Co-financed by the European Union
Connecting Europe Facility

Document title: **WATER CROSSINGS MANAGEMENT PLAN**

Document number: **1062-TGN-MNG-PLN-PJM-22-00008**

Project: **THE DEVELOPMENT OF THE ROMANIAN GAS TRANSMISSION SYSTEM ALONG BULGARIA-ROMANIA-HUNGARY-AUSTRIA ROUTE, PODISOR – GMS HORIA AND 3 NEW COMPRESSOR STATIONS (JUPA, BIBESTI AND PODISOR) (PHASE 1) (REFERENCE NUMBER IN EU LIST: 6.24.2)**

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Abbreviations

Abbreviations	Description
BRUA	Bulgarian-Romanian-Hungarian-Austrian
CESMP	Construction Environmental and Social Management Plan
EIA	Environmental Impact Assessment
ESMP	Environmental and Social Management Plan
F-CESMP	Project Framework Construction Environmental and Social Management Plan
GIP	Good Industry Practice
HDD	Horizontal Directional Drilling
HSE	Health, Safety and Environment
HSE-MS	Health, Safety and Environment Management System
HSES	Health, Safety, Environment System
HSSE	Health, Safety, Social and Environment
JOCE	Official Journal of European Community
KPI	Key Performance Indicators
PMU	Project Management Unit
PR	Performance Requirement

1 Introduction

1.1 Overview

The Construction Environmental and Social Management Plans (CESMP) defines the actions and measures necessary for the overall management of environment and social impacts for both the Project beneficiary (TRANSGAZ S.A., represented by the Bulgarian-Romanian-Hungarian-Austrian Project Management Unit (BRUA PMU)) and contractors in line with the applicable law and other obligations. The CESMPs are comprised of a suite of management plans.

This CESMP is the Project Water Crossings Management Plan, document no 1062-TGN-MNG-PLN-PJM-22-00008.

1.2 Purpose of the Water Crossings CESMP

Project construction activities in relation to water crossings can result in negative impacts upon the water environment and users. This CESMP therefore:

- Outlines the key policies, legislation and standards relating to waste management;
- Defines roles and responsibilities;
- Outlines actions and measures necessary for the effective management of water crossings;
- Covers both accidental and intended impacts due to water crossings;
- Details specific control measures to be implemented by the Company and its contractors (and subcontractors);
- Incorporates the requirements of the Regulatory EIA findings, Supplemental Environmental Assessment (June 2017), international standards, Romanian legislation, Lenders requirements and Project-specific construction permits.
- Considers the Company's general approach to water crossings management procedures and methodologies.

In doing so, this CESMP defines the actions and measures necessary for the overall management of water crossings by the Project beneficiary (TRANSGAZ S.A., represented by UMP – BRUA), Contractors and sub-contractors, in line with the applicable laws and other obligations.

1.3 Scope of Water Crossings CESMP

This CESMP covers all construction activities throughout the Project construction phase and is applicable to all Transgaz staff, Contractors and Sub-contractors. Whilst this Water Crossings CESMP will act as a 'framework' to determine what the Contractors will be expected to produce, Contractors are required to ensure that all requirements of the Water Crossings CESMP are adopted within their own management plans. Further information on Roles and Responsibilities is provided in Section 5 of this CESMP.

1.4 Document Management

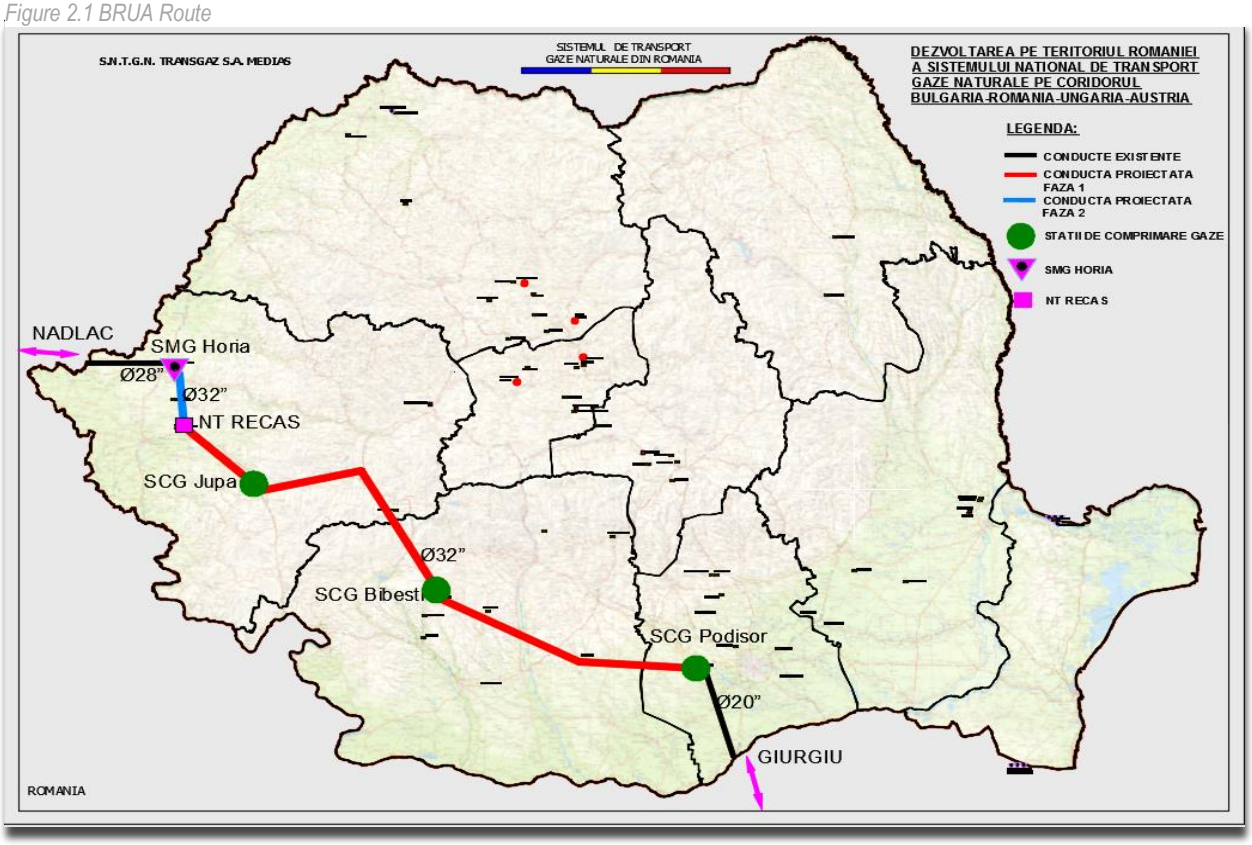
This Plan will be managed and controlled by the Document Control and Archiving Department within the BRUA PMU. The methods for document management and improvement during the construction phase are described in the Document Guide to be developed by the BRUA PMU.

2 The BRUA Project

2.1 Project Overview

SNTGN Transgaz SA Medias ("Transgaz", "the Company" or "the Beneficiary"), the licensed operator of the Romanian National Gas Transmission System, is developing a 529 km natural gas pipeline between Podisor in southern Romania and Horia in the west of the country (the "Project"). The pipeline, which for much of the route will be buried and will upgrade or run alongside existing pipelines, represents the Romanian section of the BRUA Natural Gas Transmission Corridor. In addition to the pipeline itself, the Project will also require construction of three new Gas Compressor Stations at Podisor, Bibesti and Jupa, as well as a range of supporting infrastructure including block valve stations, construction camps, pipe storage areas, watercourses and infrastructure crossings and access roads.

Figure 2.1 BRUA Route



Whilst the majority of the route is on land currently used for farming, it does pass through a number of specifically sensitive areas, including seven Natura 2000 Sites, and the nationally important Dinosaurs Geo-Park. It also passes close to a number of sites of archaeological value including the ancient city of Tibiscum near Jupa. In some of these areas, as well as near major roads and railways and for the 8 major rivers, this will involve the use of horizontal directional drilling. In mountainous areas, special "hammering techniques" may also be applied.

2.2 Environmental and Social Commitments

The Project is subject to various environmental and social requirements that are managed by the Company through the implementation of its Health, Safety and Environmental Management System (HSE-MS)[1]. This HSE-MS includes a specific Project Framework Construction Environmental and Social Management Plan (F-CESMP) as well as associated topic/activity specific CESMPs. Operational phase Environmental and Social Management Plans will be developed at a later stage prior to BRUA operation. The overall approach to the integration of the above documents is described in Section 4.2 of the F-CESMP document.

[1] Integrated Management Manual Quality-Environment-Occupational Health and Safety, code MSMI-CMSSO Ed. 03/Rev.

2.3 Project Approach to Water Crossing Management

Crossing a waterbody can either be achieved by way of Horizontal Directional Drilling (HDD) or open-cut excavation techniques. The main Rivers listed in Table 2.1 will be crossed by HDD.

Table 2.1 Rivers Crossed by HDD

River	Length of crossing (m)
Cotmeana	416
Olt	475
Torrent (of the River Gilort)	455
Jiu	424
Râul Mare	457
Timiș (at Jupa)	867
Spaia	323
Glavița	326
Timiș (at Lugojel)	384
Chizdia	325
Bega	375
Mureș	411

The Project will also cross a further 115 rivers and 319 irrigation channels, drainage channels and tributaries where HDD will not be used and the open-cut approach will be taken. The full list of water courses to be crossed in included in Appendix 4 to this Plan. The approach to be taken to water crossings h has considered recommendations given by the National Authorities and hydrological and geological studies. Appendices 4 and 5 list all the planned water crossings. Appendix 6 describes the technical procedures for water crossings.

Open cut techniques involve the physical removal of materials from the water course to achieve the required burial depth of the pipeline. This has the potential to result in negative impacts upon the water environment, such as pollution of the watercourse, an increase in suspended sediments and disruption to aquatic/riparian flora and fauna. The Project, therefore, seeks to proactively manage such impacts upon the water environment as a result of water crossings and to this effect has identified specific obligations for both the Company and contractors regarding water crossing management.

3 Key Policies, Legislation and Standards

3.1 Overview

The Project is subject to a range of policies, legal and regulatory requirements and other applicable standards and technical requirements of relevance to this CESMP. Where two or more of the identified standards are inconsistent or contradictory, unless otherwise justified, the Project will adopt the more stringent.

