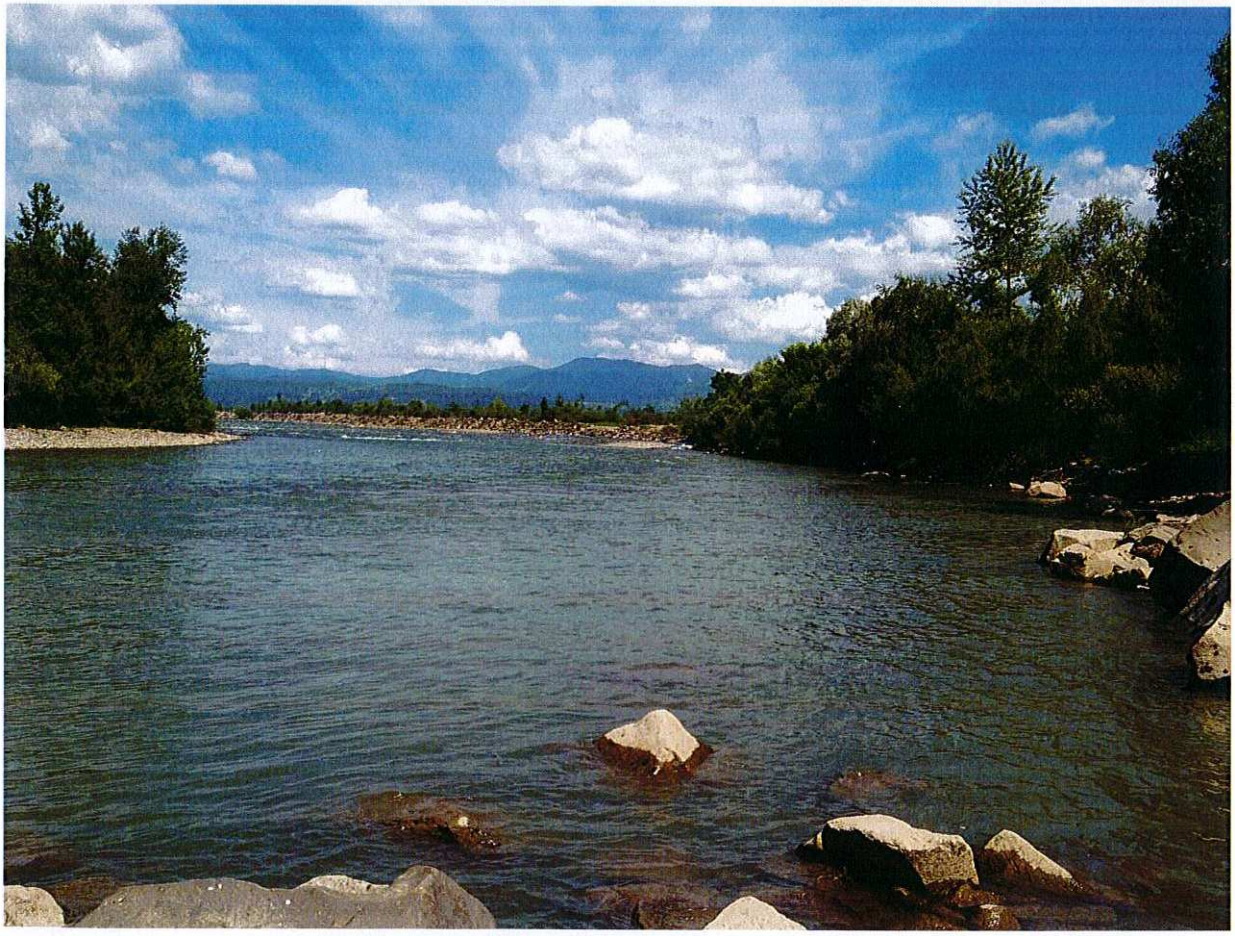
NATIONAL COMPANY FOR ROAD INFRASTRUCTURE ADMINISTRATION (CNAIR SA)

Plan co-financed by the European Union through the European Regional Development Fund

Environmental report for zonal urbanistic plan for „Bridge over Tisa in Tepliţa area on Sighetu Marmaţiei"



S.C. EXPERT PROIECT 2002 S.R.L.

JUNE 2018

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1. GENERAL INFORMATION

1.1. Documentation recognition data

1.1.1. Plan name

"Bridge over Tisa in Tepliţa area on Sighetu Marmaţiei".

1.1.2 Plan beneficiary

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Certification for developing environmental studies according figure 1.

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CERTIFICAT DE ÎNREGISTRARE

În conformitate cu prevederile Ordonanţei de urgenţă a Guvernului nr. 195/2005 privind protecţia mediului, aprobată cu modificări şi completări prin Legea 265/2006, cu modificările şi completările ulterioare şi ale Ordinului ministrului mediului nr. 1026/2009 privind condiţiile de elaborare a rapoartelor de mediu, rapoartelor privind impactul asupra mediului, bilanţurilor de mediu, rapoartelor de amplasament, rapoartelor de securitate şi studiilor de evaluare adecvată.

În urma analizei solicitării depuse şi informaţiilor furnizate şi susţinute în procedura de înregistrare de:

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persoana juridică este înscrisă în ***Registrul Naţional al elaboratorilor de studii pentru protecţia mediului la poziţia nr. 626*** pentru

RM	[x]
RIM	[x]
BM	[x]
RA	[x]
RS	[ ]
EA	[x]

Emis la data de : **09.10.2014**
Valabil până la data de : **09.10.2019**

PREŞEDINTELE COMISIEI DE ÎNREGISTRARE

Mihail FÂCĂ
SECRETAR DE STAT

Figure 1. Certificate for developing environmental studies (RM, RIM, BM, RA, EA)

1.2. General data on the content and main objectives of the plan, the relationship with other relevant plans and programs

1.2.1 The main content and objectives of the plan

1.2.1.1. The main objectives of the plan

Requests of the program – theme

The general objective of the zoning plan (PUZ) for the bridge over Tisa in Tepliţa area in Sighetu Marmaţiei is to regulate urban, legal and technical infrastructure and ensuring the legal base, obtain clear provisions for the area that is the foreseen, namely the creation of a link road between Romania and Ukraine, near the most important village in the north of the Maramueş county, Sighetu Marmaţiei, by contributing to the integrated development in the region and the border area of northwestern Romania.

The P.U.Z. for the establishement of the road bridge over the Tisa River is aimed to regulate the ways of achieving a modern communication route with implications for the regional development of the area, streamlining the traffic, increasing the safety of the users, reducing the travel times and also shortening the road link with Russia, Baltic countries, Poland, Hungary and Slovakia.

Provisions of the locality development program for the studied area

The plan for the construction of the road bridge over the Tisa river aims to build a road link between Romania and Ukraine in the area of Sighetu Marmatiei, Maramures County. The route alternative approved by the feasibility study will be located in the Tepliţa area of Sighetu Marmaţiei, Maramureş County on the territory of Romania and in the area of the Biserica Albă in Ukraine.

The approved route alternative consists of a connecting road that branches from the national road DN 18 (km 69 + 260), crosses the Camara district and then the Tisa River. The length of the connection road (separated from DN 18) plus that of the bridge (up to the territory of Ukraine) is 1.200 m.

The approved route alternative is located in the incorporated area and in unincorporated area of Sighetu Marmaţiei Municipality, in present the land is occupied by private plowed fields and grove in the immediate vicinity of the Tisa River, on the territory of Romania and land classified in the fourth category on Ukraine territory.

The Urban Zonal Plan establishes the specific regulations for an area in the administrative territory of the city, draws the roads, proposes the territory zoning, providing the necessary facilities and infrastructure. The purpose of the work is to provide to local authorities and advisers a unified and concrete methodology for identifying and delimiting land to build objectives and setting conditions for use. It is very important to use rational land, linking the general interests of the local community with private interests.

The urban zonal plan pursued in principle the following:

- analysis of the existing situation;
- dimensioning of the proposed constructions and facilities corresponding to the surface of the studied ground and according to the design theme;
- equipping with utilities;

- integration and harmonization of new constructions in the built environment and the existing natural environment;
- ensure conditions for environmental protection.

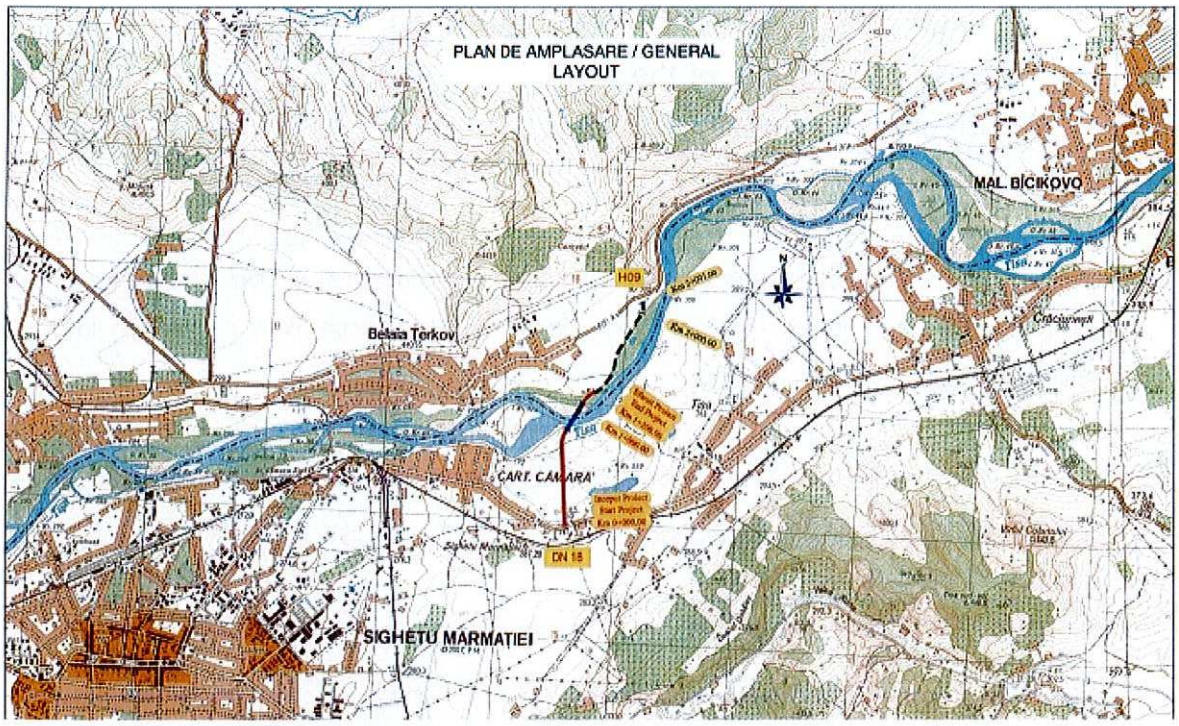


Figure 2. Location of the bridge over Tisa and the connection road

1.2.1.2. Content of the plan

1.2.1.2.1. Functional zoning – regulations, territorial balance, urbanistic indicators

According to the PUZ for the bridge over Tisa river in the Tepliţa area of Sighetu Marmaţiei, the obligatory functional areas are:

1 - bridge area;
2 - the border crossing point area;
3 - connecting road area;
4 - the roundabout area.
These are presented in table no. 2

Table 2. Functional area provided in the PUZ

BALANCE SHEET		
PROPOSED FUNCTIONAL AREAS		
ZONAL URBAN PLAN FOR LOCATION OF NEW BRIDGE OVER THE TISA		
	Surf. mp./Ha.	
RIGHT OF WAY FOR EXPROPRIATION	82228,62 mp.	
	8,22 Ha.	
out of which:		
MEASURED AREA IN TOPOGRPHICAL SURVEY	73683 mp.	
	7,36 Ha.	
From above areas, each proposed functional sub-area has been calculated. Calculation was done only for carriageway, pedestrian ways, green areas, road median areas and constructions		

FUNCTIONAL AREA	Total area without side slopes and land reclamation	Proposed indicators
	mp./Ha.	P.O.T./C.U.T./H.max
TR - ROAD TRANSPORT AREA	**65850,60 mp.**	
P.O.T. max. (%)		**4%**
C.U.T. max.		**0,2**
R.M.H.		**10,00m.**
divided in:		
TR1a - BRIDGE AREA	**7619,17 mp.**	*without indicators*
	0,76 Ha.	*without indicators*
	area calculated for	
carriageway	4450,32 mp.	
pedestrian ways	1036,90 mp.	
median area	2131,95 mp.	
TR1b - CROSS BORDER AREA	**44874,59 mp.**	
	4,48 Ha.	
P.O.T. max. (%)		**3,80%**
C.U.T. max.		**0,03**
R.M.H.		**10,00m.**
	area calculated for	
carriageway	33525,21 mp.	
pedestrian ways	4452,63 mp.	
green area	4572,11 mp.	
constructions	1716,16 mp.	
median area	608,48 mp.	
TR1c - CONNECTION ROAD AREA	**6682,74 mp.**	*without indicators*
	0,66 Ha.	*without indicators*
	area calculated for	
carriageway	4903,55 mp.	
pedestrian ways	1779,19 mp.	
TR1d - ROUNDABOUT AREA	**6674,10 mp.**	*without indicators*
	0,66Ha.	*without indicators*
	area calculated for	
carriageway	4649,29 mp.	
pedestrian ways	928,78 mp.	
green area	1096,12 mp.	

