



This project is funded by
The European Union

Environmental Protection of
International River Basins Project
Contract No. 2011/279-666



A project implemented by a Consortium
led by Hulla & Co. Human Dynamics KG

Project Activity 2.4.1

Design Report for JFS II in the Caucasus Countries



Scope of works and technical checklists

for the Surface Waters (SW) joint field surveys to cover the data gaps in the selected pilot basins of the Caucasus sub-region: Armenia, Azerbaijan and Georgia

1. Objectives and background information

This activity will contribute to the implementation of the Activity-2: 'Development of joint River Basin Management Plans (RBMPs) for selected river basins' and specifically for Activity 2.4: 'Joint field surveys to cover the gaps'. Main objective of this task will be introducing elements of the EU Water Framework Directive (EU WFD) compliant monitoring practice in the beneficiary countries, with specific focus on the Joint Field Surveys (JFSs), as a mechanism of filling the data gaps for final classification of the identified surface water bodies (WBs) and defining ecological status of surface waters objects in the selected pilot areas.

The project team will concentrate on the ecological status/potential of river water bodies (at least WBs at risk) during JFS-2014 activities. Therefore the following JFS objectives are identified for JFS-2014:

- 1) **Risk assessment / ecological status assessment** of river WBs with identifying so-called ecological "hot-spots" (bad or poor status). The precise WFD terminology to use should be "risk assessment" because EPIRB project have not resources and time to provide a real ecological status assessment in the 6th project countries! The final result should be preparing WFD colour maps representing WB at risk (failing WFD environmental objectives to meet 'good status'), which will be an essential tool for pilot river basin management plans!
- 2) First steps in **verification (validation) of proposed classification systems (biology & hydromorphology)** within the pilot RBs.
- 3) Continuing hydrobiological & hydromorphological **field training** during the survey activities.

As identified during the basin selection process - 'Selection-confirmation of the pilot basins' (Task 2.1.1) conducted during the Inception Period and confirmed by the national beneficiary institutions, the Joint Field Surveys shall be organized in the following pilot basins:

Armenia: the Akhuryan pilot basin, the area combining hydrological basins of the Akhuryan and Metsamor rivers;
Azerbaijan: the right tributaries of the Central Kura, starting from the Georgian border before the Mingechevir Reservoir that includes four major watersheds of the Agstafachay, Tovuzchay, Shamkirchay and Ganjachay rivers;
Georgia: the Chorokhi-Adjaristkali pilot basin, the area that includes Georgian part of the Chorokhi trans-boundary river, its major tributary - the Adjaristkali sub-basin and some smaller watersheds (the Kintrishi, the Chakvistkali, the Korolostkali and the Medjinistkali watersheds among them, draining directly to the Black Sea.

This activity is a direct follow up of the previously completed tasks by the project team, namely: 'Preliminary Identification of Water Bodies' (Task 2.2.2), 'Typology of Water Bodies' (Task 2.2.3) and 'Preliminary Classification of Water Bodies Based on Available Data (Task 2.3.1) and will contribute to filling the missing data gaps for final classification of Water Bodies.

A preliminary identification of the water bodies was undertaken using the guidelines proposed in Annex II of the WFD and the relevant WFD Common Implementation Strategy guidelines. The first step in this process was

determining the geographical extent of these water bodies based on all relevant considerations including to river types, human impacts, protected areas and use of the water bodies. For a simpler typology System-A, based on Eco-regions as specified in Annex XI of the WFD, were used for the project pilot basins in the Caucasus sub-region. Further, the analysis of baseline situation undertook preliminary classification to describe ecological conditions and identify ecological/biological, hydro-morphological and physical-chemical classes for each segment of water bodies, as well as ecological potentials for heavily modified water bodies.

However, to cover the gaps discovered after identification of water bodies, typological description and initial classification, the project will conduct joint field surveys in each selected pilot basin. This will allow filling in the gaps with respect to reference conditions, as well as baseline data required for final classification of the water bodies and establish type-specific reference conditions wherever these are not available based on the 'selected' water quality elements that the project team and the national monitoring agencies in each participating beneficiary country will identify during the planned JFSs.