3.2 Company Policies

Transgaz's *Health Safety and Environment (HSE) policy* (as outlined in the Integrated Management Manual Quality-Environment-Occupational Health and Safety, code MSMI-CMSSO Ed. 03/Rev.) and *Corporate Social Responsibility policy* apply to all activities carried out by, or on behalf of, the Company as part of this Project. Details of these policies are provided in Section 7.3 of the F-CESMP Document.

3.3 National Legislation and Permits

All contractors are also required to comply with all relevant national regulatory requirements. Whilst contractors are required to verify the latest regulatory requirements themselves, an indicative list of Romanian national legislation is provided in **Appendix 3**.

Contactors must also ensure that relevant requirements of the various construction-related permits for the Project issued by national (and local) regulators are addressed. Any requirements arising from the revision/amendment of those permits will also be applied. Key permits are summarized in Section 3.2 of the F-CESMP.

3.4 International Legislation and Permits

A range of international standards and commitments are applicable to this CESMP as described in Section 3.3 of the F-CESMP. These include the European Bank of Reconstruction and Development (EBRD) Environmental and Social Performance Requirements (PRs), with PR3 and PR6 being especially relevant to this document. All contractors are required to comply with all such requirements as they apply to their activities.

The following European Union Directives are relevant to this CESMP and have been taken into account:

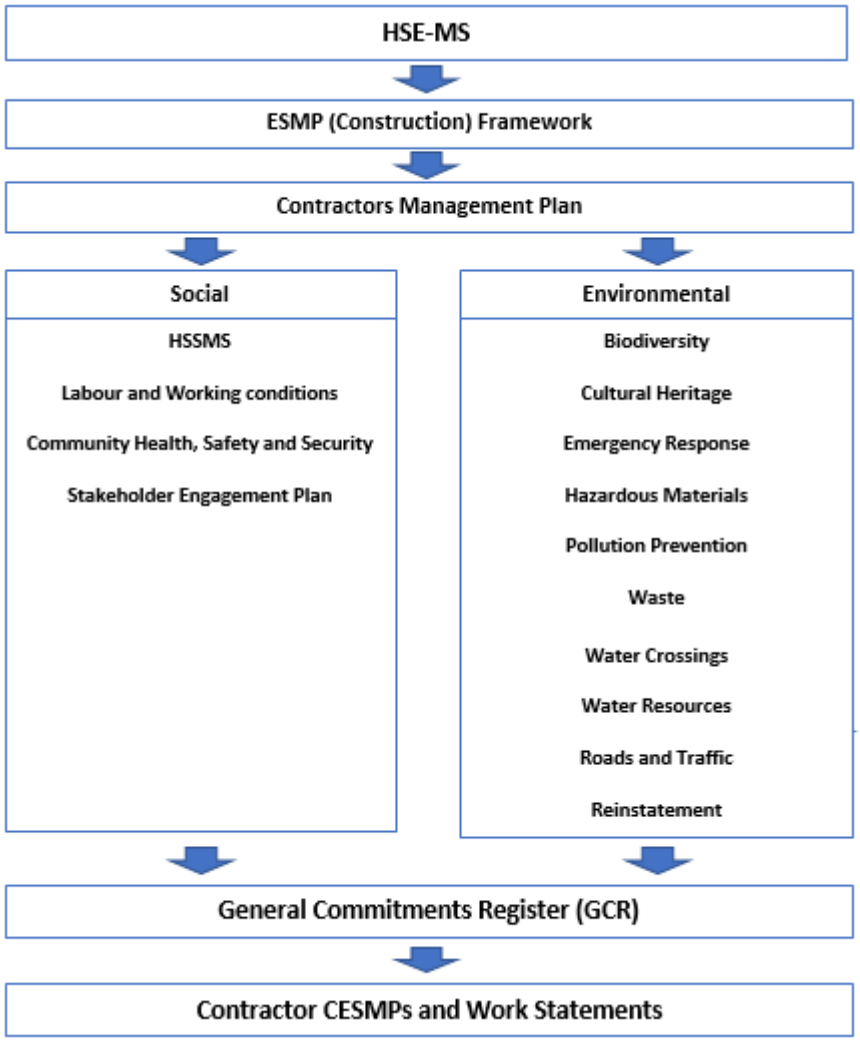
- Directive 2000/60/EC Water Framework Directive;
- Directive 2008/105/EC on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council.

4 Linkages to other Elements of Transgaz HSE-MS

4.1 Overview

This CESMPs forms part of the Project HSE-MS as described in the F-CESMP. Where relevant the CESMP should be read in conjunction with other HSES-MS elements including the ESMP source documentation, control documentation and the key HSE-MS documentation. These are described further in Section 4.1 of the F-CESMP and illustrated in Figure 4.1 below:

Figure 4.1 Links to other HSE-MS documentation



4.2 Linkages to other CESMPs

A listing of the CESMPs and their document numbers is presented in Section 4.2 of the F-CESMP Document. The other CESMPs considered to be of particular relevance to this Water Crossings CESMP are as follows:

- Biodiversity CESMP, Document No. 1062-TGN-MNG-PLN-PJM-22-00006
- Roads and Traffic CESMP, Document No. 1062-TGN-MNG-PLN-PJM-22-00012
- Water Resources Management CESMP, Document No. 1062-TGN-MNG-PLN-PJM-22-00007
- Pollution Prevention CESMP, Document No. 1062-TGN-MNG-PLN-PJM-22-00003
- Reinstatement CESMP, Document No. 1062-TGN-MNG-PLN-PJM-22-00014
- Emergency Response CESMP, Document No. 1062-TGN-MNG-PLN-PJM-22-00015
- Stakeholder Engagement Plan, Document No. 1062-TGN-MNG-PLN-PJM-22-00016
- Waste Management CESMP, Document No. 1062-TGN-MNG-PLN-PJM-22-00005
- Hazardous Materials CESMP, Document No. 1062-TGN-MNG-PLN-PJM-22-00004

5 Key Roles and Responsibilities

5.1 Overview

An integrated approach to water crossings management involves a range of stakeholders, including the Company, the Contractors (and subcontractors), local authorities, regulatory agencies and the general public. Effective water crossings management therefore requires robust processes regarding information dissemination, training, and designation of responsibility, management actions, monitoring, control, and remedial actions.

Roles and responsibilities for the Company and Contractors are detailed below. Further information on specific responsibilities for CESMP actions is outlined in Appendix 1 and Appendix 2.

5.2 Company Roles and Responsibilities

Transgaz HSE management roles and responsibilities during the Project construction phase are detailed in the BRUA PMU "Control system, safety and environmental protection Guidelines". Further information is also provided in other documents listed in the F-CESMP document.

With regards to this CESMP, Transgaz S.A. is responsible for key management activities including:

- Development of bidding conditions regarding water crossings management;
- Professional training of a Transgaz Water Crossings Management representative on site;
- Monitoring contractor performance, supervision and control of contractors;
- Management cooperation in case of an ecologic accident[2] (including registration and communication of events); and
- Management of Transgaz's own impacts upon the water environment.

Specific roles and responsibilities within the Company the following roles and responsibilities will apply presented in Table 5.2 will apply.

Table 5.2 Company Roles and Responsibilities

Position	Responsibilities
Director general SNTGN TRANSGAZ SA	Approves the Water Crossings CESMP
BRUA – Execution Manager & BRUA – HSSE Manager	Ensures compliance with the requirements set out in this Plan; - Has overall responsibility for implementation of this Water Crossings CESMP, including by the Contractors; Develops, monitors and revises this plan, according to changes in the legislation or other requirements emerging; -Ensures the necessary training for BRUA PMU staff on water crossings is delivered; -Centralizes the information related to the management of water crossings by the Contractors; Provides the support necessary for contractors to comply with the Water Crossings CESMP; Ensures that this Water Crossings plan is available to all BRUA PMU employees and contractors; Performs regular audits of the main Contractor's performance to monitor compliance against the requirements of this Plan;

[2] Ecologic accident – an event resulting from an unforeseen and accidental spillage or emission of a hazardous or polluting substance (whether liquid, solid, gasseous or vapour) that could result in detrimental impacts to the environment and/or local communities

	Monitors and reports all risks, non-compliances with this Plan and incidents relating to water crossings management and reports them to the company management; and Prepares an annual environmental report that includes water crossings management details.
Environmental responsible on site of Transgaz from PMU BRUA	Will verify the implementation of contractors' obligations including regular audits.

5.3 Contractor Roles and Responsibilities

Overarching Contractor HSSE requirements are defined in the relevant articles of their contracts and associated mandatory Annexes. Each contractor must also implement all relevant requirements of the CESMPs, including this Water Crossings CESMP. Contactors are also responsible for ensuring that any subcontracted work meets these requirements. In addition, within the Project, responsibility for water management lies with the Contractors according to the principle "polluter pays".

Contractors will therefore be required to present to the Beneficiary, represented in the Project by BRUA PMU in accordance with the requirements, their proposed approaches to:
-Management of water crossings on site.
-Any other conditions outlined in this CESMP or its Appendices.

In addition contractors will present the Beneficiary with details of:
-A nominated representative on water crossings management;
-Records of any impacts associated with water crossings management.

Further specific responsibilities of the Contractor/sub-contractors are outlined in the Appendix 1 and Appendix 2 to this CESMP and in Table 5.3 below.

Table 5.3 Contractor Roles and Responsibilities

Position	Responsibilities
Contractor/Subcontractor Environmental responsible	- Ensures that all activities are carried out in accordance with the requirements of this Water Crossings CESMP; - Produces a Water Crossings Management Plan in line with this Plan. - Performs regular inspections at work sites, to ensure all activities are being performed in accordance with the requirements of the Water Crossings CESMP; - Keeps all necessary records and reports on water crossings according to any relevant legislation. Ensures all staff receive the necessary training in relation to water crossings management; Produces monthly and an annual environmental reports that include details on water crossings management that must be sent to Transgaz - Ensures all subcontractor activities are conducted in line with this Water Crossings CESMP. - Reports on all risks, non-compliances with this Plan and incidents. - Ensures all necessary measures are taken to remedy any non-compliances.