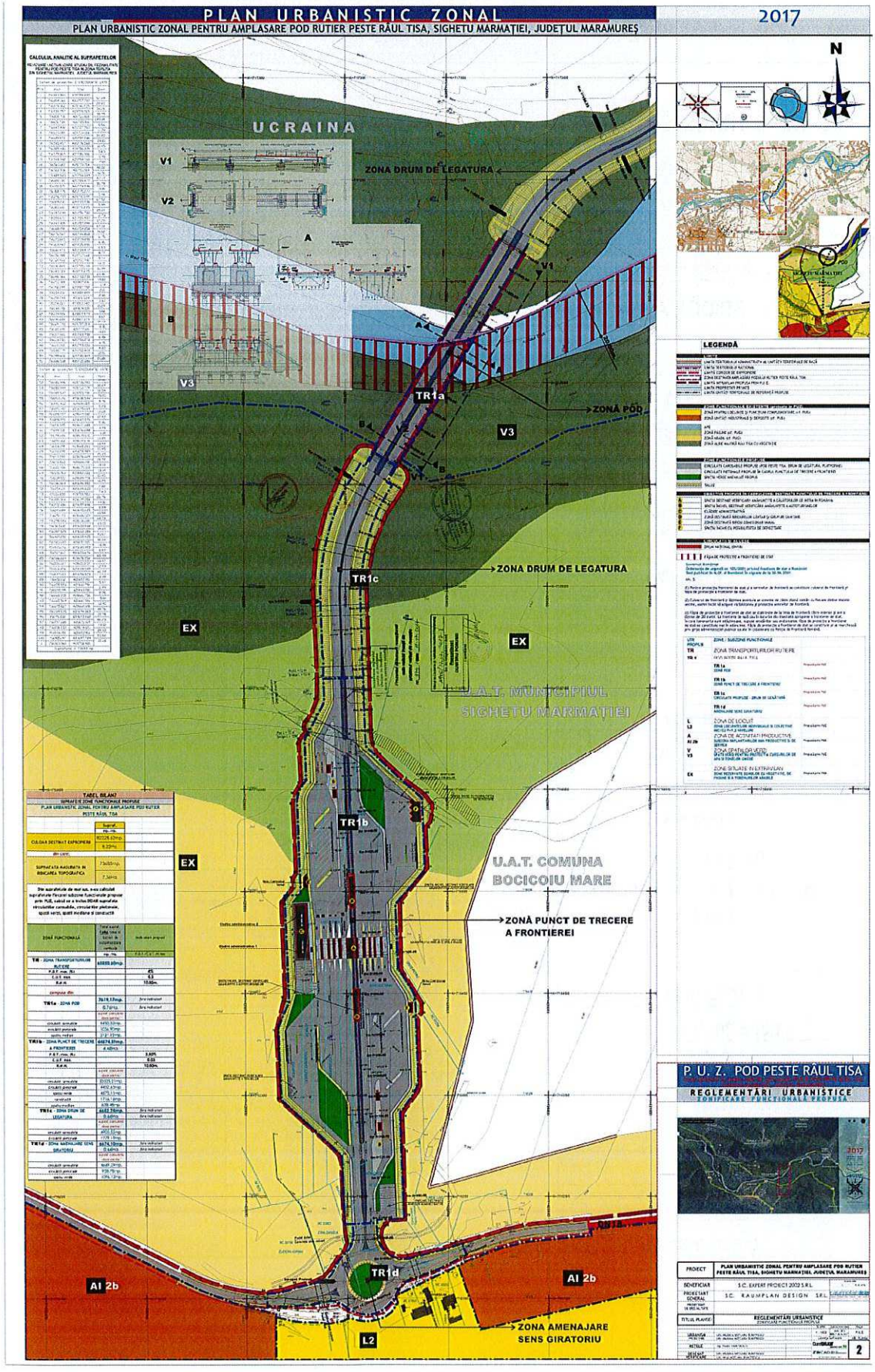


Figure 3. Urbanistic regulations – zoning proposed through PUZ

1.2.1.2.2. Constructive solution adopted

❖ **Road works**

On the plan, the studied route separates from the kilometric position 69 + 260 of the national road DN 18. At the detachment of the connecting road from the national road DN 18, at km 0 + 000, a roundabout intersection was designed.

The proposed route has a total length of 1,200 ml and unfolds mainly in alignment. Before entering the ramp of the bridge, the route crosses a curve with 200 m radius. At the exit of the bridge the road get onto a 185 m radius curve.

The maximum gradient is 4.00% and the minimum is 0.30%. The connection rays are summarized between 1.500 and 5.000

❖ **Water supply**

According to *SR 1343-1 / 2006* and I9 Standard - 2013 art.14.152 will be calculated the needs for water and sanitary.

❖ **Water restitutions**

According to SR 1846 -1.2-2006,STAS 9470-73, will be calculated and and dimensioned the waste water effluent as well as waste water treatment plant related.

❖ **Water supply network for hygienic and sanitary purposes (in the perimeter of the platform of the border crossing point)**

The constructive solution adopted took into account the following:

- the characteristics of the location area;
- safety in execution;
- safety in operation.

The water supply networks in the perimeter of the platform of the border crossing point shall be executed with a PIED (PN6) pipe, buried below the freezing depth, at - 1,25 m from the final road surface and at 0,50 m distance from the curb, towards the outside of the pavement. The networks will be equipped with connections to sanitary consumers (customs office, administrative buildings, toilets located in control areas, etc.). Individual water consumption will be counted for each consumer individually.

The water supply line of the state border crossing area will be made from the city and will be made of PIED pipe (PN6) mounted buried below freezing depth.

The water supply networks will be equipped with shafts with slicing and drainage valves (CV, placed from place to place at a distance of approximately 300 m) and a fire pit with a general water meter (CA) at the entrance to the perimeter of the area. The water supply network of the border crossing point will be made under another plan.

❖ **Wastewater sewerage networks (in the perimeter of the border crossing platform) and rainwater sewage (in the area over the bridge over Tisa and in the perimeter of the border crossing platform)**

For collecting and evacuating the rainwater have been designed a modern water evacuation system, with drainage wells located in curbs and piping for directing them to the wastewater pre-treatment stations, equipped with

hydrocarbon separator and desnispator, mounted on the abutment and discharging them into the emissary, respectively the Tisa River. This drainage system consists of PVC-KG Dn 250 mm pipes with a total length of 505,20 m and the connections are PVC-KG Dn 110 mm with a length of 41.00 m.

In order to avoid problems caused by adverse winter frost, piping for directing rainwater from spouts to oil separators will be provided with modern defrost systems. This system consists of special heating cables with UV protection which will be installed on the piping storm water control and be controlled via thermostats with temperature and humidity sensors, fully equipped by the related electrical switchboards. The system also includes elements for sealing the heads, junction doses, clamps and other items that are provided by manufacturers. The components are provided by system manufacturers.

At the base of the backfill slope have been designed concrete ditches and culverts for collection of the rainwater from the connection road area. At backfill heights greater than 2.00 m have been designed verge gutters to be discharged trough chase located on the backfills. For treatment of the rainwater that washes pollutants deposited on the road platform have been designed oil separators.

Wastewater collection networks generated at the border crossing point will be built on another plan.

❖ **Electricity**

The electricity supplier in the area where the investment objective is located will analyze and propose the technical solution for the execution of the power supply connection and the networks related to the construction and specific facilities for the control and verification of the border crossing.

Two solutions for public lighting have been proposed:

- solution 1: lighting fixtures with LED tele-management system;
- solution 2: High pressure sodium vapor lamps.

❖ **Telecommunications**

The providers of internal and external communication services of the border crossing area will analyze and propose the technical solution for the execution of the specific systems necessary for the activity of the border crossing area.

❖ **Labor protection and PSI**

During the execution of the construction works, the general and specific norms of each area of utility execution will be respected, in order to eliminate possible accidents at work.

During the execution of the works will be provided fire protection measures, namely:

- fully equipped PSI docks and sand box;
- portable extinguishers with ACM powder, chemical foam and CO_2;
- 50 kg road dry extinguishers with chemical foam, with ACM powder.

1.2.1.2.3. Development of public amenities

The bridge over the Tisa river and the border crossing point on the territory of Romania will be equipped with utilities networks (water, sewage, electricity, telecommunication) necessary for crossing the border of citizens and cars (cars, trucks, coaches, trucks)

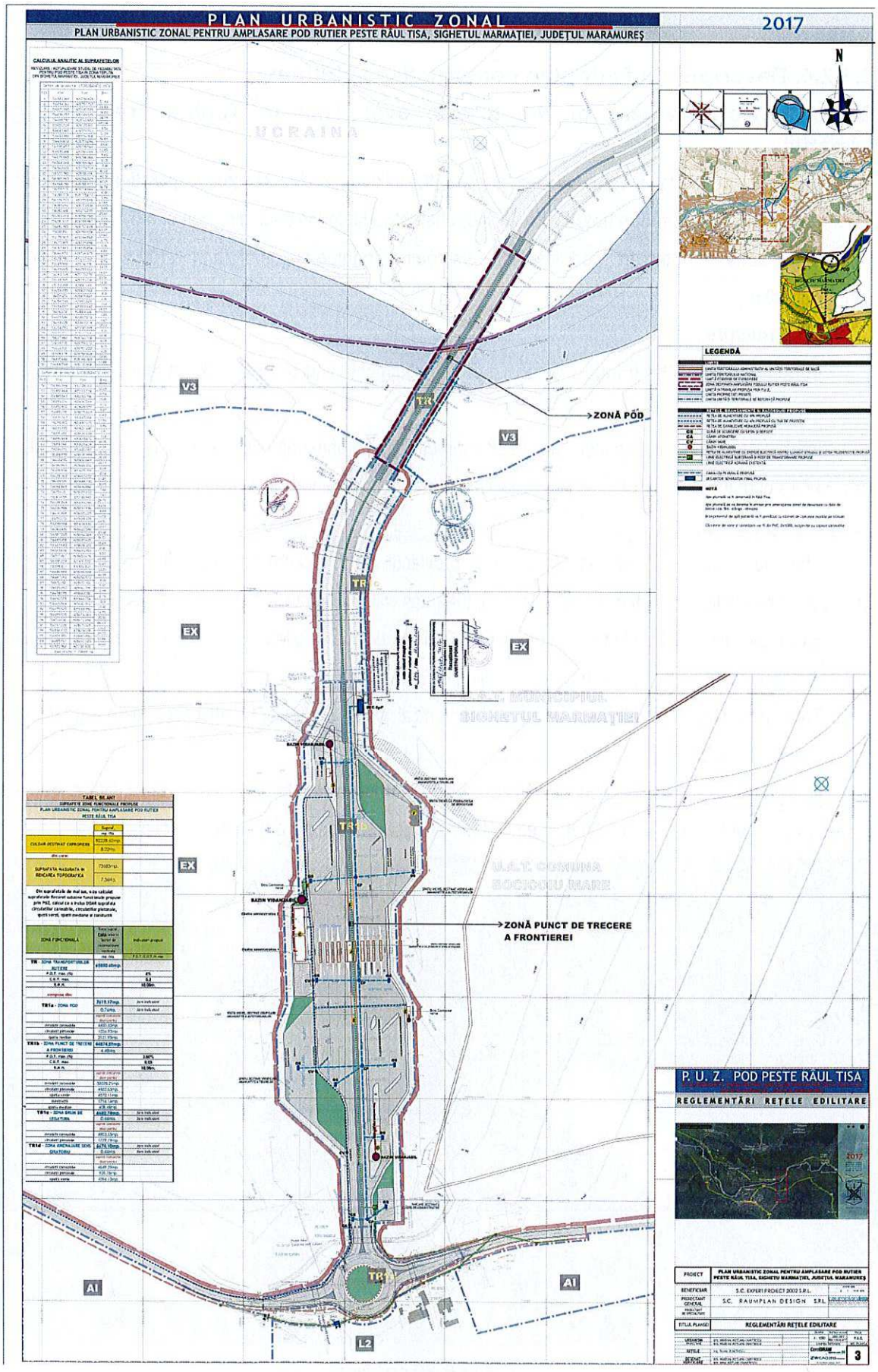


Figure 4. Urban regulations - proposed utilities networks

1.2.1.2.4. Description of adopted constructive solutions

1.2.1.2.4.1. Achievement of the bridge over Tisa in Tepliţa area in Sighetu Marmaţiei

For crossing the Tisa River have been adopted the following technical solution: **parallel bridges with joint deck concrete steel, continuous beam with variable height** (a bridge in each direction of movement).

Static scheme of the art work is continuous beam with three spans of 70 m + 100 m + 70 m and a total length of 261,20 m.

- **Infrastructure**

Infrastructure of the bridge will consist of two abutments and two piers, direct founded on two concrete blocks.

Each pier will be founded indirectly on 18 indirectly piers foundation of large diameter (1.50 m) and 10.00 m length. Before carrying out the piers will be analysed the results obtained on the trial piers regarding their bearing capacity. The piers are associated on the top with prestressed concrete foundation raft with 3.00 m height.

The piers elevations are laminated and provided in plan with hydrodynamic shape upstream and downstream. The section formation is cassette type, the gaps will be filled with common concrete.

Each abutment will be founded indirectly on 9 indirectly drilling pilots with 1,50 m and 10.00 m length. The pilots will be associated on the top with concrete pilling of 2,00 m high.

The piers elevation will be carried out of vertical walls, completed with bench beam, guard wall and reinforced concrete before foundations and beam.

In the lateral side of the abutments are provided turned concrete walls, trapezoidal forms, with variable thickness (0.50 m at the ends and 1.00 m in embedment vertical section from front to flush filler picked.

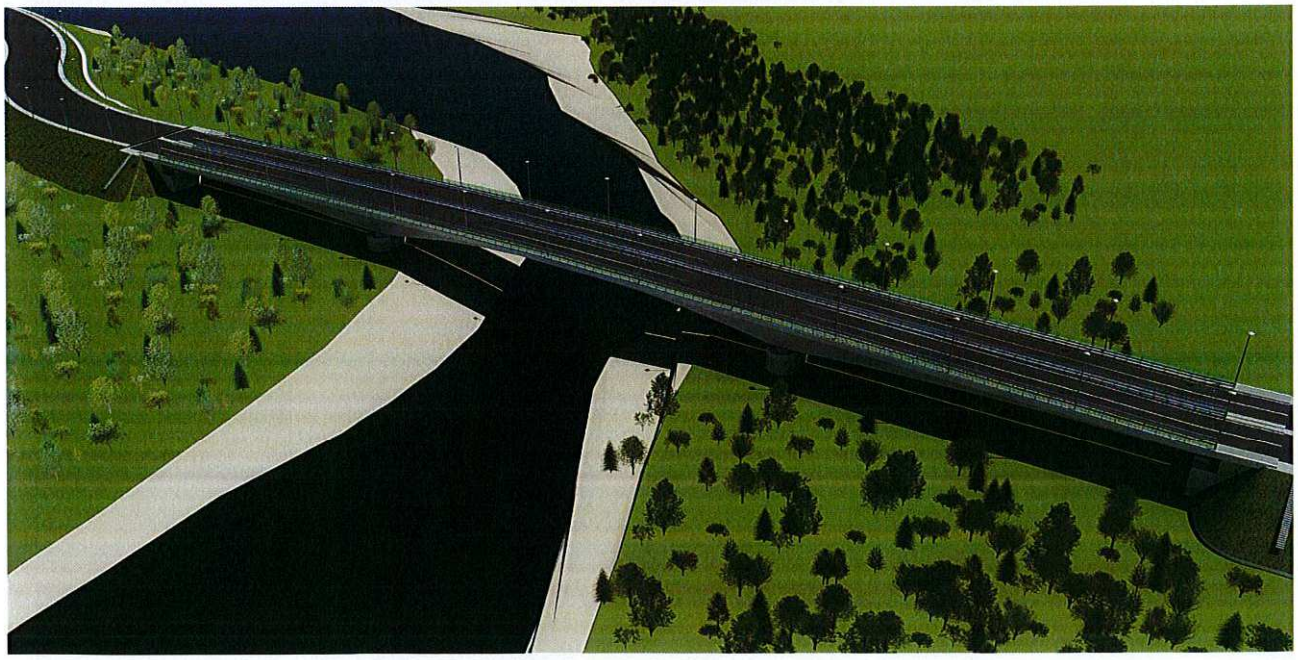


Figure 5. 3D simulation

The infrastructure will be executed using sealed metallic enclosures. Before pouring the concrete, will be carried out dewatering waste water infiltration.

The bearings used will be of modern type with seismic isolators.

- **Connection with embankments**

For the connection of the bridge with the ramps road structure have been provided connection boards.

Bridge connecting with embankments in the abutments area, is made with pears cone quarters. They were provided with scales and chase.