While introducing 'selected' elements of the EU WFD compliant monitoring for filling the data gaps, specific attention will be paid to the following quality elements as essential minimum conditions for identifying ecological status of the WBs in a limited capacity:

- 1) Hydro-biological quality elements: *macro-invertebrates*;
- 2) Hydro-morphological quality elements: water flows, physical characteristics - channel characteristics, river bank and floodplain characteristics;
- 3) Physico-chemical quality elements: general water quality parameters and specific relevant pollutants - heavy metals

It is also worth to mention that the hydro-morphological and physical-chemical quality elements during the JFSs will serve as a supporting to the biological elements for final classification of WBs. The detailed list of all three quality elements, as required by the EU WFD, is presented in the **Annex 1**.

Project Activities: The JFSs in the selected pilot basins of the Caucasus sub-region will contribute to *Task 2.4.2 - Conduct joint field survey*.

2. Sampling timeline, institutional arrangement and locations

Sampling timeline for the 2nd phase of the Joint Field Survey in the Caucasus is the following:

- i) Chorokhi-Adjaristkali pilot basin: July 14-18, 2014
- ii) Akhuryan-Metsamor pilot basin: July 14-18, 2014
- iii) The Central Kura pilot district: July 21-25, 2014

Sampling and consequent laboratory analysis will be done by the relevant national monitoring laboratories in each country that are also a part of the project beneficiary institutions:

- Environmental Impact Monitoring Centre, Ministry of Nature Protection (AM);
- State Hydrometeorological and Monitoring Service, Ministry of Emergency Situations (AM)
- National Environmental Monitoring Department, Ministry of Ecology and Natural Resources (AZ);
- National Hydrometeorological Department, Ministry of Ecology and Natural Resources (AZ);
- Department for Environmental Pollution Monitoring of the National Environment Agency (GE)

- Department of Hydrometeorology of the National Environment Agency (GE).

Sampling locations for each pilot basin are given in the tables below and also presented in the attached Location maps.

i) Locations of JFS sampling sites at Chorokhi-Adjaristkali pilot basin, Georgia:

#	River	Location of sampling site
1	Dekhva	Downstream of village Bobokvati - 2SW-11 R1
2	Korolistkali	Village Kapreshumi - 2SW-09
3	Chorokhi	Mouth - 2SW-06
4	Charnali	Village Charnali - 2SW-07
5	Chorokhi	Downstream of a new HPP construction - 2SW-05
6	Adjaristkali	Village Pirveli Maisi - 2SW-03
7	Adjaristkali	Downstream of Shuakhevi, at confluence with the riv. Chvana - 2SW-02
8	Achkva	Kobuleti, Mouth - 2SW-08
9	Kintrishi	Kobuleti, Mouth - 2SW-10 R5
10	Adjaristkali	Village Kveda Makhunceti - 2SW-04
11	Adjaristkali	Khulo Downstream - 2SW-01
12	Boloko	Upstream of village Zeda Tkhilnari - 2SW-12 R2
13	Adjaristkali	Downstream of village Adjaristkali - 2SW-14 R9
14	Adjaristkali	Upstream of village Tskhmorisi - 2SW-13 R10
15	Naghvarevi	Upstream of village Chvana - 2SW-15 R8
16	Chorokhi	Confluence with the riv. Makho - 2SW-16 R11
17	Kintrishi	Upstream of village Chakhnati - 2SW-17 R6
18	Akavreta	Upstream of village Namonastrebi - 2SW-18 R4
19	Adjaristkali	Village Kveda Makhunceti - 2SW-19
20	Machkhelistskali	Upstream of village Kokoleti - 2SW-20 R7
21	Skurdidi	Upstream of village Skurdidi - 2SW-21 R3

ii) Locations of JFS sampling sites at Akhuryan-Metsamor pilot basin, Armenia:

#	River	Location of sampling site
---	-------	---------------------------

1	Yeghnajur	Village Garnarich, before the inflow to Lake Arpi
2	Karmirjur	Village Shaghik, before the inflow to Lake Arpi
3	Dzoraget	Village Dzorakert, before the inflow to Lake Arpi
4	Tavshut	Downstream the village Tavshut
5	Lernajur	Downstream the village Lernagyugh
6	Hartashen	Downstream the village Hartashen
7	Akhuryan	Between Berdashen and Poqr Sepasar Settlements
8	Akhuryan	Downstream Amasia city
9	Akhuryan	Downstream the village Krasar
10	Akhuryan	Upstream Gyumri city
11	Akhuryan	Downstream Gyumri city
12	Ashotzq	Village Krasar
13	Keti	Village Keti
14	Jajur	Village Jajur
15	Artikjur	Upstream Artik city
16	Karkachun	Downstream the village Benyamin
17	Jrarat	Downstream Karnut Reservoir
18	Selav-Mastara	Upstream the village Qarakert
19	Metsamor	Village Gai
20	Metsamor	Village Ranchpar

iii) Locations of JFS sampling sites at the Central Kura pilot district, Azerbaijan:

#	River	Location of sampling site
1	Ganjachay	Zazali
2	Ganjachay	Zurnabad
3	Mirzikchay	Shehriyar
4	Ganjachay	Topalhasanli
5	Qoshqarchay	Yalqishlaq
6	Qoshqarchay	Khoshbulaq

7	Gushchuchay	Gushchu
8	Gedebeychay	after Gedebey
9	Shamkirachay	Qalakend
10	Shamkirchay	Mehrili
11	Shamkirchay	Chinarli
12	Vocanchay	Chobankend
13	Zayamchay	Yaniqli
14	Tovuzchay	Oysuzlu
15	Axinjachay	Qaralar, before AM border
16	Jagazchay	Alpod
17	Agstafachay	Qazakh-Bridge
18	Akhinjachay	Upper Tovuz city
19	Tovuzchay	Below reservoir
20	Agstafachay	Below reservoir

3. The JFS sampling checklists

i) Checklist for sampling physical-chemical elements:

Equipment/Item	Quantity	Confirmation
Water sampler	1	
Field equipment to measure pH, O₂, t and conductivity (calibrated)	1 set	
Portable refrigerators with cooling elements (or cooling boxes)	depending on the capacity	
Sample containers: - bottle for nutrients - bottle for heavy metals, - bottle for organo-chlorine pesticides	3 for each sampling site	
Fixation and conservation compounds	1 set (depending on the elements)	
Pipette	2	

Field sample labels	30 +	
Distilled water	10 L	
Water proof waders	1	
Labeling tape	1	
Alcohol-resistant marking pens	2	
Watch	1	
Pencil and paper	1	
Gloves (if working in polluted or very cold water)	2	
Liquid Soap for cleaning	1	
Sampling protocol	30 +	

ii) Checklist for sampling hydro-biological elements (macro-invertebrates):

A) General

Equipment/Item	Quantity	Comments
GPS	1 +	Geographic coordinates & altitude
Map	1	Locations, orientation
Camera	1+	Documentary evidence
Antibacterial liquid (soap)	1	Polluted areas (untreated domestic effluents, etc.)
Life jackets (if need it)	2+	Important for turbulent and stormy rivers, and for Lake Arpi (AM)

B) Benthic macro-invertebrate sampling in rivers & Lake Arpi (AM)

Equipment/Item	Quantity	Comments
Hand net sampler (Standard pond net) - With a long pole (1.5 m long) - Mesh size: 500 µm	2+	Hand net is the most important tool for kick & wash sampling (acc. to ISO 7282, incl. multihabitat sampling AQEM/STAR methodology)
Surber sampler (rectangular frame) or Hess Sampler (cylindrical type)	1	OPTIONAL! Quantitative macro-invertebrate sampling.

