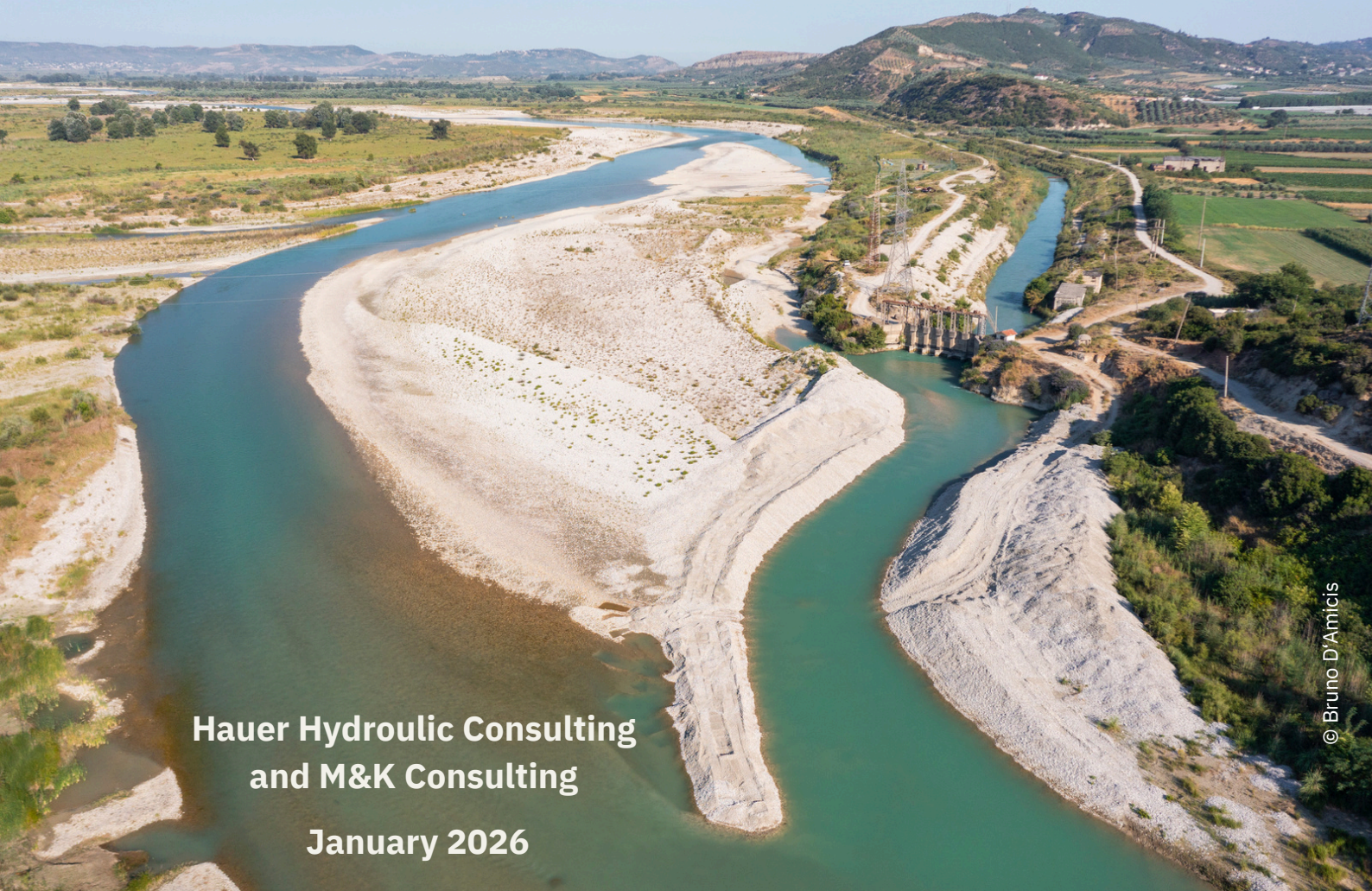
Under Pressure:

Water Abstraction in the Vjosa Wild River National Park



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and M&K Consulting

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Water abstraction into the irrigation canal Vjose-Levan-Fier © Bruno D'Amicis

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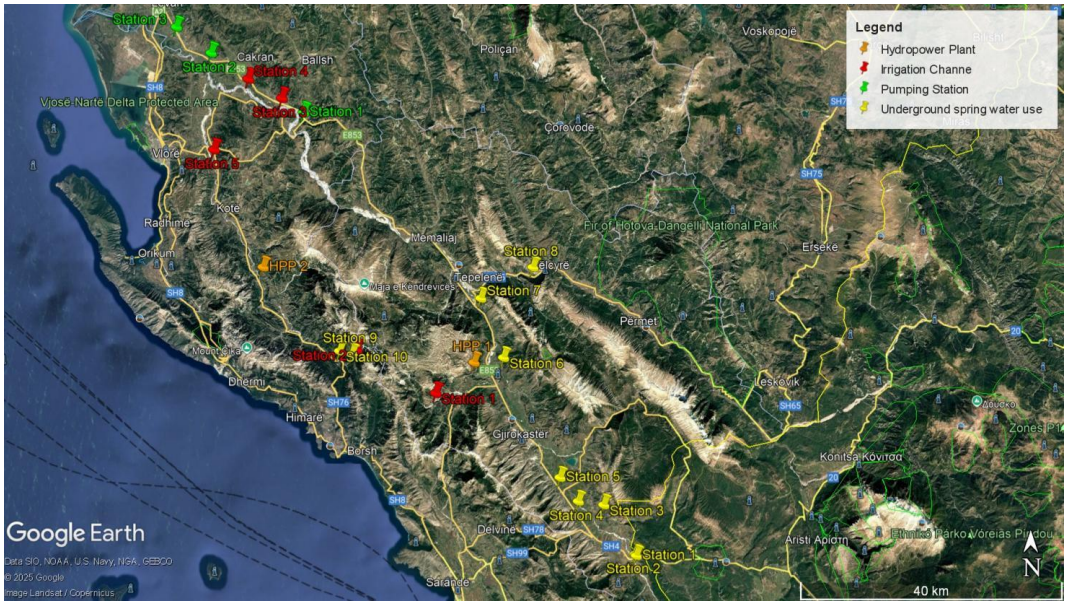

Figure 1 The map shows the locations of the stations

Water abstraction for irrigation is a huge pressure for aquatic ecosystems and will increase due to impacts on and intensification of the hydrological cycle due to climate change in future. As Europe is the fastest warming continent, droughts will be more frequently occurring with prolonged periods of water scarcity for agriculture especially in the southern parts, like Albania. Beside this increasing climate pressure, there is an additional huge impact due to water abstraction in the Vjosa basin, hosting the first "wild river national park" in Europe. The presented report covers the most important water abstraction sites, differing between (i) irrigation channels, (ii) underground / spring water use and (iii) pumping stations and (iv) hydropower plants within the spatial boundaries of the National Park. In total 20 stations were identified at and along the main river Vjosa and in major tributaries like the Shushica and Kardhiqi. The total amount of permitted and partially documented abstracted water was documented with 12.012 m³/s. However, this number is obviously higher, as for seven sites, no numbers on permitted waters abstraction was available.

Especially the water abstraction of the irrigation channels in the lower part of the Vjosa River were documented for having a strong impact on the wetted areas and instream habitats. During August 2025, low flow conditions at the Vjosa in the area of Pocem were around 20 m³/s. Two major irrigation channels (e.g. Levan – Fier) however, extracted around 9 m³/s. Thus, between 1/3 to 1/2 of the total discharge of the Vjosa River was diverted for irrigation during summer low flow periods in 2025. Based on the presented findings and the review of the possibilities for hydrological monitoring of the water abstractions, two recommendations for handling water abstraction are included in the report. One of how the legal process for water abstraction should be implemented in Albania by the responsible water management institutions (mainly AMBU) and the second of how a continuous water abstraction monitoring in the Vjosa National Park could be set up in a low-cost by efficient way.

2 INTRODUCTION

2.1 AIM OF THE STUDY

The Vjosa River, one of the last wild rivers in Europe, is subject to increasing hydrological, environmental, and anthropogenic pressures. Understanding these pressures and their potential impacts requires accurate assessment of the various pressure forms, supported by state-of-the art techniques.
The main objective of this study was the identification of existing water abstraction in the Vjosa basin, to identify and describe the sites in detail as well as to document the total amount of water abstraction. To achieve this, a detailed field survey was undertaken, employing state-of-the-art geospatial technologies, including LiDAR, total station, GPS, and UAV photogrammetry. These methods provided complementary datasets which form a robust foundation for the analysis as well as basic information for the hydraulic modelling for some of the water abstraction sites. In total, 20 sites were identified and surveyed in detail. These represent the main categories of water use and abstraction:

1. Irrigation Channels (5 stations):
2. Underground / Spring Water Use (10 stations):
3. Pumping Stations (3 stations):
4. Hydropower Plants (2 stations):

METHODOLOGY 3

3.1 ORGANIZATION AND THE REALIZATION OF THE RESEARCH ACTIVITY

The water abstraction study was carried out following three stages.

(i) Reviewing existing information on water abstraction

During this first stage a detailed collection of the bibliographical data and the previous reports were carried out. The consultation and integration of these works in this study has been very important to identify the water abstraction pressures along the Vjosa River Basin. All the previous information helped on preparing a detailed and a strong field work programm.

(ii) Field work

During this stage the topographical surveys of 20 stations have been conducted by integrating UAV-LiDAR, drone photogrammetry, and ground-based surveys (Total Station and GPS). The main objective of this combined measurements was the state of the art assessment of the different bathymetric boundary conditions around the abstraction sites.

(iv) Data processing and modelling

The integration of UAV-LiDAR, photogrammetry, and ground survey data produced a unified spatial dataset that combined topography, and potential infrastructure. In some cases, the river cross-sections and embankment geometry were incorporated into hydraulic models. With the calibrated hydraulic models the amount of water abstraction for e.g. irrigation channels was calculated.

3.2 Details on the remote sensiong approach applied in this study – State-of-the-art for future water abstraction monitoring in Albania

Background

Modern river basin m and water management studies require high-resolution geospatial data that accurately represent both natural features and human-made structures. UAV-based surveys, integrating LiDAR and photogrammetry, provide comprehensive spatial coverage and enable the simultaneous mapping of river morphology, and critical infrastructure such as water supply systems and industrial facilities. When combined with ground-based measurements from e.g. total stations and GPS instruments, these methods deliver precise and reliable datasets for hydrological modelling, risk assessment, and planning.

By integrating UAV-LiDAR, drone photogrammetry, and ground-based surveys, a very precise approach of determining the boundary conditions for water abstraction could have been established in the project. This approach captured natural features, anthropogenic modifications (e.g. intake channels), and critical water-dependent infrastructure such as water supply systems and beverage factories. The approach enhances both the optional on site assessment and the follow up practical management of river basins and should be used as a state-of-the art approach for the bathymetric monitoring water abstraction in Albania in future.

(i) UAV-LiDAR for River Basin and Embankment Modelling (Terrain).

Unmanned Aerial Vehicles equipped with LiDAR systems were deployed to capture dense elevation data across the river corridor and water abstraction facilities. LiDAR-derived point clouds provided accurate slope profiles, crest elevations, and structural geometry of embankments,.

(ii) Drone Photogrammetry for Infrastructure Mapping (Terrain).

Alongside LiDAR, UAV photogrammetry was employed to capture high-resolution aerial imagery of the studied areas. The photogrammetric process produced orthophotos and 3D textured models, which were crucial for identifying man-made features, like;
Water Supply Structures: **Pumping stations**, **intake points**, **irrigation channels**, and **small-scale reservoirs** were mapped with high accuracy.

Their location in global coordinates and relative to the river was documented to assess potential pressures on the river.

Beverage Factories and **Industrial Facilities**: Photogrammetry enabled the precise identification of beverage factories and related facilities situated near the river basin. Documenting their footprint, access routes, and proximity to the floodplain is vital for both risk assessment and water management planning. While LiDAR focused on structural geomorphology and topography, photogrammetry provided important contextual visual information, supporting the interpretation of the infrastructure distribution.

(iii) Total Station and GPS for Ground Control and Cross-Sections (Wetted area).