- **Superstructure**

The superstructure of each bridge will be made of a metal box with variable height provided at the top with prestressed reinforced concrete flooring.

The static scheme of the bridge planks is continuous beam mixed concrete-steel with variable height, with theoretical openings 100.00 m + 70.00 m + 70.00 m. The bridge deck length is 242.60 m (including heads deck over the bearings) and the length of the bridge is 261.2 m.

The concrete deck is cased with tilt vertical walls and has varying height from 3.00 m in field and on the abutment, and up to 5.00 m in the intermediate supports area. Inside the box are provided diaphragms with hollow board in order to ensure access of maintenance personnel. The deck will be industrial achieved in section that will be assembled on the site. Flooring tiles will be made of precast reinforced concrete. For up taking the negative moments on intermediary supports it was provided in the longitudinal prestressing concrete slabs. At the edges of the deck beams are provided with prefabricated parapet with architectural composition.

At beneficiary request, has been opted for manufacturing the deck from weatherproof special steel, CORTEN type. The weather resistance it is due to the oxide layer that forms on the steel surface. This oxide layer represent the patina, it is formed in time and has a brownish tint.

If will be adopted the classic solution for manufacturing the metal deck, the colour of corrosion protection will be chosen from RAL 8004 Copper brown  and RAL 6018 Yellow green 

- **Path, pavement, fences, bridge equipment**

Each bridge related to a movement sense is ensured a carriageway of 8.00 m for two lanes and a 2,05 m sidewalk for pedestrians, separated from the roadway by a metal safety fences which match the level of protection very high H4b according to Standard AND 591/2005 and "Standard for traffic safety protection systems, roads, bridges and highways" indicative AND 593-2014. It will be created a sidewalk in each movement direction in order to ensure the local border traffic (pedestrian).

For pedestrian protection have been provided metal pedestrian parapets. The road bridge has the following composition:

- stabilized asphalt mixtures MAS16 - 4 cm;
- asphalt concrete for bridges BAP16 - 4 cm;
- screed protection waterproofing BA8 - 2 cm;
- hydro - insulation - 1 cm.

The road pavement has the following composition:

- asphalt mixture BA8 - 3 cm;
- concrete pavement filler in C 35/45;
- hydro-insulation - 1cm;

- **Joint-covering devices**

The joint-covering devices are tightly type and will be mounted on the right of each abutment joint. All parts of dilatation devices will be provided by the manufacturers. After sizing, resulting expansion joints that must provide a breath of 30 cm.

Sizing coverage expansion joints was made taking into account the following considerations:

- maximum-minimum temperature difference during their operation;
- movements generated by seismic shifts;
- multiple functionality: dilated longitudinal and transverse, correlation with bearings and seismic devices;
- assembly temperature of + 15 ° C. For other mounting temperatures will make the necessary corrections.

- **Devices for collection and disposal of rainwater from the bridge**

For the collection and disposal of storm water has been provided a modern drainage system with drains placed in curbs and pipes for directing water toward pre-treatment stations and oil separators mounted on abutments and their discharge in the emissary respectively Tisa river. The drainage system consists of PVC-KG pipes DN 250 mm, with a total length of 505,20 m, and connections are PVC-KG DN 110 mm with a length of 41.00 m.

In order to avoid problems caused by adverse winter frost, piping for directing rainwater from spouts to oil separators will be provided with modern defrost systems. This system consists of special heating cables with UV protection which will be installed on the piping storm water control and be controlled via thermostats with temperature and humidity sensors, fully equipped by the related electrical switchboards.

The system also includes elements for sealing the heads, junction doses, clamps and other items that are provided by manufacturers. The components are provided by system manufacturers.

- **Lightning system**

The bridge will be equipped with a modern lighting system, complemented by an adjacent architectural lighting art works of this type. Lighting columns, which will provide lighting and visual guidance during the night, are made of metal material, having a height of 10 m above the carriageway.

Lightning with a power of 150 W / pcs are mounted on poles using consoles with 1.20 m length. Sizing lighting system was made taking into account the required lights, the distribution of lighting and other considerations.

Technically, it took into consideration the provisions in relation with connection to existing substations and safety panels. The lighting system consists of adjacent architectural lighting planor type power 1000 W / pcs.

The lighting system will be LED type, with remote system, system that will be able to control, monitor, measure and manage the operation in optimal parameters of the lighting network in order to reduce the electricity consumption, CO_2 emissions and operating costs.

- **Markings and signs**

Will be provided horizontal and vertical markings required for traffic safety on the bridge.

- **Technical Inspection Equipment**

On bridges with variable height, as is the case of the bridge over Tisa, the classic solution for maintenance is to ensure the access nils inside the box for ensuring the inside inspection.

For ensuring the inspection outside the bridge will be used devices like "Bridge inspector". Given the variable height of the box, it would be difficult installation and operation of maintenance trolleys outside the box.

For access on the infrastructure and therefore to enable maintenance works of bearings have been provided accesses from the nils of the box equipped with safety features. The infrastructure bench will be provided with safety railings for safety of the maintenance operations.

- **Bridge time behaviour monitoring systems**

Due to important dimensions of the work, it has been planned to establish a modern system for monitoring the behaviour of the structure in time, in accordance with current rules. This continuous monitoring system involves:

- installation of sensors aiming continuous displacements under loading of road convoys and the climatic effects (in the structure, in sections with maximum displacements, at infrastructure supports in order to verify the possible subsidence);
- sensors that continuously monitor the temperature levels and wind pressure in some sections of the bridge;
- sensors which measure the change in convoys efforts and other actions in sections and bars characteristic of the major structural elements;
- sensors that constantly measure the water level evolution;
- real time transmission of all the information gathered by the monitoring system to a central dispatch and processing of measurements based on the interpretation of specialized software for databases.

This monitoring system will be operable at the time of static and dynamic test and will be used to collect additional data on the behaviour of the structure under test convoys.

Information will be collected centrally by CESTRIN through regional directorates of roads and bridges, respectively DRDP Cluj in case of the bridge over the Tisa, and will be used in the BMS and in the research field.

- **Riverbank protection**

At the request of the Ukrainian side, a riverbank protection was provided downstream of the bridge, on the right bank (the Ukrainian bank). The riverbank protection has a length of 630 m and serves to preserve the current configuration of the right bank downstream of the bridge, against erosion in the minor bed (to prevent modification of the minor bed conformation). The shore protection will not be built in the minor riverbed, but on the shore.

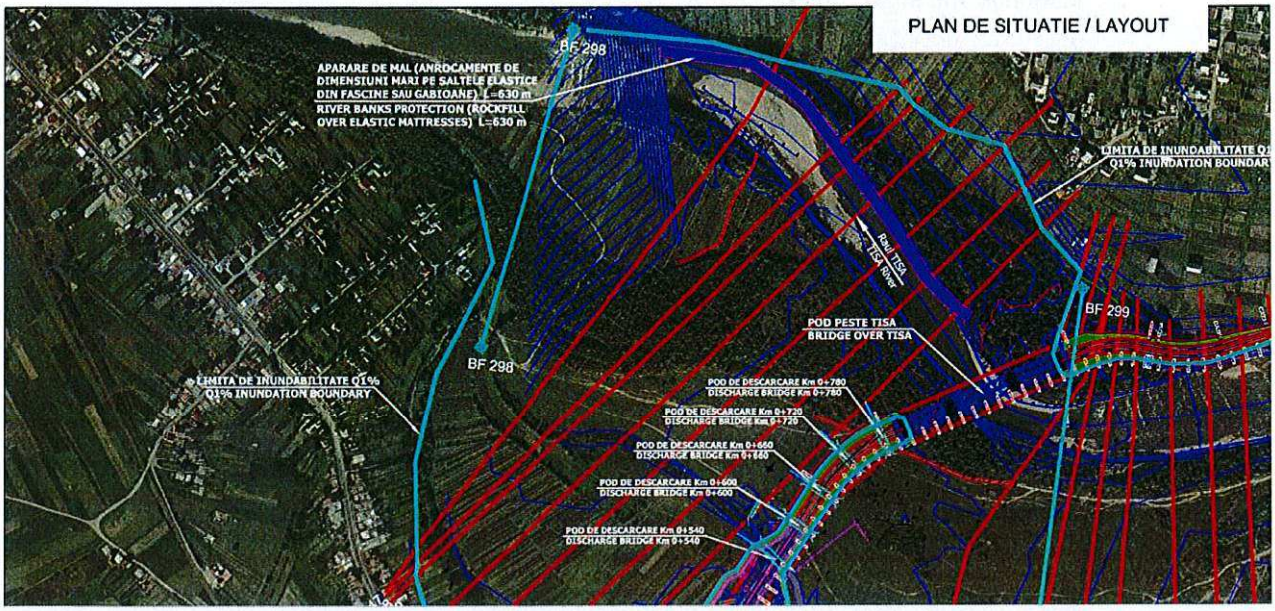


Figure 6. Location of the riverbank protection in Ukraine

The riverbank protection will be made of large-scale rockfills on elastic mattresses of fascine or gabion scrolls with a height of 1.00 m and a width of 10.00 m.

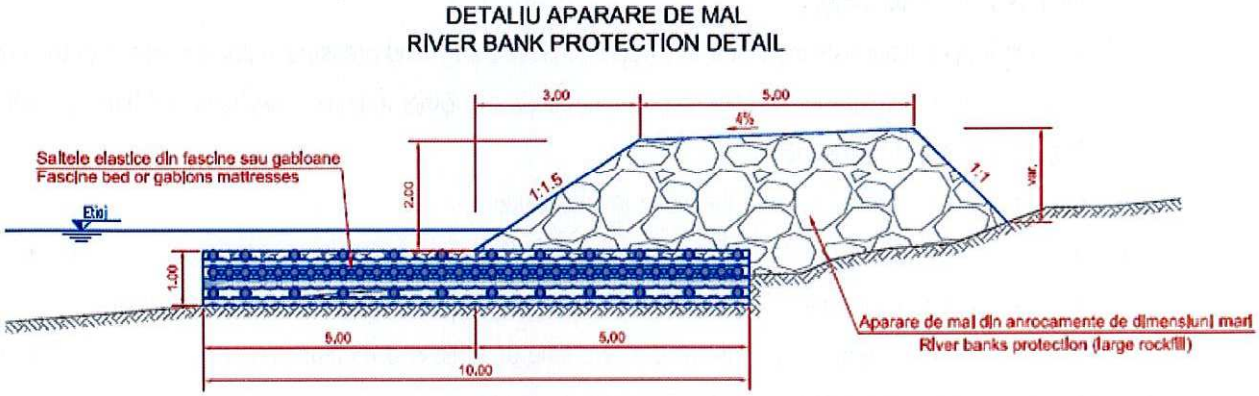


Figure 7. Riverbank protection detail

Upstream of the bridge, the body of the linking road on the Ukrainian bank also plays a role of shore protection through the waterproofing works proposed (1,00 m above the level of the slope from the 1,100 m above the Q 1% level).

Also, the red line of national road 18 will be lifted to a length of approximately 420 m to make the connection with the planed connecting road. The embankment of the exited national road 18 will also have a shore defense role through the prescribed waterproofing works (the wall slope from the 1,00 m trough over the Q 1% level).

1.2.1.2.4.2. Discharge bridges at km 0+540, 0+600, 0+660, 0+720 and 0+780

In order to discharge the water at high flow rates, at km 0+540, km 0+600, km 0+660, km 0+720 and km 0+780 will be carried out discharge bridges with 12,00 m openings. The designed bridged will have flexible structures composition of galvanized corrugated steel plates joined by bolts.

For the achievement of these bridge could be adopted two solutions:

a. open structure with a single opening, founded on concrete blocks. Implementation of this solution involve works for the thalweg;
b. two adjacent enclosed structures. In this case, the steel structures will sit on a loose sand layer of 15 cm thick settled upon a foundation of ballast compacted at least 98% Proctor, wrapped in geo-textile material.

The filler around the steel structure will be made of Proctor compacted ballast at least 98% in layers up to 30 cm. In filling embankment will provide a layer of non-woven geotextile 500 g / m^2 and 1 mm geo – membrane which protects the metal structure.

The slopes will be paved on the height of 1.00 m height above the calculated level of the flow with insurance 1%. The outsides ends of the steel structure will be provided crown concrete elements with the role of stiffness the heads and supporting the embankment pears.

The bridge platform and road structure will have the same characteristics as the connection road in the current path.

1.2.1.2.4.3. Achievement of the connection road

The connection oh the bridge over Tisa River with DN 18 will be made via a connecting road. The protection of the slopes on the ramps will be done with a pear up to 1.0 m above the level resulting from the hydraulic calculation for the Q1% flow rate.

The route plan

In plan, the studied route emerges from the km 69 + 200 of the national road DN 18. At the exit of the connection road from the national road DN 18 was designed a roundabout intersection type.

The proposed route has a total length of 1,200 ml and unfolds mainly in alignment. Before entering the ramp of the bridge, the route crosses a curve with 200 m radius. At the exit of the bridge the road get onto a 185 m radius curve.

The longitudinal profile

The maximum gradient is 4.00% and the minimum is 0.30%.

The connection rays are summarized between 1.500 and 5.000 m.

Transverse profile

The proposed route of the road is a connection road, technical class III, for which, according to GO no. 43/1997 on 'Legal Regime of the road" and MT Order No.45 / 1998 on "technical rules for the design, construction and modernization of roads" the transverse profile has the following dimensions and elements:

- road platform: 19,53 m;
- width of carriageway: 4 x 3.75 = 15.00 m;
- width of the frame strips: 2 x 0.90 m = 1.80 m;
- directional separators – concrete cross-beam H2 type – 0,67 m;
- width for concrete cross-beam H2 type 2 x 1,03 m;
- left – right footway 2 x 2,50 m;
- safety barriers + left – right metallic pedestrian parapets;

- transverse profile in the carriageway will be type roof with a slope of 2.5%;
- the transverse slope of the shoulders will be 2.0%.

On the bridge ramps are placed a verge culvert and on the slopes are placed side ditch of 25 in 25 m.

Road structure

In order to dimensioning the road structure on the access road to the bridge over the Tisa was established the perspective traffic, according to the study traffic appendix to the feasibility study. In determining the future traffic were considered evolution coefficients for the European roads in medium variant.

The perspective period for whose have been made the sizing is 15 years from commissioning. Based on perspective traffic, it was established the volume of computation traffic for the perspective period of 15 years.

Depending on computation traffic volume expressed in million standard axles (M.O.S.) of 115 kN, the access road km 0 + 000-1 + 200 frame in the following traffic class:

Access road to the bridge: $Nc_{15\ years}$ = 0.045 m.o.s LIGHT

The road structure under review it is characterized by the thickness of each layer and by the deformability characteristics of the materials in the road layers and the foundation soil.

Verifying the road structure at the demands of the standard axle involves computation of specific strains and tensions in critical points of the road complex, characterized by a state of maximum stress. The calculations were made with the program CALDEROM 2000.

