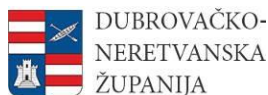


# D.4.1.1 – Development and execution of an ad-hoc infrastructure tank



## Document Control Sheet

<b>Project number:</b>	10044130
<b>Project acronym</b>	WATERCARE
<b>Project Title</b>	Water management solutions for reducing microbial environment impact in coastal areas
<b>Start of the project</b>	01/01/2019
<b>Duration</b>	36 months

<b>Related activity:</b>	4.1 – Implementation of the WQIS in the pilot site to improve the Water Quality Monitoring
<b>Deliverable name:</b>	Development and execution of an ad-hoc infrastructure tank
<b>Type of deliverable</b>	Report
<b>Language</b>	English
<b>Work Package Title</b>	WATERCARE Pilot realization
<b>Work Package number</b>	4
<b>Work Package Leader</b>	ASET SPA

<b>Status</b>	Final
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<b>Version</b>	1
<b>Due date of deliverable</b>	September 2020
<b>Delivery date</b>	June 18 <sup>th</sup> 2021

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# 1. INTRODUCTION

Activity 4.1 aims the construction of a storage tank at the service of the urban waste water network site on the left bank of the stream Arzilla in Fano.

The purpose of the intervention is to solve the problems of bathing waters at the mouth of the stream Arzilla due to the presence of a combined sewer overflow that discharges the waste waters in excess into the river.

Thanks to this infrastructure, the developed WQIS will be fully deployed demonstrating the significant improvement of water quality in bathing water surroundings.

## 2. DESIGN BASIS

Fano is a town located in front of the Adriatic Sea and in summer time any beach is crowded of people and tourists.

The town has mostly a combined sewer system that in case of any intense rain event discharges in the environment by means of overflows the waste water exceeding the system capacity. This happens even in some bathing areas and especially during the summer season when the rain events are shorter but more intense. The consequence is a negative impact on the water quality downstream the overflows outlet and the bathing prohibition near the discharges.

The Arzilla beach (located near the Arzilla river mouth, one of the most important beach of the town) is seriously affected by this problem, because of the vulnerability of the environment and of the number of the people haunting the beach.

The intention of the Municipality government and ASET is to solve the issue in order to mitigate the effects on the marine environment. After a stage of feasibility assessment, the solution has been identified in the construction of a reinforced concrete reservoir with enough capacity to storage the volume of waste water exceeding the sewer system capacity. This will avoid the discharge of polluted water in the river mouth and will allow to treat all the waste water collected by the sewer system.



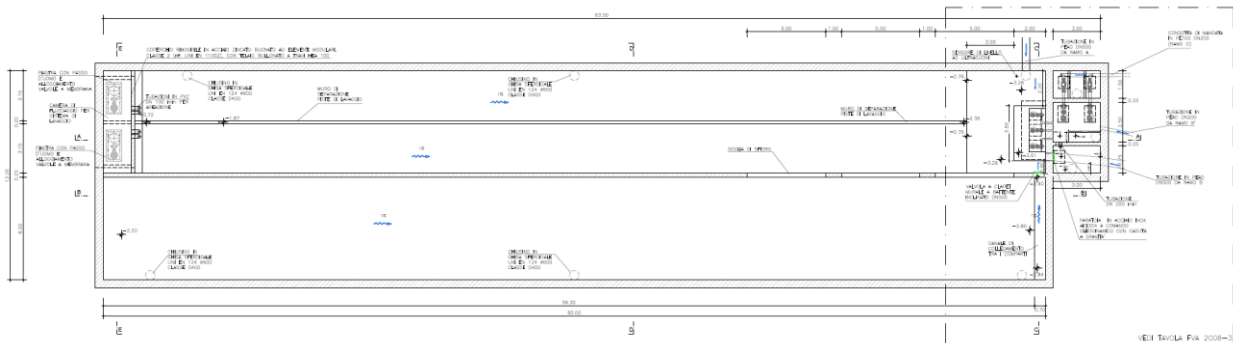
Arzilla river left bank - Existing configuration

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## 3. PROJECT IN DETAIL

The project consists of the construction of the following items:

