

FEATURE OF TECHNICAL SERVICE

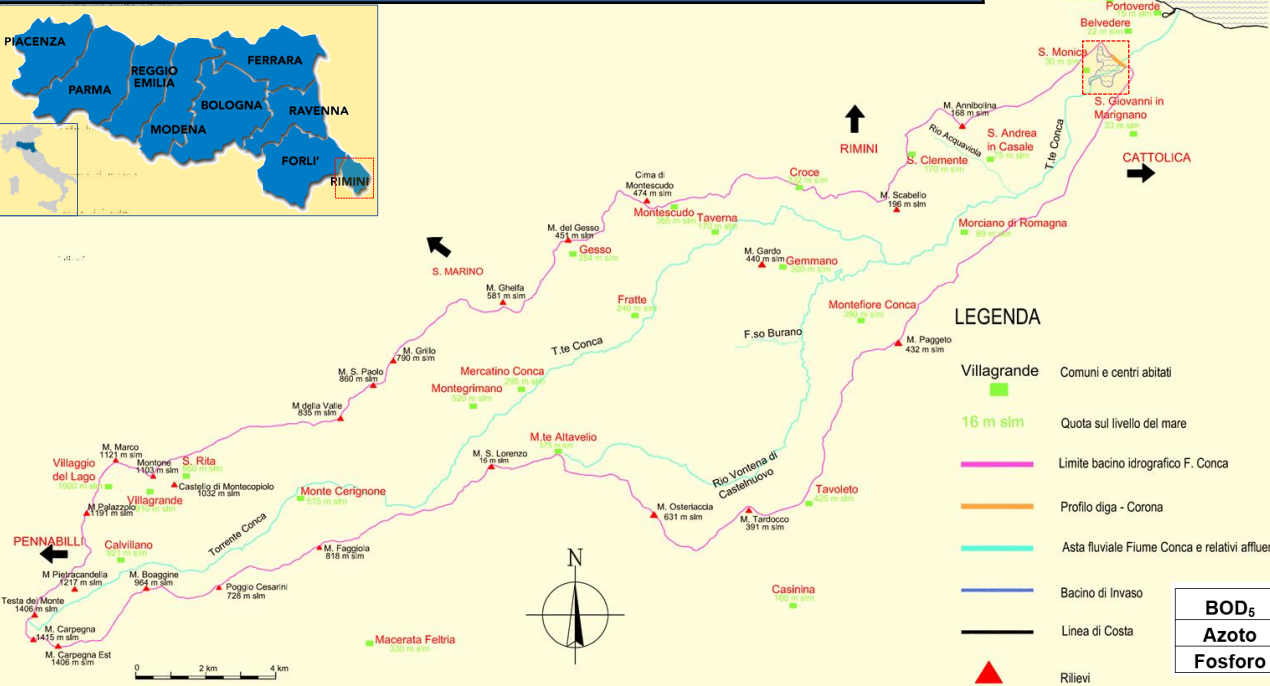
Subject	Management project of the reservoir «Diga del Conca» according to the instructions of Ministerial Decree 30 june 2004, under Article 40 Comma 2 of D.L. 11 may 1999 N.152
Carried out by	SGAI Srl di E. Forlani & C.
Client	HERA S.p.A.
Service length	2005