Considering the road structure solution, has been designed rigid road structure for the border crossing point platform and flexible road structure for the road, including the road braces adjacent to roundabout intersection, with the following structures:

- **Rigid road structure:**
  - 22 cm concrete slab BcR 4.5 – SR 183 – 1:1995;
  - 15 cm natural aggregates stabilised with hydraulic binder – STAS 10473/2-86, SR ENV 13282-1:2013 and STAS 6400-84;
  - 20 cm ballast foundation – SR EN 13242, A1:2008 and STAS 6400-84;
  - 15 cm ballast form layer – SR EN 13242, A1:2008 and STAS 12253/1984;
  - geo-textile with non contaminant purpose;
  - earth filling;
  - stripping of 30 cm topsoil;
- **Composition of the flexible road structure:**
  - 4 cm of wear layer of stabilized asphalt mixture MAS16 - AND 605/2014;
  - 6 cm connection layer of asphalt concrete BAD20 - AND 605/2014;
  - 8 cm bituminous base layer with protecting gravel chippings AB31.5 - AND 605/2014;
  - 20 cm foundation top layer of crushed stone optimal mix - SR EN 13242, A1:2008 and STAS 6400-1984;
  - 30 cm lower foundation layer of ballast - STAS SR EN 13242, A1:2008 and 6400-1984;
  - 15 cm ballast form layer - SR EN 13242, A1:2008 and STAS12253 - 1984;
  - geo-textile with non contaminant purpose;
  - earth filling;

- stripping of 30 cm topsoil;

Considering that the connection road will be located in the major river bed of Tisa river, the following conditions were imposed for its realization:

- the road ramps will be protected by concrete pavement, both upstream and downstream up to a height of 1.00 m above the maximum level of exceptional waters for the 1% assurance flow;
- 4 discharge bridges have been proposed to ensure a level of free entry at the level of exceptional waters to avoid flooding;
- the road territory level is at a minimum height of 3.00 m from N.A.E for Q1%

The conditions required for the arrangement of the roundabout on the detachment from DN 18 are as follows:

- the National road ramps will be protected by concrete pavement on its left side to the Tisa river at a height of 1.00 m above the maximum level of exceptional waters for the 1% insurance flow;
- the discharge bridge provides a free level at the entrance to the exceptional water level to avoid flooding.

1.2.1.2.4.4. Achievement of the customs checkpoint

Have been designed a customs checkpoint to comply with future traffic. This unfolds over a length of about 530 m and will be provided with parking area for cars and freight scales, parking for cars, administrative building. Access to the country and exit from the country will be achieved on five lanes for each direction of movement.

- **Romania – Ukraine sense**

Before the border crossing point have been designed the following car parks:

- administrative buildings parking (32.50 m x 15.50 m) - 23 places for cars (size 2.50 m x 5.00 m);
- parking for cars and trucks - 10 places for trucks (size 4.00 m x 16.50 m);
  - 13 places for cars (size 3.00 m x 5.50 m).

Before the custom checkpoint will be installed two cars scales, each with dimensions 27.00 m x 4.50 m.

After passing through the checkpoint was designed a closed space for detailed inspection of cars with 3 parking spaces (with dimensions of 3.00 m x 5.00 m) and a space for detailed verification of barrages with 4 parking spaces (with dimensions of 4.00 m x 16.50 m with storage possibility) and space for barrages scanning (Roboscan).

The movement directions are separated by a New Jersey cross-beam and a netting fence and at the exit from border checkpoint, have been designed a bend space with 20.00 m length.

For pedestrian transit through the border crossing point has been designed a pedestrian sidewalk, 2.50 m width.

- **Ukraine – Romania sense**

Before the border crossing point have been designed the following car parks:

- trucks parking – 10 places for large vehicles (4.00 m x 16.50 m dimensions);
- parking for administrative building (32.50 m x 15.50 m) – 20 places for cars (2.50 m x 5.00 m dimensions).

Before the checkpoint will be installed two cars scales, each with dimensions 27.00 m x 4.50 m.

After passing through the checkpoint was designed a closed space for detailed inspection of cars with 3 parking spaces (with dimensions of 3.00 m x 5.00 m) and a space for detailed verification of barrages with 4 parking spaces (with dimensions of 4.00 m x 16.50 m, with storage possibility) and space for barrages scanning (Roboscan).

The movement directions are separated by a H2 concrete cross-beam and a netting fence and at the exit from border checkpoint, have been designed a bend space with 20.00 m length.

For pedestrian transit through the border crossing point has been designed a pedestrian sidewalk, 2.50 m width.

- ***Composition of the road structure for the parking:***
  - 22 cm concrete slab BcR 4.5 – SR 183 – 1:1995;
  - 15 cm natural aggregates stabilised with hydraulic binders – STAS 10473/2-86, SR ENV 13282-1:2013 and STAS 6400-84;
  - 20 cm ballast foundation – SR EN 13242+A1:2008 and STAS 6400-84;
  - 15 cm ballast form layer - SR EN 13242, A1:2008 and STAS 12253/1984.

- **Lightening systems**

The custom checkpoint platform will be equipped with a modern lighting system, being provided electric poles of metallic material, having a height of 10 m. Lightning pieces with a power of 150 W / pcs are mounted on poles using consoles with 1.20 m length.

Sizing lighting system was made taking into account the required lights, the distribution of lighting and other considerations. Technically, it took into consideration the provisions in relation with connection to existing substations and safety panels. The lighting system consists of adjacent architectural lighting planor type power 1000 W / pcs.

The lighting system will be LED type, with remote system, system that will be able to control, monitor, measure and manage the operation in optimal parameters of the lighting network in order to reduce the electricity consumption, CO_2 emissions and operating costs.

Functionally endowment of custom checkpoint includes the following:

- **Construction**
  - 2 x 250 m^2 administrative buildings, necessary for activities of Border Police and Customs Directorate of the ANAF;
  - area for detailed inspection of the travellers – only those entering in Romania;
  - area for cars detailed inspection – 2 x 160 m^2;
  - control cabins for border crossing points;
  - administrative cells, for custom commissioner, trucks weigh office, vignettes sales office;
  - toilets.
- **Platform works and equipments**
  - a sidewalk for control booth for border crossing points;
  - blinds necessary for the control zone of border crossing points and of the truck scales;
  - radiation protection wall (in the Roboscan's area);
  - trucks scale – 4 pieces;
  - ramp and detailed control channel for trucks - 2 pieces;
  - automatic barriers - 18 pieces;
  - automated traffic sign;

- electric generators - 2 pieces;
- ITS system - one piece.

Taking into account the location of the border crossing point, the following conditions were imposed for the execution of the border crossing point platform:

- the ramps of the platform will be protected by concrete wall, both upstream and downstream up to a height of 1.00 m above the maximum level of exceptional water for the 1% assurance flow;
- the discharge bridge will ensure a free level at the entrance to the exceptional water level to avoid flooding;
- the road territory level and practical the level of 0 elevation for all the buildings arranged on it will be at a minimum height of 1.35 m from the exceptional level of water for Q1%..

1.2.1.2.4.5. Works to ensure drainage of rainwater

From the point of view of the main functions for the areas covered by the PUZ, a majority percentage is the road or pedestrian traffic, which in terms of hydraulic equipment is characterized by the gravitational take-over of the meteoric waters, proper treatment and conduction through concrete ditches to the emissary (Tisa River)

- For collecting rainwater, the following works were planned:
- at the bottom of the embankment have been designed concrete walls and gutters for collecting the rainwater from the area of the road;
- at heights greater than 2.00 m there were provided embankment gutters that will be discharged by means of discharge side ditch on the roadbed;
- hydrocarbon separators for rainwater treatment;
- the water drainage system for the customs crossing point area is channeled and directed to the hydrocarbon separators and discharge to the emissary (river Tisa);
- culverts for maintaining the natural water drainage system existing before the construction of the connecting road and the bridge;

The rainwater that sweep the site organization platform will be collected through perimeter ditches and led to a decanting basin.

Also, 3 box culverts were designed for the rainwater drainage, at km 69 + 200 of DN 18 (after the roundabout) and at km 0 + 040 of the planed road (over the thermal water brook).

At present, on the right side of DN 18 there is a channel of land through which the thermal water from Tepliţa Lake flows and discharge into the Tisa River. It crosses an earth platform through a Ø 1000 culvert. In order to ensure the continuity of the canal, under the future connecting road, at km 0 + 040 was provided a box culvert with D = 5 m and 24 m long.

- **Waste water sewerage networks in the perimeter of the border crossing point platfom**

According to SR 1846 -1.2-2006,STAS 9470-73, will be calculated and and dimensioned the waste water effluent as well as waste water treatment plant related.

According to the municipal conditions for waste water disposal there were provided 4 scooping basins, corresponding to the size of the waste water effluent, each connected to hygienic-sanitary consumers (customs office, administrative buildings, toilets located in the control areas, etc.). .) through an underground mesh made of a corrugated polypropylene SN 8 pipe with diameters of max. 200 mounted buried below freezing depth to - 1.25 m from the final road surface.

It should be noted that the works planed on the areas covered by the zonal urbanistic plan have an insignificant influence from the point of view of the Tisa river flow in the studied area. Thus, the level difference between the exceptional water level for Q 1% free and set-up is only 0.25 m.

All arranged areas, with functional role according to the PUZ, are located above the flood elevation.

At the same time, the earthworks, especially on the border crossing point, are located perpendicular to the watercourse, in a position parallel to the inhabited area downstream, being practically a dike for protection and energy dissipation for the intravilan village.

1.2.1.2.5. Site organization, demolition, network deviations

The site organization necessary for the construction of the bridge over Tisa in Tepliţa area in Sighetu Marmaţiei will be located outside the natural protected areas (at about 175 m of the overlapped limits of the ROSCI0251 Tisa Superioară and ROSPA0143 Tisa Superioară) and at a great distance from the Tisa riverbed (approximately 1,000 m), as shown in Figure 18.

- **The facilities of the site organization**

The site organization will be equipped with a crane, a storage platform for prefabricated elements, a parking for machinery, auto-vans and cars, a laboratory, 5 containers, from which three for offices, one for tools and another for storage, and two ecological toilets, waste treatment plant and two car wash ramps.

The administrative building will be made of mono-bloc barracks. The water supply will be made from a proper drilling, and the waste water will be treated through the treatment plant.

Arrangement of the platform at the border crossing point will require vegetation deforestation, stunning excavations, land fillings for ramps, final systematization works. If, during the execution of the platform and buildings within the border crossing area and the bridge across the Tisa river, there will be found ungrounded transport networks (gas, electricity, telecommunication) not identified on the ground, these will be deviated on the basis of specific technical documentation.

- **Provisional access ways**

Temporary access ways to the route where the bridge over the Tisa River will be located are from the south boundary (DN 18) to the Tisa River. They are on the way of the connecting road, so they will not affect other surfaces. Also, the exploitation routes existing in the analyzed area will be used.

- **Sources of water, electricity for the organization of the site**

The water required for the plan will be taken from a proper drilling, and drinking water will be purchased bottled. Water dispensers will be installed.

For the supply of electricity a generator will be installed in the site organization or the site organization will be connected to the existing electricity network in the vicinity of the site. Night lighting will be assured by mounting columns with lamps and solar panels.

❖ **Work program, work schedules, reception schedule**

The proposed implementation period is 24 months.

The duration of the bridge operation is 100 years and the duration of the decommissioning is 6 months.

The works schedule is presented in Table 3.

Table 3. Works schedule

NO	WORKS NAME	YEAR I												YEAR II											
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
0	1	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
I	**DESIGN**																								
1	DESIGN																								
II	SITE ORGANIZATION																								
1	SITE ORGANIZATION																								
III	**NEW BRIDGE "JOINT DECK CONCRETE STEEL"**																								
A	PREPARATORY WORKS																								
B	INFRASTRUCTURE																								
C	SUPRASTRUCTURE																								
D	LANE, SIDEWALK, CROSS-BEAM																								
E	EMBANKMENT CONNECTION																								
F	BRIDGE OUTSIDE LIGHTING																								
G	BRIDGE INSIDE LIGHTING CASE																								
H	BRIDGE WATER DRAINAGE																								
I	TESTING AND MONITORING																								
IV	**WORKS ON CORRUGATED IRON CULVERT L=54,00 M**																								
A	INFRASTRUCTURE																								
V	**WORKS ON CORRUGATED IRON CULVERT L=54,00 M**																								
A	INFRASTRUCTURE																								
VI	**WORKS ON CORRUGATED IRON CULVERT L=56,00 M**																								
A	INFRASTRUCTURE																								
VII	**ROADS AND PLATFORMS WORKS**																								
A	EMBANKMENT																								
B	ROAD STRUCTURE																								
C	WATER DRAINAGE																								
D	CIRCULATION SAFETY																								
E	BOX CULVERTS																								
F	ROUNDABOUT ARRANGEMENT																								
G	CUSTOM PLATFORM																								
VIII	**FUNCTIONAL EQUIPMENT OF THE CROSS-BORDER POINT**																								
A	CIVIL BUILDINGS																								
IX	**ENVIRONMENT PROTECTION WORKS**																								
1	ENVIRONMENT PROTECTION ARRANGEMENTS																								
2	TREES PLANTING																								

❖ **Cleaning on site**

The builder will ensure cleanliness in site organization and working fronts. The waste will be collected selectively and the recyclable waste will be recovered through specialized centers.

❖ **Sanitary services**

Drinking water will be provided with plastic containers through water dispensers.

In order to meet the sanitary needs, two ecological WC cabins will be installed in the site organization, and the household waste water will be treated through the treatment plant.

❖ **Technological processes for the achievement of the bridge over Tisa in the Tepliţa area of Sighetu Marmaţiei**

All structural variants examined in the feasibility study were modeled using finite element calculation in specialized programs such as CSI Bridge, the calculation being made by stages of execution, according to calculation summary – annex of the feasibility study. It is the only practical way in which can be dimensioned the bridge works.

The works necessary for infrastructure will be carried out using metallic pilling enclosures, so as to eliminate the risk of ingress of construction materials into the Tisa riverbed. Will be carried out the excavations for foundations, bearing block and reinforced concrete foundation. Subsequent will be achieved the elevations. The operation will be successive in function of the direction of the infrastructures.

After achievement of the infrastructure can begin installing the bridge planks. This can be accomplished in two technological solutions:

- **mounting technology of sections of bridge planks using crane**, on intermediate blade. In this solution, the bridge plank will be processed through sections that will be mounted by slipping on lifting operations on the intermediate bridge leg. After sections will be positioned on intermediate support will be performed assembly of the metal beam after which can proceed to the next steps of implementation: installing prefabricated slabs, achieving piece with prestressing concrete flooring collaboration with metallic deck, etc.
- **execution technology by launching.** In this solution, the bridge plank will be industrial made on segments, their solidarity by welding performed on a launch platform located on one of the two sides of the Tisa River. After checking the welds, the deck will be released on definitive infrastructure previously executed, using provisional metallic structure with role in up taking the height differences of the sectional box. In order to reduce the efforts in steel structure will be executed and mounted on the launching end of the bridge plank a metal structure ("nose"). The walls of the collected call will be finalized after completion of the bridge laying operation. Once the bridge plank will be on the right position can move on to installing prefabricated slabs, achieving piece with prestressing concrete flooring collaboration with metallic deck, etc.