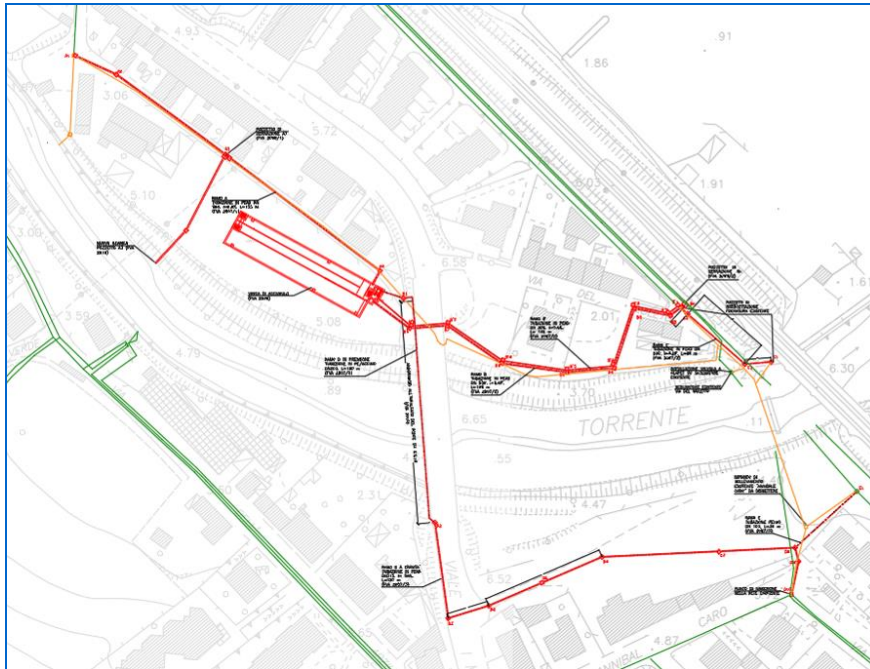
- **A new reinforced concrete underground reservoir with capacity of 1600m<sup>3</sup>;**



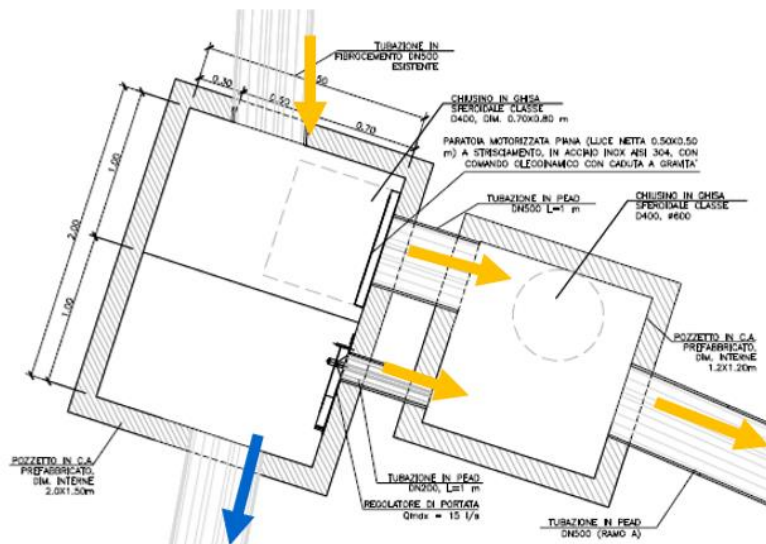
- Nr. 2 sectors each one with 60 m of length and 6.5 m of width;
  - Nr. 3 weirs L = 5 m to allow flow into the 2nd sector;
  - An internal depth: from 2.42 m to 2.96 m;
  - Automatic cleaning system for the reservoir 1st sector
  - Pumping system for emptying the detention reservoir into the pumping station;
  - Pumping station to transfer the waste water to the existing public network;
- **A new waste water system to connect the new r.c. tank and the new pumping station with the existing system:**
    - New pressure pipe DN150: 145m of length;
    - New gravity pipes (DN200/500): 705m of length;