6 Management, Mitigation, Monitoring and Verification

6.1 Management Actions

A range of management actions (and other mitigation measures) are required to be implemented in respect of Water Crossing Management. The specific management actions and mitigation measures required of Transgaz staff and its Contractors (and sub-contractors) are described in **Appendix 1** to this CESMP. These should incorporate Good Industry Practice (GIP[3]) in relation to the discharge of water from excavations, prevention of silt pollution and reduction of pollution risk, including the following measures:

- Preventing water from entering excavations, by using cut-off ditches;
- Using pump sumps in excavations;
- Minimising the disturbance of standing water;
- Minimising the amount of time stripped ground and soil stockpiles are exposed;
- Only removing vegetation from the area that needs to be exposed in the near future;
- Managing stockpiles to avoid sediment run-off;
- Using geotextile silt fencing at the toe of the slope, to reduce the movement of silt;
- Collecting run-off in soakaways (referred to as polders in the translation of the regulatory EIA) and allow suspended solids to settle before disposal;
- Diverting clean water away from the area of construction work in order to minimise the volume of contaminated water;
- Equipment and vehicle wheel washing to be carried out in a designated area of hard standing located away from any watercourse or surface water drain;
- Discharging of treated water to the environment with formal approval from the relevant regulator;
- Contaminated water tankered off site for authorised disposal.

6.2 General Monitoring Activities

Monitoring provisions for this Water Crossing Management CESMP have been developed through the process outlined in Table 6.2.

Table 6.1 Approaches to monitoring

Objective	Approach
1: Risk Based	Monitoring programs to address material issues base on the use of the 'source-pathway-receptor' approach in the Environmental Social Impact Assessment. These are commensurate with: • the scale and nature of the activity, • the assessed potential level of impact (and uncertainty thereof), and • the sensitivity of the local environment within the activity area of influence
2: Compliance Based	Addition monitoring programs to meet specific regulatory needs.

Following this approach the proposed monitoring plans should meet both Transgaz's requirement to understand and manage the Project's potential impacts during each construction activity/ location and any specific requirements of the Romanian authorities. The specific monitoring requirements for this Water Crossings CESMP are presented in Appendix 2

During the construction phase, if the Biodiversity Specialist determines that a watercourse is ecologically sensitive to changes in flow or water quality, Contractors will be required to undertake water quality, turbidity and flow monitoring according to GIP. Monitoring should be undertaken both immediately upstream of the water crossing site (to establish natural baseline levels) and then at intervals up to 2km downstream of the construction site, to determine the extent of any impacts and the need for any intervention (e.g. temporary cessation of works) or other application of GIP mitigation. Equally, where human receptors are identified

[3] For example, Guidance for Pollution Prevention Works and maintenance in or near water: GPP 5, January 2017

that are located within 2km of the water crossing site, monitoring should also be undertaken as directed by the Biodiversity Specialist and according to GIP.

6.3 Management System Verification Monitoring

Management System verification monitoring requirements, as detailed in the F-CESMP Document, are divided into three levels as shown in Table 6.3.

Table 6.3 Auditing Management System

Tier	Objective	Responsible	Description
Tier 1:	Transgaz management system audits.	Transgaz	These audits are aimed at assessing the Transgaz HSES management system elements and assessing their continued suitability throughout the project life cycle.
Tier 2:	Transgaz CESMP audits.	Transgaz	These audits are undertaken by the Transgaz BRUA team to confirm compliance by the Company and its contractors with the CESMPs.
Tier 3:	Contractor self-audits.	Contractor	These audits are to be undertaken by contractors to confirm compliance by themselves and their sub-contractors with the CESMPs and their own HSE management systems. The managing contractors shall ensure that audit reports are provided to Transgaz

In addition to the above, there are also expected to be regulatory audits and lender compliance monitoring visits. The nature and structure of these will be confirmed with regulators and lenders.

6.4 Key Performance Indicators

Both the General Monitoring and the Management System Verification Processes require robust Key Performance Indicators (KPI) to be developed. These are quantitative or qualitative measurements used to gauge performance over time and can be used to assess the effectiveness of control measures. The KPIs considered relevant to this Water Crossings CESMP are shown in Table 6.4 below.

Table 6.4 Key Performance Indicators for Project Water Crossings Management

ID	KPI	Target	Monitoring Measure	Associated Management Actions
KPI-001	Number of reported non-compliances with the requirements of this CESMP	Zero per month	N/A	All measures identified in Appendix 1
KPI-002	Number of non-compliances closed due to corrective actions being taken within the defined timeframe (set on a case by case basis)	100% of all non-conformities remedied within the defined timeframe.	N/A	All actions identified in Appendix 1
KPI–003	Number of reports of near misses reviewed for root cause and a	100% of near miss reports reviewed and shared	N/A	N/A

	corrective action identified and shared across all spreads within 48 hours to prevent future occurrence			
KPI–004	Number of complaints received from the community related to turbidity	Zero per month	WcM2	WcM023 WcM011 WcM007 WcM004 WcM003
KPI-005	% of all staff who have received relevant and adequate training	100% compliance with training requirements.	WcM5	N/A
KPI-006	Number of incidents of water pollution	Zero per month	N/A	WcM002 WcM003 WcM004 WcM005 WcM007 WcM008 WcM009 WcM018

The specific auditing and monitoring requirements for the verification of each of the management measures described within this Water Crossings CESMP (Appendix 1) are identified in Appendices 1 and 2. This includes identification of the relevant audit tier level (1 to 3) to be undertaken.

6.5 Training

Training needs for all TRANSGAZ and Contractor staff shall be identified at the outset, before construction works commence, and a training plan developed.

7 Appendices

7.1 Appendix 1: Water Crossings Management Actions

Ref	Topic	Location	Requirement	Responsibility	Verification Process	GCR Ref
WcM 001	Water Crossings Management	All	All requirements in the Environmental Agreement in relation to water crossings management must be met.	Contractor	Cross check the requirements of the Environmental Agreement	All relevant
WcM 002	Water Crossings Management	All	Any relevant requirements in the Pollution Prevention CESMP associated with water crossings management should be put in place.	Contractor	Cross check the requirements of the Pollution Prevention CESMP	
WcM 003	Schedule	All watercourses	The duration of water crossing construction activities should be limited as far as reasonably practicable to limit adverse effects on water quality.	Contractor	Durations within or shorter that the period scheduled.	
WcM 004	Pollution Prevention	All Watercourses	Standard pollution control measures will be implemented i.e. to prevent silt contamination by keeping water out of the works area using appropriate isolation techniques, such as coffer dams and by-pass channels.	Contractor	Visual inspection	
WcM 005	Pollution Prevention	All Watercourses	The equipment will be brought to the site in perfect state of operation, the technical revisions and oil exchange being already made.	Contractor	Visual inspection and audit of equipment service records	

Ref	Topic	Location	Requirement	Responsibility	Verification Process	GCR Ref
WcM 006	Schedule	All Watercourses	Monitoring the meteorological bulletins meant to take the equipment outside the areas which could be flooded, in case of high waters.	Contractor	Records of bulletins consulted.	
WcM 007	Sediment Management	Sensitive Areas	Implement measures against sedimentation. Use of settling ponds, silt fences and screens to prevent sediment transport.	Contractor	Visual inspection	
WcM 008	Pollution Prevention	All Watercourses	Wastewater should be prevented from entering surface water bodies without prior assessment and treatment if necessary.	Contractor	Visual inspection, records of wastewater treatment	
WcM 009	Pollution Prevention	All Watercourses	The placing of concrete in, or near to, any watercourse must be controlled to minimize the risk of pollution.	Contractor	Visual inspection	
WcM 010	Bank Restoration	All watercourses	The vegetation layer should be salvaged and stored to aid in bank reinstatement following construction.	Contractor	Visual inspection	
WcM 011	Bank restoration	All Watercourses	Where the pipeline crosses surface watercourses and where required in the water management permits, erosion control for banks will be implemented as specified in the appropriate chapter of the EIA. Near watercourses the Contactor will ensure reinstatement is like-for-like (i.e. bank material, profile and vegetation should be maintained, Geo coir will be used to retain bank edges where required (see specific mitigation).	Contractor	Visual inspection	

Ref	Topic	Location	Requirement	Responsibility	Verification Process	GCR Ref
WcM 012	Pipeline laying	Water Crossings	The natural bed level and material should be maintained as far as possible. The pipeline should be buried below the natural bed level to allow the natural bed level to be maintained.	Contractor	Visual inspection	
WcM 013	Pipeline laying	Water Crossings	The pipeline should be buried deep enough so that it is not exposed during high flows.	Contractor	Visual inspection	
WcM 014	Pipeline laying	Water Crossings	The pipeline should not be laid within the channel or where it could obstruct high flows to limit the risk of the pipe being damaged and erosion of the bed.	Contractor	Visual inspection	
WcM 015	Traffic Access	All watercourses	Construction traffic will only cross watercourses via existing bridges and roads and river fording rivers will be avoided wherever possible.	Contractor	Audit of routes taken by construction traffic	
WcM 016	Pipeline installation	Construction sites	Surface water crossings will be undertaken in accordance good industry practices.	Contractor	Visual inspection	178,191
WcM 017	Restoration works	All Watercourses	Channel banks and flood defences will be restored on completion of water-crossing works.	Contractor	Visual inspections	37, 38, 179
WcM 018	Restoration works	Construction sites	Use clean, native materials during bed and bank restoration works.	Contractor	Visual inspection	37,38,179

Ref	Topic	Location	Requirement	Responsibility	Verification Process	GCR Ref
WcM 019	Restoration works	Sensitive Areas	Implement Special Method statements for construction and reinstatement at special/sensitive areas, in accordance with permits obtained from Romanian Waters, in locations identified in the Plan of Biodiversity in close contact with the water.	Contractor	Visual inspection against requirements of the method statements.	43,102,202
WcM 020	Schedule	All Watercourses	*Water crossing works will be scheduled wherever practical during periods of low flows.	Contractor	Audit of the schedule for water crossings	30
WcM 021	Flows	All Rivers	Natural flow rates should be maintained during works in watercourses as far as possible at all times.	Contractor	Records of flow monitoring.	
WcM 022	Flows	All Rivers	Construction of the surface water crossings will seek to ensure minimal impacts from interrupting river flow by identifying downstream users and determining their river water supply needs and by using measures such as channel diversions to ensure minimal interruption to flow.	Contractor	Records of flow monitoring	191
WcM 023	Turbidity	All Rivers	Monitor turbidity in rivers during water crossing works in the river bed, where there are permitted abstractions and/or sensitive biodiversity receptors identified within 2km downstream, and take corrective actions where required.	Contractor	Records of turbidity monitoring	181