After closing the structure will move on mounting on waterproofing, pouring the layers of the carriage, mounting the parapets and other equipment on the bridge.

The construction works will not be carried out in Tisa minor riverbed. Raw materials and waste will be stored at distance of Tisa riverbed, in special arranged areas, that so will not be any risk of their impairment in river course.

During execution of the construction works, will not be modified the water flow regime, water level, physic-chemical characteristics of the Tisa water.

In the feasibility study has been analysed even the bridge stepwise execution:

- In the first phase will be executed one bridge that will be used for both movement ways (one lane for each movement direction). In order to ensure the pedestrian traffic in safe conditions, the bridge executed in the first stage will have sidewalks on both sides and, following the execution of the second bridge, the sidewalk from the new bridge will be closed to pedestrian traffic and will be utilised as inspection and service sidewalk for the maintenance personnel;
- In the second stage will be executed even the second bridge and will be regulated movement in one direction on each bridge in part, on two lanes. The second bridge will have only one pedestrian sidewalk to the outside.

Even in this execution alternative, the bridge ramps, the connection road and the platforms of the border crosiing point will be executed in complete solution (four lanes).

❖ **Technological processes for the achievement of the connection road**

A. Assume works for execution of the earthworks in all road indent including intersections as follows:

- cleaning the road indent of branches, leaves, shrubs and chaotic vegetation, etc .;
- excavation of the layer of vegetal soil over its entire thickness;
- carrying out digging or filing works up to the foundation bed level;
- execution of the water drainage bridges in the site.

B. Achievement of the road structure across the platform as follows:

- execution of embankments;
- execution of the ballast foundation layer (lower foundation layer);
- execution of the inferior foundation layer of ballast;
- execution of the upper layer of stabilized ballast foundation;
- priming the cationic emulsion support layer and casting the bituminous anodic layer;
- prior to laying the wear layer, the surface of the bonding layer is also prepared by cleaning, priming and possibly remediating, depending on the time elapsed between the two layers.

C. Execution of works to ensure water leakage which consist in:

- construction of concrete ditches and gutters;
- execution of hydrocarbon separators;

D. Installing the safety sill;

E. Arranging intersections;

F. Vertical markings and horizontal markings.

1.2.2. Relationship with other relevant plans and programs

In the achievement of the urban zonal plan for the bridge over Tisa in Tepliţa area in Sighetu Marmaţiei, the following provisions were taken into account:

- Maramures County Territorial Planning Plan;
- General Urban Plan of Sighetu Marmaţiei Municipality.

- **Provision of the General Urban Plan of Sighetu Marmaţiei Municipality**

➢ **Functional zoning**

According to provisions of the General Urban Plan of Sighetu Marmaţiei Municipality, the location of the bridge over Tisa is classified as an area for transport.

T – TRANSPORT AREA

TR – Road transport area: TR 1–sub-unit of isolated transport units.

ACCEPTED USES

TR 1 - constructions and arrangements for the hiring and maintenance of means of road and fixed transport related to public transport and freight transport functions, as well as related services.

❖ **Land occupation**

❖ **Main features of the functions occupied by the studied area**

The assignment for use and functions of the surface of the studied area is currently the free field, land owned by the Town Hall and land owned by private individuals or legal entities.

❖ **Relationships between functions**

According to the provisions of P.U.G. Sighetu Marmaţiei Municipality, the area includes the river Tisa, located in the north of the administrative territory belonging to Sighetu Marmaţiei.

❖ **The occupancy rate of the built-up area**

The area studied by P.U.Z. is situated in the unincorporated area of Sighetu Marmaţiei Municipality and is mostly land owned by private individuals or legal entities.

❖ **Qualitative aspects of the built fund**

There are no edifices in the area of the studied field.

❖ **Services insurance to the area in conjunction with neighboring areas**

Taking into account the nature of the objective studied by P.U.Z. (bridge and border crossing), the provision of the service area in relation to the neighboring areas is less present. The traffic infrastructure is present (local road and national road) and connects with the rest of the localities in the county and the country.

❖ **Green space insurance**

At this stage, given the land's destination, there are no green spaces or recreational areas.

- **Provisions of Maramureş County Territorial Urbanism Plan**

For the strategic objective no. 2 of Maramureş County Territorial Planning - "Fluidization of the intra-county cooperation relations with the neighboring national and cross-border regions" a series of proposals are made regarding the Municipality of Sighetu Marmaţiei, of which the most important is the construction of a high tonnage road bridge to allow for a real cross-border exchange of goods. It is also envisaged to resize the border crossing

point by building a new bridge over the Tisa River about 4,5 km upstream of the historic bridge. The new bridge will be connected to DN 18 via a connecting road. Given its socio-economic importance, this objective has been targeted as a short-term objective.

Also, at the achievement of the P.U.Z. for the bridge over Tisa in Tepliţa area in Sighetu Marmaţiei have been taken into account the following plans and programs at national level:

- **Territorial Development Strategy of Romania**

The Territorial Development Strategy of Romania is the document underlying the entire spatial planning system (spatial planning and urban planning) at national level, basing regional, county and local strategic documents (territorial development strategies, land development plans, regional development plans) and operational documentation (urban planning) as well as other development strategies at national level with territorial relevance and impact.

The bridge over Tisa in Tepliţa area in Sighetu Marmaţiei is included in Romania's Territorial Development Strategy, at territorial measures for cross-border areas: territorial measures for EU external borders - the northern border with Ukraine, respectively the socio-economic development of the cross-border area interconnection of networks of localities in the cross-border area.

- **National Urbanism Plan - PATN**

PATN is the support of complex and sustainable development and represents the specific contribution of Romania to the development of the European space and the premise of the inclusion in the dynamics of the European economic and social development. The plan includes the following sections:

- Section I - Communication routes;
- Section II - Water;
- Section III - Protection Areas;
- Section IV - Natural risk areas;
- Section V - Tourist Areas.

In section 1 – Communications routes - the development of the road network has been included the construction of a new bridge over the Tisa River.

- **Area Urbanism Plan - PATZ**

PATZ shall be drawn up for territories grouped in an area with common geographical, economic or / and other characteristics, comprising all or part of the administrative territory of several administrative territorial units. This type of plan generates territorial zonal policies on concrete issues of common interest.

- **The Strategic Territorial Development Concept Romania 2030 (2008)**

Following the approval by the Romanian Government in 2005 of a Memorandum on the territorial development guidelines, in 2008 has been elaborated the Strategic Territorial Development Concept Romania 2030. This document was submitted to public consultation and considering the provisions of Law no. 350/2001 was the basis for the development of the Territorial Development Strategy of Romania.

A concept of territorial development bases and guides Romania's territorial development strategy from the perspective of a partnership-built document agreed by institutional, sectorial and territorial actors.

The strategic objectives proposed by the strategic concept were:

- valorization of the peripheral by developing the role of connector and relay at continental and intercontinental level;
- linking to the European network of poles and development corridors;
- patterning and balanced development of the network of urban localities;
- affirmation of urban-rural solidarity;
- rural development;
- strengthening and developing interregional links as a support for regional development;
- adequate development of different categories of territories;
- increase of the territorial competitiveness;
- protecting, developing and capitalizing on natural and cultural heritage.

- **Master Plan of Transport of Romania (MPGT)**

The Master Plan of Transport of Romania is the strategic document for the development of national transport infrastructure and is a strategic tool for planning major interventions (plans and other actions) that are significant for national transport objectives.

The overall objective of the MPGT is to ensure the conditions for efficient, sustainable, flexible, secure, balanced transport modes in harmony with the environment and in connection with trans-European transport networks – pre-conditions for the country's economic development.

The strategic objectives of the Master Plan of Transport are:

- improving the mobility of the population and the business environment along the TEN-T transport network, the national connectivity corridors as well as the regional connectivity corridors defined in the MPGT;
- increasing the accessibility of urban development poles,of the areas with economic development potential as well as the accessibility of areas in Romania that have indirect access to the national highways / roads network;
- improving safety conditions in transport and reducing the risk of accidents in areas with accidents due to road jams, traffic delays and difficult traffic conditions;
- promoting forms of road, water, rail and air transport that protect biodiversity and have a favorable impact on emissions of pollutants into the atmosphere.

The bridge over Tisa in Tepliţa area in Sighetu Marmaţiei is included in the MPGT on the list of priority plans for the 2014-2020 programming period, at heading 20 of Chapter III - new TRANSREGIO / EUROTRANS plans.

- **Plan for Flood Prevention, Protection and Mitigation for Flood Effects (PPPDEI) in Somes – Tisa River Basin**

The purpose of the Plan for Prevention, Protection and Mitigation for Flood Effects in Somes - Tisa River Basin is to reduce the risk of natural disasters (floods) with effect on the population by implementing preventive measures in the most vulnerable areas. At the achievement of the PPPDEI in Someş - Tisa river basin, the general principles contained in the National Strategy for Short-Term Flood Risk Management (approved by Government

Decision no 1854/2005) and in the National Strategy for Flood Risk Management on Medium and Long Term (approved by GD no. 846/2010).

During the design of the bridge over Tisa in the Tepliţa area of Sighetu Marmaţiei, have been taken into account the provisions of the PPPDEI in SomeȘ-Tisa River Basin, and also the floodability limits.

- **National Strategy for Sustainable Development of Romania Horizons 2013 - 2020 - 2030**

The overall objective of this strategy is to continuously improve the quality of life for present and future generations by creating sustainable communities capable of managing and using resources efficiently and harnessing the ecological and social innovation potential of the economy to ensure prosperity, and social cohesion.

- **National Waste Management Strategy 2014-2020 (SNGD)**

This strategy, mainly, aims significantly reduction of the rate of waste generation by encouraging its prevention and reuse, as well as reducing the amount of waste requiring subsequent management and improving product design and use of materials in order to increase the efficiency of resource use, by improving designing products to reduce the amount of materials used in the manufacturing process and utilities such as energy, water over the life of the product, etc.

At the design of the bridge over Tisa has been taken into account the provisions of this strategy, and the works have been dimensioned and programmed to significantly reduce the amount of waste for the construction period.

2. CURRENT ENVIRONMENT STATE AND PROBABLE EVOLUTION IN THE SITUATION OF NON-IMPLEMENTATION OF THE PLAN

2.1. Geographical and administrative location

The future bridge over the Tisa River will ensure the connection between Sighetu Marmaţiei City from Romania and the Biserica Albă (White Church) from Ukraine, and the connecting road will be executed with detachment from the DN 18 in the km 69 + 240 area.

The area where will be realized the road bridge over the Tisa River is located in the unincorporated area of Sighetu Marmaţiei, in the northern part of the UAT, accessible by the road that ensure connection with Viseul de Sus (DN 18).

The Sighetu Marmaţiei city is the second largest urban center in Maramureş County after Baia Mare (county residence).

The Sighetu Marmaţiei municipality polarizes spatially an ethnographic and historical-geographical region known as "Maramureş Country" or "Maramureşul Istoric" located in the north-eastern part of the current Maramureş County. The Maramureş Historic Region is isolated from the point of view of geographic accessibility, which has consequences on population density.

The Historic Maramures has a density of 63.5 inhabitants / km^2 and the population density at the county level is 80.9 places / km^2.

The connection of the city to the national and county road network is made by the national road 18 (DN 18) Baia Mare - Sighetu Marmaţiei - Borşa; the national road 19 (DN 19) Satu Mare - Negreşti Oas - Sighetu Marmaţiei and the county road 186 Sighetu Marmaţiei - Vadul Izei - Bârsana - Săcel. Sighetu Marmaţiei Municipality is also a border crossing point connecting to Solotvino city of Ukraine and the Ukrainian national road H 09.

The area of the road bridge over the Tisa River is functionally part of the category of peripheral areas, preferred for the location of industries or other activities incompatible with the other central or peri-urban areas of the locality.

Industrial objectives are located in the industrial area situated in the north of the city on industrial woodworking platforms, the Mecanica platform. The location of the industry has greatly depended on access to the railways and accessibility to national roads. Thus, the clothing and knitwear factories are located north of the city with access to DN 18. A number of industrial sites have been located already after 1990 in the eastern part of the city depending on the lower price of the land.

Significant characteristics of the area, related to the evolution of the locality

Part of the studied area was relatively recently introduced in Sighetu Marmaţiei town, in 2009, on the occasion of updating the PUG documentation.

The other part, located outside the country, is used almost exclusively for agriculture. The increase in the demand for individual dwelling houses in recent years has led to the introduction of the studied area into the urban area of the locality, being meant for the realization of individual houses with a rural character.

The significant features of the area are the following:

- flat land, without high vegetation (fruit trees or other trees);
- free construction area per allotment.

Development potential

The studied area is an area with a particular development potential primarily for individual urban dwellings supported by the following aspects:

- an area located in incorporated area of the city in connection with the city and its facilities;
- possibility of realization of the technical - municipal facilities necessary under conditions of normal technical and financial efforts;
- area without sources of pollution.

2.2 Current state of the environmental factors

2.2.1. Water

2.2.1.1. Hydrogeological and hydrogeographic conditions of the site

Hydrographic considerations

Sighetu Marmaţiei Municipality is located in the lower terraces of the Tisa, Iza and Ronişoara rivers. The Tisa River (Q = 78 m³ / s) is the main collector of the Maramures Depression. The Iza River (Q = 16.3 m³ / s) flows into the Tisa River in the western extremity of the city, and the Ronişoara River has a confluence with the Tisa River in the eastern part of Sighetu Marmaţiei.

From hydrological point of view, the area is tributary to the Tisa River, with permanent water flow and collector of various tributaries on the left, of waters descending from Rodna and Maramures massive.

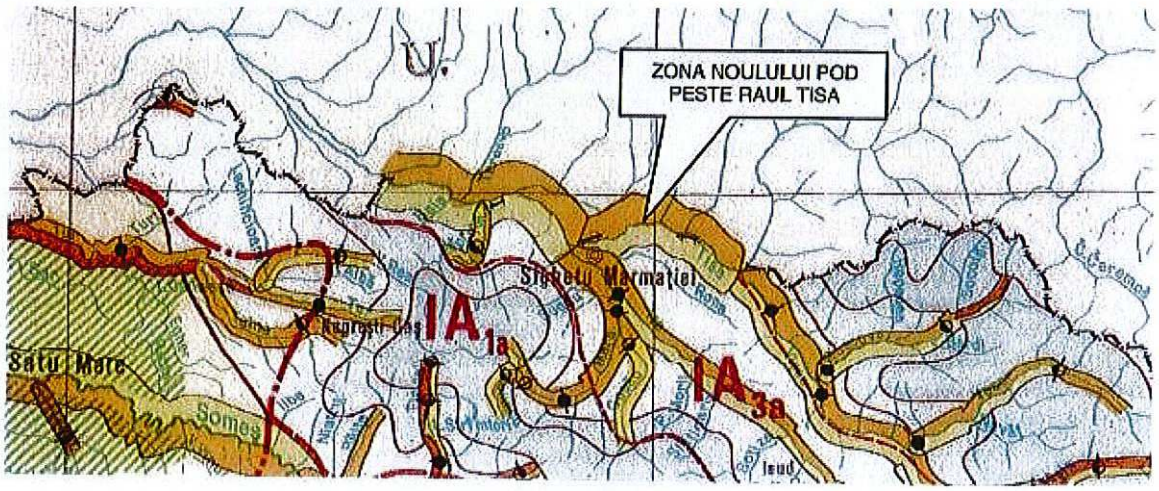


Figure 8. Hydrografic map of the analysed area
Source: Institute of Geography of Romania

In the analysed area, the Tisa River has a minor riverbed with average width and a major bed of large width, which forms coastal belts in the bending area of the river. According to geotechnical study, in the bridge location there is a coastal belt on the Ukrainian border.