Naturalists dredge (lightweight dredge 1-5 kg, mesh size 1 mm or less) with a rope	1 -	A small dredge (rectangular or triangular frame) for manual operation (throwing by the river bank or from a boat); Sampling during high water level season (flooded river) or sampling in a dangerous turbulent velocity (from the river bank).
Bucket (approx. 10 l in volume or less)	1 +	Washing hand net and sieving macro-organisms
Set of 3 sieves (diameter 20 cm) - Sieve 1: mesh size (200 – 500 µm); - Sieve 2: mesh size (1 – 2mm); - Sieve 3: mesh size (4 - 8mm).	1 (3 pc.) +	Sieving the collected sample on site (cleaning roughly the substrata from macro-invertebrates). The mesh size can vary to certain level but the smallest mesh size should be 200 µm (maximum 500 µm, not more).
Sample containers / jars (1000 ml in volume) - Plastic is better; - With a screw cap.	2 (per sampling site – one reserve)	To collect final sample after pre-treatment (sieving & cleaning); Conservation with ethanol.
White tray (White sorting plastic tray) (approx. size 60 x 30 cm)	1 +	To spread the sieved sub-samples into the white tray for field macro-invertebrate observations; White color is important; Exact size is not essential.
Fixation and conservation compounds (Ethanol 90 %)	15l +	Formaldehyde (formalin) could be used but it is toxic (human carcinogen)!
Tweezers - Long tweezers; - + Small or medium size.	2 +	Operation with macro-invertebrates during pre-treatment procedure.
Plastic spoon (normal size)	2 +	To throw the sample from sieves to the sample containers.
Permanent marker	1 +	Inscribing on the
Sampling field protocol for macroinvertebrates	30 – 40 +	Multihabitat sampling techniques acc. to AQEM/STAR methodology.
Field magnifying glass (no special requirements)	2 +	Field preliminary observations of macro-invertebrates (taxonomic identification to family or genus level <i>in situ</i> – for rapid assessment)
Water proof waders and waist belt	2 – 3 +	It is good to have two types of fishing waders: (i) long type by the chest; and (ii) 'high boot' type

Labelling tape	2-3+	To label the sampling container.
Meter ruler (to measure width and depth; and bottom substrata – stones, gravel, cobbles, etc.)	1+	To measure width and depth; and bottom substrata – stones, gravel, cobbles, etc.
Stop Watch	1 +	Measuring sampling duration, e.g. timing of kick-sampling.
Pencil and paper (alcohol proof)	1 +	Labeling
Gloves	2 +	For polluted waters.
Field meters (pH, DO, temperature, EC)	1 set +	Combine portable device (pH, DO, temperature, EC) or three devices (pH-meter, Oxi-meter, Conductivity-meter).

ANNEX 1: Water quality elements and monitoring parameters**Table 1 Biological quality elements and indicative parameters for monitoring rivers**

Quality element	Parameters
<i>Macro-invertebrates*</i>	<i>Composition and abundance of benthic fauna</i>

* *The bottom dwelling (benthic) macro-invertebrate community in rivers (i.e. the immature aquatic stages of aerial insects mayflies, stoneflies etc.) together with Crustacea (e.g. shrimps), Mollusca (e.g. snails and bivalves), Oligochaeta (worms) and Hirudinea (leeches) will be particularly determined.*

Table 2 Hydro-morphological quality elements and indicative parameters for monitoring rivers

Quality elements	Sub-elements	Indicative parameters
<i>Continuity</i>		<i>Number, location and possibility to cross barriers</i> <i>Accessibility/connectivity for fish</i>
<i>Hydrological regime</i>	<i>Quantity and dynamics of the water flow</i>	<i>Water level</i> <i>Discharge, current velocity</i>
<i>Morphological conditions</i>	<i>Variation of depth and width of the river</i>	<i>River course</i> <i>Cross section and degree of naturalness</i>
	<i>Structure and substrate of the river bed</i>	<i>Presence of artificial river bed</i> <i>Degree of naturalness in substrate composition of the river bed</i> <i>Erosion/sedimentation structures</i>
	<i>Structure of the riparian zone</i>	<i>Presence of embankment zone</i> <i>Land use of embankments</i> <i>Land use of flood plain/river valley</i> <i>Possibility for entirely natural inundation</i> <i>Possibility for entirely natural meandering</i>

Table 3 Physical-chemical quality elements and parameters for monitoring rivers

Quality elements	Indicative parameters
<i>thermal conditions</i>	<i>water temperature</i>
<i>oxygenation conditions</i>	<i>dissolved oxygen, oxygen saturation</i> <i>BOD5</i> <i>COD</i>