* Commitment from the Environmental Permit

7.2 Appendix 2: Monitoring

ID	Activity	Description	Parameters	Location	Standards	Frequency	Tier (1/2/3)
WcM1	Turbidity Monitoring	Where there are permitted abstractions or the Biodiversity Specialist has identified sensitive biodiversity receptors within 2km downstream, measure turbidity immediately upstream of construction works for water crossings.	Turbidity (NTU)	Immediately upstream of any water crossing construction activities	N/A – to establish a baseline	Daily (or as instructed by the Biodiversity Specialist) during works in the river bed.	N/A
WcM2	Turbidity Monitoring	Where there are permitted abstractions or the Biodiversity Specialist has identified sensitive biodiversity receptors within 2km downstream, measure turbidity downstream of construction works for water crossings.	Turbidity (NTU)	At 500m intervals for 2km downstream of the construction activities.	According to Good Industry Practice	Daily (or as instructed by the Biodiversity Specialist) during works in the river bed.	N/A
WcM3	Flow Monitoring	Where there are permitted abstractions or sensitive biodiversity receptors within 2km downstream, measure flow immediately upstream of construction works for water crossings	Flow (m3/sec)	Immediately upstream of any water crossing construction activities in the Rivers Cainelui, Cerna and Oltet only.	N/A – to establish a baseline	Daily (or as instructed by the Biodiversity Specialist) during works in the river bed.	N/A
WcM4	Flow Monitoring	Where there are permitted abstractions or sensitive biodiversity receptors within 2km downstream, measure flows downstream of construction works for water crossings.	Flow (m3/sec)	At 500m intervals for 2km downstream of the construction activities in the Rivers Cainelui, Cerna and Oltet only.	According to Good Industry Practice	Daily (or as instructed by the Biodiversity Specialist) during works in the river bed.	N/A

WcM5	Training	Audit of records to demonstrate all contractor/sub-contractor staff have received the relevant training	Evidence of training provided.	All water crossings sites	Level of training required	Tier 2 – bi-annual Tier 3 - quarterly	2 & 3
WcM6	Restoration	Inspection of river bank profile and any associated flood defences	Erosion of river bank profile and damage to flood defences	All water crossings sites	There is no bank erosion and flood defence structures are undamaged.	Immediately after construction and then 6 monthly for 3 years	N/A
WcM7	Restoration	Inspection of river bed profile and pipe trench	Scour around the pipe and erosion of the river bed	All water crossings sites	There is no scour around the pipe or erosion of the river bed.	Immediately after construction and then 6 monthly for 3 years	N/A

7.3 Appendix 3: Legislation

Ref	Legislation
	- Water Law no. 107/1996, as further amended and supplemented;
	- STAS 9824/0-74 – Setting-out the constructions. General prescriptions
	- STAS 9824/1-87 – Setting-out the civil, industrial and agricultural-zootechnical constructions
	- STAS 9824/3-74 – Setting-out the public roads designed
	- SR 438-3:2012 – Steel products for concrete reinforcing. Part 3: welded meshes
	- SR 438-1:2012 - Steel products for concrete reinforcing. Part 1: Reinforcing steel, hot rolled.
	Standards and technical QAC, norms :
	- SR 6898-1/1995 – Steel pipes helically welded. Part 1: Pipes for general use
	- SR ISO 4427-2:2010 – Sewerage systems of plastic materials. Pipes and polyethylene fittings (PE) for water supply. Part 2: Pipes
	- NT 118 – 2013 – Technical rules for the design and execution of natural gas transport pipelines
	- C 169-88: Normative regarding the execution of embankments works;
	- C 83-75: Guide for executing the detail setting in constructions;
	- ST 009-2011: technical specification regarding steel products used as fittings: requirements and performance criteria;
	- P 59-1986: technical instructions for the design and use of reinforcing with welded meshes of the concrete elements;
	- C 28-1999: technical rules for welding the concrete reinforcements;
	- NE 012/2010: Normative for the production and execution of concrete works, reinforced concrete and pre-compressed concrete. Execution of concrete works;
	- NE 012/1-2007 – Code of practice for the execution of concrete works, reinforced concrete and pre-compressed concrete. Concrete production”;
	- NE 013-2002: Code of practice for the production of precast concrete items, reinforced concrete and pre-compressed concrete. This section will detail the legislative requirements for the construction, of the watercourse crossings, that may vary within each jurisdiction, potentially involving national, provincial and local approval processes.

7.4 Appendix 4: Rivers

Nr.crt	Cod	River name	Flow rate Q1% (mc/s)	Location (km)	Open-cut Techniques Total length (m)	Open-cut Techniques Ballasting pipe (m)	HDD (m)	Execution Time Total (days)	Execution Time Work in river bed (days)
LOT 1					**2004.9**	**851.6**	**891**	**348**	**140**
1	TA1	Neajlov river	340	4+859	62	37		8	5
2	TA2	Dambovnic river	350	11 + 265	59	32		8	5
3	TA3	Glavacioc Creek	70	30+ 142	58.2	32		8	5
4	TA4	Vii valley	46	36 + 794	45	21		6	3
5	TA5	Virosi valley	10	38 + 859	55.5	32		8	5
6	TA6	Clanita Creek	21	40 + 861	47	21		6	3
7	TA7	Dobrei Creek	22	44 + 758	29	26		4	4
8	TA8	Teleorman river	290	50 + 859	39.4	17		5	2
9	TA9	Bucovel Creek	31	54 + 567	33.9	10		5	2

10	TA10	Cainelui river Stauleni lake	48	58 + 832	176	76 Coffer dam		24	14
11	TA11	Burdea Creek	47,5	65 + 302	56.3	21		8	3
12	TA12	Tecuci Creek	23	69 + 639	46.7	21		6	3
13	TA13	Cotmeana river+Lerului valley	520	75 + 804			416	32	0
14	TA14	Vedea river		81 +000	62	32		8	5
15	TA15	Osica Creek		84+ 008	56.1	10		8	2
16	TA16	Negrisoara Creek		95+653	51.2	21		7	3
17	TA17	Plapcea Mica Creek		98+738	52.4	21		7	3
18	TA18	Plapcea Creek		102+809	48	24		6	4
19	TA19	Pialita Creek		105+132	38.7	10		5	2
20	TA20	Gota Creek		107+647	41	10		5	2

21	TA21	Stejarul Valley (Darjov Creek)		110+150	35	10		5	2
22	TA22	Teslui river		114+533	48	21.2		6	3
23	TA23	Olt river		119+741			475	37	0
24	TA24	Oporelu chanel		120+101	47	27		6	4
25	TA25	Dalga Creek		121 +782	45	21		6	3
26	TA26	Bazavanul Creek		124+193	33	10		5	2
27	TA27	Dalga Creek		129+842	44	16		6	3
28	TA28	Creek Putreda		134+109	30	10		5	2
29	TA29	Creek Pesceana		136+282	34	10		5	2
30	TA30	Creek Pesceana		137+470	52	21		7	3
31	TA31	CreekPesceana		138+195	49	21		7	3
32	TA32	Creek Verdea		139+388	39	16.2		6	3
33	TA33	Creek Pesceana		142 461	38	16		6	3

34	TA34	Creek Gusoianca		144+ 809	35	10		6	2
35	TA35	Creek Gusoianca		145+787	31	10.2		5	2
36	TA36	Creek Gusoianca		146 +142	45	16		7	3
37	TA37	Creek Gusoianca		149+371	36	10		5	2
38	TA38	Creek Gusoianca		154+968	36	10		5	2
39	TA39	R. Cerna		162+763	61	32 Coffer dam		8	5
40	TA40	Creek Glamana		165+500	48	21		6	3
41	TA41	Creek Omorocea		167 + 32	32	10		5	2
42	TA42	CreekSasa		171 +718	44.5	16		6	3
43	TA43	River Oltet		175+287	85	43 Coffer dam		14	8
LOT 2					**1259.4**	**509**	**424**	**237**	**117**

1	TA 44	Creek Pesteana		184+699	44	21		7	3
2	TA 45	Creek Plosca		186+605	45	18		7	3
3	TA 46	Creek Amarazuia		192+349	53	21		7	3
4	TA 47	River[AGL270] Amaradia		196+663	52.4	27 Coffer dam		14	10
5	TA 48	Creek Totea		198+836	47.5	10		7	2
6	TA 49	Creek Vladimir		206+897	38	10		5	2
7	TA 50	River[AGL271] Gilort		225+32	89	43 Coffer dam		16	10
8	TA 51	River [AGL272]Zlast		-	27	6		4	1
9	TA 52	River[AGL273] Budieni		240+510	57	22		10	7
10	TA 53	River[AGL274] Amaradia		244+240	74	43		14	10
11	TA 54	River[AGL275] Amaradia		246+639	69	32		12	8

12	TA 55	River[AGL276] Amaradia		248+269	62	32		12	8
13	TA 56	River[AGL277] Inoasa		249+853	47	21		7	5
14	TA 57	River[AGL278] Inoasa		250+452	33	7		5	3
15	TA 58	Creek Iazul Topilelor		258+637	34	8		5	3
16	TA 59	River[AGL279] Jiu		261+129			424	33	0
17	TA 60	Creek Cartiu		269+457	43	16		5	3
18	TA 61	Creek Baleia		292+786	49	21		5	3
19	TA 62	River[AGL280] Jiul de Vest		293+766	76	43		21	14
20	TA 63	River[AGL281] Crevedia		300+705	40.2	10		5	3
21	TA 64	Creek Crevedia		301+646	45.1	8		5	2
22	TA 65	River[AGL282] Crevedia		304+403	66.7	10		12	2

23	TA 66	Creek Valley Ráchitei		307+627	34	10		4	2
24	TA 67	Creek Crivadia		311+557	37	16		4	3
25	TA 68	Creek Crivadia		311+845	51	27		6	4
26	TA 69	Creek Muncel		313+806				0	0
27	TA 70	Creek Barusor		314+892	45.5	27		5	4
28	TA 71	Creek Valley Verde		319+676				5	2
LOT 3					**1784.5**	**911.7**	**3057**	**615**	**211**
1	TA 72	River Bárbat		321+960	98	76		16	14
2	TA 73	Creek Rusor		327+51	56.8	32		7	4
3	TA 74	River Serel		327+182	61	32		14	4
4	TA 75	Creek River Alb		330+123	36	16		6	3
5	TA 76	River Paros		331+83	60.8	32		10	6
6	TA 77	River Salasul		332+10	42	16		7	3
7	TA 78	River Sibisel		337+120	53	28		9	5

