Working Paper

Georgian Water and Power LLC

The results of the visual inspection of water reservoirs located near Chatmi mountain in city Rustavi

Notice to Client #1

Site visit

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1. Introduction

At the request of the Georgian Water and Power Ltd (GWP) Gruner Stucky Caucasus Ltd has carried out the site visit with purpose of visual assessment of the status of water supply reservoirs located in Rustavi city, close to Chatma mountain, operated by GWP.

The joint site visit was carried out on 29th August and 19th September 2024 by Gruner Stucky Caucasus Ltd engineers together with the representatives of GWP.

Based on the site visit findings Gruner Stucky Caucasus Ltd has prepared general assessment of conditions and recommendations of the reservoirs.

2. Site Visit

The site is in the city Rustavi near Chatmi mountain (ID# 02.05.01.383). Three water reservoirs are located within the project area. Water reservoirs No.1 and No.3 are in operation, whereas No.2 is not operational (Figure 2-1). Reservoirs were constructed in previous century, approximately in the period of 1950-1970 years.

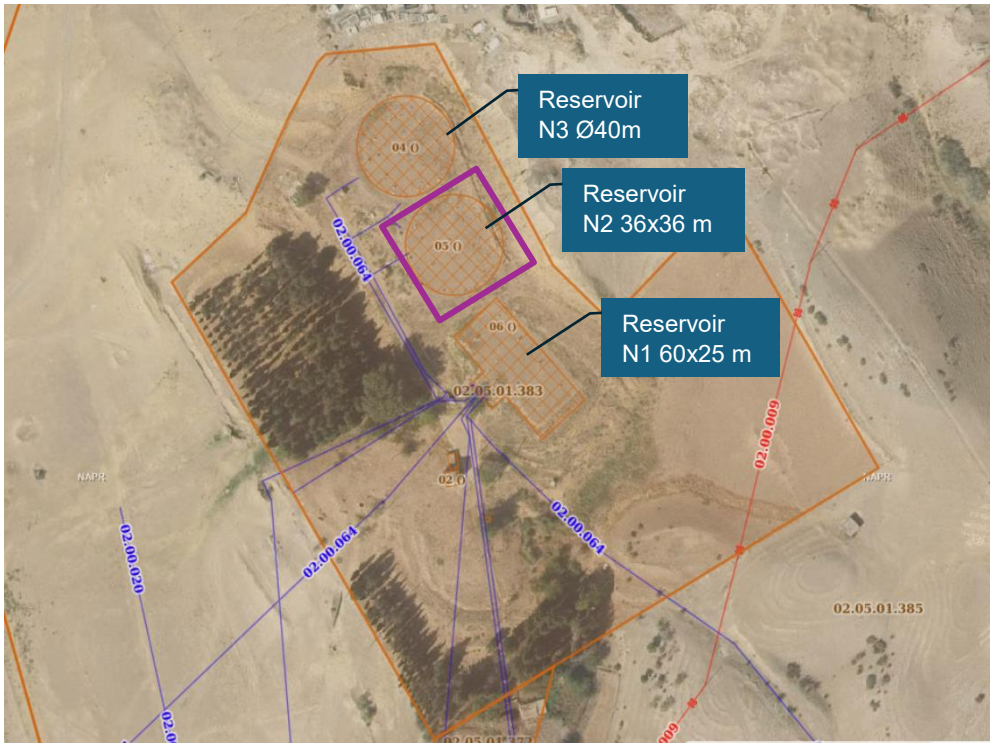

Figure 2-1 Locations of the facilities to be rehabilitated

On 29th August 2024, during the site visit, water reservoirs No.1 and No.3 were in operation (full of drinkable water), therefore only water reservoir No.2 was inspected.

On 19th September 2024, the reservoir No.1 was visually inspected after preliminary emptying and cleaning procedures carried out by GWP personal.

3. Current Conditions

3.1 Water Reservoir No.1

Water Reservoir No.1 (60x25m) represents reinforced concrete structure, including two similar sections. Reinforced concrete columns are arranged in the middle part of the reservoir, which are tied with beams in the upper part. The roof slab, basement and walls represent reinforced concrete structures (Photo 3-1).

Photo 3-1 Water reservoir No.1

Based on visual inspection it was observed that the right section of the reservoir is more damaged than the left. It was also revealed that during previous rehabilitation after opening of cracks reinforcement bars were not damaged and corroded.

Based on the visual inspection the following damages were observed:

1. Cracks has been observed on the walls, beam, roof slab and bottom of the reservoir. The main reason of the water reservoir damages is uneven foundation settlements caused by water infiltration into the soil (Photo 3-2, Photo 3-3 and Photo 3-4).
2. The waterproofing layer is damaged on the inner side of the water reservoir (Photo 3-2)
3. The main drainage pit of the drainage system located behind the water reservoir is damaged and not operational (Photo 3-5).