To ensure the accuracy of UAV-derived data, total stations and GPS surveys were further conducted to establish ground control points (GCPs) for the points (i) and (ii). These georeferenced benchmarks provided the positional precision required for both LiDAR and photogrammetry outputs. Furthermore, systematic cross-sections were measured across the river channel and embankments, complementing UAV data in areas where water surfaces reduced photogrammetric accuracy. This information was important for the setting up the hydraulic models as (i) and (ii) are not penetrating the water surface and thus no information of the channel bottom of water diversion structures can be produced by (i) and (ii).

(iv) Data Integration and Modelling of Terrain and Wetted area.

The integration of (i) UAV-LiDAR, (ii) photogrammetry, and (iii) ground survey data produced a unified spatial dataset that combined topography and infrastructure. Hydraulic Modelling was build on these high resolutiong terrain and underwater information.

Advantages of the Combined Approach: (a) High Coverage: UAV surveys provide rapid mapping of both natural and industrial features, (b) Multi-Purpose Outputs: LiDAR excels in structural modelling, while photogrammetry delivers visual identification of infrastructure and (c) Precision: Total station and GPS ensure survey reliability and enable detailed cross-sections of critical locations.

4 CATEGORIES OF WATER ABSTRACTION

Based on reviewing the existing literature as well as the conducted field work, 20 sites were documented as well known water abstraction sites which are further described in detail. In this chapter the water abstraction is presented for different categories. These represent the main categories of (i) water use and (ii) energy generation within the basin:

(1) Irrigation Channels (5 stations):
Stations 1, 2, 3, 4 and 5
These stations represent major irrigation abstraction points, documenting water diversion for agricultural use. They are critical in assessing the interaction between river discharge and agricultural demand.

(2) Underground / Spring Water Use (10 stations):
Stations 1 to 10
These sites include springs and groundwater abstraction wells. Their mapping and quantification provide insight into subsurface water exploitation, recharge potential, and cumulative pressure on the basin's aquifer systems.

(3) Pumping Stations (3 stations):
Stations 1, 2 and 3
These are mechanical installations that lift water from the groundwater and the river for municipal supply and sometimes irrigation. Their operational capacity and location relative to embankments and settlements are key factors in local water management.

(4) Hydropower Plants (2 stations):
Stations 1 and 2
These represent pressures with water abstraction used for energy production, with the potential influence on river flow regulation, sediment transport, and ecological continuity.

4.1 The irrigation Channels

The irrigation Channels are represented by the following stations:
STATION 1 - Kardhiqi irrigation Scheme
STATION 2 - Kuçi Springs
STATION 3 - Water intake channel of Mollaj village
STATION 4 - Vjosa River - Levan-Fier Canal
STATION 5 - Shushica Irrigation Scheme

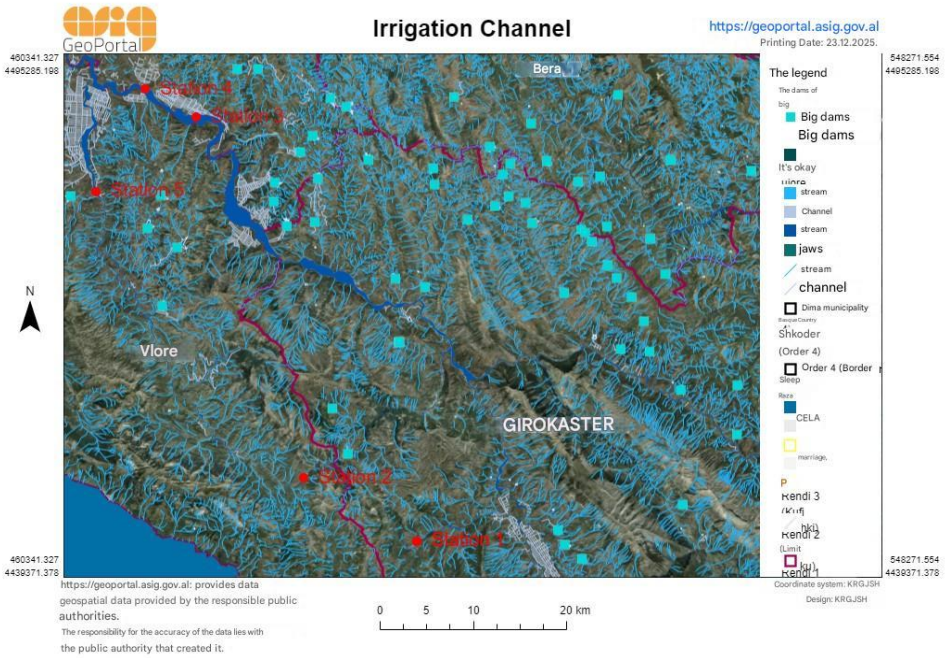

Figure 4.1.1 The map shows the locations of the Irrigation channel

These stations correspond to major irrigation abstraction and diversion points, documenting water withdrawals and flow diversions for agricultural use through both gravity-fed and engineered channel systems. As such, they provide essential information on the magnitude, timing, and spatial distribution of irrigation abstractions, which represent one of the most relevant human pressures on river systems during the dry season.
Monitoring these locations is critical for assessing the interaction between river discharge, irrigation demand, and seasonal water availability, particularly under conditions of low-flow periods and increasing water stress. The collected data support the quantification of water diverted from the main river and tributaries, enabling the evaluation of how abstractions may influence hydrological regime alteration, including

reductions in downstream flow, changes in flow variability, and potential impacts on environmental flow requirements.
Overall, these monitoring points represent a key component for integrated water resources management, linking agricultural abstraction patterns with hydrological conditions, river basin planning, and long-term sustainability objectives.

STATION 1 - Kardhiqi irrigation Scheme

Station 1, named "Kardhiqi irrigation Scheme", is composed by the dam sector and the main channel sector. The dam is located at coordinates 4441966.00 m N, 413050.00 m E. The abstractions are inside the Drinos River. The main channel starts at the coordinates 4442007.00 m N, 413128.00 m E. This station is situated approximately 1.5 km from the village of Zhulat and about 22 km from the city of Gjirokastër. This facility is under construction and it's a Water intake channel. It is located to the Zhulat–Taroninë Stream and has a flow rate of **80 liters per second (80 l/s) or 0.08 m³/s** and an annual volume of 622,280 m³.

Figure 4.1.2. Location of the station 1 - Kardhiqi irrigation Scheme.

Figure 4.1.3. The abstractions are inside the Kardhiqi River.

Figure 4.1.4. View of the Dam Station.

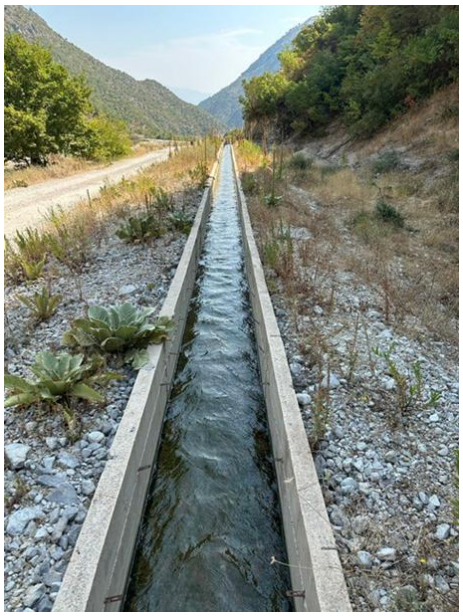

Figure 4.1.5. Photo of the channel Station.

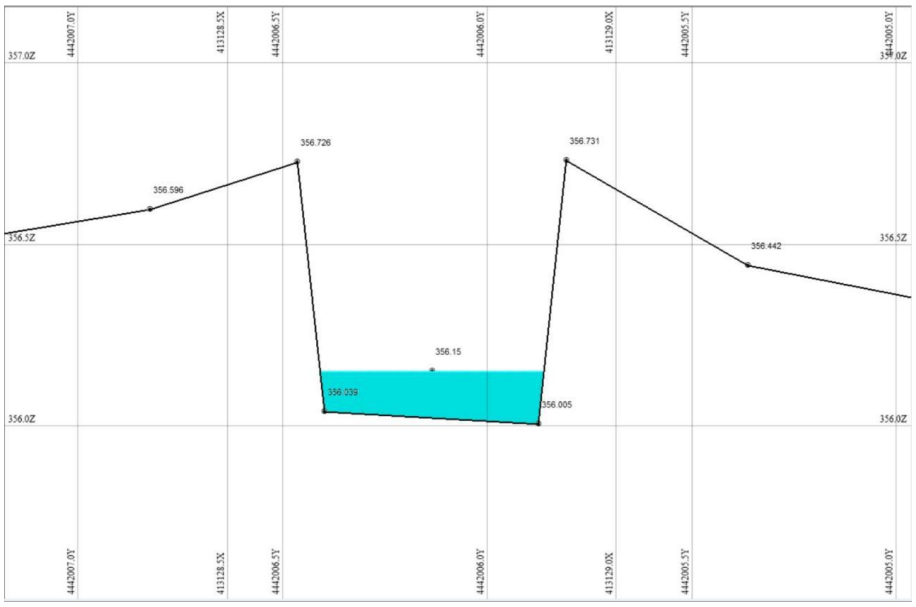

Figure 4.1.6. Cross-section nr 1.

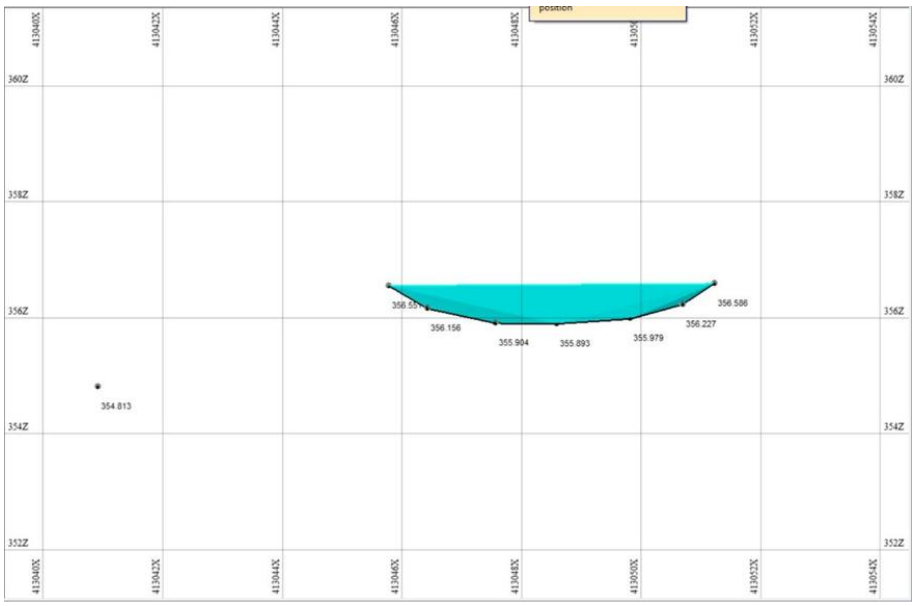

Figure 4.1.7. Cross-section nr 2

STATION 2 – Kuçi Springs

Station 2, named "Kuçi Spring" is located at coordinates 4450096.00 m N, 402324.00 m E. The abstraction is inside the Shushica River. This station is situated approximately 1.5 km from the village of Kuç and about 32 km from the city of Himarë. This facility is under construction and is planned to provide the water supply for Himara. **The former permitted water abstraction rate** for this facility is up to **139 liters per second (139 l/s) or 0.139 m³/s**. However, based on the IUCN Rapid Assessment the number of water abstraction was adjusted to **(60 - 90 l/s) or 0.060 – 0.090 m³/s.**

Figure 4.1.8 Location of the station 2 - Kuçi Springs

Figure 4.1.9 The abstraction is inside the Shushica River.

Figure 4.1.10. Frontal view of the station

STATION 3 - Water intake channel of Mollaj village

Station 3 is located at coordinates 4487516.00 m N, 389645.00 m E. The abstraction is inside the Vjosa River. This station is situated approximately 4 km from the village of Mollaj and about 14 km from municipality of Mallakastra.

Figure 4..11 Location of the station 3 - Water intake channel of Mollaj village.

Figure 4..12. The abstraction is inside the Vjosa River

Figure 4.1.13. DOM (Digital Orthophoto Map).

Figure 4.1.14. View of the station.