	<i>total suspended solids</i>
<i>nutrient conditions</i>	<i>NO3</i> <i>NH4</i> <i>PO4 (orthophosphates)</i>
<i>salinity</i>	<i>Conductivity</i> <i>Cl</i> <i>SO4</i> <i>total dissolved solids (total mineralization)</i>
<i>acidification status</i>	<i>pH</i>
<i>specific relevant pollutants</i>	<i>As, Cd,Pb, Ni, Cu, Zn</i>
<i>Micro pollutants</i>	<i>OrganoChlorine Pesticides : Aldrin, Hexachlorobenzene, Endrin and pp DDT</i>

ANNEX 2: The JFS sampling location maps

- 1) 2nd JFS Sampling Locations – Armenia
- 2) 2nd JFS Sampling Locations – Azerbaijan
- 3) 2nd JFS Sampling Locations – Georgia

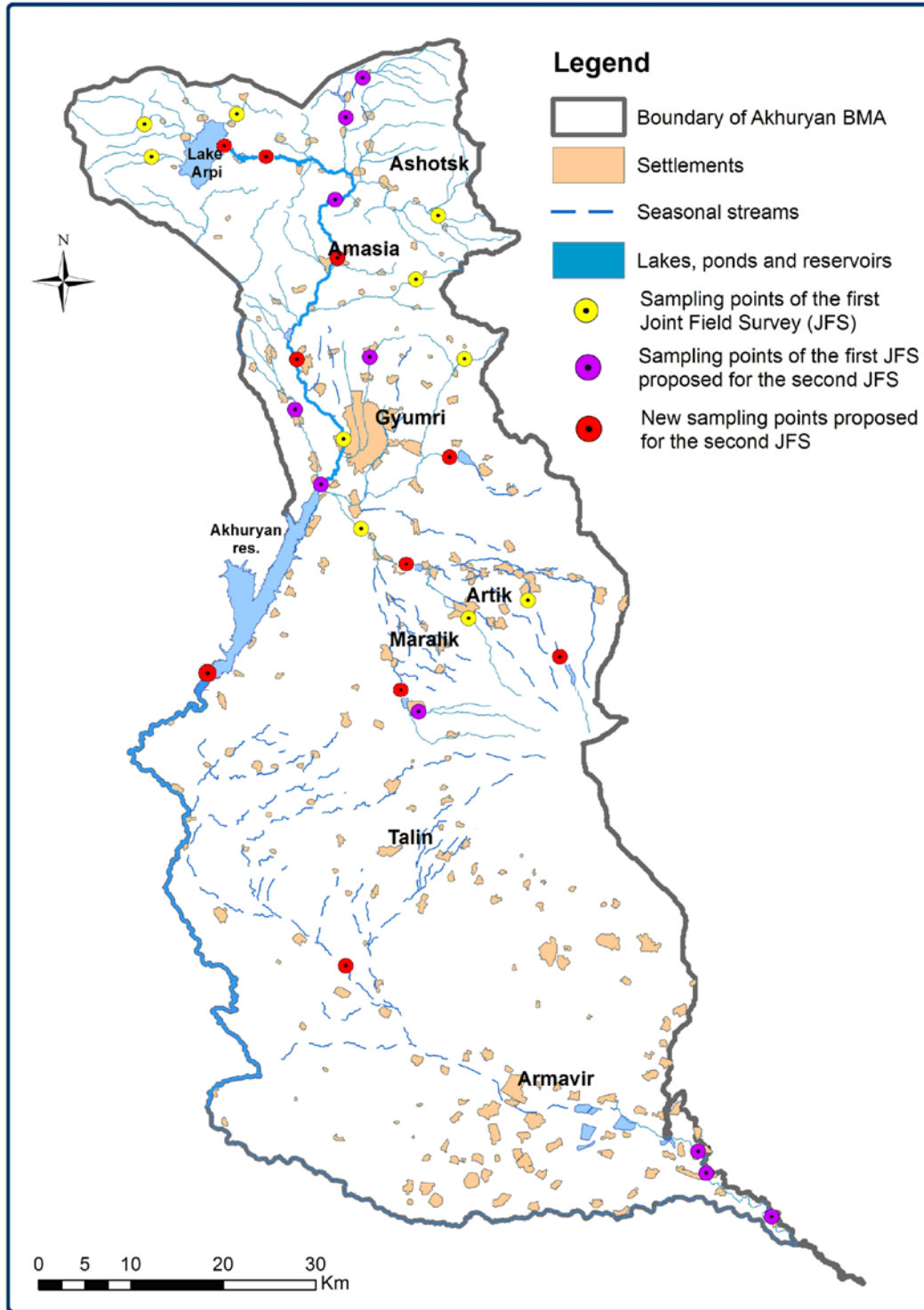


Figure 1: Locations of the sampling points proposed for the second Joint Field Survey in Armenia