8	TA 79	River Mare		338+983			457	35	0
9	TA 80	Channel ul Creek de Câmp-irigat	4,41	348+813	31.7	17		8	8
10	TA 81	Channel Odovajnita-necadastrat		350+7	31.8	9		10	8
11	TA 82	River Râusor	14,09	353+923	25	11.9		4	2
12	TA 83	River Breazova (aval)	154	354+292	39.5	20		6	4
13	TA 84	River Breazova (amonte)	154	354+920	45.3	30		7	5
14	TA 85	River Zlotina	51,4	356+451	49.2	26.6		7	4
15	TA 86	River Breazova	96,70	359+106	43.1	22.9		7	4
16	TA 87	Creek Valley Zeicani	5,82	359+534	41.8	24		7	4
17	TA 88	Creek Talher-aval	28,47	361+455	23.6	7		4	1

18	TA 89	Creek Talher	28,47	361+551	45	21		7	3
19	TA 90	Creek Talher	28,47	362+046	30.1	23		5	4
20	TA 91	Creek Talher	28,47	362+494	28.2	7		4	1
21	TA 92	Creek Talher	28,47	362+670	37.1	10		5	1
22	TA 93	River Bistra	149	364+708	34.2	15		5	2
23	TA 94	Valley Bucovita	30,90	369+824	26.5	11		4	1
24	TA 95	River Marga	122	376+828	44.8	17		7	4
25	TA 96	River Hodincior	29,70	380+506	73.3	29		12	6
26	TA 97	Creek Slatina	13,90	382+550	25.1	8		4	1
27	TA 98	Valley Mare	19,90	384+249	34.4	14		5	2
28	TA 99	Bistra Màrului	308	388+445	82.7	48		14	8
29	TA 100	Valley Scoartei	24,60	393+502	34.1	12		5	2
30	TA 101	Creek Eruga	10,10	398+259	90.8	59		18	14
31	TA 102	Creek Eruga-aval	19,60	402+330	78.1	56.6		16	14

32	TA 103	Creek Eruga	19,60	402+605	31.1	11		8	5
33	TA 103bis	Creek Eruga-aval	19,60	402+667	36.1	28		9	8
34	TA104	River Satului Axin(River)	109	404+015	34.7	16		8	5
35	TA105	River Timis	716	406+000			866.4	70	0
36	TA106	Creek Macicas	51,80	411+779	36,6	17,5		9	4
37	TA107	Creek Vana Secàneascà	48,90	416+608	29.7	8		7	2
38	TA108	Creek Vana Mare	28,30	420+75	37.3	17		9	4
39	TA109	River Spaia	47,70	429+000			322.4	26	0
40	TA110	River Stiuca	36,30	432+359	43.8	22		7	6
41	TA111	River Timis	1248	437+872			384	32	0
42	TA112	River Binis	96,80	452+059	39.1	16.7		21	8

43	TA113	River Glavita	112	465+261			325.8	30	0
44	TA114	River Bega	311	459+286			375	32	0
45	TA115	Creek Minisul Bâtrân (Timisul Mort)	13,80	460+168	35.8	15		19	8
46	TA116	Channel Chizdia	65,10	460+683			325	26	0
47	TA117	Creek Glogovátu	7,71	466+388	40.7	25		7	4
48	TA118	River Mociur	23,60	469+450	45.3	26		8	4
49	TA119	Valley Isvarsita (debleu DD16)	10,90	473+483	27.9	11		5	2
50	TA120	River Lipari (Valley satului)	3,23	474+731	41	17		7	3

7.5 Appendix 5: Channels

Irrigation channel

Nr. Crt.	Cod	Irrigation channel name	Location (km)	Open cut Techniques		HD HDD (m)	Status
				Total length (m)	Ballasting pipe (m)		
LOT 1				2172.9	656	198	
1	THC	Channel	km 12+185	15	15		no water
2	THC 1	Ripple valley	km 15+753	35.3	10		no water
3	THC 2	Valley de Margine	km 24+496	30.9	15		no water
4	THC 3	Valley Strâmbă Tributary V. Porasca	km 31+897	58.1	21		no water
5	THC 4	Tributary V.Pietrișului și Valley Petrisului	km 35+527	53.7	37		with water
6	THC 5	Valley Tributary Stâng R. Teleorman	km 47+685	41	21		no water
7	THC 6	Valley Tributary Stâng R. Teleorman	km 49+518	37.7	10		no water
8	THC 7	Channel 1	km 50+266			38	DJ 504 + CE no water –with protection pipeline
9	THC 8	Channel 2	km 50+406	36.1	15		CE- no water
10	THC 9	Valley Strâmbeni	km 56+97	49.1	10		valley - no water
11	THC 10	Valley Plescara	km 60+557	36	10		valley - no water
12	THC 11	Valley Berzei	km 62+314	60.5	10		valley - no water

13	THC 12	Valley lui Taras	km 67+676	40.2	10		valley - no water
14	THC 13	Valley Cioroiului	km 68+315	62	10		seepage (h=3,1-3,3m)
15	THC 14	Valley Balancelul	km 69+309	56.7	21		seepage (h=3,9- 4,1m)
16	THC 15	Valley Copacului	km 73+730	36.6	10		valley - no water
17	THC 16	Channel 3	km 74+630	37.8	10		CE – no water
18	THC 17	Valley Lerului (416m)	km 75+687	0	0	0	Found in the table with water undercrossings at pos. TA13
19	THC 18	Valley Coada Alamu	km 79+596	40.4	10		valley -infiltratii de apa
20	THC 19	Channel	km 81+457	30	10		CE - no water
21	THC 20	Valley Șoimului	km 85+466	61	10		valley - no water
22	THC 21	Ripple Valley	km 87+075	29	10		no water
23	THC 22	Ripple Valley	km 87+893	39	10		no water
24	THC 23	Valley Viișoara	km 92+404	40	10		no water
25	THC 24	Valley Viișoara	km 92+490	38.4	8		no water
26	THC 25	Valley Viișoara	km 92+736	36.5	10		no water
27	THC 26	Channel	km 94+46	25	6		CE, no water
28	THC 27	Valley Berbecului	km 94+685	39	10		valley - no water

29	THC 28	Valley Gura Văii	km 95+733	35.3	10		valley - no water
30	THC 29	Channel	km 96+135	39	10		CE. no water
31	THC 30	Creek Adâncătura	km 98+445			48	CE. DN 65
32	THC 31	Channel	km 101+736	31	10		CE, no water
33	THC 32	Valley Mogoșești	km 103+813	67	21		valley - no water
34	THC 33	Valley Racovat	km 118+852	29	10		valley - with water
35	THC 34	Channel Dalga	km 121+68	31	10		Concrete irrigation channel
36	THC 35	Channel	km 124+450	41	10		CE no water
37	THC 36	Channel	km 127+157	32	10		CE - no water
38	THC 37	Channel	km 127+745	44	10		CE, no water
39	THC 38	Channel	km 131+22	47	10		CE, no water, De
40	THC 39	Channel	km 139+483	60.6	6		CE , no water, cond.GN(500
41	THC 40	Tributary R. Pesceana	km 140+423	48	16		valley - water
42	THC 41	Tributary R. Pesceana	km 141+173	26	10		valley - no water
43	THC 42	Tributary Creek Gușoianca	km 146+462	30	10		valley - water
44	THC 43	Tributary Creek Gușoianca	km 147+146	40	10		valley - no water
45	THC 44	Channel	km 149+647	37	10		CE-no water

46	THC 45	Creek Burdălești	km 150+319	43	17		valley-water infiltrations
47	THC 46	Tributary R. Cerna	km 160+724	49	21		valley - water
48	THC 47	Channel	km 161+428	28	10		CE- no water
49	THC 48	Creek Geamana (Tributary Creek Glamana)	km 165+843	33	10		valley - no water
50	THC 49	Channel	km 173+807	23	6		CE-no water
51	THC 50	Channel	km 174+599	27	10		CE -no water
52	THC 51	Channel	km 175+716	25	10		CE-no water
53	THC 52	Channel	km 175+969	22	6		CE-no water
54	THC 53	Channel	km 176+79	29	6		CE-no water
55	THC 54	Channel	km 176+411	30	10		CE-no water
56	THC 55	Channel	km 176+687	34	10		CE-no water
57	THC 56	Channel	km 177+667			112	CE-no water
58	THC 57	Channel	km 178+38	20	6		CE-no water
59	THC 58	Channel	km 178+148	30	10		CE-no water
60	THC 59	Channel	km 178+205	32	10		CE-no water
61	THC 60	Channel	km 178+821	27	6		CE-no water
62	THC 61	Channel	km 179+468	18	6		CE-no water

LOT 2				4658.68	965.2	534.8	
1	THC 62	Valley	km 181+127	42	16		valley - no water
2	THC 63	Valley	km 181+738	37	10		valley - no water
3	THC 64	Tributary Creek Olteț[AGL283]	km 182+499	25	6		CE-no water
4	THC 65	Creek Plosca	km 187+336	28	6		valley - no water
5	THC 66	Channel	km 192+636	41	10		CE-no water
6	THC 67	Channel	km 195+345	48.5	10		CE-no water
7	THC 68	Channel	km 196+785	24	6		ditch-no water
8	THC 69	Channel	km 196+884	24	6		ditch-no water
9	THC 70	Channel	km 197+589	31	10		ditch-no water
10	THC 71	Channel	km 200+47	50.7	20		ditch-no water
11	THC 72	Channel	km 200+123	40	16		irrigation channel – no water
12	THC 73	Channel (Torrent)	km 200+432	62	21		Torrent – no water
13	THC 74	Channel	km 201+919	44.1	32		Valley – no water
14	THC 75	Channel	km 203+107	32	8		Valley – no water
15	THC 76	Channel (irrigation ditch)	km 203+969	26	6		irrigation channel – no water
16	THC 77	Channel (irrigation ditch)	km 207+31	15.9	18		irrigation channel – no water

17	THC 78	Channel (irrigation ditch)	km 207+276	40	17		irrigation channel – no water
18	THC 79	Drain channel	km 210+44	19.4	0		CE-no water, concrete ditch
19	THC 80	Drain channel	km 210+788	100	0		CE-no water, concrete ditch
20	THC 81	Drain channel	km 210+955	100	0		CE-no water, concrete ditch
21	THC 82	Drain channel	km 211+77	100	0		CE-no water, concrete ditch
22	THC 83	Drain channel	km 211+274	100	0		CE-no water, concrete ditch
23	THC 84	Channel (no water Valley)	km 211+560	100	0		Valley – no water
24	THC 85	Drain channel	km 212+958	144	0		CE (THC85+THC86)
25	THC 86	Drain channel	km 213+3	0			CE (THC85+THC86)
26	THC 87	Drain channel	km 213+212	34	6		CE-no water
27	THC 88	Drain channel	km 213+270	80	0		CE-no water, concrete ditch
28	THC 89	Drain channel	km 213+364	80	0		CE-no water, concrete ditch
29	THC 90	Drain channel	km 213+627	22	6		CE-no water
30	THC 91	Channel	km 215+57	38	6		CE-no water
31	THC 92	Channel	km 215+579	0	0	28.8	CE-no water
32	THC 93	Channel	km 215+946	28	6		CE 7 -no water

