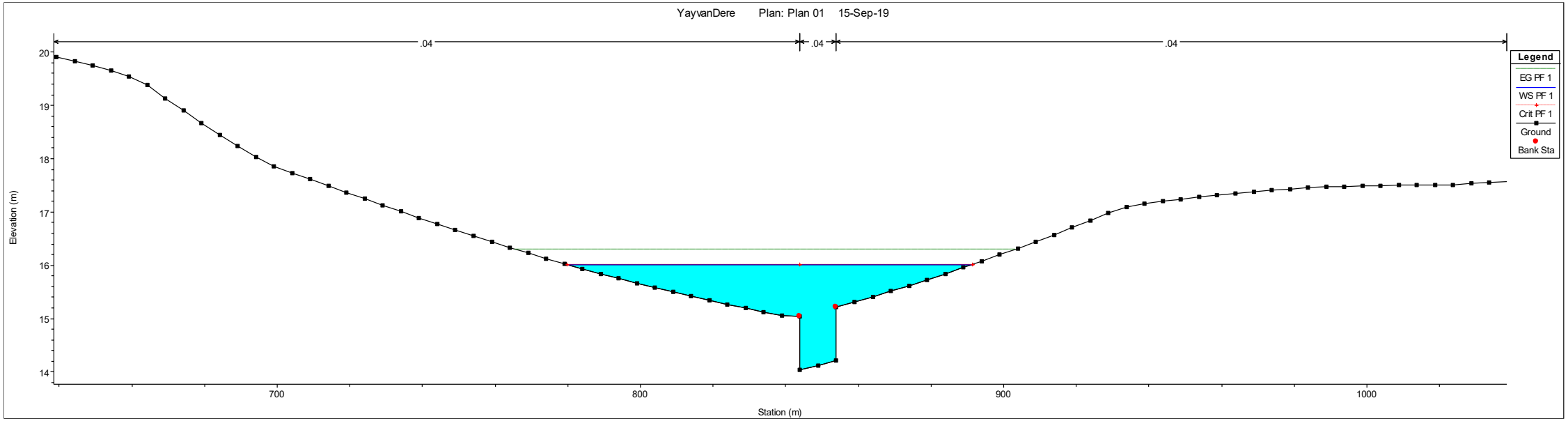
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (m)
Station (m)


YayvanDere Plan: Plan 01 15-Sep-19
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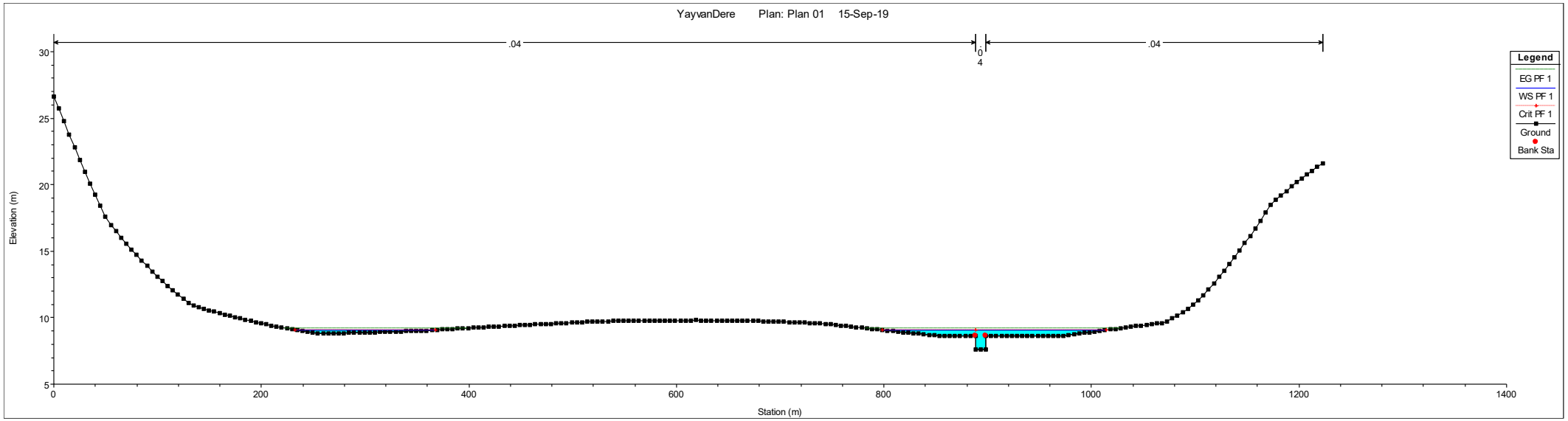
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (m)
Station (m)