The formation of the coastal belt on the Ukrainian border and shore protection from rubble stone rock fill on the Romanian border is due to the meander of the Tisa river, which, typically, during floods, uptakes land on the

outside bank of meanders and deposit it on shore interior thereof.

River banks are average height, the Romanian border is higher.

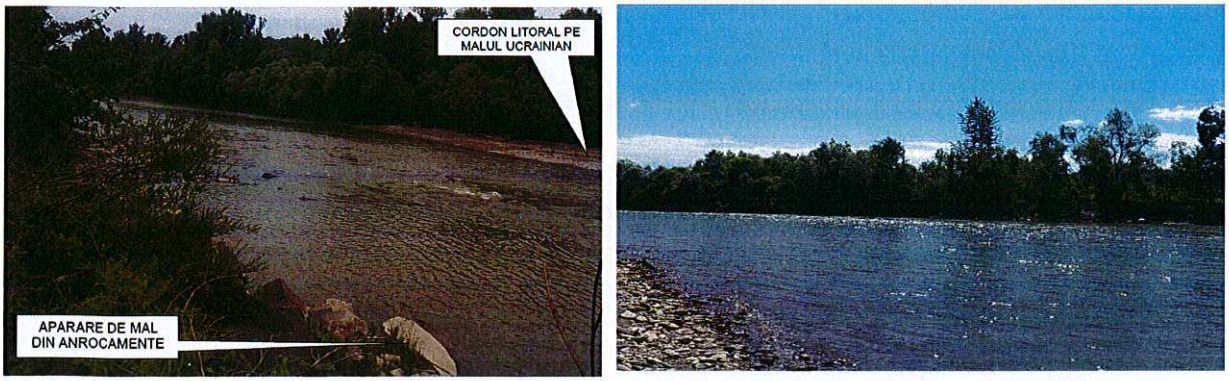


Figure 9. Costal belt on the Tisa riverbank

Hydrogeological considerations

From the hydrogeological point of view as classified in Romania hydrogeological map, the area is framed in a region with groundwater present in local aquifers, these aquifers are in coarse grained rocks, which belong to gravels and sands from composition of terraces and intermountain basins.

Because the Sighetu Marmaţiei Municipality is located on the lower terraces of the Tisa, Iza and Ronişoara rivers, the water level is 5 to 6 m deep in the western and central area of the locality, in the eastern area (on the first river terrace) the groundwater drops to 12.5 m. The groundwater is potable.

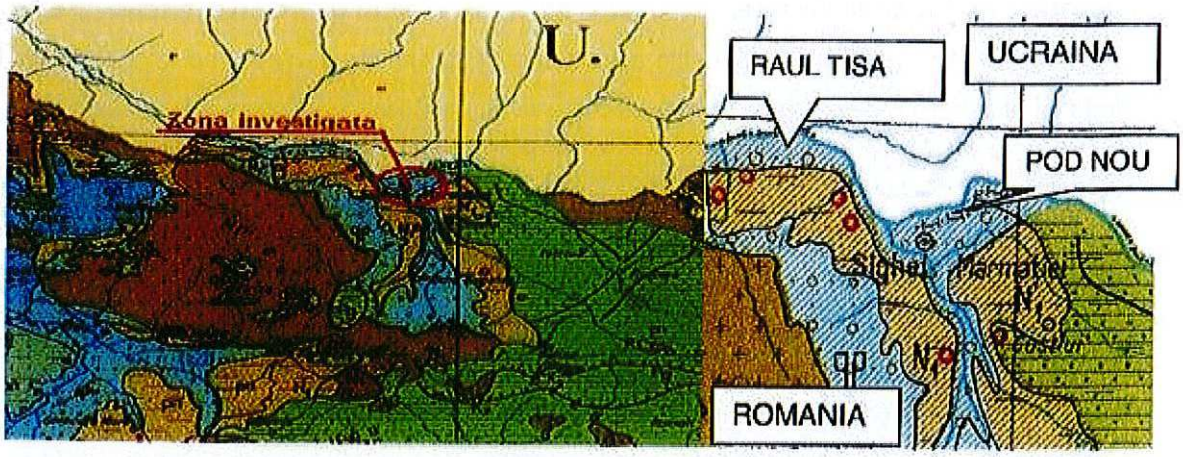


Figure 10. Hydrogeological map of the Sighetu Marmaţiei area

Source: Institute of Geography of Romania

2.2.1.2. Water supply

There is no water supply on the bridge site.

2.2.1.2. Waste water management

There is no sewerage network at the bridge site.

2.2.1.3. Pollution sources

There are no significant sources of pollution of surface or underground water in the location of the bridge over Tisa in Tepliţa area in Sighetu Marmaţiei.

2.2.1.4. Evolution forecast

In the case of non-implementation of the plan "Bridge over Tisa in Tepliţa area in Sighetu Marmaţiei" the evolution of the water environmental factor would be linear, there would be no significant changes compared to the current situation. Neither implementation of the plan will have a significant impact on surface or underground waters. The impact generated by the construction and operation of the Tisa bridge over the quality of surface and underground water is described in Chapter 6.

2.2.1.5. Maps and drawings on water chapter

Figure 11. Map of Maramureş County on which the main rivers are represented

2.2.2. Air

2.2.2.1 General data

From climate perspective, Maramures County fall within the sector of moderate continental climate and the mountain climate, with moderate thermal regime, moisture rich relatively, large rainfall. Climate peculiarities are the result of geographical position in the extreme V - NV of the country, wide open to the west, which provided new insights oceanic air masses.

In the county can be found both depressions below 200 m altitude and ridges Rodnei Alpine Mountains (2,300 m altitude), which setting a natural vertically climate ratios. According to the plan of analysis and hedging of Maramures county, opening wide to the west of relief favours oceanic air masses advection why determines unstable weather with showers of rain or drizzle spring and summer and autumn rains continue and early winter especially.

Rodnei and Maramures Mountains form "a dam" orographic important in front of the cold advection N and E, which causes that the western half of the county is not affected by strong frosts and harsh winters caused by the invasion of these air masses.

Air temperatures recorded annual rates between -1.0 ° C and 10.0 ° C. The annual amount of rainfall is between 700-1500 mm, higher in the north and north-west of the county, according to the report on the state of the environment in Maramures County in 2013.

According to the plan of analysis and hedging of Maramures County rainfall is between 700 and 1500 mm annually, in Maramures County is recorded some of the highest values of rainfall in the country: (1500 mm / year in the upper basin of Vaser). The average number of rainy days per year reaches 140, and the days when it snows reach 30. Rainfall is distributed inconsistently across the county, with considerable increases from west to east.

According to the plan of analysis and hedging of Maramures County, the largest amounts of precipitation (respectively 61.3%) fall within hot interval (April – September). Distribution of precipitation in seasons is the following: winter - 17%, spring - 22%, summer - 39%, fall - 22%. The largest amount of rainfall is registered in Rodnei Mountains and Maramures.

The dominant winds blow from the west (with an average annual rate of about 18-20%) and the north (with a frequency of approximately 10-11% - Ocna Sugatag). Annual average speeds remain between 3 and 3.8 m / s and the mountains reach values higher than 50 m / s, according to the report on the state of the environment in Maramures County in 2013.

In Sighetu Marmaţiei area, the climate is temperate continental with oceanic influences due to the opening of the Maramureş Depression to the west. According to the Urban Development Strategy of Sighetu Marmaţiei Municipalit 2017-2023, the average annual temperature is 8.5 °C (46 °F) in the Tisa corridor and between 2 and 4 °C in the mountain sector (Igniş Mountains) included in the administrative area of the city.

The average rainfall is 743 mm³ / year, and the snow layer is maintained between November and March. The minimum pressure is recorded in February and October, and the maximum pressure in June. As a result of thermal inversions, the temperatures decrease in winter to below -20 ° C, the cold air in the lower part of the Maramures Depression keeps the temperatures very low for periods up for two or three weeks. The winds flow in the Tisa and Izei valleys in the west-east direction.

Climatically, according to the Climatic Atlas of the Socialist Republic of Romania issued by the Meteorological Institute in 1965, the perimeter analyzed for PUZ has the following characteristics:

- multi-annual average of air temperature is 9 - 10°C;
- first day of frost - October 1st - October 11th;
- the last day of frost - April 21 - May 1.

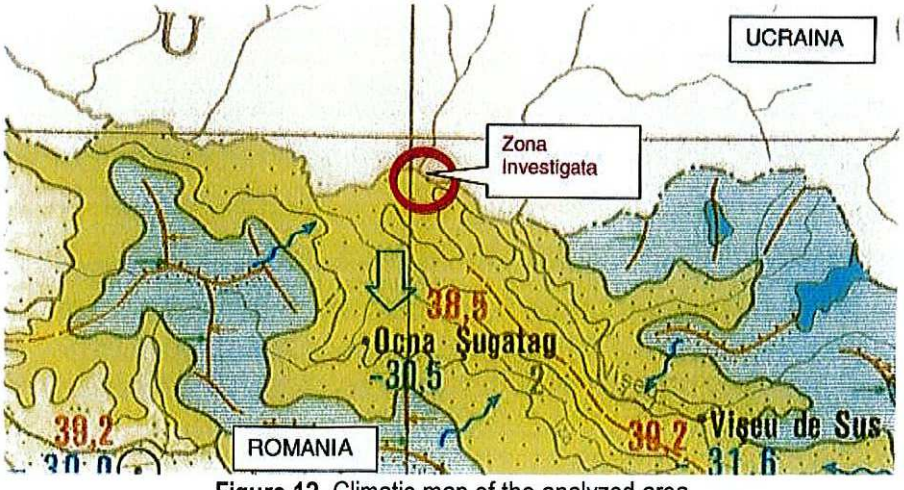


Figure 12. Climatic map of the analyzed area

Source: Institute of Geography of Romania

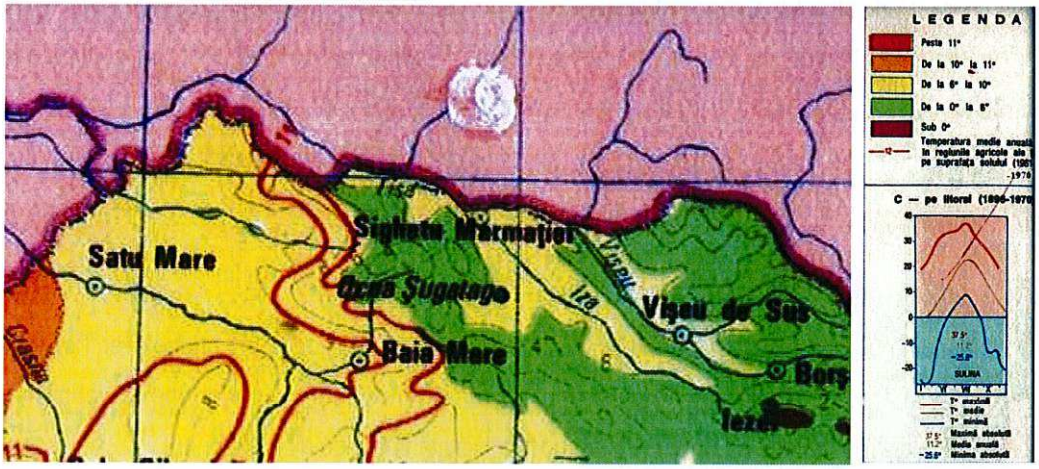


Figure 13. Map of average annual temperatures

Source: Institute of Geography of Romania

Background pollution is the pollution existing in areas where there is no direct influence of pollution sources. Impact pollution is pollution in areas under the direct impact of pollution sources.

Ambient air quality monitoring in the Maramures county was conducted in compliance with the law 104/2011 on ambient air quality which transpose in the national legislation the provisions of Directive 2008/50 / EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe and Directive 2004/107 / EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel, polycyclic aromatic hydrocarbons in ambient air.

In Baia Mare are five automatic stations and a network of air quality monitoring manual. According to the report on the environment state in Maramures County in 2016, 2 of the 5 automatic monitoring stations were stopped in the first part of 2016.

Data on air quality in Maramures County are presented in accordance with the report on the environment state in Maramures County in 2016:

- **Concentration of nitrogen dioxide (NO_X)**

The NO_2 concentrations measured in 2016 at the monitoring stations in Baia Mare did not exceed the limit values provided by the Law no. 104/2011 for daily and annual average.

- **Concentrations of sulfur dioxide (SO_2)**

The limit values provided by Law no. 104/2011 on ambient air quality for sulfur dioxide are 350 µg / m^3 for average hourly concentrations and 125 µg / m^3 for daily average concentrations.

The concentrations of SO_2 measured in 2016 werewas much below the admissible limit values provided by Law no. 104/2011 for hourly and daily environments.

- **Particulate matter**

According to law 104/2011 daily limit value for PM10 is 50 µg/m^3, with conditions that this value do not be exceed more than 35 times in a calendar year in each station, and the annual limit value is 40 µg/m^3.

According to the report on the environment state in Maramures county in 2016, for technical reasons, the catches of PM10 concentrations in stations MM1 (73.8%), MM4 (29.5%) and MM5 (46.2%) in year 2016 were below the 75% minimum adherence percentage for the quality criteria. The fully stopped initially stations MM4 and MM5

have been reinstated in the second half of the year.

At the five stations there were no exceedances higher of 35 of the limit value for the average daily concentration of PM10, the envisaged maximum number to not be exceeded in the Law no. 104/2011.

At the plan site the air quality is good, no significant exceedances of monitored parameters have been recorded.

2.2.2.2 Pollution sources

The main pollution sources currently affecting the air at the location of the bridge over Tisa in Tepliţa area in Sighetu Marmaţiei are represented by agricultural activities and those carried out on the gravel pits (extraction and transport of construction materials), but they have no significant impact on air quality.

2.2.2.3 Evolution forecast

In the case of non-implementation of the plan "Bridge over Tisa in Tepliţa area in Sighetu Marmaţiei" the evolution of the air environmental factor would be linear, there would be no significant changes compared to the current situation. Also, neither implementation of the plan will have a significant impact on air quality. The impact generated by the construction and operation of the Tisa bridge over the air quality is described in Chapter 6.