33	THC 94	Drain channel	km 216+391	35	10		CE- no water
34	THC 95	Drain channel	km 216+786	84			CE- no water
35	THC 96	Drain channel	km 217+183	25.4	6		CE- no water
36	THC 97	Drain channel	km 217+665	30	6		CE- no water
37	THC 98	Drain channel	km 218+412	45.2	21		CE- no water
38	THC 99	Drain channel	km 219+482	131.8			CE-no water, concrete ditch
39	THC 100	Channel (Valley)	km 220+361	52	27		CE- no water
40	THC 101	Channel (Valley)	km 221+263	30	10		CE- no water (CE 3a)
41	THC 102	Drain channel	km 221+485	36	16		CE- no water, CE 3
42	THC 103	Channel	km 221+641	44	21		CE- no water
43	THC 104	Channel	km 223+48	49	8		CE- no water
44	THC 105	Channel	km 223+69	49	6		CE- no water
45	THC 106	Channel	km 224+12	0	0	52	CE- no water +DJ 661
46	THC 107	Channel	km 226+903	0	0	454 (HDD)	Torrent – no water
47	THC 108	Channel	km 228+584	85	21		CE- with water
48	THC 109	Channel	km 229+152	59	10		CE- no water
49	THC 110	Channel	km 229+535	29	6		CE- no water

50	THC 111	Channel	km 230+696	57	10		CE- no water
51	THC 112	Channel	km 231+333	25	6		CE- no water
52	THC 113	Channel	km 231+614	46	28		CE- no water
53	THC 114	Channel	km 233+777	52.5	21		CE- no water
54	THC 115	Channel	km 236+95	82	21		CE- no water
55	THC 116	Channel	km 241+221	33	8		CE- no water
56	THC 117	Channel	km 241+386	33	10		CE- no water, Lupoaia
57	THC 118	Channel	km 244+498	26	8		CE- no water
58	THC 119	Channel	km 245+234	25	6		CE- no water
59	THC 120	Channel	km 245+507	112			CE-no water, concrete ditch
60	THC 121	Channel	km 245+910	8.3			CE-no water, concrete ditch
61	THC 122	Channel	km 246+357	42	17		CE- no water
62	THC 123	Channel	km 249+557	6			CE- no water
63	THC 124	Channel	km 251+288	32	10		CE- no water
64	THC 125	Channel	km 251+755	44	21.2		CE- no water
65	THC 126	Channel	km 251+793	44	21		CE- no water
66	THC 127	Channel	km 251+901	40	10		CE- no water

67	THC 128	Channel	km 252+429	41.3	16		CE- no water
68	THC 129	Channel	km 252+849	58.6	27		CE- no water
69	THC 130	Channel	km 256+774	65	10		CE- no water
70	THC 131	Channel	km 256+864	30.4	10		CE- no water
71	THC 132	Channel	km 256+983	49.48			CE-no water, concrete ditch
72	THC 133	Channel	km 258+395	67	17		CE- no water
73	THC 134	Channel	km 258+440	40	6		CE- no water
74	THC 135	Channel	km 260+235	36	10		CE- no water
75	THC 136	Channel	km 263+124	38	10		CE- no water
76	THC 137	Forest Torrent	km 266+156	59	21		CE- no water
77	THC 138	Valley	km 272+701	48.7	16		valley – no water
78	THC 139	Torrent vf. Munte (Pas Vulcan)	km 284+967	46	0		torrent – no water
79	THC 140	Channel	km 294+144	71.7	0		One undercrossing for 4 channels THC140+THC141+THC142+THC143
80	THC 141	Channel	km 294+157	0	0		
81	THC 142	Channel	km 294+176	0	0		
82	THC 143	Channel	km 294+201	0	0		
83	THC 144	Channel	km 294+439	31	0		CE- no water

84	THC 145	Channel	km 294+536	33.7	0		Drain pipe (Dn600)-3 pieces
85	THC 146	Channel	km 295+715	34	10		CE- no water
86	THC 147	Channel	km 295+930	24	0		CE-no water, concrete ditch
87	THC 148	Channel	km 297+616	38	6		CE-no water, concrete ditch
88	THC 149	Channel	km 299+100	39.5	6		CE-no water, concrete ditch
89	THC 150	Channel	km 299+878	38	10		CE-no water, concrete ditch
90	THC 151	Channel	km 300+802	23	6		CE-no water, concrete ditch
91	THC 152	Channel	km 302+328	37	6		CE-no water, concrete ditch
92	THC 153	Channel	km 303+62	19.3	6		valley – no water
93	THC 154	Valley Loc. Dealu Babii	km 303+133	22	8		valley – no water
94	THC 155	Creek Mătiești	km 303+452	30	8		valley - with water
95	THC 156	Channel	km 304+374	66.7	26		Corbului spring + Crevedia river – with water
96	THC 157	Valley	km 309+588	34.4	10		valley – no water
97	THC 158	Valley	km 310+584	34.2	10		valley – no water
98	THC 159	Channel	km 311+63	27.3	5		CE – no water
99	THC 160	Valley	km 314+564	38.9	10		valley – no water

100	THC 161	Valley	km 315+102	39.3	10		valley – no water
101	THC 162	Valley	km 315+394	38	16		valley – no water
102	THC 163	Valley	km 315+542	29	10		valley – no water
103	THC 164	Valley	km 316+28	61	10		valley – no water
104	THC 165	Valley	km 316+367	36	10		valley – no water
105	THC 166	Valley	km 316+686	28.6	6		valley – no water
106	THC 167	Valley	km 317+448	35.6	6		valley – no water
107	THC 168	Valley	km 318+295	38.2	8		valley – no water
108	THC 169	Valley	km 318+545	41.6	6		valley – no water
109	THC 170	Valley	km 318+715	40.4	6		valley – no water
LOT 3				4289.2	1277.6	591.08	
1	THC 171	Channel	km 320+542	29	6		One undercrossing for 2 channels
2	THC 172	Channel	km 320+557	0	0		CE – no water, De + THC172 + THC 171
3	THC 173	Channel	km 321+497	24	6		CE – no water
4	THC 174	Channel	km 322+525	180	0		CE-no water, concrete ditch
5	THC 175	Channel	km 324+154	25	6		CE – no water
6	THC 176	Channel	km 324+261	121.4	0		CE-no water, concrete ditch

7	THC 177	Channel	km 324+817	180.4	0		CE-no water, concrete ditch
8	THC 178	Channel	km 328+471	33.3	0		CE-no water, concrete ditch
9	THC 179	Channel	km 329+67	44.7	21		CE – no water
10	THC 180	Channel	km 329+183	23.1	0		CE-no water, concrete ditch
11	THC 181	Channel	km 330+594	172	0		CE-no water, concrete ditch
12	THC 182	Channel	km 333+533	29	10		CE – no water
13	THC 183	Valley Maleiei	km 335+806	43.9	19		valley – no water
14	THC 184	Channel	km 336+701	23	0		CE-no water, concrete ditch
15	THC 185	Channel	km 337+477	30	5		CE – no water
16	THC 186	Channel	km 337+614	31	10		CE – no water
17	THC 187	Channel	km 338+264	29.1	5		CE – no water
19	THC 188	Channel	km 339+507	145.5	0		CE-no water, concrete ditch
20	THC 189	Channel	km 340+238	28	6		CE – no water
21	THC 190	Channel	km 341+941	118	0		CE-no water, concrete ditch
22	THC 191	Channel	km 342+726	224	0		CE – no water, (THC191 + THC192 + THC193), concrete ditch. One undercrossing
23	THC 192	Channel	km 342+758	0	0		

24	THC 193	Channel	km 342+836	0	0		
25	THC 194	Channel	km 344+130	19.4	7		CE – no water, continuous concrete cast ditch
26	THC 195	Channel	km 344+633	21.2	7		CE – no water, continuous concrete cast ditch
27	THC 196	Channel	km 345+112	19.4	6.5		CE – no water, continuous concrete cast ditch
28	THC 197	Channel	km 345+237	28.4	15		CE – no water, continuous concrete cast ditch
29	THC 198	Channel	km 345+489	18.5	6.5		CE – no water, continuous concrete cast ditch
30	THC 199	Channel C6	km 345+676	18.2	7		CE – no water, continuous concrete cast ditch
31	THC 200	Channel	km 346+000	21.6	6.5		CE – no water, continuous concrete cast ditch
32	THC 201	Channel C5	km 346+125	21.3	6		CE – no water, continuous concrete cast ditch
33	THC 202	Channel C4	km 346+540	20.9	6		CE – no water, continuous concrete cast ditch
34	THC 203	Channel CC3	km 346+754	17.7	6		CE – no water, continuous concrete cast ditch

35	THC 204	Channel	km 346+950	19.4	6		CE – no water, continuous concrete cast ditch
36	THC 205	Channel C3	km 347+000	19.7	6		CE – no water, continuous concrete cast ditch
37	THC 206	Channel CC2	km 347+212	19	6		CE – no water, continuous concrete cast ditch
38	THC 207	Channel C2	km 347+416	19.3	6		CE – no water, continuous concrete cast ditch
39	THC 208	Channel CC1	km 347+462	20.6	6		CE – no water, continuous concrete cast ditch
40	THC 209	Channel C1	km 347+810	19.4	6		CE – no water, continuous concrete cast ditch
41	THC 210	Channel CC4	km 348+075	14	6		CE – no water, continuous concrete cast ditch
42	THC 211	Channel CC35	km 348+511	22.8	9.2		CE – no water, continuous concrete cast ditch
43	THC 212	Channel	km 348+980	13.9	6.9		CE – no water, continuous concrete cast ditch
44	THC 213	Channel	km 351+023	24.8	10.7		CE – no water, continuous concrete cast ditch