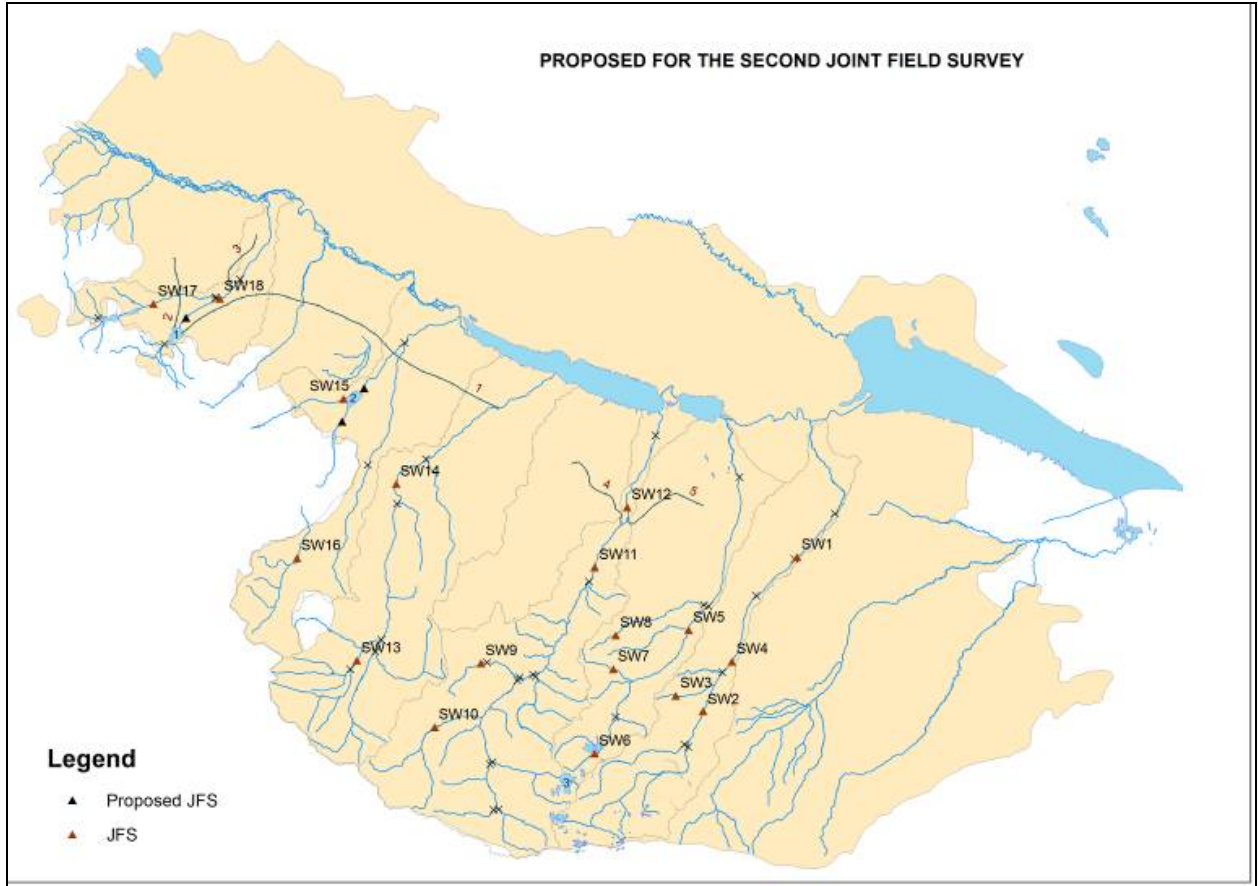


Figure 2: Locations of the sampling points proposed for the second Joint Field Survey in Azerbaijan