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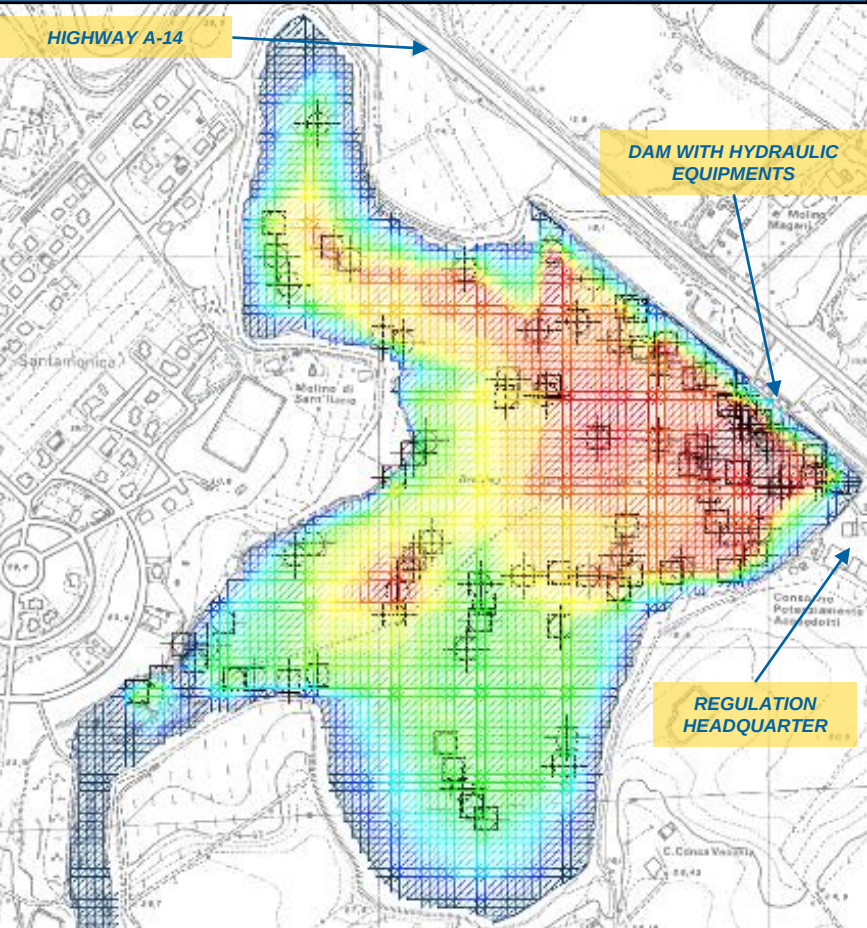
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Watersheds tributary to the Conca River reservoir



Plan view and elevation of the reservoir «Diga Conca»



View of the reservoir «Diga Conca»



RESERVOIR «DIGA DEL CONCA» – Investigation stage, characterisation of the reservoir and sedimentation process

The reservoir «Diga del Conca» is located in the province of Rimini, between the municipalities of San Giovanni in Marignano and Misano Adriatico. The basin has been designed to perform two functions: recharge of groundwater and water supply with the treatment of the storage water. According to the disposal of the Ministerial Decree 30 June 2004, an accurate study of the basin, dam and hydraulic equipments was carried out, thanks to define the **forecast framework of the management and maintenance activities** to carry out for ensure the **maintenance and gradual restoration of the useful capacity of the reservoir**, ensuring the operation of the discharge and catchment systems in all operation conditions.

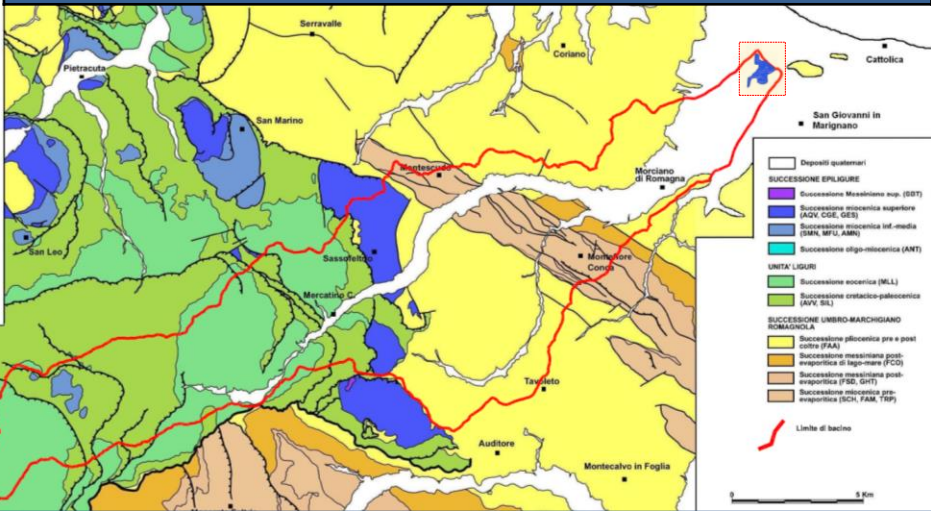
The design approach consists on the realization of accurate research and studies of geology-geotechnical, hydrological, hydraulic, environmental and structural, based on both the data collected from previous projects and those obtained from the new investigation campaigns (surveys, measurements and tests). Analyzing the geological and geomorphological framework present in the reservoir of the Conca River, it was found that the presence of predominantly clay soils characterized by a **high erodibility** for an extension equal to 65% of the basin, while those with **medium erodibility** occupy 22% and those with **low erodibility** only 13%. Therefore, the amount of material resulting from the ablation of superficial soils is in the order of 80,000m³/year. From the comparison of the granulometric analysis, obtained from sediment samples collected on several occasions in subsequent survey campaigns (1979, 2002 and 2005), they showed similar values with limo prevalence (50-67.5%), Clay (26.7-45%) Sands (5.2%). All this explains the formation of a **substantial deposit in the basin**, of about 8,000-10,000m³/year, due to the solid transport sedimented in the May-October period of closure of the hydraulic regulation system.