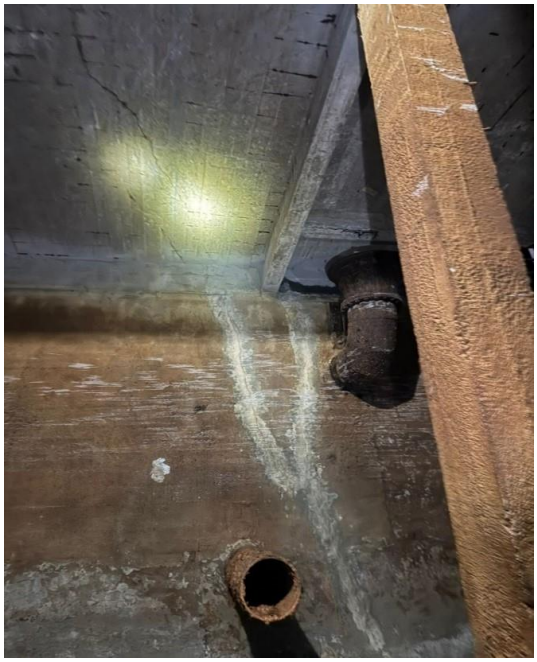

Photo 3-2 Cracks on the walls and roof slab of water reservoir No. 1

Photo 3-3 Crack on the bottom of the water reservoir No. 1

Photo 3-4 Crack on the beam of the water reservoir No 1

Photo 3-5 Damaged drainage well

3.2 Water Reservoir No.2

Water reservoir No.2 (36x36 m) was built with reinforced concrete precast structures, probably according to the typical design ТП 901-4-82c84 (Photo 3-6).

Photo 3-6 Water reservoir No.2

During the visual inspection, the following main damages of the water reservoir were observed:

1. On the precast roofing slabs the stripped off reinforcement bars are seen (Photo 3-7).
2. Cracks are observed on the walls and invert of the water reservoir (Photo 3-8).
3. The waterproofing layer is damaged on the inner side of the water reservoir (Photo 3-9).
4. According to the local engineers information, the Ø300 mm drain pipe of the reservoir is damaged and not operational (Photo 3-10).