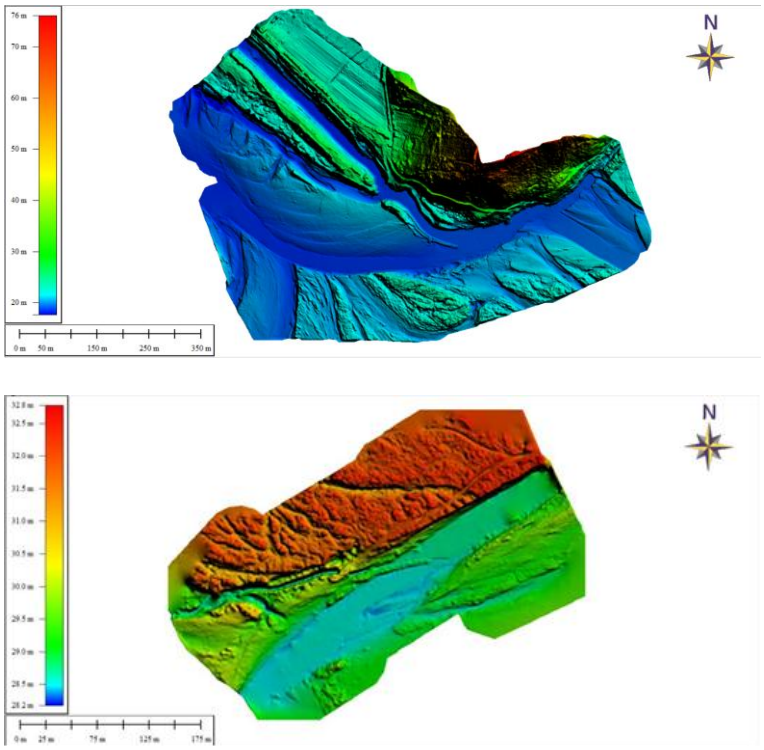

Figure 4.1.15. DEM (Digital Elevation Model).

Figure 4.1.16. DOM (Digital Orthophoto Map) with the 1 cross-sections at the Vjosa.

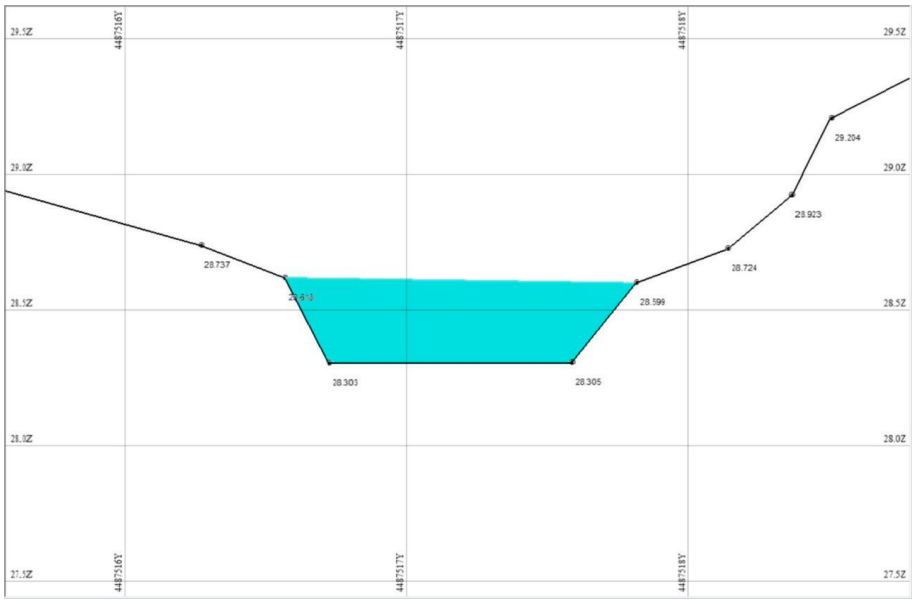

Figure 4.1.17. Cross-section nr. 1.

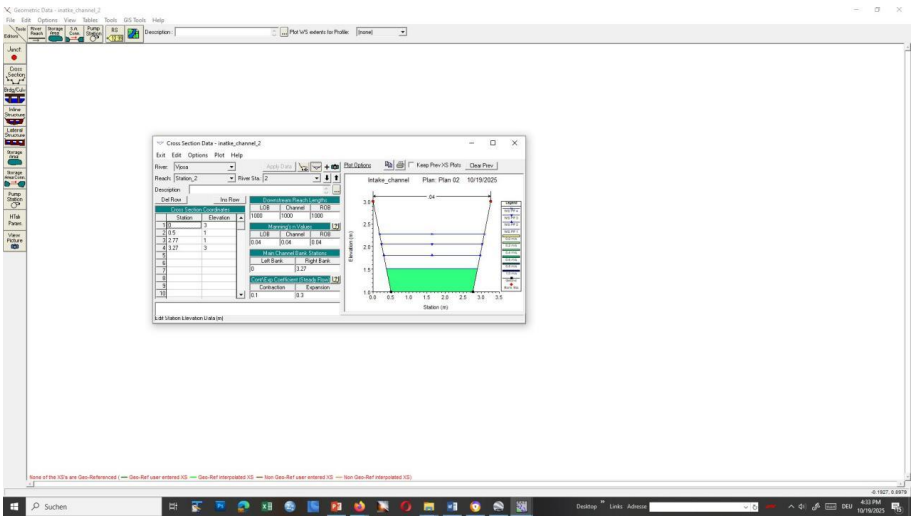

Figure 4.1.18. Hydraulic modelling results for Water Abstraction Site 2.

According to the modelling results presented in the figure and compared to the measured bathymetry and water depths, the water abstraction is possible at this site with **1000 – 1500 l/s or 1.0 – 1.5 m³/s** (constantly discharged into the irrigation channel).

STATION 4 - Vjosa River - Levan-Fier Canal

Station 4, named "Vjosa River - Levan - Fier Canal", is located at coordinates 4490507.00 m N, 384475.00 m E. The abstraction is inside the Vjosa River. This station is situated approximately 1 km from the village of Gjonç and about 32 km from the city of Fier. This is an **Irrigation Channel**.
Vjosa River
- Levan - Fier is located in the village of Selishtë and takes water from the Vjosë River through six gates measuring 2m x 6m, which are controlled by an electric motor. The water is taken in by free flow, while the supply to the intake is assisted by the construction of a provisional embankment, which is erected every year, across the riverbed. The **annual amount of water** is calculated to be **233,280,000m3 or (av. 7.4 m³/ s),** but because the irrigation system does not operate at full capacity, the volume may be smaller. These numbers were validated by hydraulic modelling for the situation in August 2025. In figure the modelling results are presented, highlighting that based on the artificial bathymetric changes between 5 – 8 m³/s are constantly discharged into the irrigation channel.

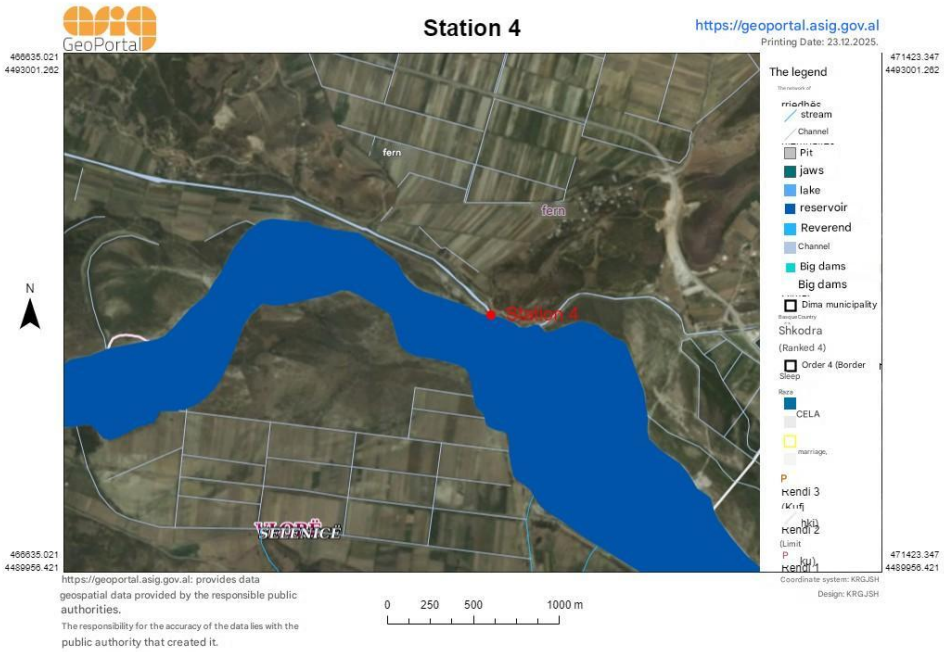

Figure 4.1.19. Location of the station 4 - Vjosa River - Levan-Fier Canal

Figure 4.1.20. The abstraction is inside the Vjosa River.

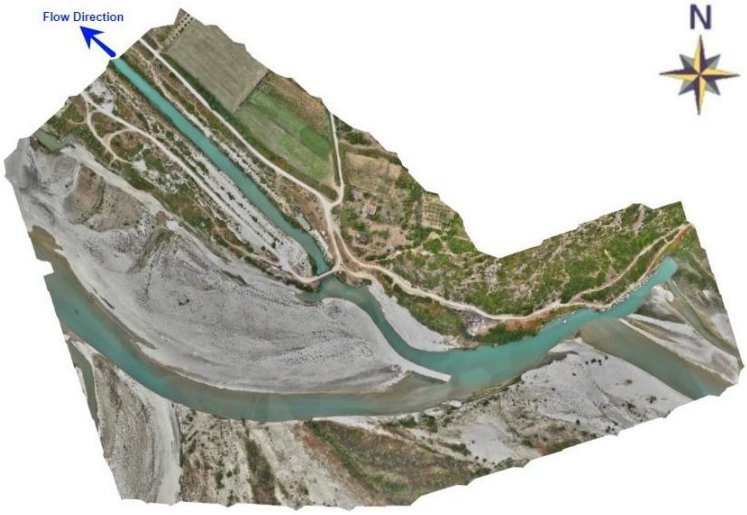

Figure 4.1.21. DOM (Digital Orthophoto Map).

Figure 4.1.22. Photo of the Station.

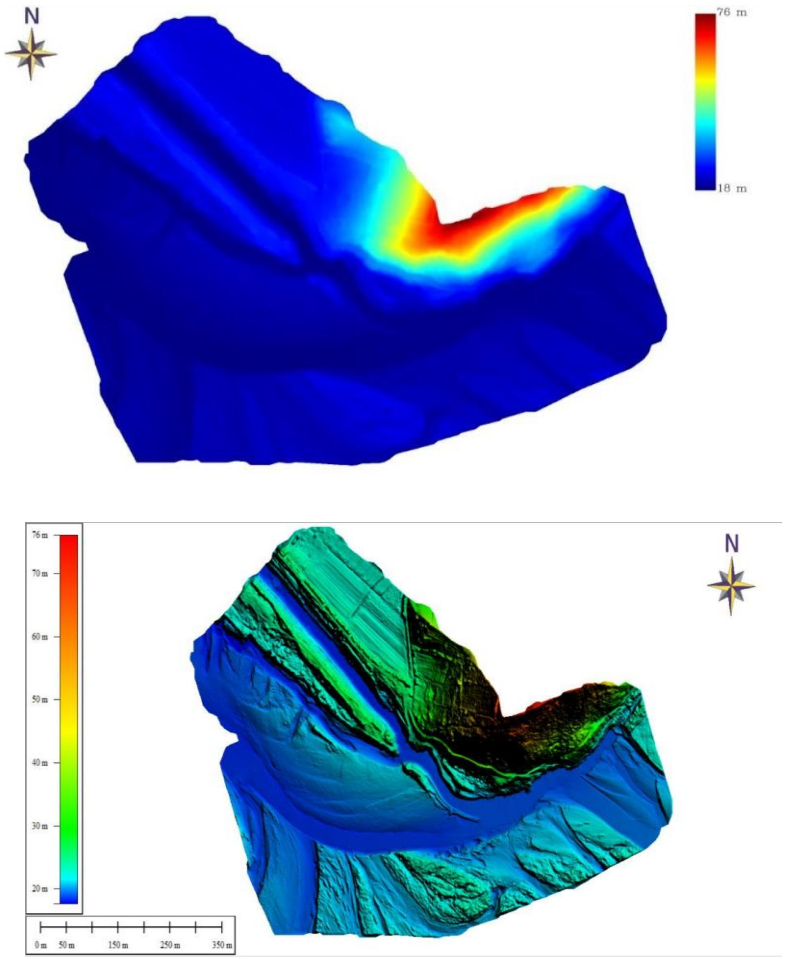

Figure 4.1.23. DEM (Digital Elevation Model).