To reconstruct the geometry of the basin and assess the degree of sedimentation was realized the **three-dimensional model of the surface of the reservoir bed**, based on historical projects and surveys carried out on the site. In this way, the useful capacity of the basin has been estimated, considering the high level of the dam amounting to 17.1 m. Since the reservoir is located near the Adriatic sea, in a strongly urbanized context typical of the Rimini Riviera, the **impact of anthropogenic activities on the quality of the overgrown waters**, which are used to meet the peaks of summer water demand, has been assessed. Therefore, analyses were carried out on timely and widespread loads due to anthropogenic activities such as: household sewage, industrial discharges and full citizen dischargers. In detail, the parameters were monitored are the following: **BOD₅, Nitrogen, Phosphorus** and the presence of **heavy metals**.

Water quality analysis

Puntuali						Diffusi	Totale
Depuratori (t/anno)	Reti non deporate (t/anno)	Carico ecced. (t/anno)	Scaricatori di piena (t/anno)	Industria (t/anno)	Totale puntuale (t/anno)	(t/anno)	(t/anno)
13.2	0.0	9.1	21.3	0.0	43.6	45.6	89.2
6.3	0.0	1.9	2.3	0.0	10.5	84.3	94.8
0.7	0.0	0.3	0.7	0.0	1.7	28.0	29.7

Geologic map of the Conca River reservoir

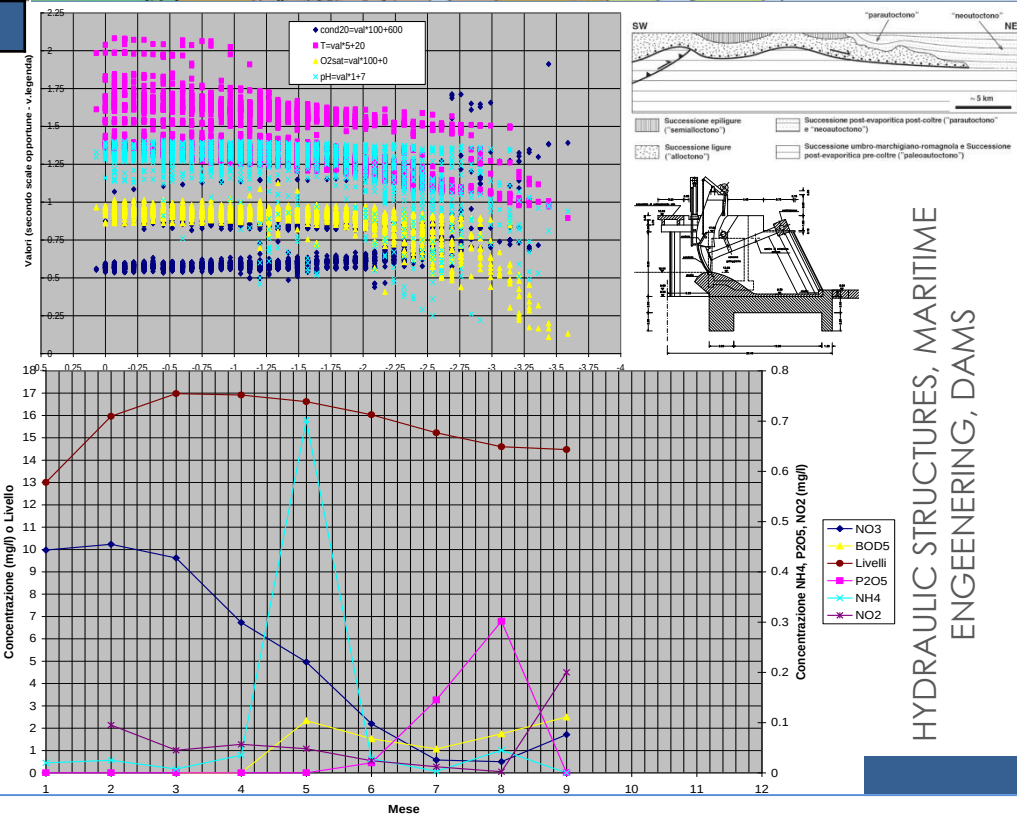
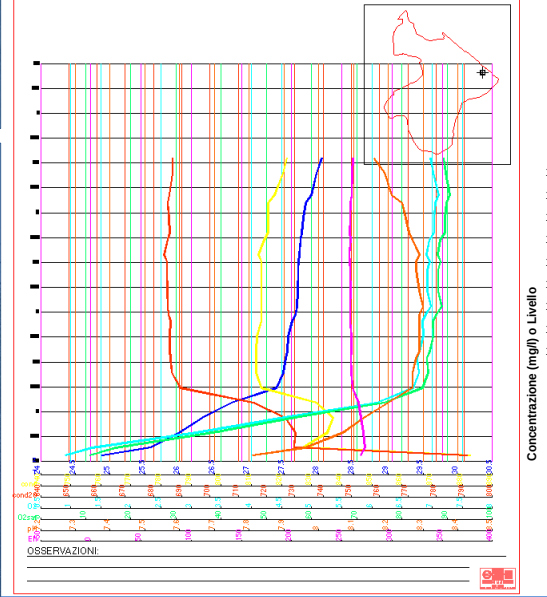