YayvanDere Plan: Plan 01 15-Sep-19
.04
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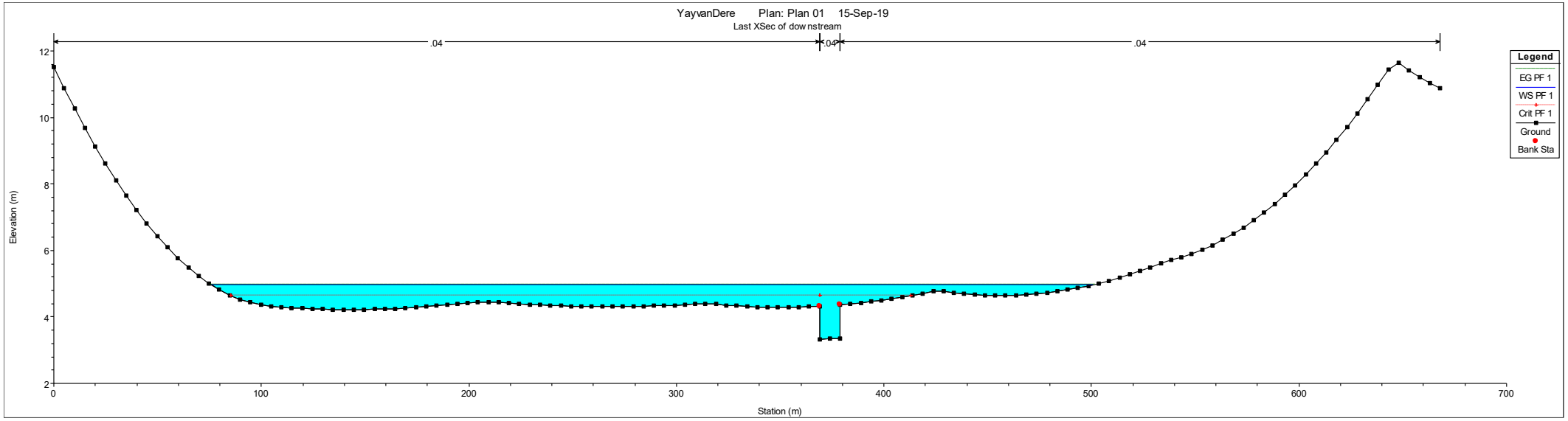
Crit PF 1
Ground
Bank Sta
Elevation (m)
Station (m)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Last XSec of downstream
.04
.04
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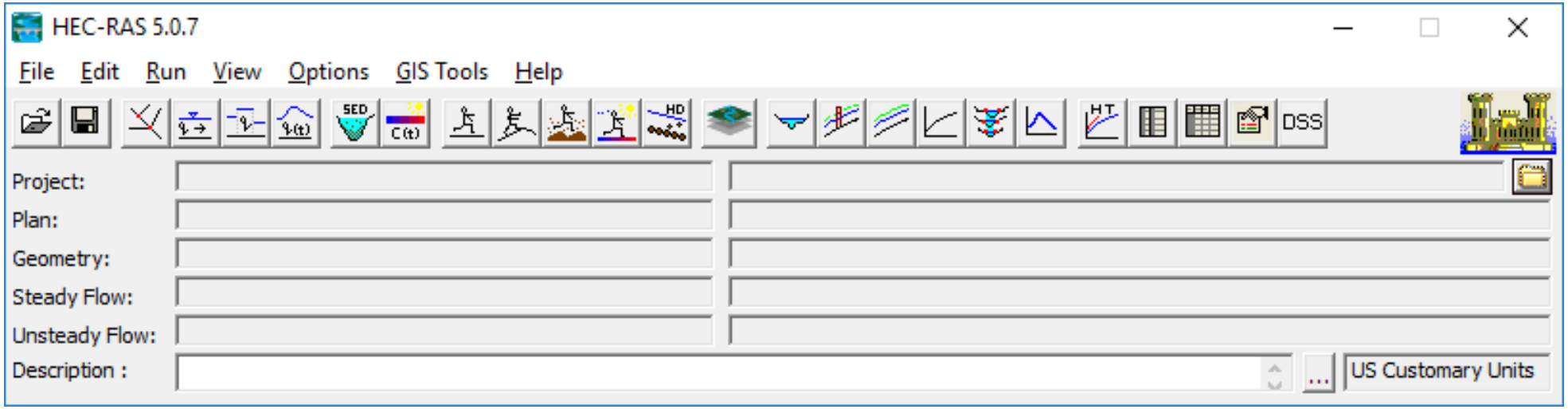
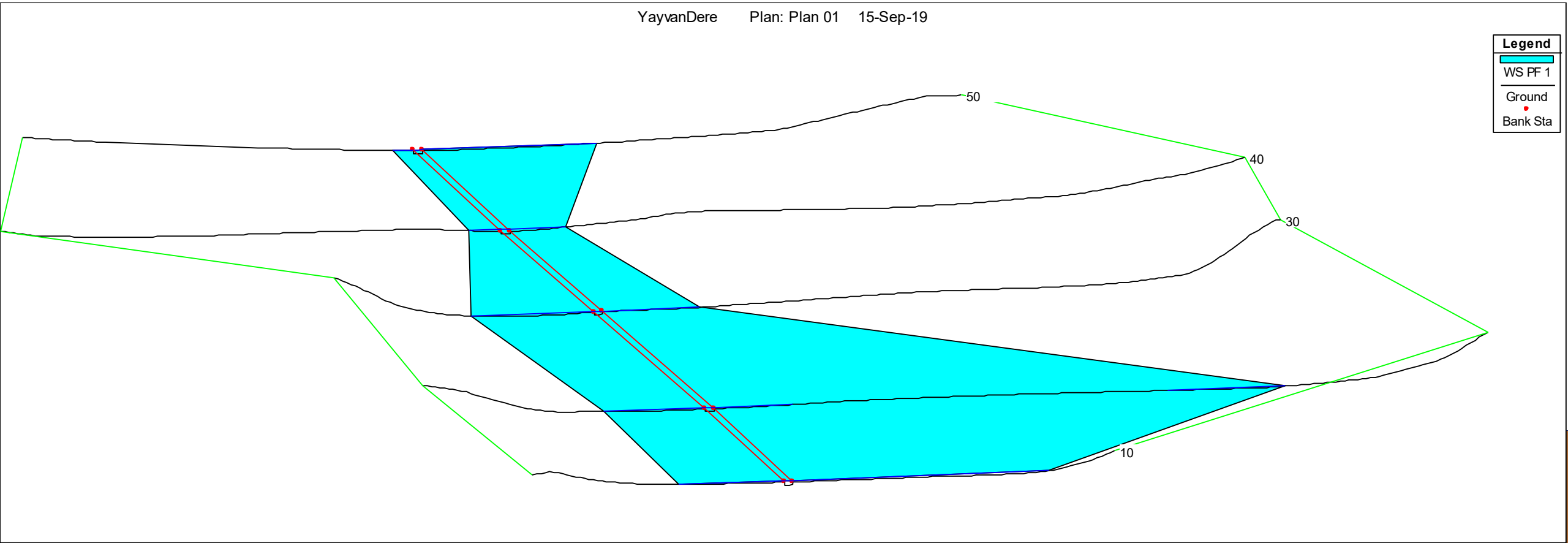
Crit PF 1
Ground
Bank Sta
Elevation (m)
Station (m)


