

# WATER TREATMENT

COMPANY PROFILE AND  
STATEMENT OF CAPABILITIES 2023



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# 1 Company Profile

## About TECHNITAL

### *Description*

TECHNITAL is a private joint stock company established more than 50 years ago (in 1964) and is one of the oldest engineering consultancy companies in Italy. Thanks to its high level of expertise, its dynamic nature and versatility, management autonomy and efficiency and its sophisticated hardware equipment and software libraries, the Company has been awarded large scale international and national projects by major public and private entities and by international funding organizations.

TECHNITAL's headquarters are situated in Verona, Italy. The organization abroad includes 16 between branches and subsidiaries in Algeria, Armenia, Bosnia & Herzegovina, Croatia, Djibouti, Georgia, India, Iraq, Kenya, Kosovo, Qatar, Tanzania, Trinidad & Tobago, Tunisia, Uruguay and Zambia and a number of local offices which is continuously changing according to the on-going international projects (at the moment there are 4 local site offices).

### *Services*

TECHNITAL is a dynamic company whose sectors of activity cover transport infrastructure (roads and motorways, railways, inland waterways, urban transport, ports and airports), hydraulics (water treatment and desalination plants, dams, aqueducts, sewerage systems, waste water treatment), maritime and coastal engineering, environment, energy (incineration and waste to energy plants, hydroelectric plants, solar plants, biogas plants), waste treatment (recycling plants, dump sites), buildings, architecture and urban planning.

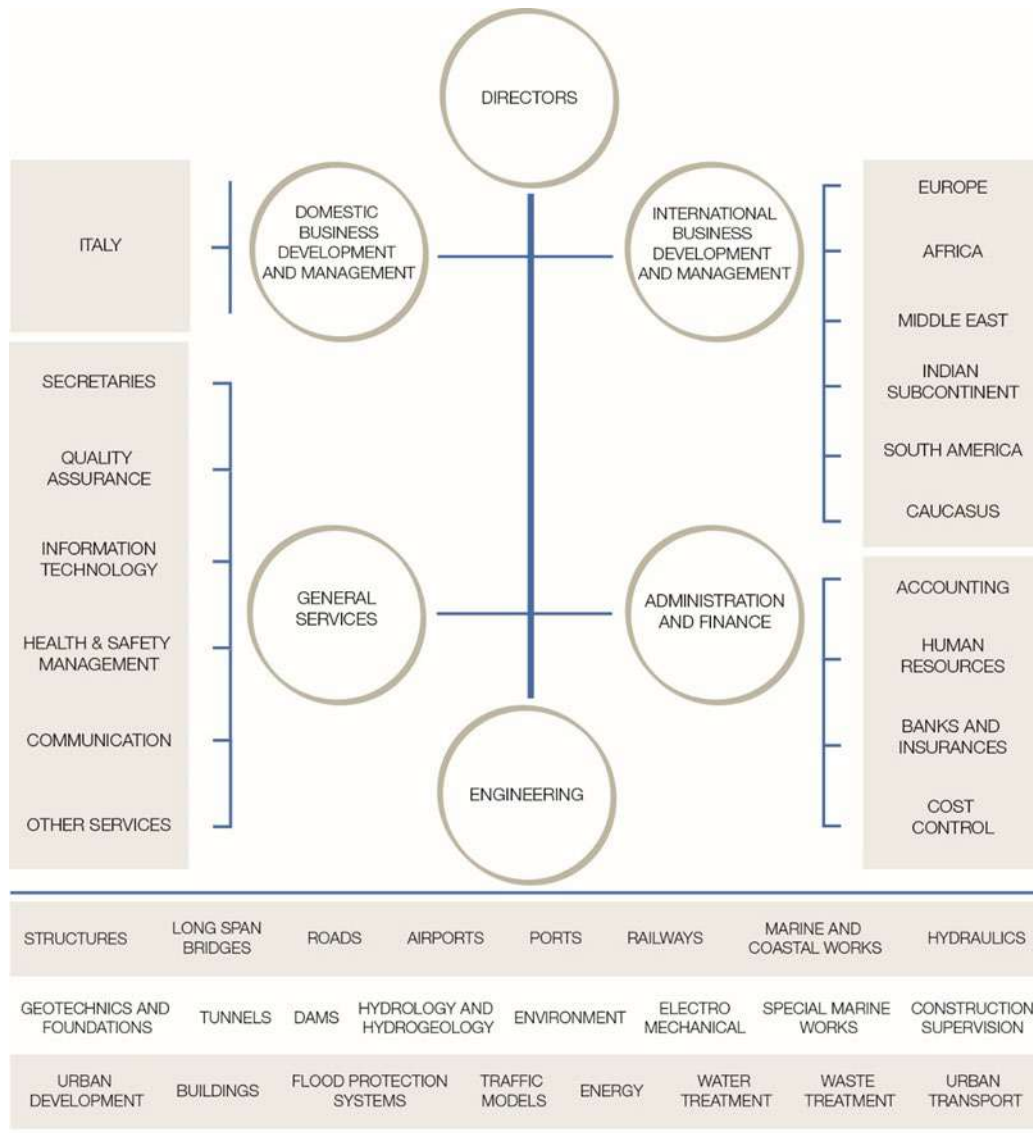
The company covers the full range of services, from planning and feasibility studies through to detailed design, works supervision and technical assistance:

- } project management
- } planning and economic-financial evaluation of investments
- } feasibility studies and technical-economic evaluations
- } all levels of design
- } environmental impact assessment and studies
- } traffic studies
- } procurement and assistance with tenders
- } construction supervision, quality assurance, testing and commissioning
- } co-ordination and supervision of research and laboratory tests
- } development of hydrodynamic and hydrogeological analysis and simulations
- } development and application of analysis methods and computer modelling.

TECHNITAL has worked in several countries world-wide: Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Bahamas, Benin, Bolivia, Bosnia & Herzegovina, Brazil, Bulgaria, Burkina Faso, Burundi, Cayman Islands, Colombia, Croatia, Cuba, Cyprus, Czech Republic, Democratic Republic of the Congo, Djibouti, Dominican Republic, Egypt, Ethiopia, Georgia, Germany, Ghana, Greece, Guatemala, Hungary, India, Iraq, Italy, Jordan, Kenya, Libya, Madagascar, Malawi, Malaysia, Mali, Mauritania, Monaco, Montenegro, Mozambique, Nicaragua, Niger, Norway, Panama, Peru, Poland, Qatar, Republic of Haiti, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Slovenia, Somalia, Spain, Sudan, Syria, Tanzania, Togo, Trinidad & Tobago, Turkey, Uganda, Ukraine, U.A.E., United Kingdom, U.S.A., Uruguay, Venezuela, Yemen, Zambia.

*Organization and staffing*

TECHNITAL's multidisciplinary staff is organized according to the following chart:



**TECHNITAL's multidisciplinary staff includes about 250 professional employees covering the various aspects of the engineering services:** Transport, Hydraulics, Geotechnical, Marine & Coastal, Environmental Studies & Territorial Analysis, Structures, Electronic Data Processing & Systems Analysis, Quantity Surveying & Cost Estimation, Electromechanics, BIM/CAD/CAE, Works Supervision, etc.

Whenever required for the solution of specific problems, the home group is integrated by external consultants and specialists, both Italian and foreign. Seeking assistance and advice from colleagues, scientists, and academics throughout the world is part of TECHNITAL's policy of aiming for excellence.

Given the firm's considerable international experience, TECHNITAL's staff are perfectly at ease working in the main international languages (English, French, Spanish) and using international engineering codes (BS, ASTM, AASHTO, ASME, API and the like) and contract conditions (FIDIC and others).

### *Quality control*

TECHNITAL's activity is ISO 9001:2015 Quality System Management certified. The company is also certified ISO 14001: 2015 Environmental Quality Management, ISO 45001:2018 Occupational Health and Safety Management System and SA 8000:2014 Social Accountability Management System.