Figure 4.1.24. Upstream view of the Station.

Figure 4.1.25. Downstream view of the Station.

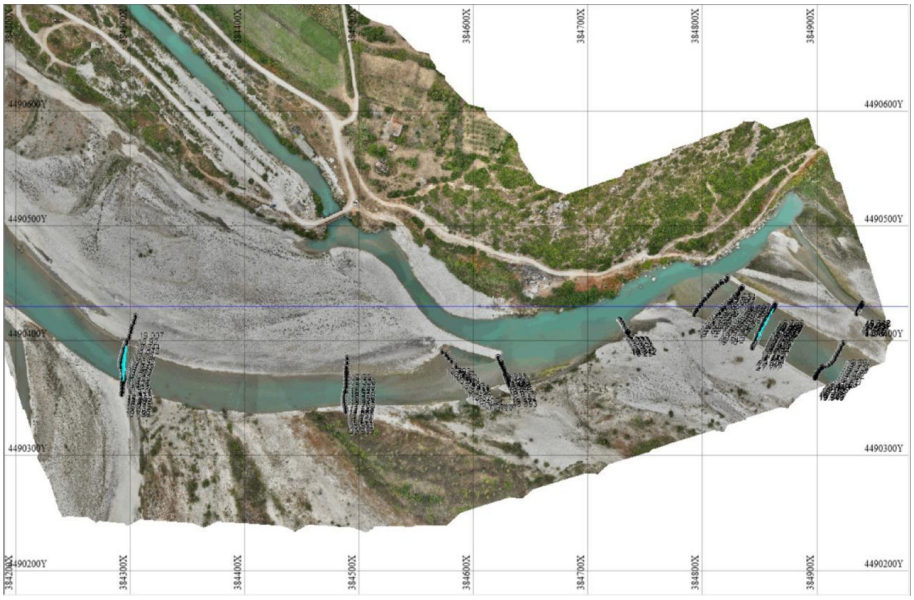

Figure 4.1.26. DOM (Digital Orthophoto Map) with the 2 cross-sections (Vjosa River).

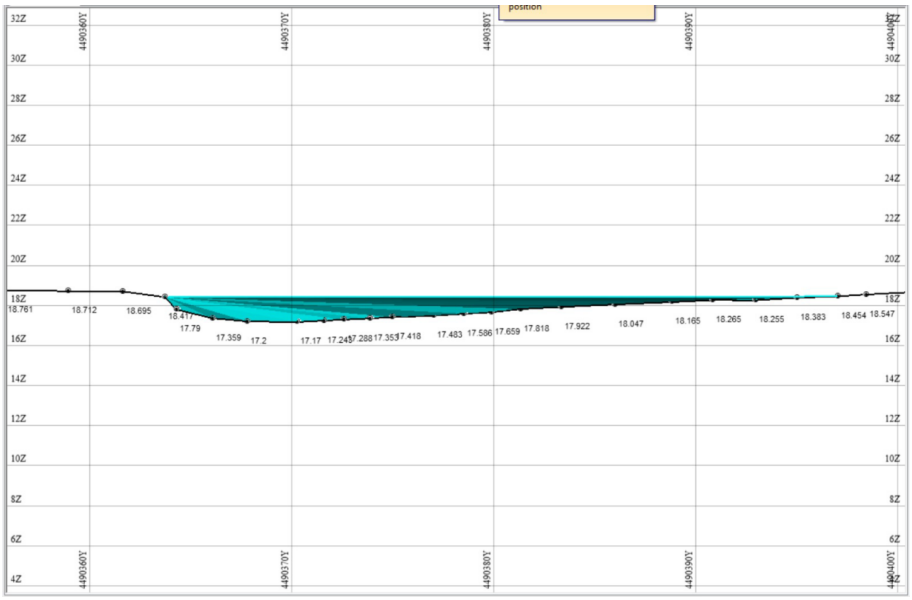

Figure 4.1.27. Cross-section nr. 1

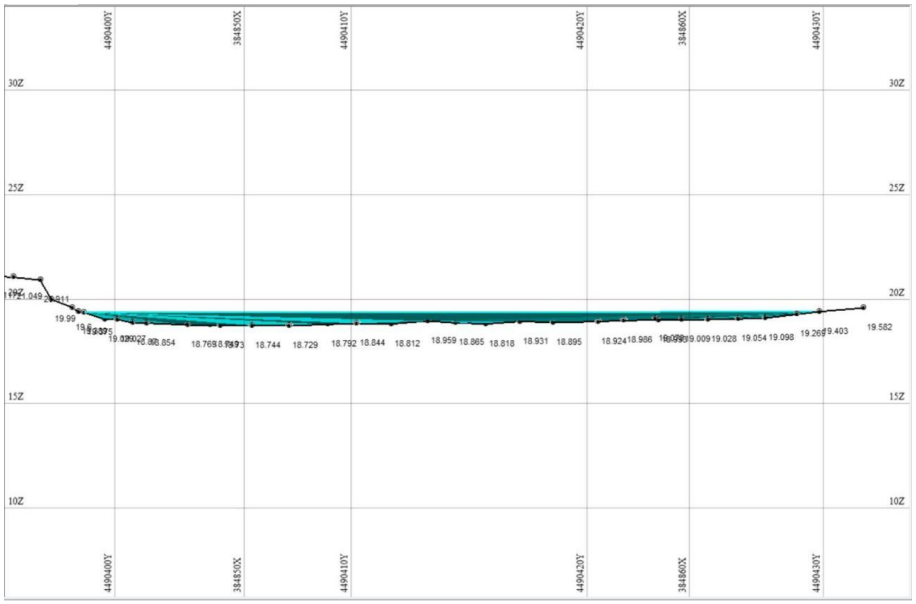

Figure 4.1.28. Cross-section nr. 2.

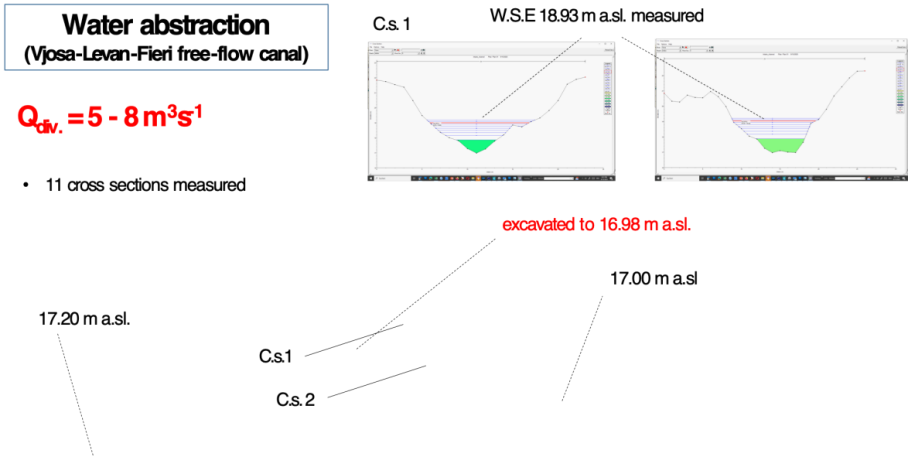

Figure 4.1.29. Hydraulic modelling results for Water Abstraction Site 3.

STATION 5 - Shushica Irrigation Scheme

Station 5, named "Shushica Irrigation Scheme", is located at coordinates 4479681.00 m N, 379100.00 m E. The abstraction is inside the Shushica River. This station is situated approximately 2.5 km from the village of Sherishtë and about 15 km from the city of Vlora. This facility is under construction and it's a water intake channel with **600 liters per second (600 l/s) or 0.6 m³/s** (0.6m³/s in 105 days). It has to irrigate 12.000 hectares of agricultural land.

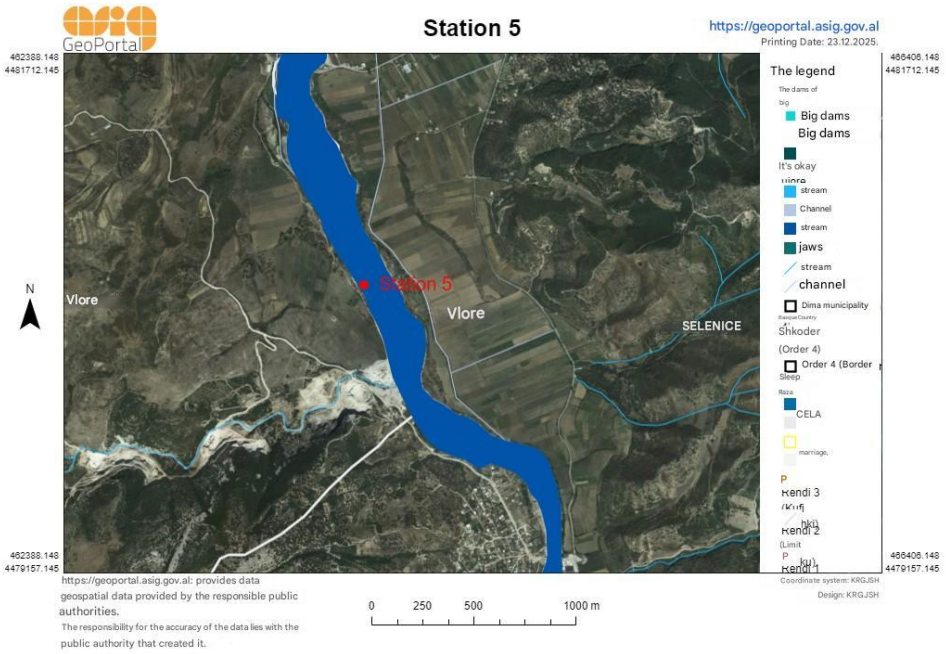

Figure 4.1.30. Location of the station 5 - Shushica Irrigation Scheme

Figure 4.1.31. The abstraction channel is inside the Shushica River.

Figure 4.1.32. View from the drone of the station and the Shushica River.

Figure 4.1.33 DOM (Digital Orthophoto Map).

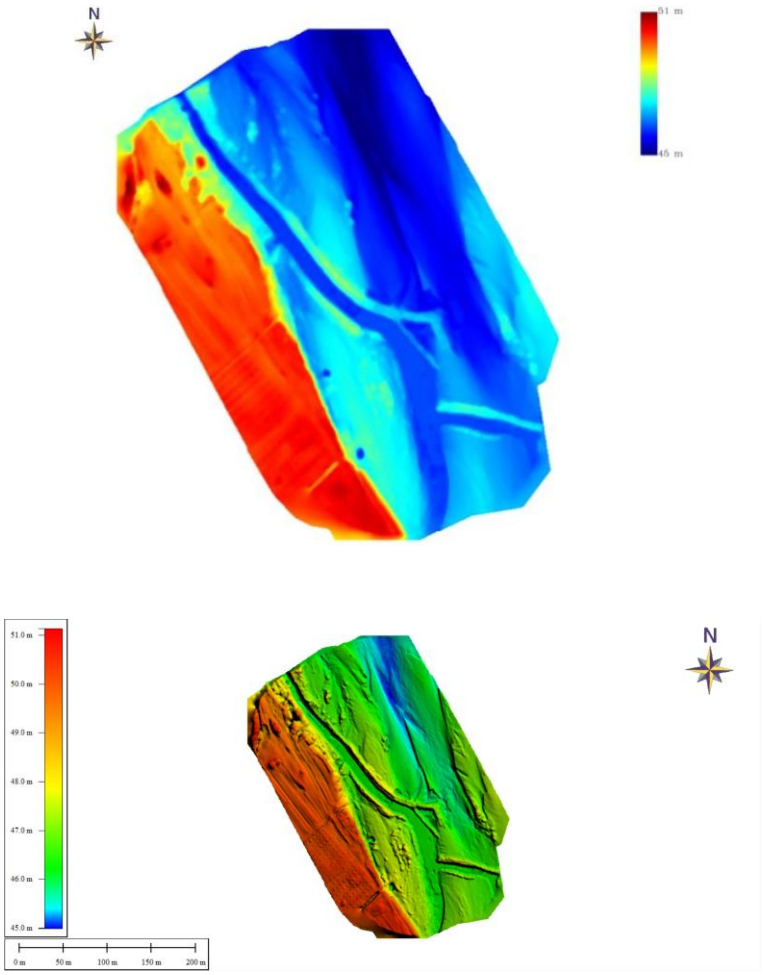

Figure 4.1.34. DEM (Digital Elevation Model).

