I, the undersigned Blaga Hadzhieva, Personal ID # 7105310010, do hereby certify that the foregoing translation from Bulgarian into English of the attached document is true and correct to the best of my knowledge. The translation comprises 2 (two) pages.

Translator: *Blaga Hadzhieva*

Personal ID # 7105310010

Translation from Bulgarian

Explanatory note

(Structural part)

1. Introduction

This project part specifies the structural dimensions of the corrective walls. Dimensions have been determined based on hydraulic and static calculations considering specific loads. A cross sectional profile was adopted for the concrete support wall with base rein bars for the plinth joint. Hydraulic calculations were employed to determine the riverbed cross section: B=12,0 m and H wall= 1,8 m

2. Corrective walls

The walls differ in length according to the terrain, however they have identical cross section and foundation depth H=1,5 m – on top of gravel base, mixed with large boulders.

Wall No.1 – left side bank /in the direction of flow/ - 35 m long

Wall No.2 – right side bank /in the direction of flow/ - 47 m long

Wall No.3 – right side bank /in the direction of flow/ - 45 m long

The walls have been designed for ground compression force excluding live loads, since there is no new road adjacent to it, and no construction of new roads is intended due to the existing access roads to the river. As per the regulations and provisions of article 41 of the Rules for support walls, H= 4,0 m max, no seismicity design calculations are required.

The static calculations indicate the basic information used to design the walls. The relevant wall dimensions have been shown in the formwork arrangement plan. The base of the wall is B=1,10 m wide, with foundation of gravel and aggregate base following removal of water from the excavation , without substrate concrete. The walls will be made in lamella pattern of 20 m with construction joints in between.

The base shall be accepted by the Engineer as a mandatory requirement.

3. Construction technology

Construction of corrective walls can be subdivided by the following types of works:

- Construction of temporary deviator dyke from the foundation excavations

- Removal of water from the base
- Foundation framework
- Concrete works for foundations
- Formwork, reinforcing steel and formwork removal for the walls
- Backfill behind the walls

Water catchment will be constructed using:

- Concrete grade B20W04 (C16/20)
- Steel AI No.12 – structural and Φ8 distributional

Gabions will be constructed on the levelled riverbed, with depression of 30 cm. on top of the gabions a concrete cover of 20 cm will be made to extend the life of the mesh and to protect the rein bars against robbery of bars from the gabion skeleton.

Statistical calculations

1. Basic details:

- Wall height on top f plinth joint: H=1,80 m
- Backfill height behind the wall: H=1,40 m
- Foundation depth: 1,50 m
- Bulk weight of filler ballast: γ = 19 kN/m3
- Bulk weight of concrete: γ = 24 kN/m3
- Angle of internal friction: Φ=40 deg.
- Cohesion: c=0 deg.
- Variable load (inaccessible bank): q=0 kN/m3
- Allowable stress for ballast substrate: б add.= 4,0 kg/cm2

2. Loads

2.1. Dead load , wall + backfill

$$G_1 = 0.4\text{м} \times 1.80\text{м} \times 24 = 17{,}28 \text{ kN/m'}$$
$$G_2 = ½ \times 0.20\text{м} \times 1.8\text{м} \times 24 = 4{,}32 \text{ kN/m'}$$
$$G_3 = 0.25\text{м} \times 1.40\text{м} \times 19 = 6{,}65 \text{ kN/m'}$$

Total to plinth joint= 28, 25 kN/m3

$$G_4 = 1.10\text{м} \times 1.50\text{м} \times 24 = 39.6 \text{ kN/m'}$$
$$\underline{\text{Общо: } = 67.85 \text{ kN/m'}}$$

TOTAL = 67.85 kN/m

2.2 Ground pressure load for plinth joint: H=1,40 m

Conditions to use the Rankine formula:

- Slope of terrain surface: α =0
- Wall slope: ε= 0
- Angle of attrition between the wall and the soil (embankment): б=0

$$Ka = tg^2(45° - \varphi/2) = 0{,}217$$

$$p_a = \gamma . H . Ka$$

$$Ea = ½ . p_a . H$$

Rankine formula:

$$Eg = \frac{1}{2}\gamma . H^2 tg^2(45 - \frac{1}{2}\varphi) kN/m':$$

Ea = ½ .19,0 .1,40 ² . 0,217 = 4,04 kN/m‘
Mg=1/3. 1,4m .4,04 kN/m‘=1.89kNm/m‘

2.3 Ground pressure load for the mian joint:

H=1,4+1,5=2,9 meters

Ground pressure:

: $Eg = \frac{1}{2}\gamma . H^2 tg^2(45 - \frac{1}{2}\varphi)$ Ea = ½ .19,0 .2,9². 0,217=17,33kN/m‘

Mo=H/3xEg=2,9/3 . 17,33=16,75kNm/m‘

3. Moments of vertical forces

No.	kN/m3	Plinth joint		Main joint	
		Arm [m]	Moment [kNm/m’]	Arm [m]	Moments [kNm/m’]
G1	17,28	0,40	6,91	0,65	11,23
G2	4,32	0,13	0,57	0,38	1,64
G3	6,65	0,73	4,82	0,98	6,48
N central joint= 28,25			M central joint= 12,3		
G4	39,6			0,55	21,78
No. joint =67,85			Mo. joint= 41,13		

4. Design calculations
5. – main joint : No. joint = 67,85 kNm’

M=41,13-16,75 = 24,38 kNm/m‘ b=1.10м
e =M/N=24,38/67,85 =0.36м
c=b/2-0.36=0,19м c= 0,19 m ≥ b/6=0,18м.

F=1. 1,10=1,10 м²
W =1/6 . 1. 1,10² =0,20м ³
σ1 =67,85/1,10 + 67,85. 0,19/0,20 = 61,68+64,45
σ2 =67,85/1,10 - 67,85. 0,19/0,20 = 61,68-64,45

σ1=126,14kN/m²
σ2= - 2,77kN/m²

Tensile zone: $\sigma = 2/3 . N/e==2/3. 67,85/(0,36)=126kN/m^2 = 1,26$ kg/cm2

б=1,26 kg/cm2 <б add. = 4.0 kg/cm2

Plinth joint: N pl.joint= 28,25 kN/

M=: central joint – Mg =12,3 01,89 = 10,41 kNm/m’ b= 0,6 m

eo =M/N=10,41/28,25=0.37м c= b/2-eo=0,6/2-0,37=0,07м.

F=1.0,6=0,6 м²
W =1/6 . 1. 0,60 ² =0,06м ³
σ1 =28,25/0,60 + 28,25 .0,07 /0,06 = 47,08 +32,96= 80,1
σ2 =28,25/0,60 - 28,25 .0,07 /0,06 = 47,08 -32,96= 14,12
σ1=80,1kN/м² → σ max=80,1kN/м²
σ2=14,12kN/ м²

Structural reinforcement will be made via bases of plinth joint 5N 12 /m’

6. Landslide test

M= 0,45 for rock base under water level

G =ΣG=67,85kN/m’
E=ΣEa =17,33 kN/m’
Kхл = ΣG..μ/ΣE = 67,85 .0,45/17,33 = 30,53/17,33 =1,76

Conclusion: the wall is protected against sliding action : K sliding > K base =1,3

7. Capsize test

M retention = 41,13 m’

M capsize=16,75 kNm/m’

K capsize = M retention/M capsize = 41,13/16,75 = 2,46

Conclusion: the wall is protected against capsize K capsize = 2,46> K capsize/base =1,5

Prepared by:

Eng. K. Todorov

Stamp

Signature

I, the undersigned Blaga Hadzhieva, Personal ID # 7105310010, do hereby certify that the foregoing translation from Bulgarian into English of the attached document is true and correct to the best of my knowledge. The translation comprises 5 (five) pages.

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Translation from Bulgarian

Explanatory note

To the Occupational Health and Safety Plan

Project: preventive clearing of the riverbed and reinforcement of the banks of S. Bistritsa River in the common lands of v. Lilyanovo, Sandanski municipality

The Health and Safety Plan for the project has been developed in conformity with:

- The Occupational Health and Safety Act, (amended –Official gazette DV No. 76/ 20.09.2005)
- Regulation No.2 dated 22.03.2004 ref. Minimum requirements for occupational health and safety for construction works, promulgated via DV No.37 dated 04.05.04, effective as from 05.11.2004, and the associated appendices.
- Regulation No. 1-209/22.11.2004 ref. rules and standards for fire safety and accident prevention for operating facilities
- Regulation No. 7 ref. minimum requirements for occupational health and safety and use of professional equipment and tools.
- Regulation No.3 ref. instructions for employees in occupational safety , hygiene and fire prevention