TECHNITAL has developed a company policy regarding quality control which is constantly being updated and applied, taking into account the costs to be sustained to achieve the objectives of quality and maximum benefit for both the Company and the Client. Thanks to its Quality Control System, TECHNITAL is capable of guaranteeing the quality of its services and of ensuring the Client that these services satisfy the required quality standards.

### *Code of Ethics*

Ethical and responsible decision making is very important for the company in terms of risk management and in order to keep actions within the ethical and legal boundaries.

For that reason, the company is adopting a Code of Ethics (available from the web site of the company) and conduct for its Executives and Directors and for all the Employees able to fulfil requirements for responsible decision taking. Such code aims at reducing the possibility of stepping outside behavioral limits set by the company.

The Code of Ethics the company is adopting also meets the Organization, Management and Control Model pursuant to Italian Legislative Decree n. 231/2001.

*Sectors of Specialization*

TECHNITAL provides high-quality consultancy services in different areas of specialization: Roads and Motorways, Railways and Urban Transport, Airports, Ports and Waterways, Marine and Coastal Engineering, Environmental Engineering, Urban Planning, Buildings and Architecture, Hydraulic Engineering, Water Treatment, Waste Treatment, Energy.

In each of these sectors, TECHNITAL provides innovative project solutions to Government Agencies, International Financial Institutions and Private Sector Organizations.

Services provided by TECHNITAL include master plans, feasibility studies, techno-economical evaluations, traffic studies, mathematical and physical modeling, all phases of design from concept to detailed design, environmental impact studies and monitoring plans, tender document preparation and assistance in the procurement of works, construction supervision.



## 2 Our Experience

### Experience in Water Treatment

TECHNITAL's activities in the field of water treatment engineering cover a broad range of treatment technologies related to water potabilisation, storm water treatment, used water treatment to re-use of the treated water for agricultural and industrial purposes.

In this sector, TECHNITAL, counting on its consistent multidisciplinary operative structure and its technical and electronic equipment, has successfully undertaken and completed some important and difficult projects, both in Italy and abroad, particularly where the identification of the best technical-technological solution required the use of experienced experts of different complementary disciplines.

The group of highly specialized engineers can in fact be supported by experts and senior engineers with specific know-how in the following fields:

- } hydrology;
- } geology and hydrogeology;
- } geotechnics;
- } topographical surveying and mapping;
- } ecology;
- } agriculture and soil science;
- } mathematical modeling;
- } computerized graphic simulations;
- } quantity computation and cost estimates.

The services provided in this field include, among others: hydrological studies; geological and geotechnical studies; field measurements and monitoring; optimization of resources; preliminary, basic and final design of structures; feasibility studies and cost/benefit analysis; environmental impact assessment; cost estimates; technical specifications and Tender Documents; construction supervision and management.

In the specific field of the waste water treatment, Technital has developed a very deep experience related both to the design of new waste water treatment plants and to the upgrade of existing plants. In effects, it is known that the waste water treatment technology is quickly developing and upgrading and, as a consequence, the skills of the plants are to be upgraded too. The experience of Technital was gained primarily on new plants in Italy, since the early 80's, and has gradually developed abroad.

Such experience includes: traditional plants, compact plants, three-stage systems, covered plants, potabilisation plants. More in details the experience refers the following aspects wastewater pre-treatment systems (pumping stations, screening, grit and oil removal, primary settling), biological treatment (activated sludge, alternating cycles, bio filtration, mass adherent such as bio disk, trickling filters, moving bed / MBBR, membrane such as MBR), tertiary treatment (clariflocculation, filtration, disinfection), sludge treatment (thickening, aerobic and anaerobic digestion, dewatering, drying), recovery of biogas (gas engines), odour treatment (wet and dry). With regards potabilisation, clariflocculation, gravity and pressure filtration on sand filters or on coal-water, our experience has focussed on intake and outfall structures, reactors for clariflocculation, filtration by gravity or pressure on sand or coal filters, disinfection and collection and recovery tanks or nets, as well as of the treatment of the sludge produced.



The company has recently successfully designed also some plants based on MBR technology.