Figure 4.1.35. DOM (Digital Orthophoto Map) with the 2 cross-sections.

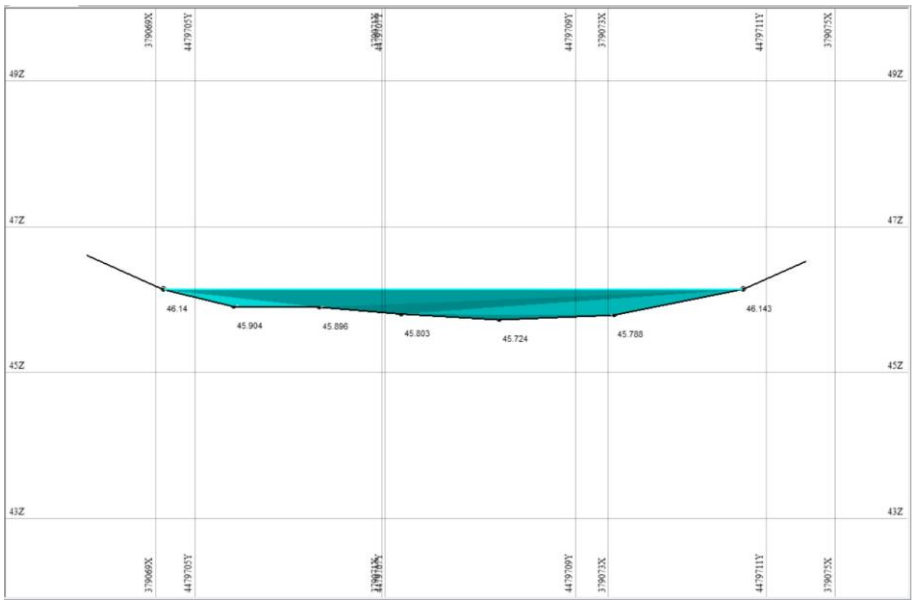

Figure 4.1.36. Cross-section nr. 1.

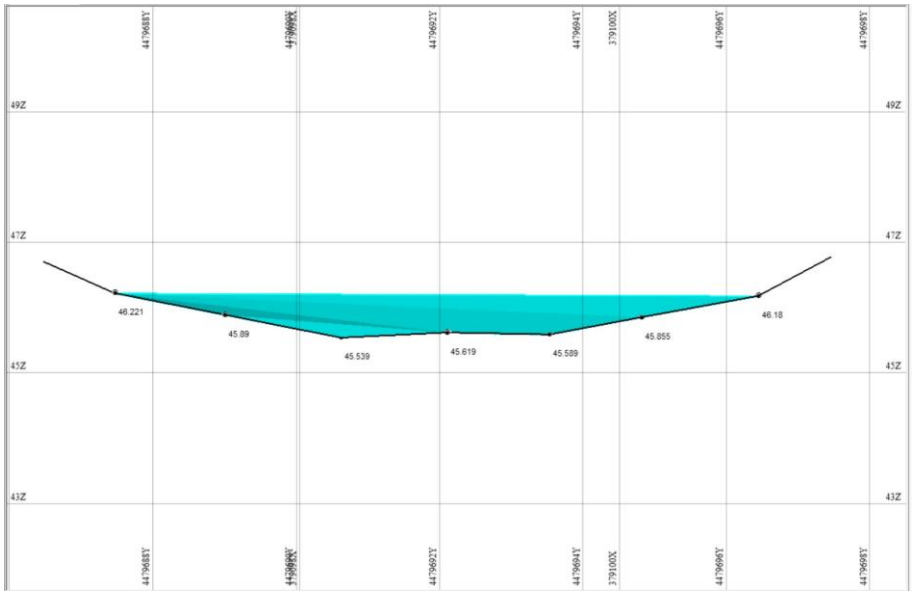

Figure 4.1.37. Cross-section nr. 2.

4.2 Underground / Spring Water Use stations

The Underground / Spring Water Use Channels are represented by the following stations:
STATION 1 - Elka
STATION 2 - Agna Group
STATION 3 - Pepsi Albania, Gline
STATION 4 - Fresh Company near Gorice
STATION 5 - Living Water
STATION 6 - Burimi Çajupi
STATION 7 - Uji Tepelena
STATION 8 - Uji Trebeshina
STATION 9 - Lepusha Spring
STATION 10 - Jona Çela

Figure 4.2.1 The map shows the locations of the Underground / Spring water use stations

These monitoring sites include natural springs and groundwater abstraction wells, representing key points of subsurface water use across the basin. Their systematic mapping, characterization, and quantification provide essential information on the spatial distribution and intensity of groundwater exploitation, including both domestic and productive uses (e.g., irrigation supply, small industries, and local water services where applicable).
Monitoring these stations supports the assessment of aquifer recharge potential, seasonal variability in spring discharge, and the influence of hydroclimatic conditions on groundwater availability. The collected data

also allow the identification of areas where abstraction may exceed natural replenishment, highlighting potential risks of groundwater depletion, reduction of spring yields, and increased vulnerability during dry periods.

STATION 1 - Elka

Station 1, named "Elka", is located at coordinates 4416981.00 m N, 443652.00 m E. The underground spring water abstraction point (intake) is located approximately 240 m from the Drinos River, within the Drinos catchment. The facility is positioned about 1.5 km from Vrisera village and approximately 28.5 km from Gjirokastër city. The site functions as a beverage production facility, relying on groundwater/spring resources.
The amount of water abstraction for "Elka" Beverage Factory in Albania is not public available. Information on specific water usage by individual companies like "Elka" is typically found in company-specific reports or local environmental impact assessments, which are not indexed by general searches. The results mainly focus on broader issues like the status of Albania's water resources and water safety for the general public.

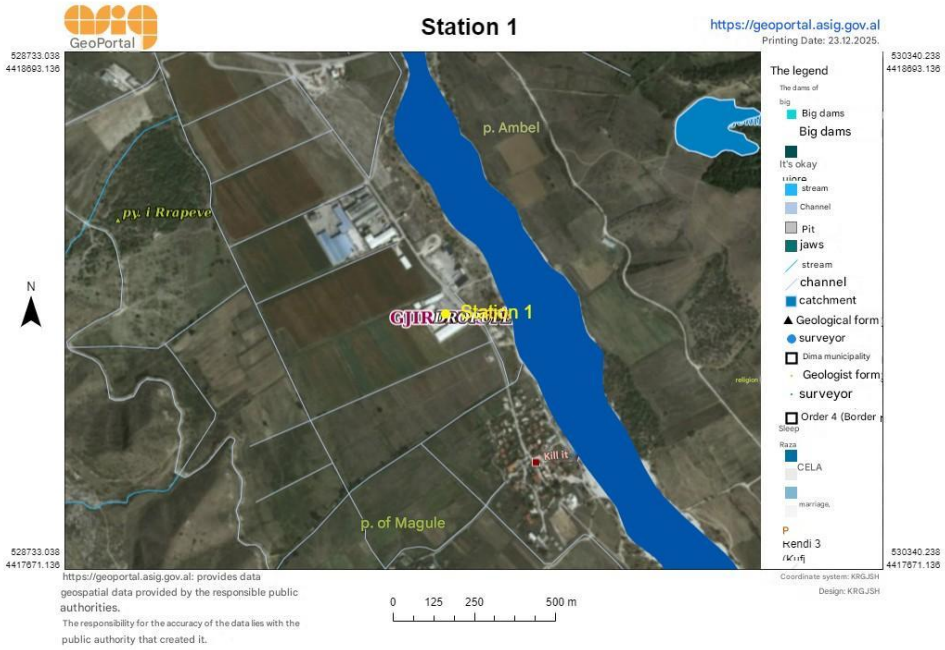

Figure 4.2.2. Location of the station 1 - Elka

Figure 4.2.3. The abstraction is 240 m from the Drinos River.

Figure 4.2.4. View from the drone of the station and the Drinos River.

STATION 2 - Agna Group

Station 2, named "Agna Group", is located at coordinates 4416767.00 m N, 443816.00 m E. The underground spring water abstraction point is situated approximately 230 m from the Drinos River, within the Drinos catchment. The station is located about 1.0 km from Vrisera village and approximately 29 km from Gjirokastër city. The site operates as a beverage production facility, supplied by groundwater/spring resources. The amount of water abstraction for " Agna Group " Beverage Factory in Albania is not public available.

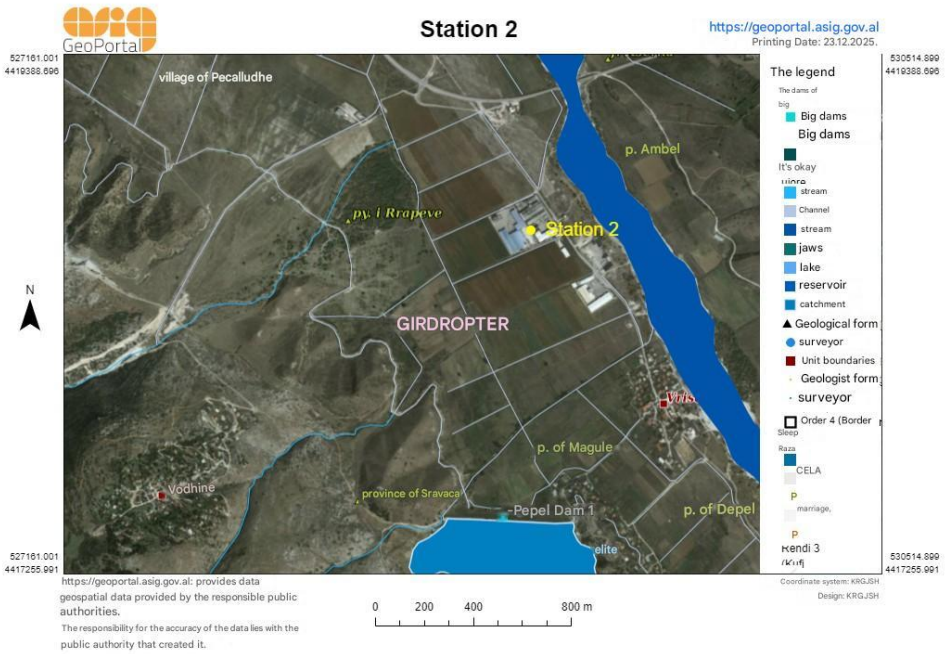

Figure 4.2.5. Location of the station 2 - Agna Group.

Figure 4.2.6. The Underground spring water use are 230 m from the Drinos River.

Figure 2.4.7. View from the drone of the station and the Drinos River.

STATION 3 - Pepsi Albania, Gline

Station 3, named "Pepsi Albania", the facility belongs to "Alfa SHA". It is located at coordinates 4424615.00 m N, 438859.00 m E. The Underground spring water use are 1400 m from the Drinos River. This station is situated approximately 1 km from the village of Glinë and about 23 km from the city of Gjirokastër. The facility operates as a beverage production factory with high production capacity, implying significant and potentially continuous groundwater/spring water abstraction rates throughout the year. At present, no publicly available information has been identified that specifies the water abstraction volume or withdrawal rate associated with "Pepsi Albania" from the Drinos River (or from hydraulically connected groundwater/spring sources in the Drinos catchment). Therefore, the exact abstraction amount cannot be quantified based on open-source data and would require verification through official permits, operator declarations, or competent authority records.

Figure 4.2.8. Location of the station 3 - Pepsi Albania, Gline.

Figure 4.2.9. The Underground spring water use are 1400 m from the Drinos River.

Figure 4.2.10. View from the drone of the Station.

STATION 4 - Fresh Company near Gorice

Station 4, named "Fresh Company", and is operating since 2006. It is located at coordinates 4425208.00 m N, 434938.00 m E. The Underground spring water use are 950 m from the Drinos River. This station is situated approximately 1.5 km from the village of Goricë and about 17.5 km from the city of Gjirokastër. The facility operates as a beverage production factory. At present, no publicly available information has been identified that directly links a company named "Fresh Company" to surface water abstraction from the Drinos River in Albania. Although the Drinos River represents a key surface water resource within the basin, and potable water supply conditions may vary locally, open-source records do not indicate that "Fresh Company" holds a documented abstraction point, licensed withdrawal, or registered operational activity associated with the Drinos River. Therefore, any potential abstraction or use cannot be confirmed without consultation of official permitting databases, operator declarations, or competent authority records

Figure 4.2.11. Location of the station 4 - Fresh Company near Gorice

Figure 4.2.12. The Underground spring water use are 950 m from the Drinos River.