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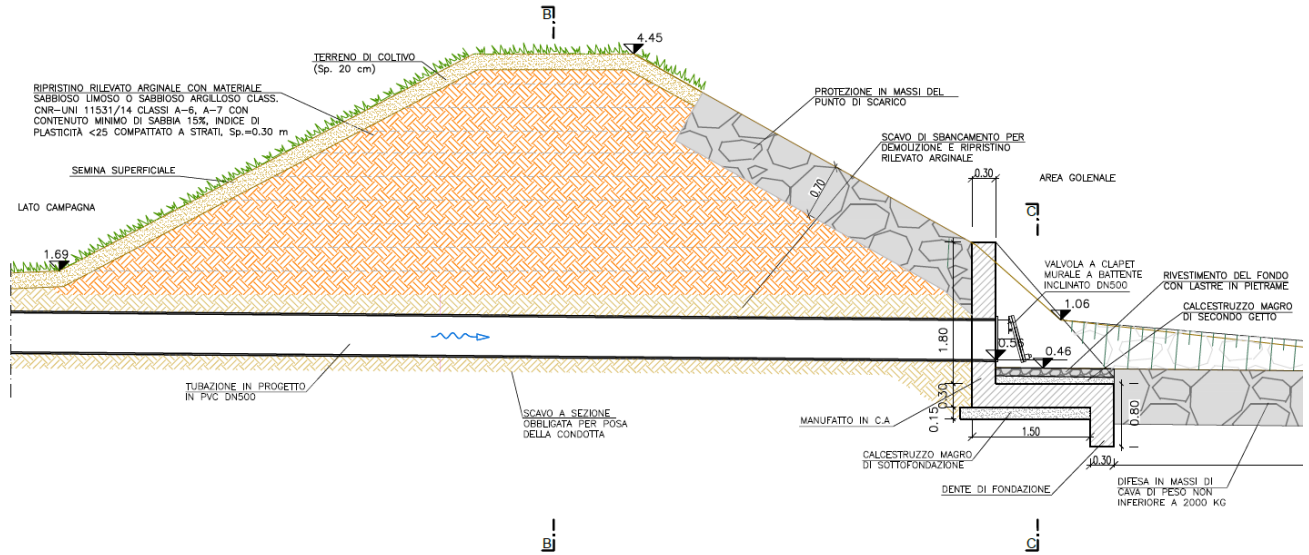


- The refurbishment of the existing overflow and the construction of new one overflow (both with sludge gates) to prevent the excess of tank filling:



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- The construction of a new discharge in the left bank of the Arzilla river.



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## 4. CONSTRUCTION STAGE

The construction works started in autumn 2019 with the unexploded ordnance clearance works, after the project approval (month of May 2019) and Public tender for construction assignment (month of October 2019).



After this first preliminary stage and after getting the approval by the Ministry of the Defence, the works started officially with the site preparation and cleaning and shallow excavation (February 2020):



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After the site preparation works the activities were stopped because of the Covid-19 disease and were restarted with the laying of a first sector of interconnecting pipes (spring 2020).

Contemporarily the provisional retaining wall made of sheet piling was placed (may 2020) to allow the further deep excavation works:



After the sheet piles and well-point system installation the deep excavation works started (up to end of July 2020)



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After the deep excavation, the concrete works started with the cast of the concrete slab (around 1000m<sup>3</sup> of concrete). The concrete cast was done continuously with no interruption in 14 hours (the 24<sup>th</sup> and 25<sup>th</sup> of September 2020, from 10pm to 12am):



Consequently, in the month of October and November 2020 the cast of the vertical walls was arranged:



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After the cast of the vertical walls, the formworks and reinforcement bars for cover slab and pumping station were placed (December 2020):



At the end of January 2021, the concrete works finished:



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The laying of the interconnecting pipes proceeded in parallel. The works were stopped in the month of July, August and September, in fact the roads around the site were very crowded any time because of the bathing season. After the end of the bathing season the activity restarted.

The following picture represents the works for the refurbishment of the existing overflow near the Arzilla river mouth (November 2020):



The last pipe for connecting the existing network with the reservoir was done in the month of March 2021:

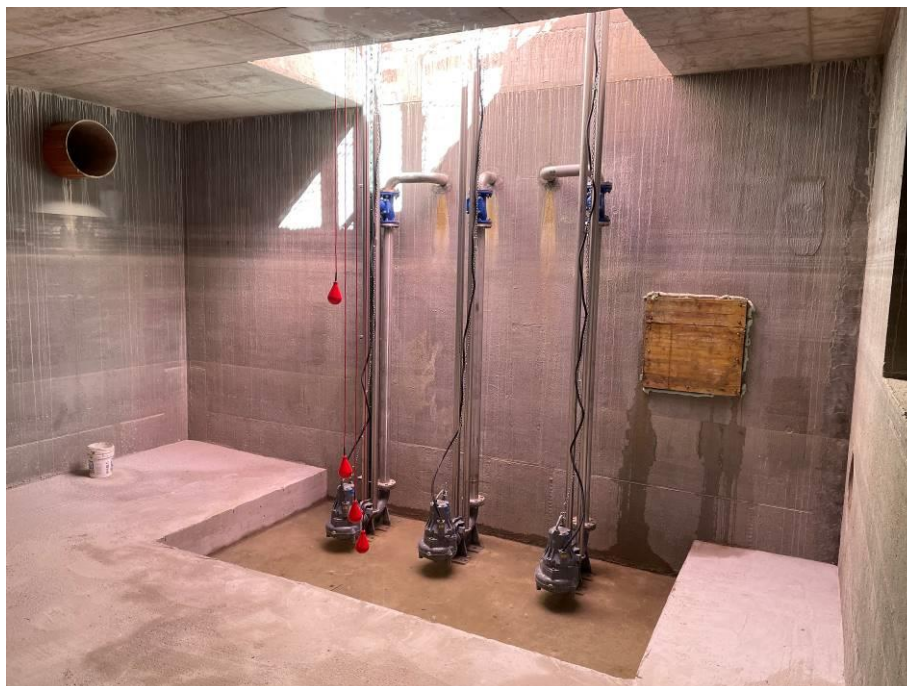


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In the month of March 2021, it was realized also the new safety discharge in the river (to be activated only if the reservoir reaches the full capacity):



After the connection of the pipes with the reservoir, the pumps and the cabinets for power supply and remote control were installed. The picture represents the pumping system for emptying the reservoir:



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The remote control gets information by a level measurement system installed in the reservoir and in case of rain events it understands the filling level. Once the water level in the reservoir gets defined limit values the sludge gates installed inside both sewer overflows (the refurbished one and the new one) closed. An automatic flow regulator allows a minimum flow when the sludge gate is closed:



Lastly, an automatic system cleans the bottom of the 1<sup>st</sup> sector of the reservoir:



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The next picture shows the final status of the area, at the end of the works (June 2021):

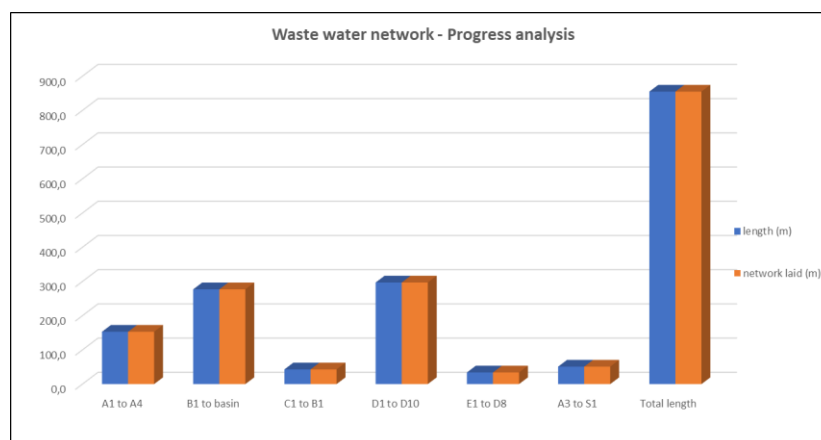
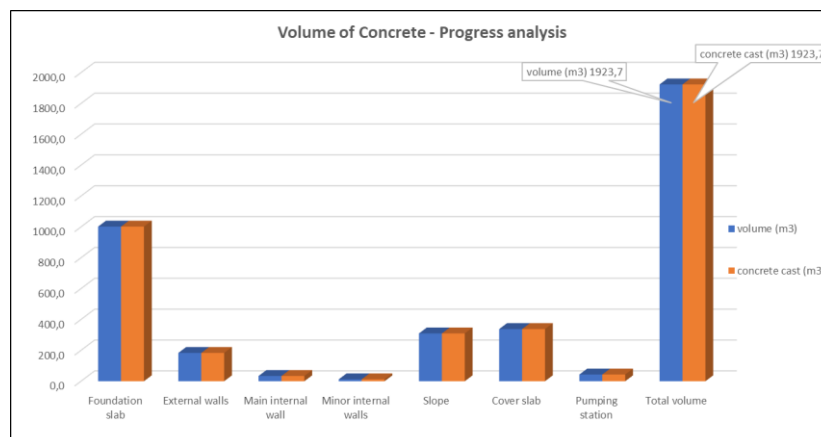


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## 5. RESERVOIR IN NUMBERS

The construction works of the new reservoir and the relevant interconnecting system with the existing sewers requested the movement and the use of an important volume of materials. In detail:

- Excavation and removal of 5000 m<sup>3</sup> of soil;
- Installation of 2000 m<sup>2</sup> of sheet piling for supporting the ground after the deep excavation works;
- Cast of more than 1900 m<sup>3</sup> of concrete (with the continuous cast of around 1000 m<sup>3</sup> in 14 hours);
- Installation of around 18000kg of steel bars for concrete reinforcement;
- Laying of around 850m of new pipes for the interconnecting system;