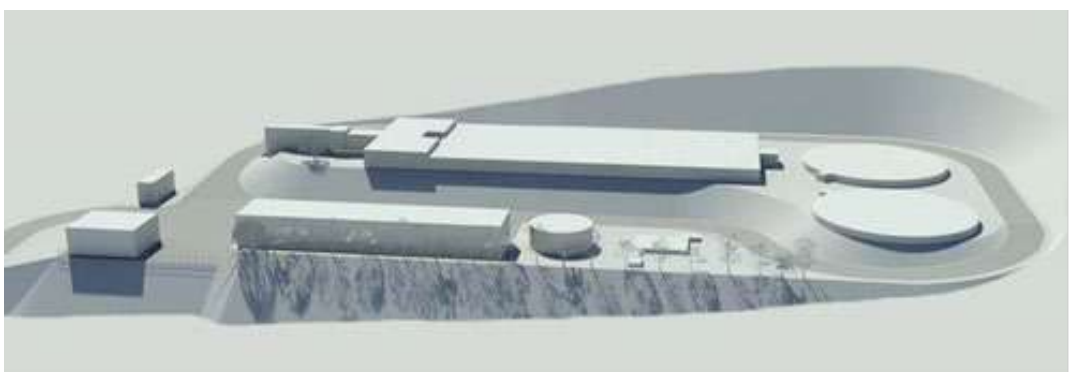
Here below some picture of the implemented plants is shown.

**Enlargement and upgrading of the wastewater treatment plant of Rozzano (Milan):** Rozzano wastewater treatment plant serves a population equivalent of 95,000 inhabitants. The project concerns the upgrade of a traditional activated sludge plant with anaerobic digestion of sludge and biogas recovery, through the use of MBR technology.



*Rozzano (Milan) wastewater treatment plant*

**Foul sewerage network in the town of Todi and new wastewater treatment plant in Porchiano -Todi (Perugia):** Porchiano wastewater treatment plant with biological treatment with activated sludge.



*Porchiano waste water treatment plant*



**Preliminary and Detailed Design of the Wastewater Treatment System of Ganvié (Benin):**

The project "Reinventing the Lake City of Ganvié" is part of the Government's action plan as one of the top priority projects of Benin in the tourism sector. Nowadays, the city of Ganvié consists mainly of stilted houses on the lake Nokoué with a population of around 37.000 inhabitants. The human presence together with presence of animal farms has generated serious conditions of pollution of the water of the lake (brackish water as the lake is in communication with the sea) which has led to deplorable hygienic conditions affecting fishing and touristic activities. The project's objective is the identification of a wastewater collection and treatment system with reference to the future scenario with a resident population of 73.000 inhabitants plus the tourist population fluctuating around 11.000 people.



*Wastewater Collection System and Treatment Plant in Ganvié – Benin*

**Enhancement of the Consortium water treatment plant and related collectors and distribution conduits at Priolo:** Upgrade of the tertiary treatment of industrial development through filters sand self-washing facility and reverse osmosis of the Priolo (Syracuse) potable water treatment plant.



*Priolo (Syracusa) drinking water treatment plant*

**Savona waste water treatment plant: deodorization plant following the connection to the Finale Ligure area:** Finale Ligure (Savona) deodorization plant for 16,000 mc / h of air scrubber with dual-stage air treatment deriving from the local pre-treatment and mechanical dehydration processes.



*Finale Ligure (Savona) wastewater treatment plant: deodorization plant*

**Wastewater treatment plant of Borgo Padova (Treviso): integration of the filtration and disinfection processes:** Castelfranco Veneto (Padua) wastewater treatment plant: filtration through canvas discs and disinfection plant facility with UV.



*Castelfranco Veneto (Padua) wastewater treatment plant: filtration and disinfection plant*

**Enhancement of the Savona Area wastewater treatment plant:** Savona wastewater treatment plant, which includes an ultraviolet rays disinfection plant with a flow rate of 5,400 m<sup>3</sup> / h placed downstream of a tertiary treatment with canvas filtration discs.