Figure 4.2.13. View from the drone of the station and the Drinos River.

STATION 5 - Living Water

Station 5, named "Living Water", and is located at coordinates 4428885.00 m N, 432151.00 m E. The Underground spring water uses are 1000 m from the Drinos River. This station is situated approximately 1.5 km from the village of Vanistër and about 11.5 km from the city of Gjirokastër. This facility functions as a Warehouse. The factory is in another location.
Living Water" is the name of a water abstraction and packaging factory located near the Drinos riverbank in Albania, with an allowed abstraction rate of up to to **6 liters per second (6 l/s) or 0.006 m³/s**.

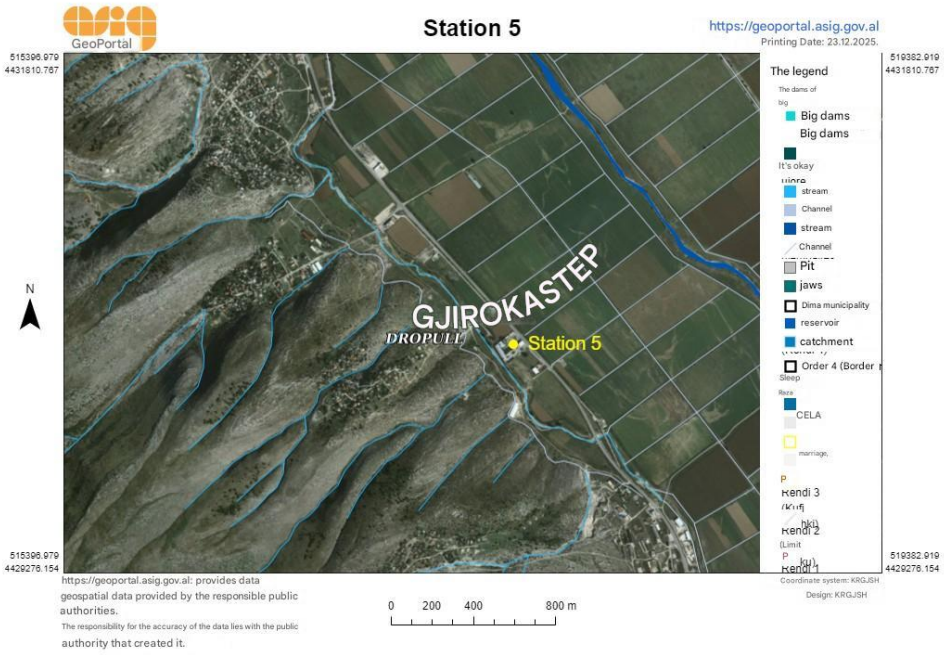

Figure 4.2.14. Location of the station 5 - Living Water

Figure 4.2.15. The Underground spring water use are 1000 m from the Drinos River.

Figure 4.2.16. Photo of the Station

STATION 6 - - Burimi Çajupi

Station 6, named "Burimi Çajupi", is located at coordinates 4447332.00 m N, 423609.00 m E. The Underground spring water uses are 400 m from the Drinos River. The station is located in the village of Andon Poçi, approximately 28.5 km from the city of Gjirokastër. The facility operates as a beverage production factory. The **permitted water abstraction rate** for this facility is **up to 5 liters per second (5 l/s) or 0.005 m³/s.**

Figure 4.2.17. Location of the station 6 - Burimi Çajupi

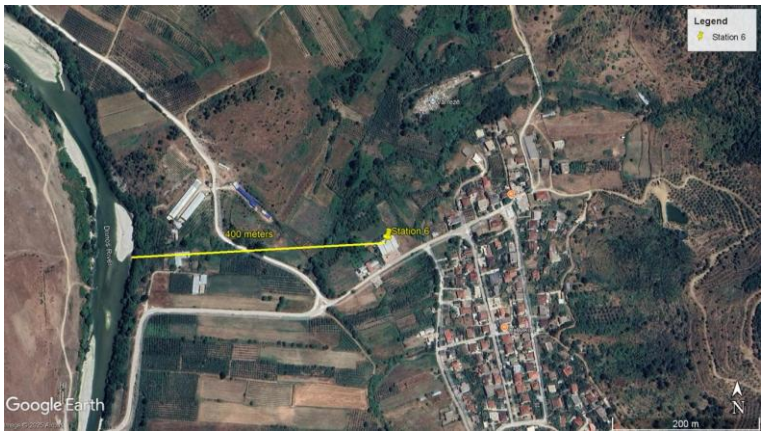

Figure 4.2.18. The Underground spring water use are 400 m from the Drinos River.

Figure 4.2.19. View from the drone of the station and the Drinos River.

STATION 7 - Uji Tepelena

Station 7, named "Uji Tepelena", and is operating since 1998. It is located at coordinates 4456458.00 m N, 420178.00 m E. The Underground spring water use are 120 m from the Drinos River. This station is situated approximately 3.5 km from the village of Luzat and about 6.5 km from the city of Tepelena. The facility operates as a beverage production factory. The permitted **water abstraction rate** for this facility is up to **5 liters per second (5 l/s) or 0.005 m³/s.**

Figure 4.2.20. Location of the station 7 - - Uji Tepelena

Figure 4.2.21. The Underground spring water use are 120 m from the Drinos River.

Figure 4.2.22. View from the drone of the station and the Drinos River

STATION 8 - Uji Trebeshina

Station 8, named "Uji Trebeshina", the facility belongs to "Bevcom sh.p.k" it is located at coordinates 4461131.00 m N, 428254.00 m E. The abstraction is 130 m from the Vjosa River. This station is situated approximately 3 km from the village of Luadh and about 3.5 km from the city of Këlcyrë. This facility functions as a Water Factory station. The **permitted water abstraction rate** for this facility is up to **6 liters per second (6 l/s) or 0.006 m³/s.**

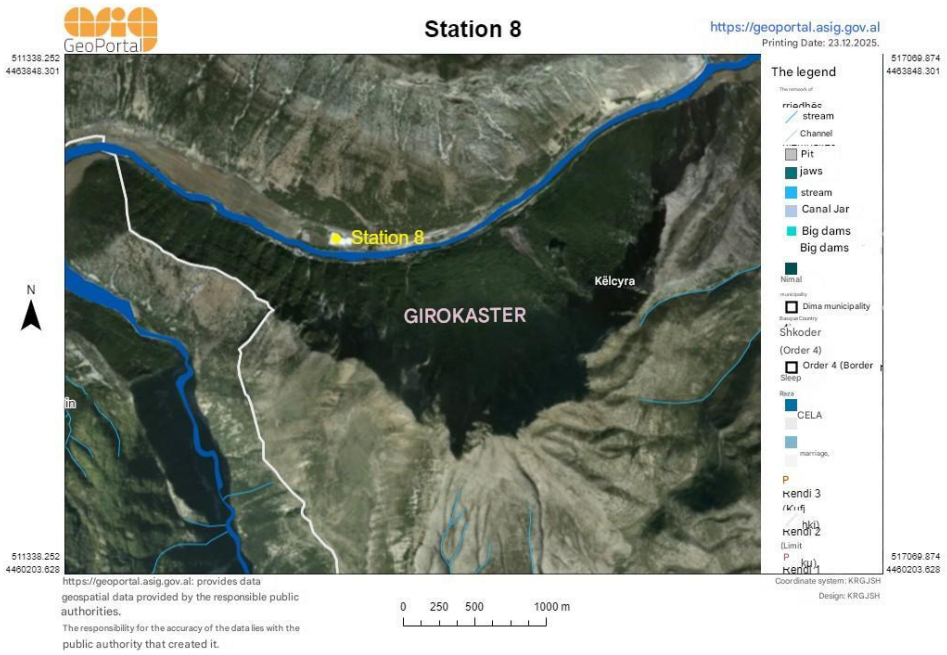

Figure 4.2.23. Location of the station 8 - Uji Trebeshina

Figure 4.2.24. Underground spring water use are 130 m from the Vjosa River.

Figure 4.2.25. View from the drone of the station and the Vjosa River.

STATION 9 - Lëpusha Spring

Station 9, named " Lëpusha Spring" is located at coordinates 4450096.00 m N, 402324.00 m E. The abstraction is inside the Shushica River. This station is situated approximately 1.5 km from the village of Kuç and about 32 km from the city of Himarë. This facility is under construction and is planned to provide the water supply for Himara. This facility functions as a Water Supply, located at the riverside.

Figure 4.2.26. Location of the station 9 - Lëpusha Spring

Figure 4.2.27 The abstraction is inside the Shushica River.

Figure 4.2.28. Frontal view of the station

STATION 10 - Jona Çela

Station 10, named "Jona Çela", is located at coordinates 4448104.00 m N, 400251.00 m E. The Underground spring water uses are 60 m from the Shushica River. This station is situated approximately 2.5 km from the village of Kuç and about 30 km from the city of Himarë. The water abstraction volume associated with "Jona Çela" (underground water use) in Albania is not publicly available.

Figure 4.2.29. Location of the station 10 – Jona Çela

Figure 4.2.30. The Underground spring water use are 60 m from the Shushica River.

Figure 4.2.31. View from the drone of the Station.

Figure 4.2.32. Downstream view of the Station.

4.3 Pumping Stations

The Underground / Spring Water Use Channels are represented by the following stations:
STATION 1 - Poçem Pumping Station
STATION 2 - Four pumping units of Varibop
STATION 3 - Kafaraj

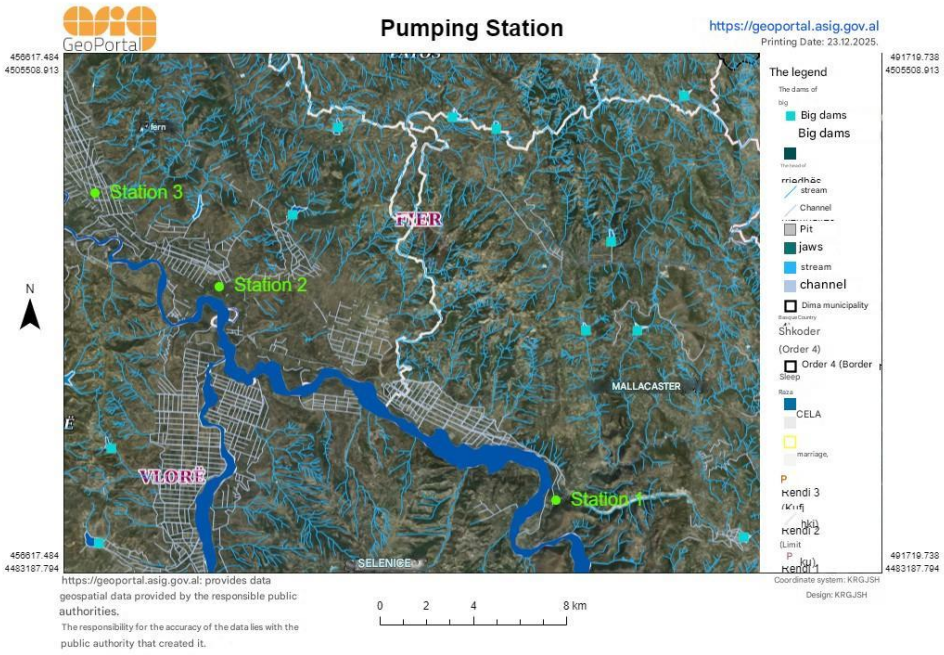

Figure 4.3.1 The map shows the locations of the Pumping stations

These stations are mechanical water abstraction and lifting installations, designed to pump water either from groundwater sources (wells/aquifers) or directly from the river system, primarily to support municipal water supply and, in some cases, irrigation demand. They represent strategic infrastructure elements within the basin, ensuring water availability during periods of low natural flow or increased consumption.
The monitoring and documentation of these pumping stations provide key information on operational capacity, abstraction volumes, pumping regimes, and seasonal variability in water demand. Their location in relation to river embankments, flood-prone areas, and nearby settlements is particularly important, as it may influence both the reliability of the infrastructure and its exposure to hazards such as flooding, bank erosion, or sediment deposition.