HEC-RAS 5.0.7
File
Edit
Run
View
Options
GIS Tools
Help
DSS
Project:
Plan:
Geometry:
Steady Flow:
Unsteady Flow:
Description :
US Customary Units


YayvanDere Plan: Plan 01 15-Sep-19
Legend
WS PF 1
Ground
Bank Sta
50
40
30
10


RISK OF DAM BREAK
İskele
Sınırüstü
Aygün
Aygün
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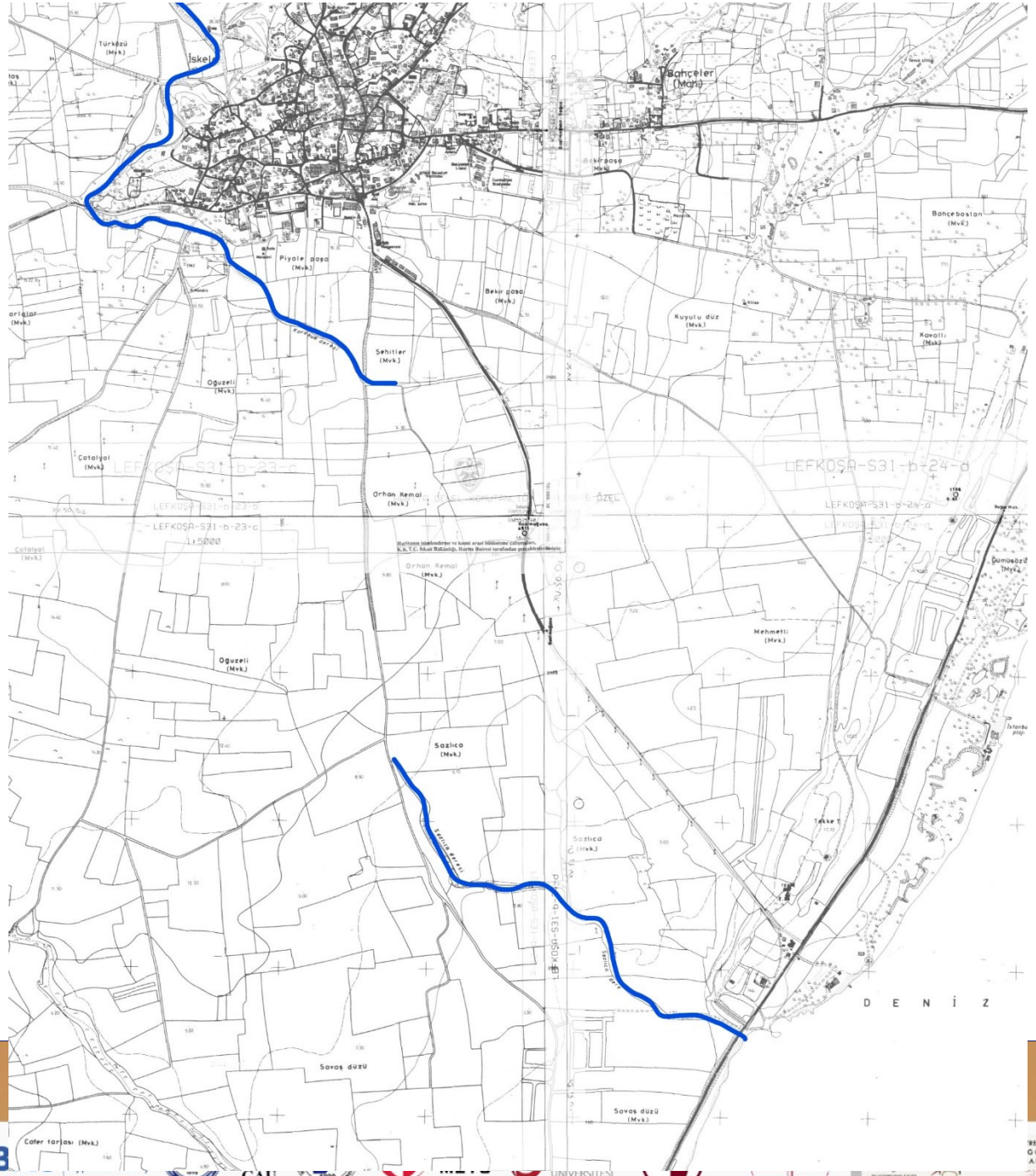
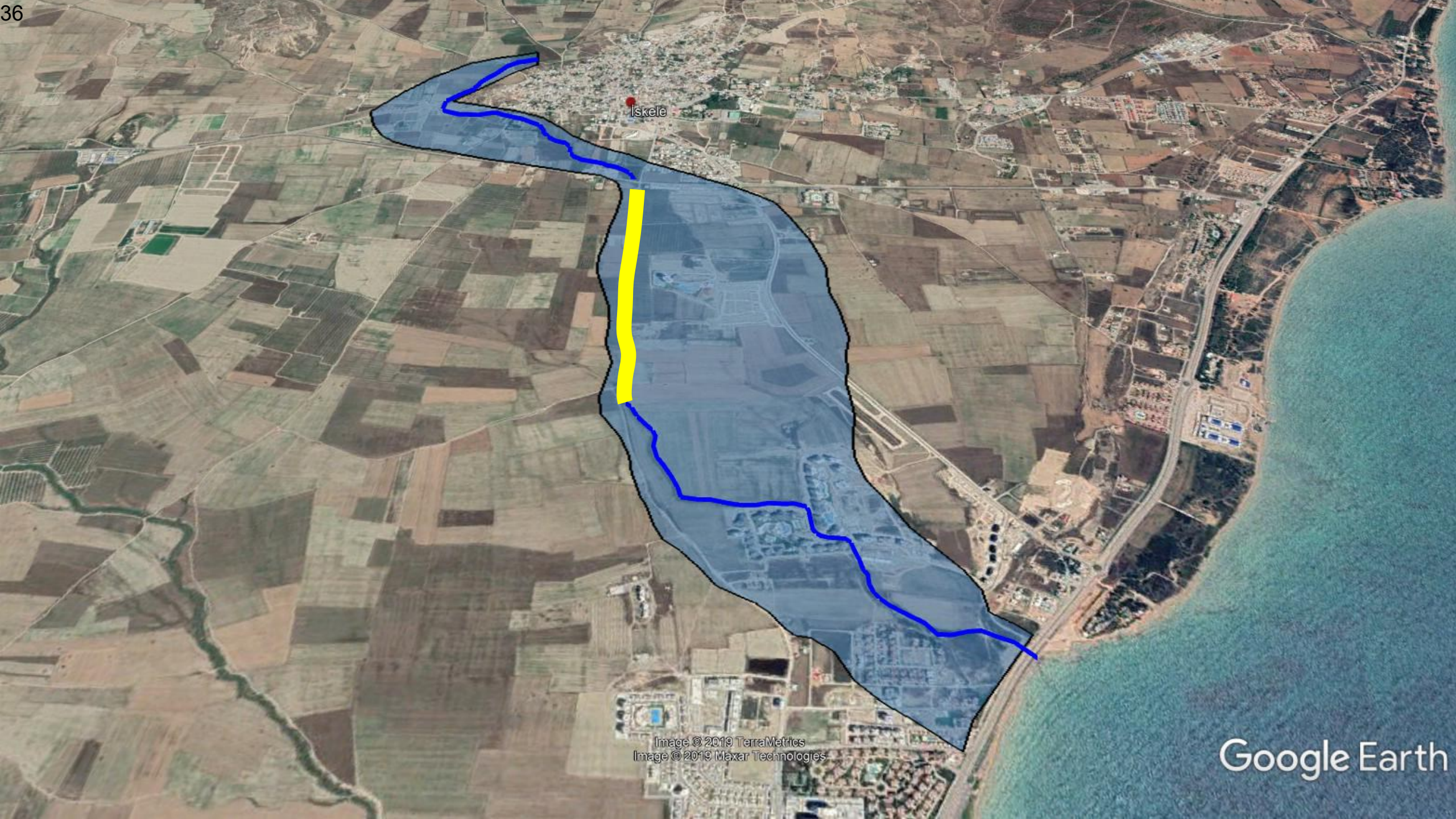
Image © 2019 TerraMetrics
Image © 2019 Maxar Technologies
Google Earth