45	THC 215	Channel	km 352+934	20.7	7		CE – no water, continuous concrete cast ditch
46	THC 216	Channel CP4	km 355+088	0	0	55.68	CE – no water + railway CF215 **
47	THC 217	Channel Ce5	km 355+381	19.3	7		CE – no water, continuous concrete cast ditch
48	THC 218	Channel Ce4	km 355+890	14.8	7		CE – no water, continuous concrete cast ditch
49	THC 219	Channel Ce3	km 356+028	22.5	9		CE – no water, continuous concrete cast ditch
50	THC 220	Channel	km 356+765	35	7.5		CE – no water, continuous concrete cast ditch
51	THC 221	Channel Ce2	km 356+927	21.6	7		CE – no water, continuous concrete cast ditch
52	THC 222	Valley	km 357+356	22.3	10		CE – no water, continuous concrete cast ditch
53	THC 223	Valley	km 357+616	28.4	16		valley - no water, continuous concrete cast ditch
54	THC 224	Valley	km 359+856	27.9	11.9		No water ditches, continuous concrete cast ditch
55	THC 225	Creek	km 360+358	39.8	18		No water spring - continuous concrete cast ditch

56	THC 226	Valley	km 360+812	28.3	6		deep valley (>6m) – no water
57	THC 227	Valley	km 361+146	39	11		deep valley (>6m) – no water
58	THC 228	Valley	km 361+297	32.7	11		deep valley (>6m) – no water
59	THC 229	Valley	km 362+817	37	14.3		valley (>3m) – no water
60	THC 230	Valley	km 363+261	9.3	6		valley (>5m) -no water
61	THC 231	Valley	km 365+350	24.6	0		valley – no water, concrete ditch
62	THC 232	Valley	km 366+320	42.4	24		valley - no water, continuous concrete cast ditch
63	THC 233	Valley	km 367+973	37.5	17		valley - no water, continuous concrete cast ditch
64	THC 234	Valley	km 368+769	29.2	16		valley - no water, continuous concrete cast ditch
65	THC 235	Valley	km 370+754	31.4	10		deep valley (>5m)- no water, continuous concrete cast ditch
66	THC 236	Valley	km 373+916	39.7	19		deep valley (>5m)- no water, continuous concrete cast ditch
67	THC 237	Valley	km 374+452	52.9	38		valley - no water, continuous concrete cast ditch

68	THC 238	Valley	km 374+843	68.3	51.1		valley - no water, continuous concrete cast ditch
69	THC 239	Valley	km 375+250	25	13.2		valley - no water, continuous concrete cast ditch
70	THC 240	Valley	km 377+000	36.3	26.3		valley - no water, continuous concrete cast ditch
71	THC 241	Valley	km 384+607	36	15.5		valley - no water, continuous concrete cast ditch
72	THC 242	Valley	km 384+789	34	19		valley - no water, continuous concrete cast ditch
73	THC 243	Valley	km 385+160	19.7	6		valley - no water, continuous concrete cast ditch
74	THC 244	Valley	km 385+339	17.8	6		valley - no water, continuous concrete cast ditch
75	THC 245	Valley	km 388+200	25,6	12.3		valley - no water, continuous concrete cast ditch
76	THC 246	Valley	km 389+483	34.5	28.2		valley - no water, continuous concrete cast ditch
77	THC 247	Valley	km 390+845	31.7	11		valley - no water, continuous concrete cast ditch

78	THC 248	Valley	km 392+233	20.5	6.7		valley - no water, continuous concrete cast ditch
79	THC 249	Channel C 108/1	km 399+064	24.6	11.5		CE - no water, continuous concrete cast ditch
80	THC 250	Channel	km 401+265	26.5	10.2		CE - no water, continuous concrete cast ditch
81	THC 251	Channel	km 401+546	26.5	10.7		CE - no water, continuous concrete cast ditch
82	THC 252	CN101	km 401+803	0	0	35.4	CN-no water + CF215 (TCF12)- Caransebes - Bautari
83	THC 253	CE9	km 402+364	78.1	57.6		Eruga spring- with water, continuous concrete cast ditch
84	THC 254	Channel	km 404+930	24	8.2		CE - no water, continuous concrete cast ditch
85	THC 255	Channel	km 408+962	19.5	6.2		CE - no water, continuous concrete cast ditch
86	THC 256	Valley Channel Izat	km 409+639	18.3	13.8		valley - no water, continuous concrete cast ditch
87	THC 257	Valley	km 409+942	16.4	12		valley - no water, continuous concrete cast ditch

88	THC 258	Channel	km 410+182	25.4	12		CE - no water, continuous concrete cast ditch
89	THC 259	Channel	km 411+550	35.5	8		valley - no water, continuous concrete cast ditch
90	THC 260	Channel	km 413+601	18.1	8		CE - no water, continuous concrete cast ditch
91	THC 261	Valley Prisaca	km 413+954	15.3	6		valley - no water, continuous concrete cast ditch
92	THC 262	Channel	km 414+242	26.4	11		no water ditches, continuous concrete cast ditch
93	THC 263	Valley Siliștea	km 414+574	20.8	10		valley - no water, continuous concrete cast ditch
94	THC 264	Channel	km 418+278	35.4	9.3		CE - no water, continuous concrete cast ditch
95	THC 265	Valley	km 418+954	20	7		valley - no water, continuous concrete cast ditch
96	THC 266	Valley	km 419+290	28.8	8		valley - no water, continuous concrete cast ditch
97	THC 267	Valley	km 420+667	23.7	10		valley - no water, continuous concrete cast ditch

98	THC 268	VALLEY	km 420+990	30.5	10		valley - no water, continuous concrete cast ditch
99	THC 269	Valley	km 422+113	18.5	7		valley - no water, continuous concrete cast ditch
100	THC 270	tributary Valley Mare	km 422+605	29.7	16		valley - no water, continuous concrete cast ditch
101	THC 271	Channel	km 423+005	30.3	7		CE - no water, continuous concrete cast ditch
102	THC 272	Channel	km 423+620	18.2	7		CE - no water, continuous concrete cast ditch
103	THC 273	Channel	km 423+792	14.1	7		CE - no water, continuous concrete cast ditch
104	THC 274	Channel e	km 424+714	68.3	24		CE - no water, continuous concrete cast ditch
105	THC 275	Channel	km 425+167	27.6	11		CE - no water, continuous concrete cast ditch
106	THC 276	Channel	km 426+250	28.2	15		CE - no water, continuous concrete cast ditch
107	THC 277	Channel	km 426+850	18.4	11		CE - no water, continuous concrete cast ditch

108	THC 278	Channel	km 427+781	15.9	7		CE - no water, continuous concrete cast ditch
109	THC 279	Channel	km 428+591	23.8	9.5		CE - no water, continuous concrete cast ditch
110	THC 280	Channel	km 437+840				CE - no water, continuous concrete cast ditch
111	THC 281	Channel CS6	km 440+208				
112	THC 282	Channel CP1	km 440+313	25.8	11		CE - no water, continuous concrete cast ditch
113	THC 283	Channel CS1a	km 441+020	0	0	46	CE – no water +str.Tr.Vuia / Lugoj
114	THC 284	Channel	km 441+170	17.3	7		CE - no water, continuous concrete cast ditch
115	THC 285	Channel	km 442+750	39.9	24		CE - no water, continuous concrete cast ditch
116	THC 286	Channel Db5	km 444+729	22.7	9		CE - no water, continuous concrete cast ditch
117	THC 287	Channel Db1	km 445+121	19.9	7		CE - no water, continuous concrete cast ditch
118	THC 288	Channel Db2	km 445+280	19.9	7		CE - no water, continuous concrete cast ditch

119	THC 289	Valley	km 445+993	15.9	4		valley - no water, continuous concrete cast ditch
120	THC 290	Channel	km 446+527	23.8	9		Channel - no water, continuous concrete cast ditch
121	THC 291	Valley	km 446+947	25.1	8		valley - no water, continuous concrete cast ditch
122	THC 292	Channel CP5	km 448+220	20.9	6		CE - no water, continuous concrete cast ditch
123	THC 293	Channel CP4a	km 448+670	0	0		CE - no water, continuous concrete cast ditch+ DC 128
124	THC 294	Channel CP4	km 449+740	25.7	11		CE - no water, continuous concrete cast ditch
125	THC 295	Channel CP2	km 450+841	18.1	6		CE - fara apa , lestare bet. Continua
126	THC 296	Channel CP2	Km 451+026	13.4	6		CE - no water, continuous concrete cast ditch
127	THC 298	Channel CCc1+drum	km 454+716	32.6	17.8		CE - no water, continuous concrete cast ditch
128	THC 299	Channel Bb1	km 456+301	0	0		drawing cannot be found

129	THC 300	Channel Bb10	km 456+511	30.9	12		CE - no water, continuous concrete cast ditch
130	THC 301	Channel Bb1	km 456+964	21.6	8		CE - no water, continuous concrete cast ditch
131	THC 302	Channel M2	km 459+455				drawing cannot be found
132	THC 303	Channel CD2	km 461+725	55.3	9		CE - no water, continuous concrete cast ditch
133	THC 304	Channel	km 462+178	21.3	7.7		CE - no water, continuous concrete cast ditch
134	THC 305	Channel CD1/1	km 462+296	27.4	12		CE - no water, continuous concrete cast ditch
135	THC 306	Tributary Glogovățu	km 465+458	20.6	6.5		CE - no water, continuous concrete cast ditch
136	THC 307	Channel Db16	km 472+694	13.6	6		CE - no water, continuous concrete cast ditch
137	THC 308	Channel VC2-Db2	km 476+752	19.6	6		CE - no water, continuous concrete cast ditch
138	THC 309	Channel VC2	km 477+700	37.1	22.3		CE - no water, continuous concrete cast ditch
TRONSON RECAȘ - HORIA				510,8	176,2		
1	THC 310	Channel valley	Km 485+642	33,7	4		valley – no water

2	THC 311	Channel valley	490+715	19,1	6,2		valley – no water
3	THC 312	Channel valley	492+907	26,4	13		valley – no water
4	THC 313	Channel crossing	494+295	21,9	7		CE - no water, continuous concrete cast ditch
5	THC 314	Channel crossing	494+891	30,6	17		CE - no water, continuous concrete cast ditch
6	THC 315	Valley	501+599	30	16		valley – no water
7	THC 316	Channel crossing	503+557	12,8	6,2		CE - no water, continuous concrete cast ditch
8	THC 317	Valley crossing Fiscutului	503+920	55,6	14		CE - no water, continuous concrete cast ditch
9	THC 318	Channel crossing Valley Mica	508+010	18	5,2		CE - no water, continuous concrete cast ditch
10	THC 319	Channel crossing	510+181	16,4	4		CE - no water, continuous concrete cast ditch
11	THC 320	Channel crossing	511+209	19,6	6		CE - no water, continuous concrete cast ditch
12	THC 321	Channel crossing ADII	511+586	58,3	15,2		CE - no water, continuous concrete cast ditch