STATION 1 - Poçem Pumping Station

Station 1, named "Poçem Pumping Station", is located at coordinates 4485269.00 m N, 393001.00 m E. The pumping stations are 370 m from the Vjosa River. The station is located in the village of Poçem, approximately 18 km from municipality of Mallakastra. This facility functions as a pumping station which serves to irrigate the agricultural lands of Hekal-Mollaj-Rroma (Mallakastër). It covers an area of 560 ha. It is administered by the Municipality of Mallakastër, as it serves as a water source for this municipality. The station has four pumps available, each with a power of 350kW that draws 200m^3/h per pump, thus with a total maxium pumping potential of 0.222 m^3/s.

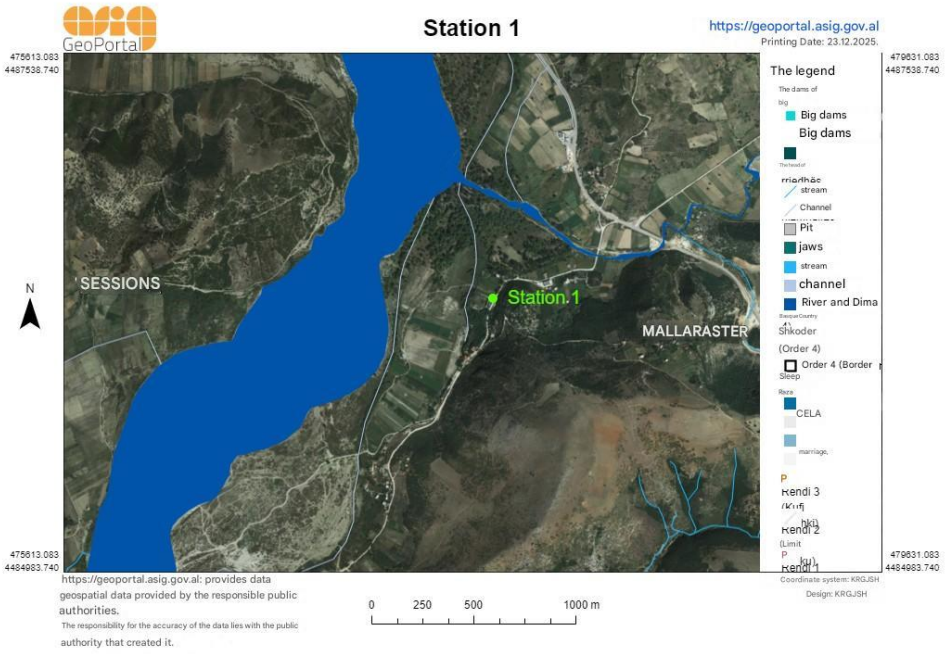

Figure 4.3.2. Location of the station 1 – Poçem Pumping Station

Figure 4.3.3. The pumping stations are 370 m from the Vjosa River.

Figure 4.3.4. View from the drone of the station and the Vjosa River

STATION 2 - Four pumping units of Varibop

Station 2 is located at coordinates 4494585.00 m N, 378727.00 m E. The pumping station infrastructure is situated approximately 560 m from the Vjosa River, about 1.5 km from Varibop village, and approximately 27 km from the Municipality of Mallakastra. The facility functions as a groundwater pumping station and consists of four pumping units (four small operational buildings) abstracting water from underground wells. The abstracted water is conveyed for public supply to the Municipality of Patos and the Municipality of Mallakastra. Due to the proximity to the Vjosa River, the abstraction system may be influenced by surface water–groundwater interactions, particularly during seasonal low-flow conditions. At present, the water abstraction volume (withdrawal rate) is not publicly available, and therefore the quantitative abstraction pressure cannot be assessed without access to official permits, operational records, or competent authority datasets.

Figure 4.3.5. Location of the station 2 – Four pumping units of Varibop.

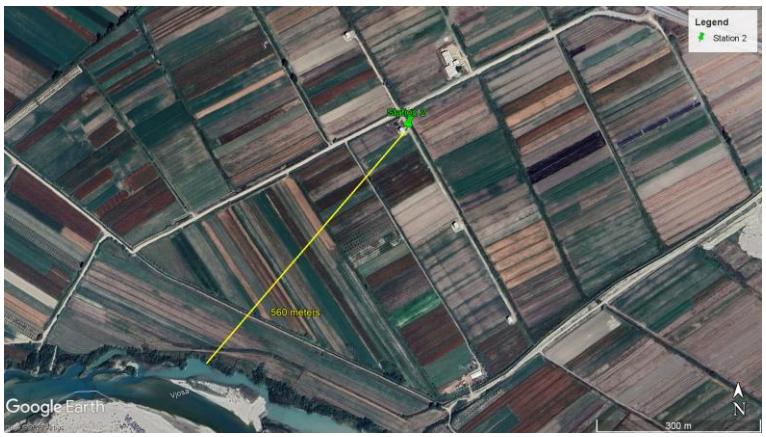

Figure 4.3.6. The pumping stations are 560 m from the Vjosa River.

Figure 4.3.7. View from the drone of the station and the Vjosa River.

STATION 3 - Kafaraj

Station 3, named "Kafaraj" is located at coordinates 4498645.00 m N, 373370.00 m E. The pumping station is located approximately 1100 m from the Vjosa River, about 1.5 km from Kafaraj village, and approximately 16 km from the city of Fier. The facility operates as a groundwater pumping station supplying the municipal water demand of Fier. The system consists of four production wells, each equipped with a relatively high-power pumping unit (~680 kW per well). The total abstraction capacity is approximately 1250 m³/h (equivalent to ~0.35 m³/s). The facility was constructed in 2023.

Figure 4.3.8. Location of the station 3 – Kafaraj.

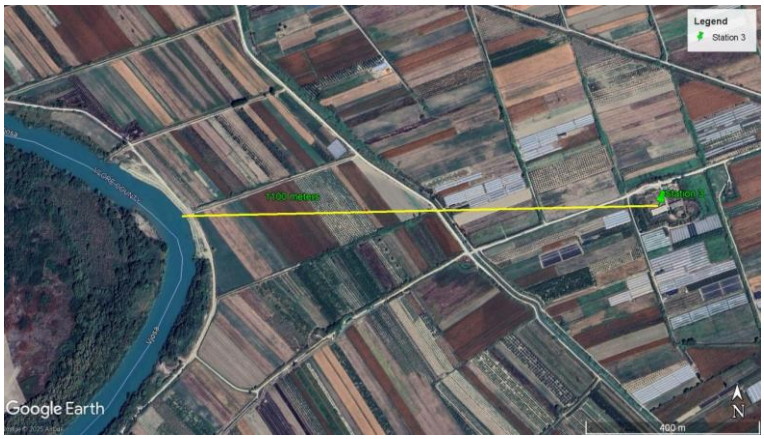

Figure 4.3.9. The pumping stations are 1100 m from the Vjosa River.

Figure 4.3.10. Photo of the Station.

4.4 Hydropower Plants

The Underground / Spring Water Use Channels are represented by the following stations:
STATION 1 - HPP 1 Peshku Picari 1 shpk
STATION 2 – HPP 2 Albanian Green Energy

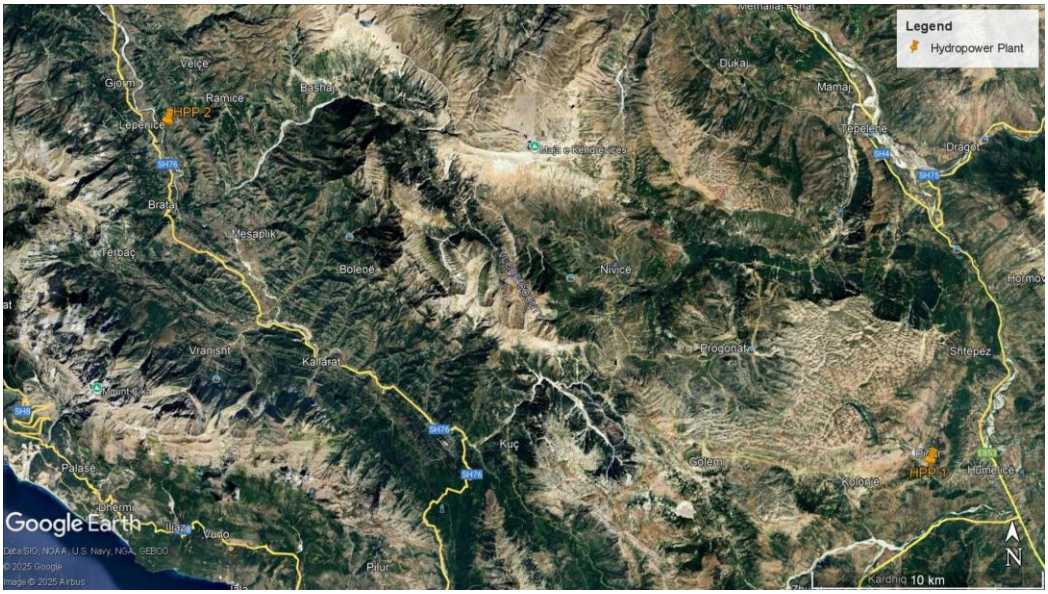

Figure 4.4.1 The map shows the locations of the Hydropower plant

These stations represent hydropower-related abstraction and diversion points, where river water is used for energy production through intake structures, conveyance systems, and turbine operation. As key hydraulic infrastructures, they constitute significant pressures on the river system, particularly in terms of flow alteration and regulation.
The operation of hydropower plants may influence the natural hydrological regime by modifying seasonal discharge patterns, reducing residual flows in bypassed reaches, and generating artificial flow fluctuations depending on operational schedules. These changes can affect downstream water availability, especially during low-flow periods, and may increase competition between energy production and other uses such as irrigation or municipal supply.
Overall, monitoring and documenting these hydropower stations is essential for evaluating their role as pressures within the basin, supporting assessments related to environmental flow requirements, hydromorphological status, sediment dynamics, and ecosystem integrity, in line with sustainable river basin management objectives.

HPP 1 - Peshku Picari 1 shpk

HPP 1, named "Peshku Picari 1 shpk", is located at coordinates 4446644.00 m N, 419055.00 m E. The hydropower plant (HPP) is located approximately 40 m from the Drinos River, about 1.5 km from Picar village, and approximately 16 km from the city of Gjirokastër. The facility operates as the Picari Stream Hydropower Plant, with a reported design abstraction/usage of 1,000 L/s (i.e., 1.0 m³/s). The reported ecological (environmental) flow is 230 L/s (i.e., 0.23 m³/s).

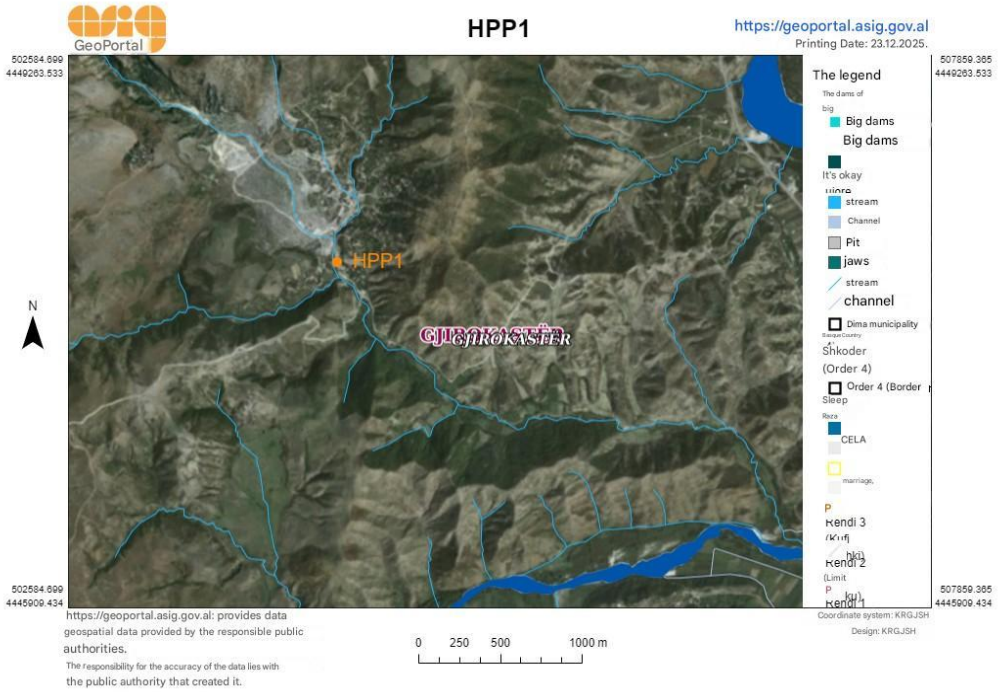

Figure 4.4.2. Location of the station 1 – Peshku Picari 1 shpk

Figure 4.4.3. The Hydropower Plant are 40 m from the Drinos River.