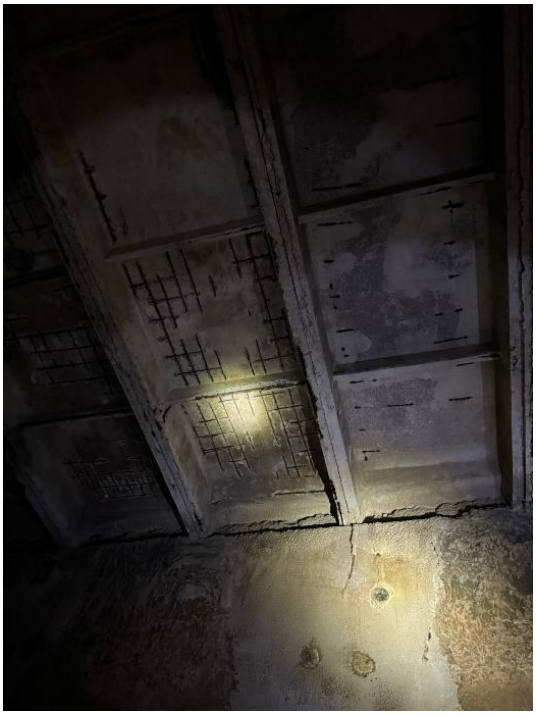

Photo 3-7 Damaged roofing tile of water reservoir No. 2

Photo 3-8 Cracks on the walls of water reservoir No. 2

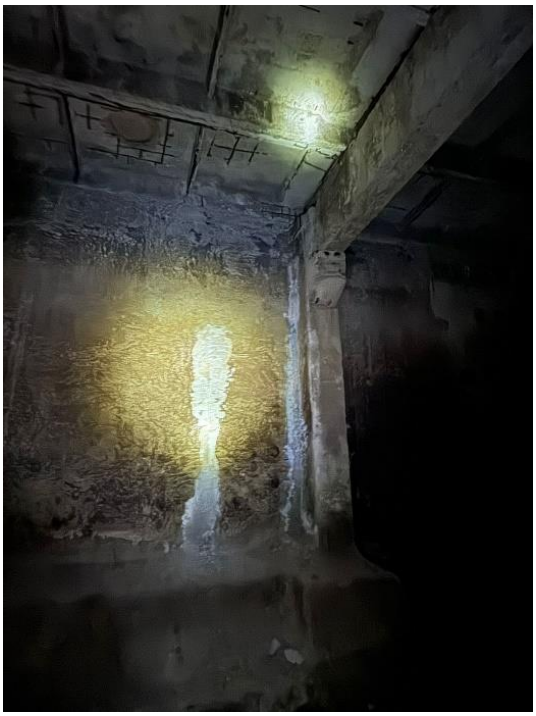

Photo 3-9 Damaged waterproofing layer of the water reservoir No. 2

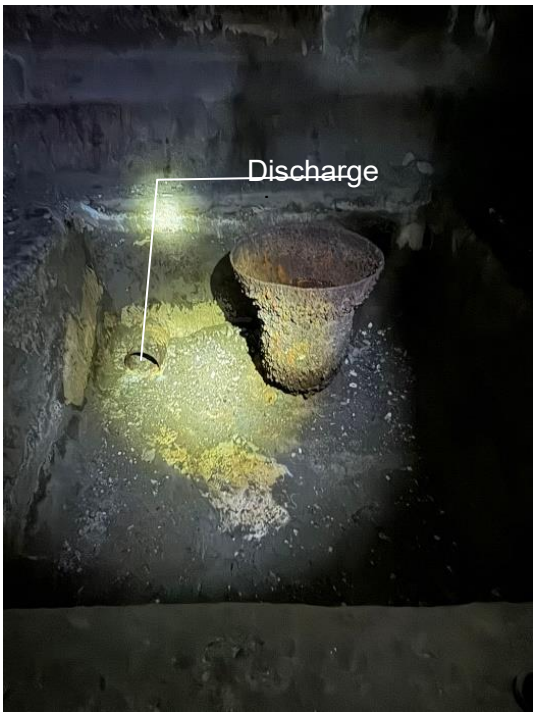

Photo 3-10 Damaged drain pipe of the water reservoir No. 2

4. Conclusions and Recommendations

Based on the site visit findings and visual inspection of the Chatmi water reservoirs the general conclusions are the following:

- Reservoirs are in operation approximately 50-70 years.
- Geotechnical conditions of reservoir's foundations are not known.
- Structural elements of reservoirs are damaged and different type of defects are observed, therefore their operation conditions based on preliminary assessment are not safe and reliable.

Based on above, preliminary recommendations can be proposed for operation of reservoirs in short-term (up to 1-2 years) and medium-term (up to 3-5 years) periods.

The proposed periods are conditional, and their duration can be significantly affected by circumstances, which cannot be identified and fixed during visual inspection (e.g. geotechnical conditions under the foundation, the degree of the corrosion or damage of reinforcement in the load-bearing structures, etc.)

The preliminary recommended remedies for water reservoirs No.1 and No.2 are identical and presented below for each of them.

In terms of long-term operation, it is recommended to construct new reservoirs.

4.1 No.1 water reservoir – short-term approach

1. Cleaning and treatment of the stripped reinforcement bars of reservoir structures with anti-corrosion material.
2. Treatment of cracks on reservoir walls and invert should be carried out according to the dergree of damage and opening width.
3. After the treatment of the cracks, the layer of reinforced mortar should be arranged on the water reservoir invert.
4. A new insulating layer should be arranged on the invert and walls with a waterproofing material, applicable for drinking water reservoirs.
5. To improve the damaged drainage system of water reservoir No.1, it is necessary to replace the damaged well.

4.2 No.1 water reservoir – medium-term approach

1. Due to the water infiltration into the foundation soils, there are uneven settlements of the reservoir foundation. In order to prevent deformations caused by possible subsequent washing of the base soil, grouting works under slab and under foundation,

should be carried out. Prior to plan grouting works, it is necessary to identify reservoir foundation conditions (physical-mechanical characteristics of the foundation soils).

2. To exclude external factors damaging the reservoir, it is necessary to ensure the guaranteed smooth operation of the drainage system.
3. Remedial works described in short-term approaches to be performed.

4.3 No.2 water reservoir – short-term approach

1. Cleaning and treatment of the stripped reinforcement bars of reservoir structures with anti-corrosion material.
2. Treatment of cracks on reservoir walls and invert should be carried out according to the dergree of damage and opening width.
3. After the treatment of the cracks, the layer of reinforced mortan should be arranged on the water reservoir invert.
4. A new insulating layer should be arranged on the invert and walls with a waterproofing material, applicable for drinking water reservoirs.
5. The damaged Ø300 mm drain pipe of the reservoir should be replaced.

4.4 No.2 water reservoir – medium-term approach

1. Due to the water infiltration into the foundation, there are uneven settlements of the reservoir foundation. To prevent deformations caused by possible subsequent washing of the base soil, grouting works under slab and foundation, should be carried out.

   Prior to plan grouting works, it is necessary to identify reservoir foundation conditions (physical-mechanical characteristics of the foundation soils).
2. To exclude external factors damaging the reservoir, it is necessary to ensure the guaranteed smooth operation of the drainage system.
3. Remedial works described in short-term approaches to be performed.

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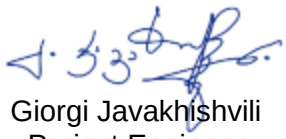

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