2.2.2.4 Maps and drawings on air chapter

Not applicable

2.2.3 Soil

2.2.3.1 Characteristics of dominant soils (type, composition, granulometry, permeability, density, etc.)

The analyzed area is characterized by the presence of meadow soils along the watercourses (especially the Tisa River) and carbonate chernozems (Figure 14).

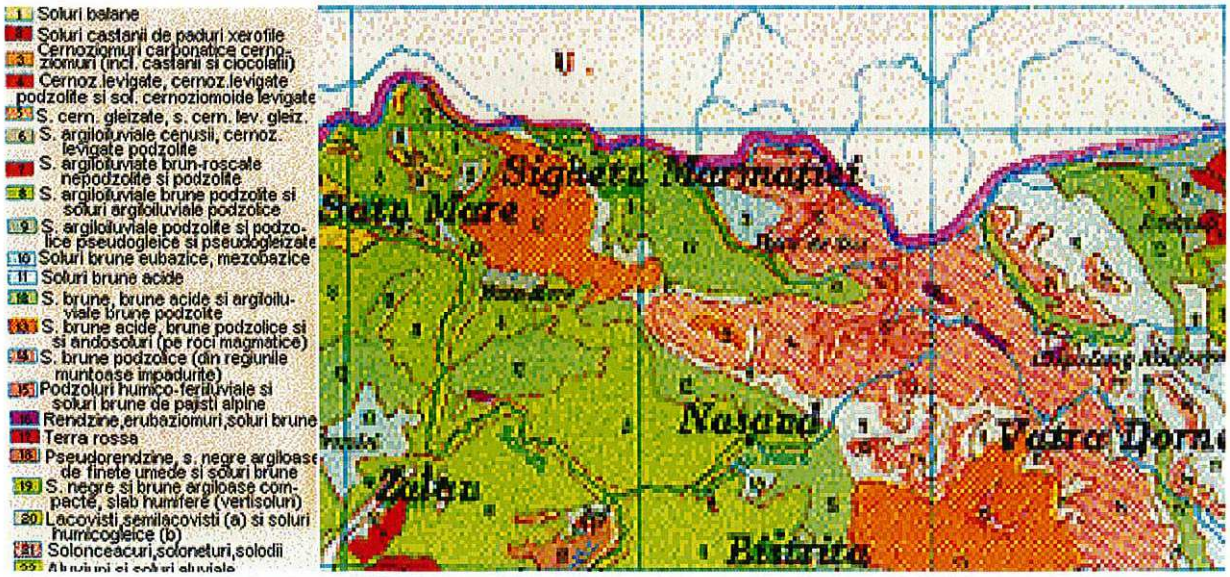


Figure 14. Soil type in the location of the bridge over Tisa in Tepliţa area in Sighetu Marmaţiei

2.2.3.2 Type of the current land use: agricultural land, forest area, industrial area, etc

According the townplanning certificate no. 115 / 23.07.2015, the land is located partly within the incorporated area and in unincorporated area of Sighetu Marmaţiei Municipality.

Ownership of the building: public domain and private properties, border area.

The current use of the land: water course (Tisa river – border), road communication routes – national road DN 18, local roads, agricultural lands – arable and meadows;

Destination set by town planning documentation and landscaping approved: bridge over Tisa River linked to DN 18.

The land in Ukraine is framed in the fourth category.

2.2.3.3. Pollution source

In the location of the bridge over Tisa in Tepliţa area in Sighetu Marmaţiei there are no significant sources of soil pollution.

2.2.1.4. Evolution forecast

In the case of non-implementation of the plan "Bridge over Tisa in Tepliţa area in Sighetu Marmaţiei" the evolution of the environmental factor soil would be linear, there would be no significant changes compared to the current situation. Neither implementation of the plan will have a significant impact on soil. The impact generated by the construction and operation of the Tisa bridge over the soil quality is described in Chapter 6.

2.2.3.4 Maps and drawings on soil chapter

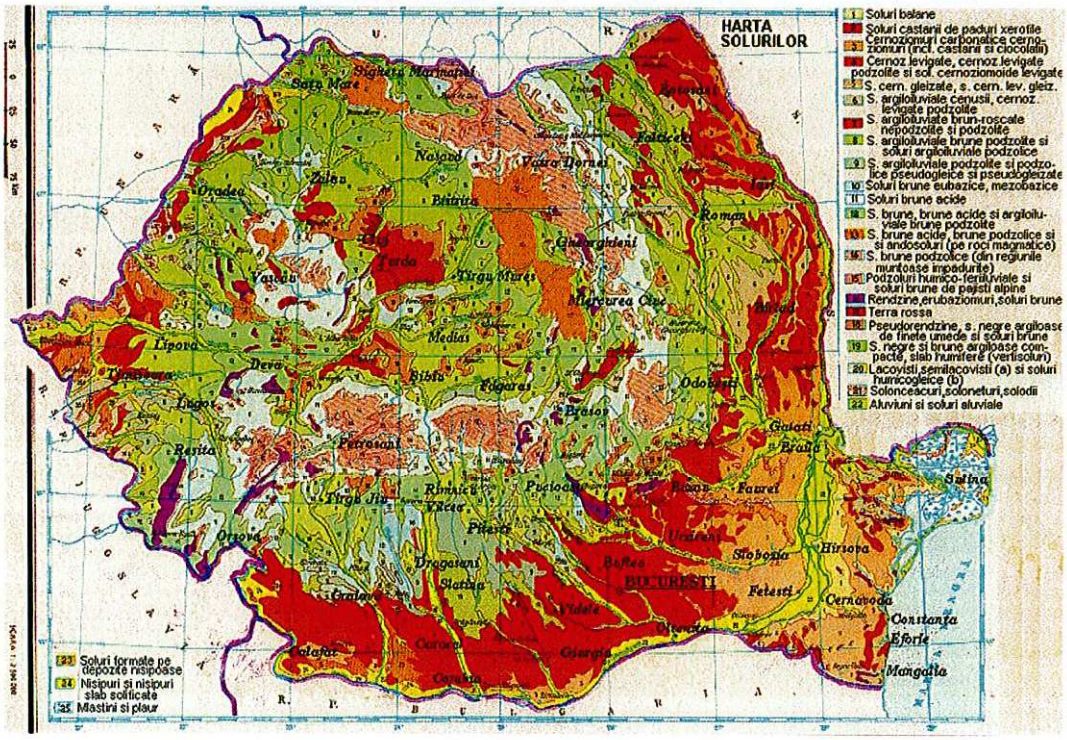


Figure 15. Map of soil types existing on the territory of Romania

2.2.4 Subsoil Geology

2.2.4.1. Overall characterization

From geological point of view, the analysed area is framed in the confluence of flysch transcarpatic located outside Maramures crystalline massif. Deposits encountered in the area are so recent, quaternary age (Holocene and Pleistocene) and even old age Neogene (Volhiniene-Bessarabiene and tortoniene).

On the surface it encountered deposits represented by sand and meadow gravel, belonging to upper and lower Holocene, under that are Pleistocene deposits with small thickness, represented by clays.

Tortonian present a transgressive and discordant nature shows and is represented by a lower horizon with sand, sandstone, marl and rhyolitic tuffs and a crystalline upper horizon containing basal aggregations and limestone. In broad areas are found, on thickness of 100-200 m, limestone, clay marl, sandstone and tuff.

Volhinian - Bessarabian follows the continuity of sedimentation and is represented by two facies: marginal and broad.

Also can be found even and other deposits, with variable thicknesses, represented by clay shale, marl sandy tuffs, sandstones, sands and conglomerates.

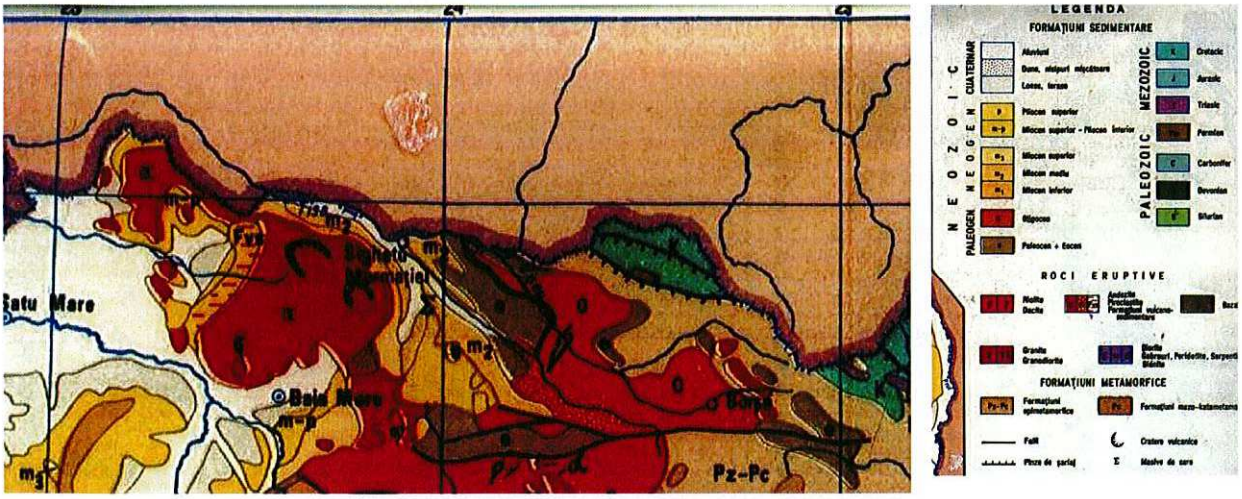


Figure 16. Geological map of the analysed area

Source: Institute of Geography of Romania

Have been performed 21 geotechnical surveys in order to determine the lithology of the future bridge.

Among the 21 geotechnical surveys performed, 5 geotechnical drillings (denoted by F) have been conducted for the two bridges, 16 geotechnical surveys to determine the lithology from the area of connection road and bridge. Among these, 4 are geotechnical surveys for road (denoted by fd), 6 are for backfill (denoted by fr), 4 are for culverts (denoted by fp) and two are intermediate drillings (denoted by fi).

- **F – 8 geotechnical surveys for bridges** with total length of 133.5 m, among 5 surveys on the Romanian border with the length between 15.0 - 20.5 m and 3 surveys on the Ukrainian border with 15.0 m length;
- **fp – 4 geotechnical surveys for culverts** with total length of 20.0 m, all the surveys on the Romanian border, with length of 5.0 m;
- **fd - 5 geotechnical surveys for road** with length of 30.0 m, among 4 surveys on the Romanian border and 1 survey on the Ukrainian border with total length of 6.0 m;

- **fr – 7 geotechnical surveys for embankments** with total length of 46.0 m, among 6 surveys on the Romanian border and 1 survey on the Ukrainian border, with length between 6.0 - 8.0 m;
- **fi - 2 intermediate surveys** with total length of 12.0 m, both surveys on the Romanian border, with the length of 6.0 m.

The drillings executed have been so mechanized boreholes type, and manual type drilling and have depths between 5.00 m - 20.50 m related to ground level.

The maximum depth for direct investigations has been 20.50 m, depth reached by F5 survey and the maximum depth for the indirect investigations was 32.00 meters, reached through geophysical measurements.

In the main bridge area, have been performed even geophysical measurements of seismic type and geophysical measurements in drill hole (down hole).

The field works have been conducted in 16.06.2015 – 17.07.2015 period, and the laboratory analysis have been conducted by "Laboratorul Central Construcţii CCF S.R.L. Bucureşti".

The land structure on the bridge location is formed on the surface from a large package of non-cohesive lands (silt and coarse) represented by sandboxes sometimes mixed with gravel or clogged and by gravel mixed with sand and boulders, beneath, to the drilling base have been intercepted cohesive earth represented by silty clay, shale clay. These rest on the argillaceous – siliceous bedrock.

The groundwater was intercepted at depths from 2.80 to 4.80 m related to the ground level in non-cohesive package from the top, being dependent on the varying flow of water from the Tisa river. Water chemistry from concrete does not indicate aggressiveness towards concrete and metal.

Classification and identification of lands intercepted in drilling has been carried out according to EN ISO 14688-1: 2004, these consist from cohesive earth (silty clay, clay, sandy clay, sandy-clay powder), with average, large and very large plasticity, wet and very wet, plastic stiff - hard, with average and large compressibility and non-cohesive earths, (sand and gravel sand) with uneven grain, with an average compaction general, wet, above saturated waters or underwater.

On the route of the connection road have not been identified any instability areas or wetlands, except one area on the vicinity with the intersection with the national road DN 18, where exist water and vegetation specific to the meadow areas.

2.2.4.3. Pollution source

In the location of the bridge over Tisa in Tepliţa area in Sighetu Marmaţiei there are no significant sources of subsoil pollution.

2.2.4.2 Evolution forecast

In the case of non-implementation of the plan "Bridge over Tisa in Tepliţa area in Sighetu Marmaţiei" the evolution of the environmental factor subsoil would be linear, there would be no significant changes compared to the current situation. Neither implementation of the plan will have a significant impact on subsoil. The impact generated by the construction and operation of the Tisa bridge over the subsoil quality is described in Chapter 6.

2.2.4.3 Maps and drawings on subsoil chapter

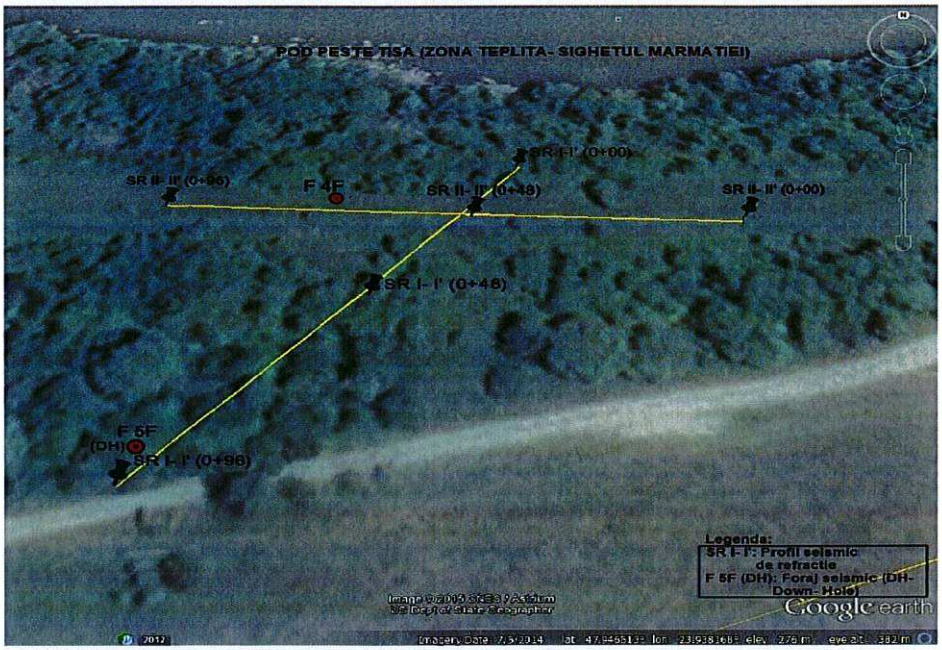


Figure 17. Location of the geotechnical profiles

2.2.5 Biodiversity

2.2.5.1 Flora

2.2.5.1.1 Overall characterization

On the Romanian bank of the Tisa river the construction works will be carried out in the overlapped territory of the special bird protection area ROSPA0143 Tisa Superioară and the site of community importance ROSCI0251 Tisa Superioară, accordind to map from figure 18.