Figure 4.4.4. View from the drone of the Station.

Figure 4.4.5. Photo of the Station.

HPP 2 - Albanian Green Energy

HPP 2, named "Albanian Green Energy", is located in the Vërmikut Stream, at coordinates 4461540.00 m N, 386599.00 m E. The abstraction point and hydropower plant infrastructure are located approximately 40 m from the Shushica River, about 2 km from Lepenicë village, and approximately 37 km from the city of Vlorë. The facility operates as the Smokthina Hydropower Plant, with an installed capacity of 9.2 MW.
The permitted water abstraction rate for this facility is up to 600 L/s (i.e., 0.6 m^3/s).

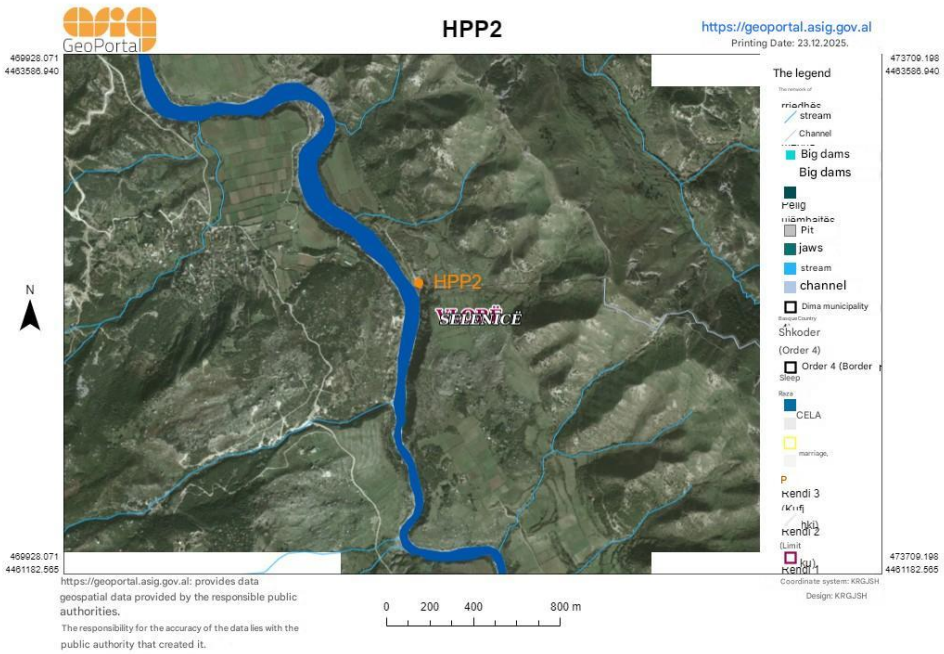

Figure 4.4.6. Location of the station 2 – Albanian Green Energy

Figure 4.4.7. The Hydropower Plant are 40 m from the Shushica River.

Figure 4.4.8. View from the drone of the station and the Shushica River.

Figure 4.4.9. Photo of the Station.

Summary & Conclusions

5

STATIONS	Geographic coordinates		Name	Water abstraction (m^3/s)
1	4441966.00 m N	413050.00 m E	Kardhiqi irrigaton Scheme	0.080
2	4450096.00 m N	402324.00 m E	"Kuçi Springs"	0.139
3	4487516.00 m N	389645.00 m E	Water intake channel of Mollaj village	1.500
4	4490507.00 m N	384475.00 m E	Vjosa River - Levan-Fier Canal	7.400
5	4479681.00 m N	379100.00 m E	Shushica Irrigation Scheme	0.600

Table 1. Geographic coordinates and the data of the Irrigation Channels.

STATIONS	Geographic coordinates		Name	Water abstraction (m³/s)
1	4416981.00 m N	443652.00 m E	"Elka"	not available
2	416767.00 m N	443816.00 m E	"Agna Group"	not available
3	4424615.00 m N	438859.00 m E	"Pepsi Albania"	not available
4	4425208.00 m N	434938.00 m E	"Fresh Company"	not available
5	4428885.00 m N	432151.00 m E	"Living Water"	0.006
6	4447332.00 m N	423609.00 m E	"Burimi Çajupi"	0.005
7	4456458.00 m N	420178.00 m E	"Uji Tepelena"	0.050
8	4461131.00 m N	428254.00 m E	"Uji Trebeshina"	0.060
9	4450096.00 m N	402324.00 m E	Lepusha Spring	not available
10	4448104.00 m N	400251.00 m E	"Jona Çela"	not available

Table 2. Geographic coordinates and the data of the Underground / spring water use stations.

STATIONS	Geographic coordinates		Name	Water abstraction (m³/s)
1	4485269.00 m N	393001.00 m E	Poçem Pumping Staton	0.222
2	4494585.00 m N	378727.00 m E	Four Pumping Stations of Varibop	not available
3	4498645.00 m N	373370.00 m E	"Kafaraj"	0.350

Table 3. Geographic coordinates and the data of the Pumping stations.

STATIONS	Geographic coordinates		Name	Water abstraction (m³/s)
1	4446644.00 m N	419055.00 m E	HPP "Peshku Picari 1 shpk"	1.000
2	4461540.00 m N	386599.00 m E	HPP "Albanian Green Energy"	0.600

Table 4. Geographic coordinates and the data of the Hydropower Plants.

Based on Table 2, the total amount of permitted and partialy documented abstrated water is **12.012 m³/s**. However, this number is obviously higher, as for seven sites no numbers on permitted waters abstraction was available.

Especially the water abstraction of the irrigation channels in the lower part of the Vjosa River have a strong impact on the wetted areas and instream habitats (Box 1.).

Box 1.
During August 2025, low flow conditions at the Vjosa in the area of Pocem were around 20 m³/s. Both irrigation channels (site 4 & 5) extract around 9 m³/s. Thus, **between 1/3 to 1/2 of the total discharge** of the Vjosa River is diverted for irrigation during **summer low flow periods**.

6 Outlook / Future Management

Water abstraction for irrigation is a huge pressure for aquatic ecosystems (Hering et al., 2015; Malmqvist & Rundle, 2002) and will increase due to impacts on and intensification of the hydrological cycle due to climate change in future (Huntington, 2006; Kundzewicz, 2008). As Europe is the fastest warming continent, droughts will be more frequently occurring with prolonged periods of water scarcity for agriculture (Rosa et al., 2020). However, this multi-purpose use problem (e.g. ecology vs. agriculture; agriculture vs. tourism/fisheries production,…) (Navarro-Ortega et al., 2015) needs to be addressed in a transparent procedure, with the request of quantitative data for the management and permits of future water diversions. Thus, this chapter of the water abstraction report addresses these important aspects by (i) how the legal process of water abstraction needs to be handled (in Albania) and (ii) how a continuous monitoring of water abstraction (with special focus on the National Park) needs to be set up.

(1) How the legal process for water abstraction needs to be handled:

To request monitoring of water abstraction for irrigation, the landowner or group of landowners need to submit an application to your local environmental or water authority. This typically involves completing an application form with details about your site, the proposed abstraction rate (approaches for quantification are presented in (2), the source of the water, and information on your planned activities. Some jurisdictions may also require additional supporting documentation and a management plan for monitoring the abstraction.

(a) Steps to request monitoring

1. Determination for local authority: Identification of the government body responsible for water resources and abstraction in the area. This is often a national environmental agency or a regional water authority.

2. Review regulations and requirements: The specific rules and guidelines for water abstraction in the region need to be checked (AMBU should provide this info for Albania). It can be expected that a specific license is needed if you abstract more than a certain volume of water per day (especially in the Vjosa National Park!).

3. The application form needs to be completed: The required application form needs to be filled out, which is usually available on the authority's website. In principle, all the necessary details, such as needs to be provided:

3.1 Landowner contact information and site details
3.2 The source of the water (e.g., river, well)
3.3 The type of abstraction point
3.4 The proposed activity or business
3.4 The volume of water you intend to abstract

4. Supporting documents need to be provided: Depending on the application, landowners may need to submit additional documents, such as a detailed site plan or a management plan for monitoring the operation.

5. Submission of the application: The completed form and all supporting documents through the designated channel needs to be submitted, which is often an online portal.

6. Await a response: The authority will process the application of the landowners and may contact you with questions. If approved, the landowners will receive the necessary license to abstract water.

(b) What to expect during the process

- The complexity of the landowners application and the requirements for monitoring will depend on the volume of water they plan to abstract and its potential impact on the environment and other water users.
- Their application may need to include details on proposed monitoring methods, such as a monitoring plan or a Flow Duration Curve (FDC) similar to hydropower applications (an example for such a monitoring approach is presented in Figure 1).
- Some jurisdictions, however, may use remote sensing and geographic information systems (GIS) for monitoring, especially in areas where ground-based monitoring is not feasible or as a supplement to other methods.

(2) Continuous water abstraction monitoring in the Vjosa NP (starting 2026):

In Figure 1, a concept for a practical, high-efficient, low-cost monitoring system of water abstraction for irrigation purposes is presented. The concepts addresses various steps how continuous data on water abstraction can be derived, without any high-end establishment of continuous water level sensors. A simple ruler has to be put in place, which covers all possible water stages in the irrigation channel (1). Based on daily observation the water stages are listed in a spreadsheet (2). With a calibrated 1-D hydrodynamic-numerical model (3), the water stages can than be finally transferred to discharges of abstraction (4).

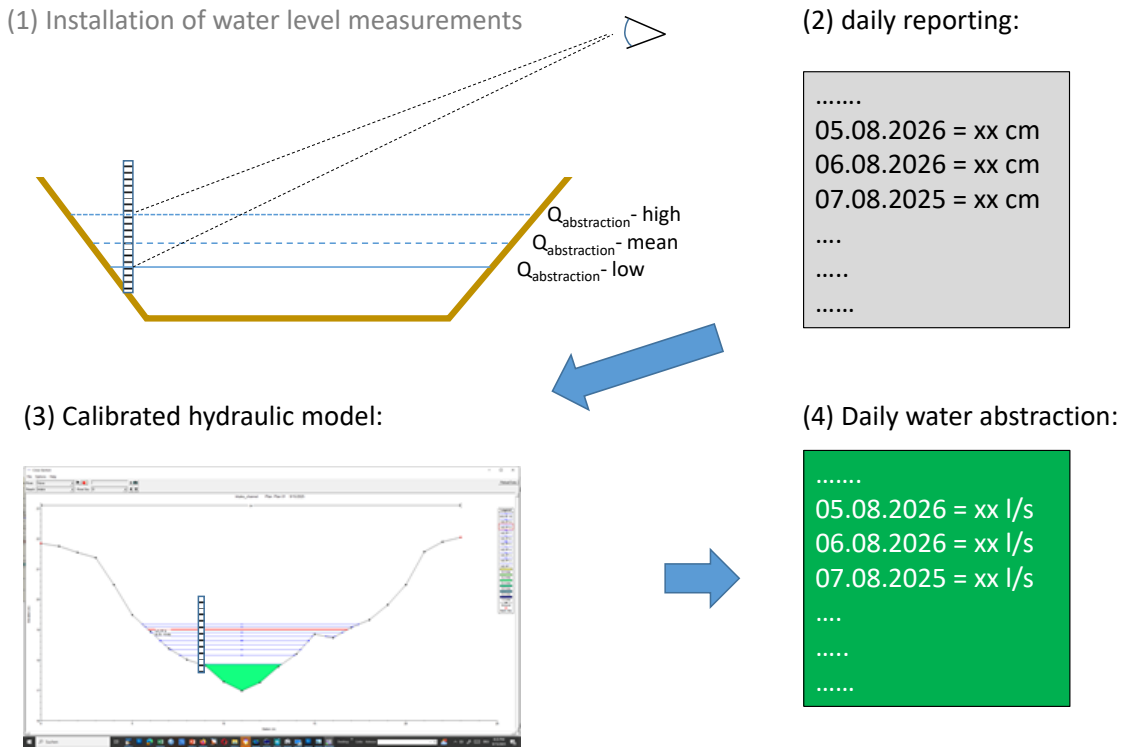

Figure 6.1 Suggested four-step procedure for deriving continuous quantitative data on water abstraction for irrigation in the Vjosa system.

7 Literature

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