13	THC 322	Channel crossing	513+306	27,5	13,1		CE - no water, continuous concrete cast ditch
14	THC 323	Channel crossing	513+496	20	5		CE - no water, continuous concrete cast ditch
15	THC 324	Valley crossing Livezile mici	514+564	27	12,3		CE - no water, continuous concrete cast ditch
16	THC 325	Channel crossing Valley Sanleani	517+020	25,4	9		CE - no water, continuous concrete cast ditch
17	THC 326	Channel crossing	527+531	21,1	5		CE - no water, continuous concrete cast ditch
18	THC 327	Channel crossing	527+876	20,6	7		CE - no water, continuous concrete cast ditch
19	THC 328	Channel crossing CA1-3	528+627	26,8	11		CE - no water, continuous concrete cast ditch

7.6 Appendix 6: Crossing Technique

1. OPEN-CUT EXECUTION - BALLASTING PIPE
Technological sequence is as it follows:
1. there are concreted in the polygon of precast items (concrete station) the pipes which will form the undercrossing stream, according to the concrete detail (ballast);
2. concrete pipe are carried on the crossing sections;
3. the pipe sections forming the crossing stream are combined on the bank, insulated and concreted in the station;
4. the wholeness welding are concreted on the spot after they have been insulated;
5. the curves of the crossing stream turning are mounted by welding (those from vertical plan);
6. the pipe trench excavation is carried out to the quota provided within the project ;
7. the pipe is released in the trench by pulling from the opposite bank, and using launchers;
8. a cofferdam is performed , which should protect for the beginning, the left bank; water is diverted to the right bank; within the enclosure the water level is decreased , filling works are carried out, restoration of the beam leaning pitching, concrete pitching restoration, etc.
9. the closing portions upstream / downstream of the cofferdam are decommissioned;
10. the upstream / downstream closing of the cofferdam related to the right bank is carried out and within this enclosure there are performed the repair works of the right bank; water is diverted to the left bank.
11. After bringing the banks to their original shape the cofferdam is disposed.
Operations from points 8 and 10 may be interchanged, depending on the river basin configuration.
Loading material of the pipe is formed of a shell of reinforced concrete (concrete class C20 / 25) with a thickness of 17.5 cm, corresponding to a ballast factor of 1.35. Welding is made of welded mesh STNB type.
Passive protection of the pipeline DN 800 mounted underground is carried out on the pipe stream with polyethylene insulation type HDPE corresponding to Class B3 in accordance with the standard EN ISO 21809-1 SR. Minimum insulation thickness will be 3.5 mm. On the wholeness welding of the pipeline mounted underground will be used shrinkable sleeves chosen and applied according to SR EN 12068/2002. The minimum thickness of shrinkable sleeves will be 3 mm. For the passive protection of concrete pipes see the tender books "passive protection".
2. DIRECTIONAL DRILLING EXECUTION

2.1 PRELIMINARY OPERATIONS HDD STARTING
Before starting the works there will be issued a report stating the following:
- The total surface of the working area;
- Springboard profile, including the pillars position and the distance between launchers;
- The value of the traction force on the pipe at the beginning, during and at the end of the drilling;
- Forwarding speed;
- Theoretical drilling profile;
- The green cover in the area that must be removed and stored separately;
- the surface and start and end points of the drilling must be restrained using stakes;
- All welds must be checked by gamagraphy;
- pipe sections must be placed on supports allowing the pulling. After the pulling, the supports must not damage the pipe insulation;
- Before shooting and after that, there should be carried out a verification of resistivity and insulation continuity;
- tolerance allowed must be less than 1 m horizontally and 0.5 m vertically from the theoretical drilling profile;
- Parameters used in calculating the traction effort and the fluid pressure during pulling must be registered continuously;
- During the operation, the transport pipeline should be blocked until it will be connected.
- After works execution, the working surface must be restored to its original condition.
Conducting directional drilling using high-pressure injection of drilling fluids while rotating mechanically the drilling tool (slab).
The accuracy of laying pipe by drilling will be ensured through the permanent electromagnetic location of the slab.
2.2 HDD OPERATION
a) Checking the profile land on the drilling shaft with devices specific to topographic works.
b) Preparation of the pickets network for developing the cable on the detection: The drilling equipment is endowed with the detection system that requires developing an insulated cable on the ground surface in the area between the machine and the run channel, namely in the area between the run channel and the pipe release point. On this cable are transmitted serial data necessary to the location of the transmitter found in the drilling engine. Thus depth can be located exactly, the position in the longitudinal axis and the bending of the drilling head.
c) The execution of the pilot drilling

From a position hole, there is drilled by using a drilling machine, by inserting rods into the ground, pursuing precisely the drilling path. Tracking is done with the detection system. The navigable drilling machine performs by using a drilling suspension through high pressure jet a tunnel. The drilling suspension (mixture of water, bentonite and additive) displaces the ground, carries the dislodged material in pits, supports the micro tunnel and reduces the friction; Typically this bentonite suspension has a specific weight of 1.1 to 1.2 t / m^3, in our case this suspension was designed to a specific weight of 1.18 t / m^3. Bentonite includes in its structure, montmorillonite clay, which has a very high degree of impermeability, and after a relatively short time it hardens.
Diameter of the drilling engine: 200mm
Length of the drilling rod: 8m ÷ 11 m
Rod diameter: 168.3 mm (6 5/8 ")
d) doubling the length of the drilling string
e) Expanding the borehole drilled
Following the pilot drilling, results a hole drilled with a diameter of 200 mm. For shooting the pipeline with a diameter of 813 mm, the hole will be expanded in steps up to a diameter of 1200 mm with a drilling system accurately determined:
- First expansion: diameter: 400mm;
- second expansion: d = 600 mm;
- third expansion: d = 800 mm;
- fourth expansion: d = 1000 mm;
- fifth expansion: d = 1200.
Drilling fluid consists of the dynamic mixing of bentonite with water, respecting the proportions determined based on the analysis. Bentonite comes from a natural mineral which is not chemically modified and which, according to the law in force, is not included in the category of dangerous substances and preparations. Mixing is done within the splash special facility provided with a pool which has two compartments for bubbling and recirculation.
For transporting the debris resulted after the drilling process, drilling suspension is pumped that recirculates from the input and output holes of the drilling. Recirculation is done through a system of vibrating sieves, separating the debris (soil dislodged) resulted. The drilling fluid circulation is the following:
- in the tank is prepared the drilling fluid naturally dispersed (water and bentonite with high content of montmorillonite clay);
- from it, is taken over the drilling fluid, ready prepared, in other working tank from which, through a high pressure pump is pumped to the drilling machine through high-pressure hoses;
- During drilling, the drilling fluid carries the material dislodged to the position pit from where it is routed through a metal trough to a metal tank;
- from this metal tank, the drilling fluid 'contaminated' is taken over to the vibrating sieves in which are separated the solids from the fluid;
- after separation the drilling fluid is sampled and if necessary it is additivated in order to be brought to the specific weight designed;
- the separated solid is loaded into vehicles and transported;
- These operations are repetitive and performed throughout the execution of the drilling; Maintaining the quality of the drilling fluid under design parameters is absolutely mandatory to the drilling operation;

Pulling the pipe is carried out using the drilling machine immediately after the widening head (5th enlargement), it engages the pipeline to be pulled. The pipeline is released from the opposite bank to the drilling location. At the pulling end of the pipeline there will be welded on the pipeline diameter a steel concrete ring OB 37 Æ 20-22 mm, serving as mechanical protection. In order to dampen the buoyant force due to placing the steel pipeline in the bentonite mud, it will cumber by introducing a PEHD pipeline with a of 400 mm and filling with water in the annulus space (between the PEHD exterior and OL interior)
The protection tube of the sensitive optical fiber is pulled after the first enlargement.
The drilling machine includes as working units:
- the drill, with which there is carried out the pipeline pulling into the borehole;
- the pressure pump of drilling fluid, necessary for the working mode of the drilling engine and of drilling slabs;
- the control unit [AGL40];
- the recirculation unit of the drilling mud;
- the preparation unit of the drilling fluid.
On completion of works, one should conclude a report which shall specify:
- The longitudinal profile of the pipeline with the values of curvature radii
- Measurements taken during drilling, related to pressure, flow of drilling fluid, thrust, coordinates x, y, z of the slab, and any other relevant data.
For the passive protection and mechanical protection of the pipelines mounted by horizontal directional drilling see the tender books "Passive protection".
2.3 TESTINGS AND CHECKINGS
- Samples
On crossings where the pipeline is installed in open trench, pressure testing will be carried out after the undercrossing completion with linear stream.
On crossings where the pipeline is installed by horizontal directional drilling, the pressure testing will be taken [AGL41] as follows:
- after the forming on field of the undercrossing stream, there is carried out a cleaning with the polyurethane piston and a checking of the pipeline calibration;
- the pipe ends are closed and are carried out, on the ground, a resistance hydraulic testing to the pressure prescribed according to the normative 118-2013 NT corresponding to the class of that location;
- after pulling the pipeline into the tunnel drilled, and the undercrossing connection to the linear stream, there is carried out the pressure and sealing testing once with the section where the undercrossing is located, according to the schedule of pressure testing from annex. 4.
- On the protection tube of the optical fiber will be carried out on the ground a hydraulic testing under the pressure of 5 bar. Testing will represent decisive stages and their results are integral part of the Construction Book.
- Testing – welding will be checked and insulation will be tested as required by the relevant tender books related to the pipeline stream and the passive protection.

- Checking: One shall check the benchmarks transmitted to the beacons, the axis of the crossing section, marking the contours that shall be dug. One shall also check the proposed within the project. One shall check whether the stratification encountered corresponds to the one from the geotechnical essay. One shall check whether the hydrostatic level encountered corresponds to that mentioned within the geotechnical report. One shall check the marks indicating the final quotas of the filling quotas. One shall check the compaction degree required by the project. A particular attention will be paid to verifying the quotas of the pipeline laying depths under the thalweg, both its mounting in open trench, and on its mounting through horizontal directional drilling.