Sedimented material analysis

COMMITTENTE: S.I.S. spa DATA: _____
COMMESSA: 02 020 - Invaso del Conca
INTESTAZIONE: Studio Qualità delle Acque di Invaso

PROVE E RILIEVI ESTERNI - LOGS	
POSIZIONE (U.T.M. Eur50 - Fuso 33)	

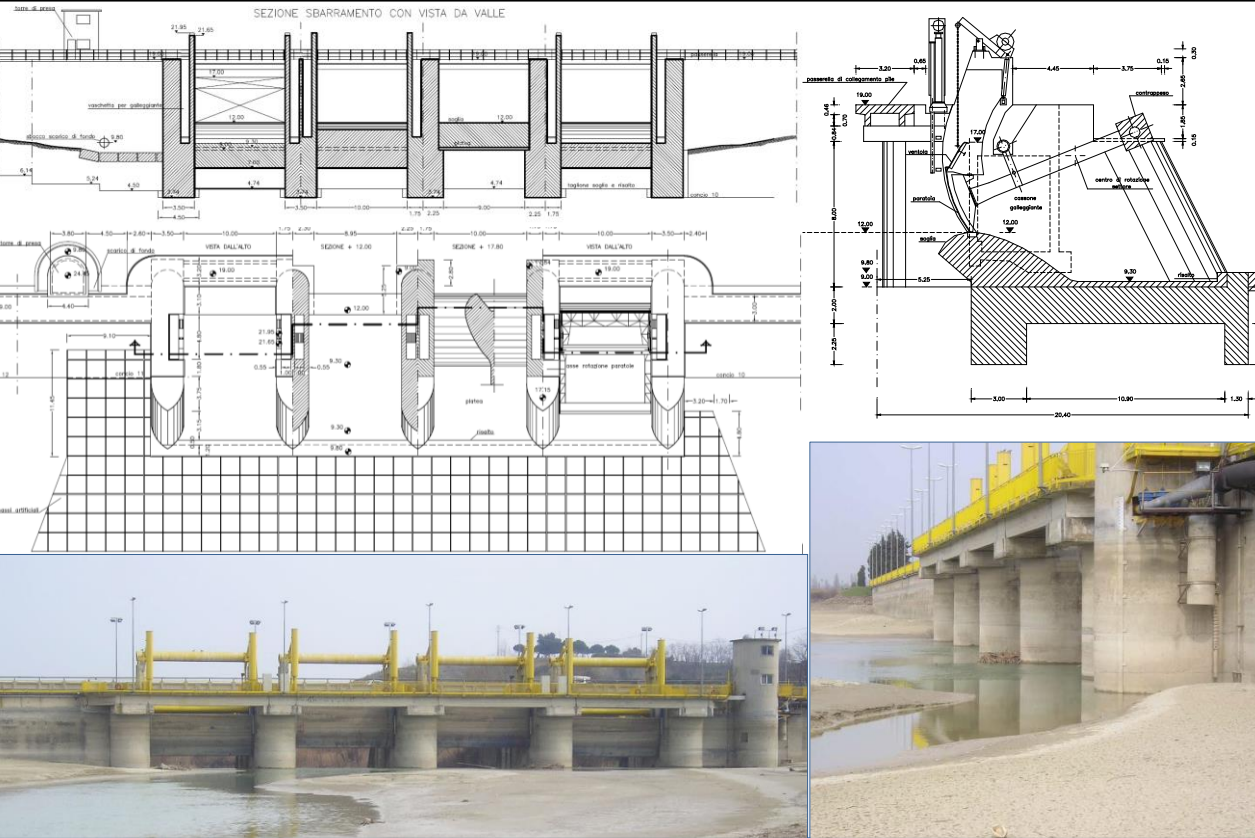
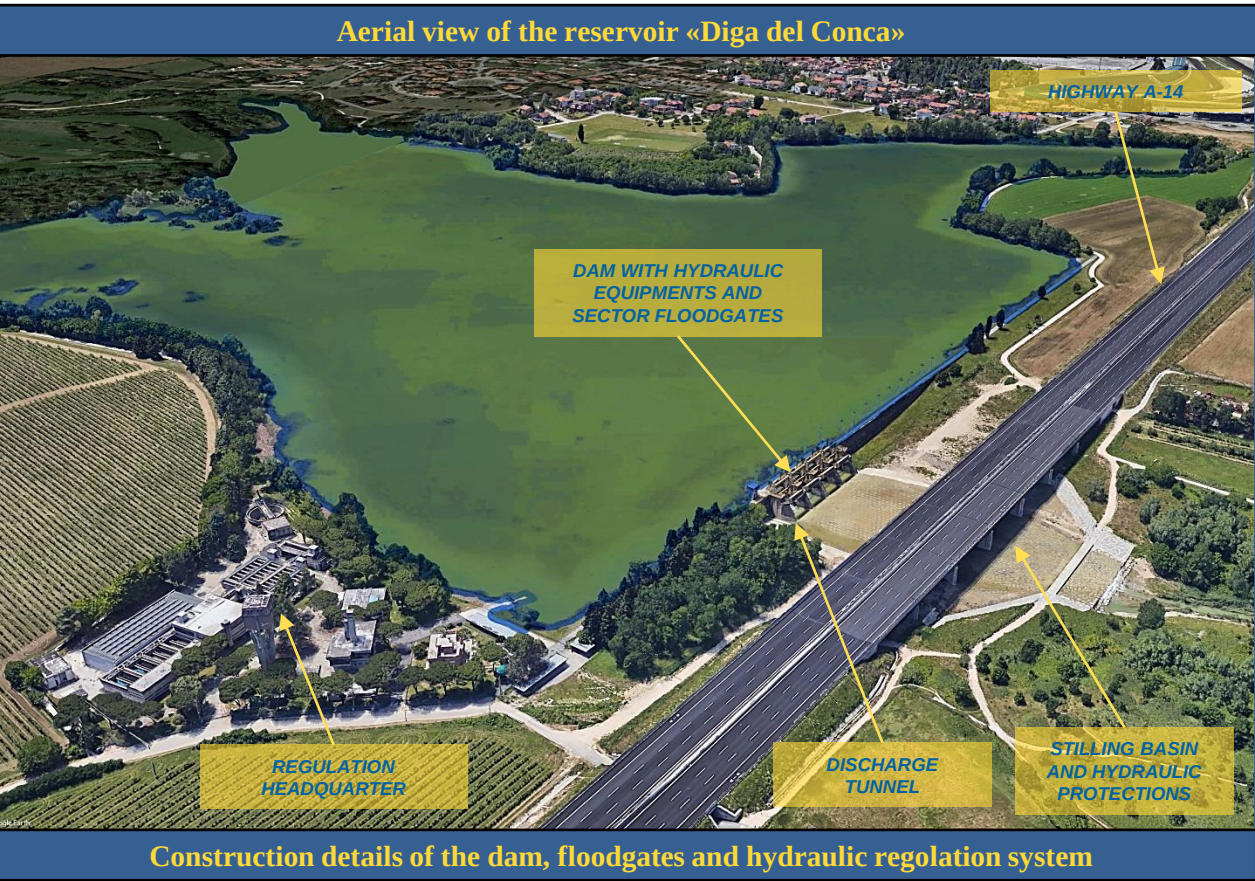
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HYDRAULIC STRUCTURES, MARITIME ENGINEERING, DAMS