İskele
Türközü (Mvk.)
Bahçeler (Mvk.)
Bahçeboğazı (Mvk.)
Piyale paşa (Mvk.)
Bekir paşa (Mvk.)
Kuyulu düz (Mvk.)
Kavallı (Mvk.)
Şehitler (Mvk.)
Oğuzeli (Mvk.)
Çataloğlu (Mvk.)
Orhan Kemal (Mvk.)
LEFKOŞA-S31-b-23-c
1:5000
LEFKOŞA-S31-b-24-a
Mehmetli (Mvk.)
Sazlıca (Mvk.)
Savaş düzü
Savaş düzü (Mvk.)
Cafer tarlası (Mvk.)
D E N İ Z


İskele
Image © 2019 TerraMetrics
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İSKELE URBAN PLANNING FLOOD RISK ASSESSMENT REPORT

İSKELE İMAR PLANI TAŞKIN RİSKİ DEĞERLENDİRME RAPORU

İskele İmar Planı Çerçevesinde Taşkın Riski Bulunan Derelerin ve Yağmursuyu Drenaj Sorunu Olan Bölgelerin Belirlenmesi ve Çözüm Önerileri

HAZIRLAYANLAR

Yrd. Doç. Dr. Bertuğ Akıntuğ
Hidroloji ve Su Kaynakları Laboratuarı
İnşaat Mühendisliği Programı
Orta Doğu Teknik Üniversitesi
Kuzey Kıbrıs Kampusu

Dr. Can Kara
Mimarlik Fakültesi
Yakın Doğu Üniversitesi

06 Aralık 2019

Conclusion

- Area is under the risk of severe flood.
- Flood events are already experienced in the history.
- Flood event will be experienced in the future for sure. When?
- Sınırüstü dam is under the risk of dam break beause of spillway capacity. (Spillway capacity: 164 m^3/s, only $Q_{100\text{-}yr}$: 400 m^3/s)
- Flood (disaster) risk reduction studies should be started as soon as possible.