*Savona wastewater treatment plant.*

**Works for upgrading the Borgomanero wastewater treatment (Novara):** Borgomanero (Novara) wastewater treatment plant serving a population equivalent of 23,000 inhabitants, with nitrification tanks and aerobic digestion of the traditional activated sludge plant.



*Borgomanero (Novara) wastewater treatment plant*

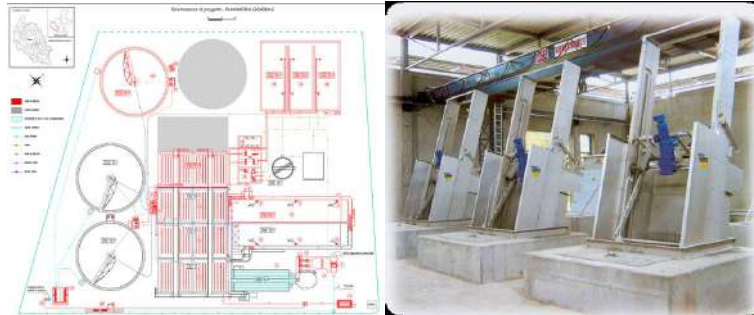
**Upgrading works of Mottola Wastewater Treatment Plant in Taranto:** Mottola (Taranto) wastewater treatment plant serving a population equivalent of 17,000 inhabitants. The plant is an activated sludge type with pretreatment, treatment of the sludge with anaerobic digestion and biogas reuse.



*Mottola (Taranto) wastewater treatment plant*



**Optimization and upgrading of the wastewater treatment plant in S. Giovanni Lupatoto (Verona):** San Giovanni Lupatoto (Verona) wastewater treatment plant serving a population equivalent of 50,000 inhabitants, including a sub vertical automatic screening section planned as pretreatment of the activated sludge with biological treatment of denitrification and nitrification;



*San Giovanni Lupatoto (Verona) waste water treatment plant-*

**Ischia wastewater treatment plant – Campania:** Ischia and Barano (Naples) wastewater treatment plant serving a population equivalent of 60,000 inhabitants, built on a gallery consisting of pretreatment structures, biological mass adherent MBBR plant, sludge treatment with aerobic digestion and air deodorization based on wet chemical treatment and bio filtration.



*Ischia and Barano (Naples) wastewater treatment plant.*

**Enlargement of the wastewater treatment plant of Cesano Boscone, Corsico, Buccinasco and Assago municipalities (Milan):** Cesano Boscone, Corsico, Buccinasco and Assago (Milan) wastewater treatment plant serving a population equivalent of 165,000 inhabitants. The project regards the upgrade and renovation of the existing plant with the introduction in the organic sector of a denitrification and nitrification phase and of an MBR sector to replace the final decanting phase. The project includes the replacement of the anaerobic sludge treatment with an aerobic digestion treatment, mechanical pre-thickening, and spin dry dewatering.



*Cesano Boscone, Corsico, Buccinasco and Assago (Milan) wastewater treatment plant*

**Upgrading and enhancement of the clarification and conditioning plant and related distribution conduits at Megara:** Megara (Syracuse) potabilisation water plant. The project includes the upgrade of the existing water treatment plant consisting of the phases of flocculation, filtration, gravity, sand, sludge treatment which in turn includes the phases of gravity thickening and mechanical dewatering.



*Megara (Syracuse) potabilisation plant*

The most recent projects carried out in this field are illustrated more fully in the following tables and project sheets.

TABLE A – COMPANY'S EXPERIENCE (For titles in **bold** type see project sheets in Appendix A)