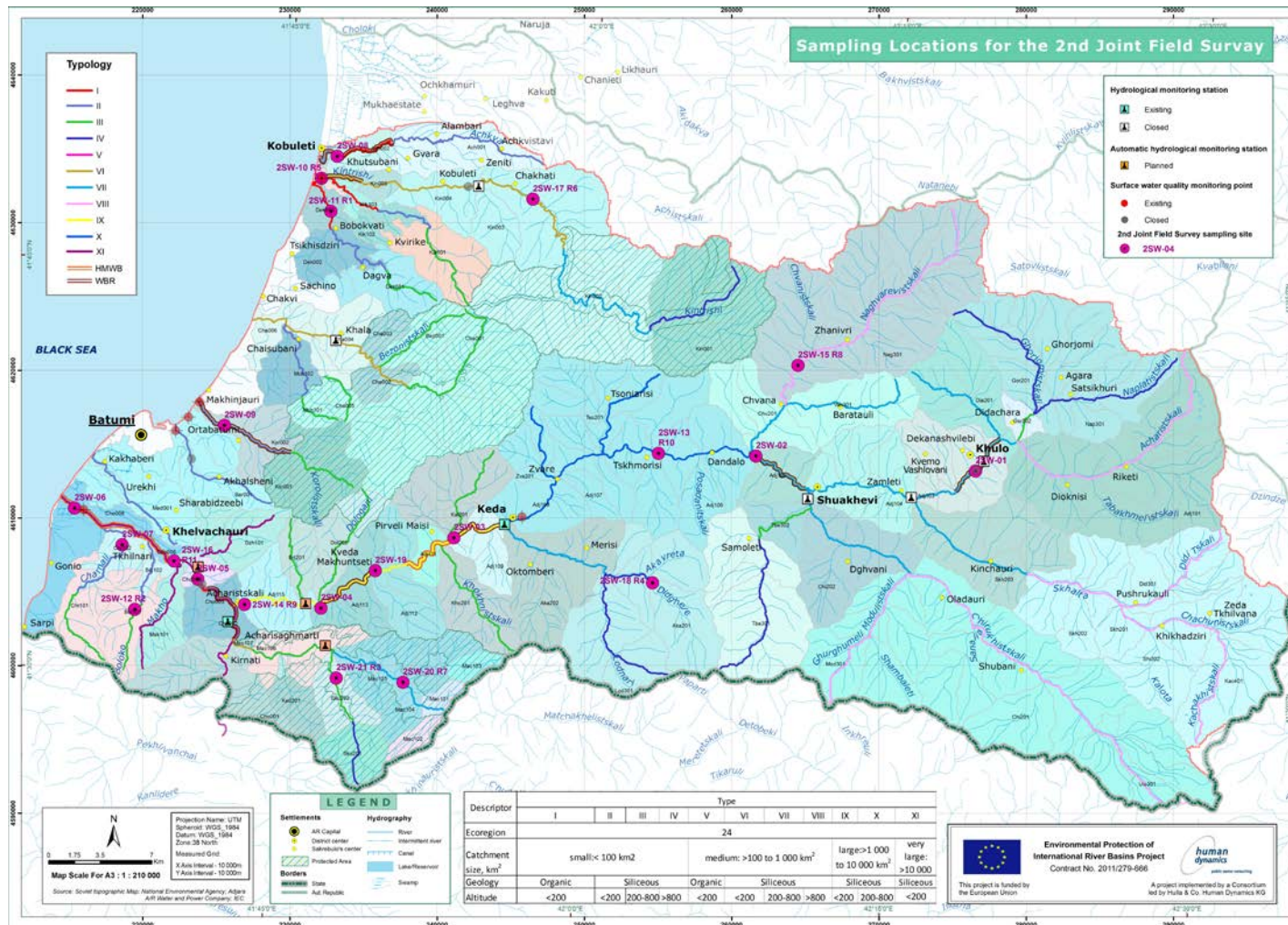


Figure 3: Locations of the sampling points proposed for the second Joint Field Survey in Georgia