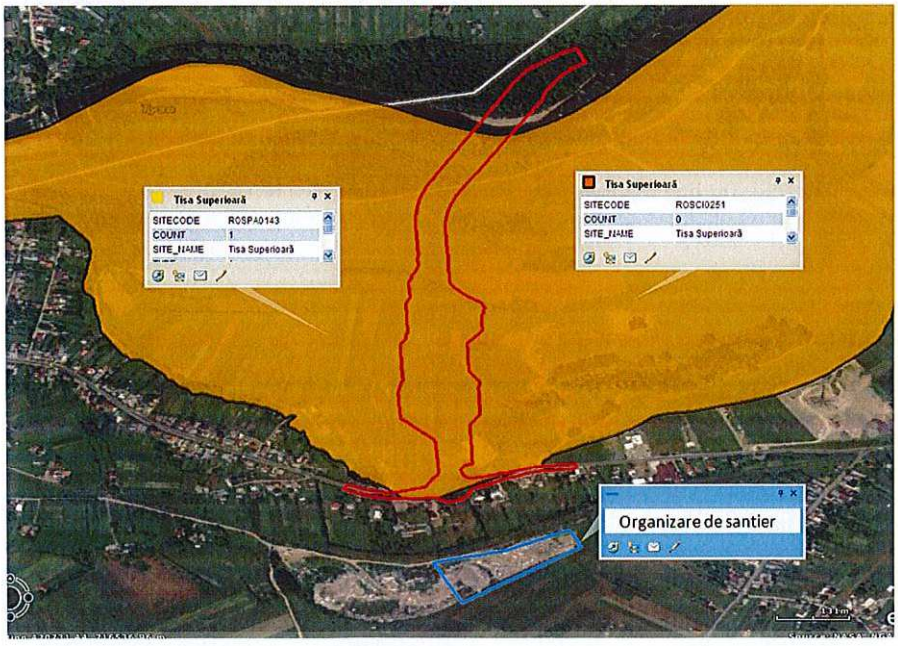


Figure 18. Plan and site organization location related to natural protected areas

An analysis of the habitats and species of community interest for which protection have been designated the two natural protected areas will be conducted below from the biology / ecology perspective as a potential presence in the proposed territory for the bridge over the Tisa River and for the connecting road.

The site of community importance has been declared for the protection of two types of habitats, one of which is a priority:

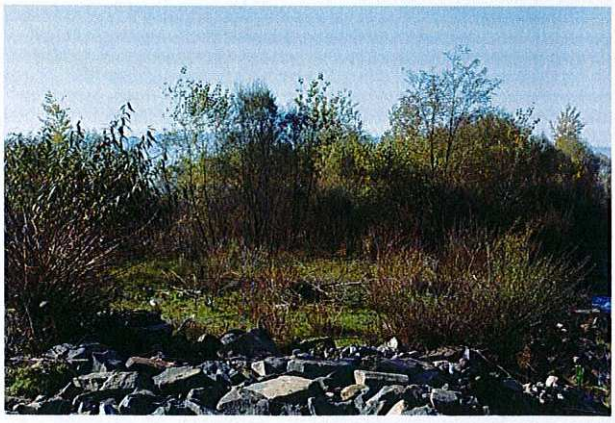
- 9110 *Luzulo-Fagetum* beech forests;
- 91EO* Alluvial forest with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae).*

The presence of a habitat is determined by the presence of characteristic species, enlightening and accompanying and characteristic vegetable associations.

The habitat 9110 Luzulo – Fagetum beech forest it is not present in the plan location, either in its boundaries due the fact that have not been identified the enlightening and characteristics species of this habitat.

In the plan location, on the Tisa riverbank, the vegetation is represented by a degraded grove. Along the Tisa valley exist discontinous grove enlightened by specimens of poplar, willow, and less common alder. Because the antropogenous activities, areas of these groves decrease emphasized reducing the nesting habitats for avifauna species, habitats for invertebrates, amphibians and small mammals, emphasizing the effect of habitat fragmentation. Groves like galleries types along the Tisa river are wildlife coridors, compensation manner for habitat fragmentation.

Currently, on the plan site and in its vicinity exist a reminiscent of the original riverside grove on strip with 5 – 6 m width, consisting of coppice accompanied by an abundant shrub layer and compact herbaceous layer. In qualitative terms, the current riverside grove is degraded. Are present the characteristic species: poplars, willows, blackberries, spindle, as well as herbs commonly present in grove, but in addition, are infiltrated a number of antropophile species, some invasive alien species as *Robinia pseudacacia, Erigeron annuus, Galinsoga parviflora*, **that so vegetation identified the location of the bridge over Tisa can not be frammed in habitat 91E0 * Alluvial forests of *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)* [alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno -Padion, Alnion incanae, Salicion albae)].**



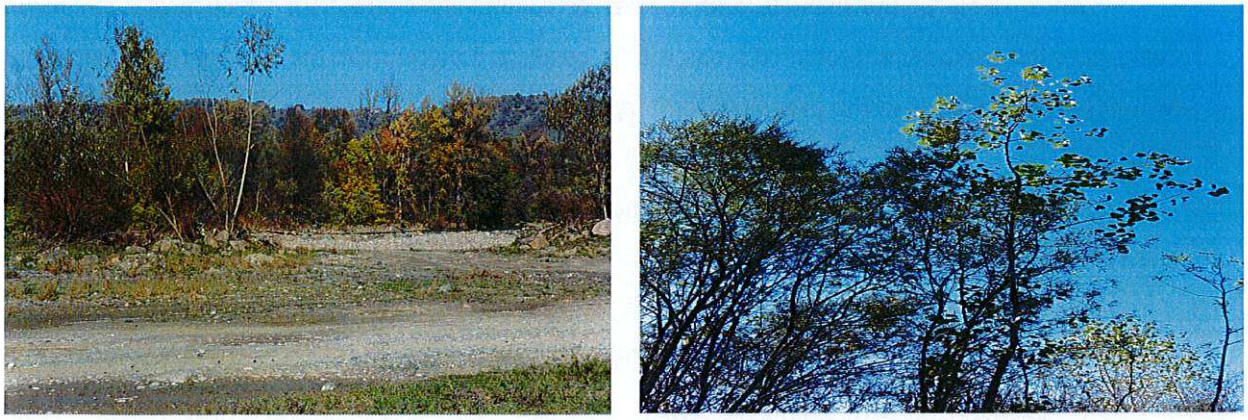


Figure 19. Aspects of the grove reminiscent on the plan location and its boundaries

Habitats from the site of the bridge over Tisa in Tepliţa area in Sighetu Marmaţiei will be minor affected by the execution of the construction works. The works require vegetation release on the land, but on small area. Despite that, grove restoration by replanting white poplar and willow (it is strictly prohibited planting black locust), restoration of the areas temporary affected by the construction works, covering with furrows of ground covered by grass, will offset the impact and ensure restoration of the Tisa riverside grove and connection of the areals.

Beside the reminiscent riverside grove, the the site where the bridge over Tisa in Tepliţa area of Sighetu Marmaţiei will be built is also occupied by arable lands that are are cultivated with wheat (*Triticum aestivum*), barley (*Hordeum vulgare*), alfalfa (*Medicago sativa*) and annual rape (*Brassica rapa*). In the cultures and in particular at the edge of service roads can be found segetal and ruderal plant associations. Within the crops and especially at the edge of the crops and the exploitation roads can be seen associations ruderal and segetal plants.

Figure 20. Crops in plan location

Figure 21. Periodically mowed grasslands in the plan location

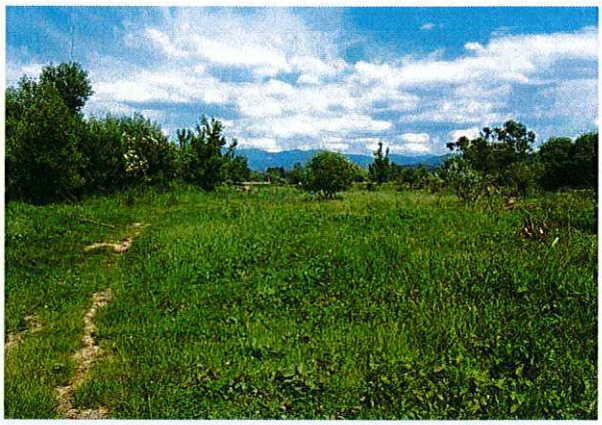



Figure 22. Areas with spontaneous vegetation in the plan location

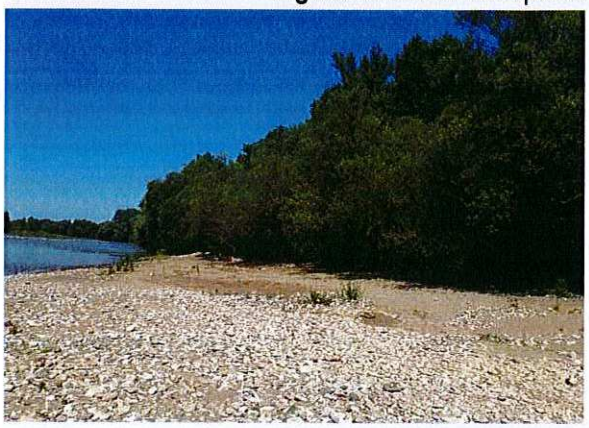
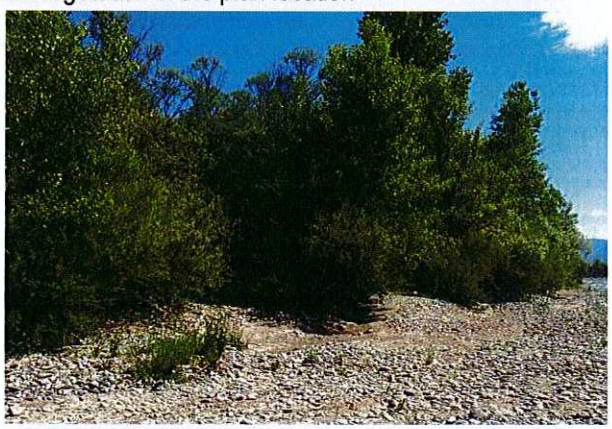



Figure 23. Willow and poplar specimens on Ukrainian border

Figure 24. *Trifolium pratense* and *Leucanthemum vulgare*

Figure 25. *Arctium lappa*

In the areas with spontaneous vegetation from the plan location and its boundaries have been identified the following species: *Alopecurus pratensis* (meadow foxtail), *Poa pratensis* (smooth meadow-grass firuţă), *Poa trivialis* (rough meadow-grass), *Poa annua* (annual meadow grass), *Galega officinalis* (galega), *Lathyrus pratensis* (Meadow pea), *Lotus corniculatus* (Common Bird's-foot Trefoil), *Melilothus officinalis* (yellow sweet clover), *Trifolium hibridum* (clover), *Trifolium pratense* (red clover), *Trifolium repens* (white clover), *Vicia cracca* (bird vetch), *Achillea millefolium* (common yarrow), *Potentila erecta* (common tormentil), *Prunella vulgaris* (common self-heal), *Chelidonium majus* (greater celandine), *Euphorbia cyparissias* (cypress spurge), *Pteridium aquilinium* (common bracken), *Ranunculus acer* (common buttercup), *Arctium lappa* (greater burdock), *Carduus acanthoides* (spiny plumeless thistle), *Onopordon acanthium* (Cotton thistle), *Chrysanthemum leucotus* (chrysanteum), *Echium vulgare* (common viper's

bugloss), *Rumex* sp (curly dock), *Urtica dioica* (stinging nettle), *Verbena officinalis* (common verbena), Carduus nutans (musk thistle), *Convulvulus arvensis* (field bindweed), *Artemisia absinthium* (absinthe wormwood), *Potentilla argentea* (silver cinquefoil), *Capsella bursa-pastoris* (shepherd's-purse), *Hordeum murinum* (wall barley), *Potentilla reptans* (creeping cinquefoil), Ballota nigra (black horehound), *Papaver rhoeas* (corn poppy), *Dianthus charthasianorum* (dianthus), *Campanula* sp. (bellflower), *Crocus vernus* (Dutch crocus), *Erigeron annuus, Erigeron canadensis, Galinsoga parviflora, Myosoton aquaticum, Humulus lupulus, Equisetum telmateia*, Equisetum palustre, Equisetum arvense, *Astragalus glycyphyllos*, Pulmonaria officinalis, *Veronica chamaedrys, Scrophularia nodosa, Glechoma hederacea, Lamium galeobdolon*, Lamium album, *Lolium perenne*, Holcus lanatus, *Calamagrostis epigeios, Dactylis glomerata, Festuca rubra, Agrimonia eupatoria, Medicago sativa*, Epilobium hirsutum, *Lythrum salicaria, Lythrum salicaria, Anthryscus sylvestris, Pimpinella saxifraga*, Angelica sylvestris, *Hypericum maculatum*, Rorippa austriaca, *Echinocystis lobata, Abutilon teophrasti, Lysimachia nummularia, Lysimachia vulgaris, Gypsophila muralis, Silene alba, Rumex crispus, Chenopodium album, Polygonum hydropiper, Polygonum persicaria, Galium mollugo, Galium verum, Dipsacus laciniatus*, Calystegia sepium, *Solanum nigrum, Veronica beccabunga, Linaria vulgaris, Galeopsis ladanum, Scutellaria galericulata, Origanum vulgare*, Lycopus europaeus, *Artemisia campestris*, Tripleurospermum inodorum, *Lactuca serriola, Tussilago farfara, Inula britannica, Leontodon autumnalis*, Tragopogon orientalis, *Centaurea jacea, Tanacetum vulgare, Helianthus tuberosus, Sonchus arvensis*, Senecio vulgaris, Bidens cernua, Alisma plantago-aquatica, Juncus conglomeratus, *Carex vulpina, Carex hirta*, Carex pseudocyperus, *Echinochloa crus-galli*;

Bushes: *Ligustrum vulgare* (wild privet), *Lonicera xylosteum* (Dwarf honeysuckle), *Crataegus monogyna* (common hawthorn), *Sambucus racemosa* (Red Elderberry), *Sambucus nigra* (black elder); *Salix fragilis, Salix purpurea, Malus sylvestris* , *Rubus hirtus, Rosa arvensis, Rosa canina, Cornus sanguine*;

Tree species: *Acer pseudoplatanus* (sycamore maple), *Ulmus glabra* (wych elm), *Salix alba* (European willow), *Populus alba* (silver poplar) and *Robinia pseudoacacia* (black locust), Acer campestre (field maple),

Figure 26. *Salix alba* (willow), *Salix purpurea* (purple willow)

No species of conservative interest or habitats for whose protection was designated the site of community importance ROSCI0251 Tisa Superior has been identified in the site of the plan.