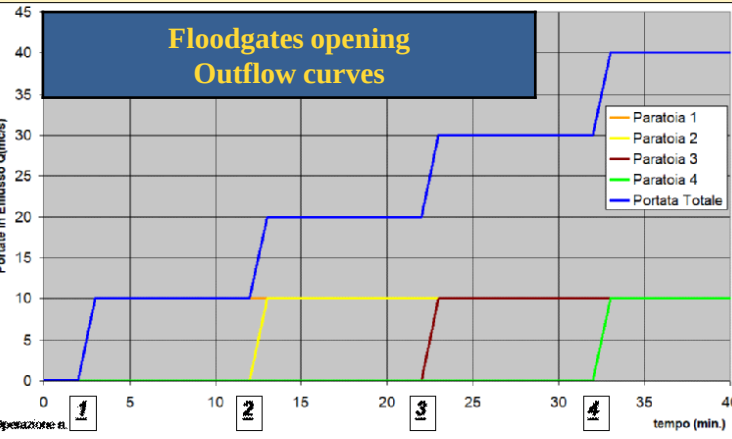
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RESERVOIR «DIGA DEL CONCA» – Management project of the basin, design issues and their resolution

Management project of a reservoir, according to the instructions of the Ministerial Decree 30 june 2004, consists of the preventive definition of the **management and maintenance procedures to carry out for ensure the maintenance and gradual restoration of the useful capacity of the basin**, while limiting the effects, related to the outflow of muddy waters, in the river bed downstream of the dam. In order to define the procedures for opening the discharge system, for each of these, it is necessary to **establish the permissible turbidity curves** by estimating the movement of sedimented material at the site of the floodgates, based on the typical speeds of runoff water. In detail, the Conca dam is equipped with the following hydraulic equipment: surface drain and discharge tunnel. The surface drain consists of a mobile crossbar of the massive gravity type, with 4 rectangular lights of 10m manned by metal floodgates to the sector over the top by fans. These are operated sequentially, by floating bins from the altitude of 17.0m above the altitude of 12.0m above sea level. The discharge tunnel, located on the hydrographic right at the outlet tower, consists of a circular concrete pipe DN1000. The water discharge tunnel takes place on the right hydrographic to the side of the sink tank of the mobile crossbar. The hydraulic regulation system of the dam allow to perform: draw-off, mud removing and purging. Such operations allow the total or partial emptying of the basin, moving the material near the bottom discharge or along the entire reservoir, thus requiring control of the levels of turbidity before, during and after the maneuvers. According to the Conca Dam Grant Disciplinary, these activities are carried out annually at the end of October at the end of the May-October closing period. In order to limit the levels of turbidity, especially in the initial phase, it is necessary to modulate the opening of the discharge tunnel, having initially operated the floodgates (to release the accumulation of sediments at the end of these) controlling the released water flows (dilution 4:1). For the discharge tunnel, in 25 minutes, the total solid volume transported downstream is equal to 13-14m³, for a volume of released water equal to 7500m³. From the calculations, it has been noted that already with 10m³/s partial opening of the floodgates and considering the technical opening times, the peaks of turbidity for each individual floodgate do not add up, allowing the culling of the turbidity in safe conditions by minimising the effects on the receptor body. In general, the opening of the floodgates and the discharge tunnel, in addition to the already treated disposal operations, can take place: for maintenance, flood events, verification of the functionality of the hydraulic regulation system and minimal outflow.



SOGGIE DI ATTENZIONE	Valore Massimo Orario	Valore Massimo nella media 4ore	Valore Massimo nella Media giornaliera
Operazione di MANUTENZIONE	12'000 mg/l	5'000 mg/l	-
Operazione di SVASO		5000 mg/l	
Operazione di SPURGO	50000 mg/l	20000 mg/l	32'500 mg/l
VALORI MASSIMI	Valore Massimo Orario	Valore Massimo nella media 4ore	Valore Massimo nella Media giornaliera
Operazione di MANUTENZIONE	25'000 mg/l	10'000 mg/l	-
Operazione di SVASO		10'000 mg/l	
Operazione di SPURGO	100'000 mg/l	40'000 mg/l	6'500 mg/l