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## 6. RESERVOIR IN OPERATION STAGE

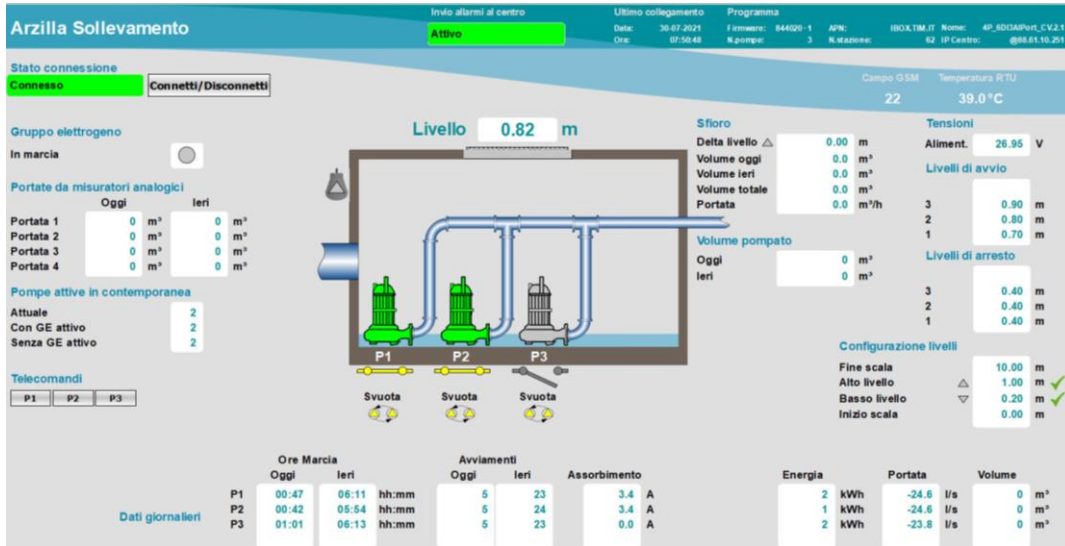
The detention reservoir of the waste water is in operation. The pipes DN500mm coming from both basins are collecting waste water inside the reservoir and the pumping system por emptying the r.c. tank discharges the water in the pumping station placed near the reservoir.

The picture shows the inside of the reservoir: the three pumps, the pipes collecting the water from the basins and the pipe interconnecting the tank sectors:

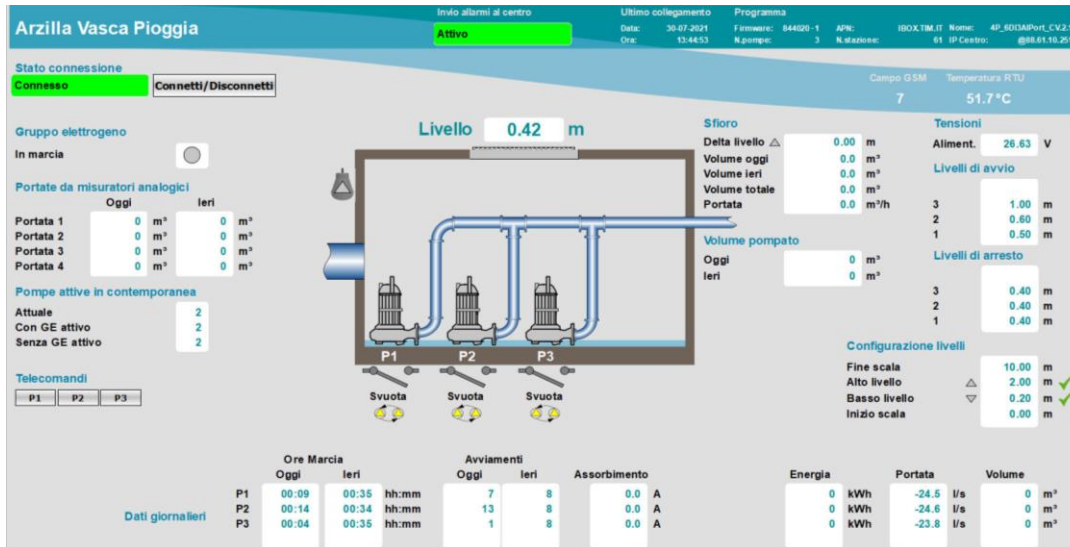


An automatic remote control defines the start/off command for each pump, in each pumping station. The commands are base on the water level inside the tank and inside the pumping station sump.





Remote control of PUMPING STATION



Remote control of PUMPING SYSTEM (emptying the reservoir)

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