PROJECT	CLIENT	PERIOD		ACTIVITIES	COST OF SERVICES €	COST OF WORKS €
		FROM	TO			
<b>WASTE WATER TREATMENT PLANTS</b>						
Flue Gas Line for the Bio-platform in Sesto San Giovanni (Milan) – Italy	Cap Holding S.p.A.	09/2021	Ongoing	Detailed Design	52,740	4,823,385
Wastewater Treatment Plant for the Municipality of Benevento – Italy	CdC Commissario Straordinario Depurazione Benevento	11/2020	Ongoing	Preliminary Design, Detailed Design	414,075	22,350,000
Wastewater Treatment Plant serving the municipalities of Forio d'Ischia and Serrara Fontana – Italy	National Commissioner for Water Treatment	06/2019	Ongoing	Preliminary Design, Detailed Design	886,047	39,121,000
Technological and functional upgrade works in the "Astico" wastewater treatment plant located in Thiene (Vicenza) – Italy	Alto Vicentino Servizi SpA	08/2015	Ongoing	Preliminary Design Final Design, Works Supervision	280,070	5,220,000
Detailed Design of the bio-platform in Sesto San Giovanni (Milan) – Italy	Cap Holding S.p.A.	05/2021	01/2023	Detailed Design	443,248	37,665,215
<b>Preliminary and Detailed Design of the Wastewater Collection System and Treatment Plant in Ganvié – Benin</b>	Agence Nationale de promotion des Patrimoines et de développement du Tourisme (ANPT) - Benin	11/2020	03/2022	Preliminary Design, Detailed Design, ESIA, Tender Documents	1,215,000	22,600,000
<b>Engineering Design Services for Wastewater Reclamation Facility for Phase 1 Konza Techno City – Kenya</b>	KoTDA (Konza Technopolis Development Authority)	08/2018	05/2020	Concept/Preliminary, Detailed and Final Design	255,430	23,000,000
<b>Upgrade works on the wastewater treatment plant that serves the territory of Castro (Lecce) – Italy</b>	Acquedotto Pugliese SpA – Bari	02/2016	03/2020	Final and Detailed Design	84,417	3,764,802
<b>Upgrade works on the wastewater treatment plant that serves the territory of San Severo (Foggia) – Italy</b>	Acquedotto Pugliese SpA – Bari	02/2016	12/2019	Final and Detailed Design	109,320	5,144,103



PROJECT	CLIENT	PERIOD		ACTIVITIES	COST OF SERVICES €	COST OF WORKS €
		FROM	TO			
Upgrade works on the wastewater treatment plant that serves the territory of San Ferdinando di Puglia – Italy	Acquedotto Pugliese SpA – Bari	02/2016	12/2019	Final and Detailed Design	62,239	2,494,559
New Wastewater treatment plant of Barga and part of sewerage system - Italy	Gaia Servizi Idrici	11/2016	04/2019	Preliminary and Final Design	132,747	5,023,387
<b>Sewage Network and Waste Water Treatment Plant in Vicenza - Italy</b>	Viacqua S.p.A.	09/2015	09/2017	Detailed Design, Environmental Studies	1,269,000	75,965,000
Strengthening, updating and improvement of the Caselle Landi purification plant - Italy	SAL s.r.l. – Società Acqua Lodigiana	05/2014	03/2017	Final and Detailed Design	38,365	436,000
Adaptation and upgrade of the Alessandria Orti Water Treatment Plant - Lot 1 (water treatment) and Lot 2 (sludge treatment) - Italy	AMAG S.p.A.	12/2015	09/2016	Preliminary, Final and Detailed Design; EIA	133,420	3,600,000
Membrane biological reactor – Naples – Italy	Naples Port Authority	01/2012	12/2015	Preliminary and Final Design	120,000	4,673,790
Construction of an underwater outfall of treated wastewater in the municipalities of Bisceglie, Corato, Molfetta, Ruvo and Terlizzi in Torre Calderino - Italy	Igeco Costruzioni S.p.A.	09/2014	10/2014	Final Design	35,000	11,773,005
<b>Enlargement and upgrading of the wastewater treatment plant of Rozzano (Milan) – Lombardy, Italy</b>	Tutela Ambientale Sud Milanese Spa, Noverasco di Opera, Milan	07/2005	11/2013	Preliminary Design, EIA, Works Supervision	381,206	14,214,700
Big project “La Bandiera Blu del Litorale Domitio” – Italy	Casertana Costruzioni S.r.l., Qatar Costruzioni S.r.l.	07/2013	10/2013	Detailed Design	70,000	19,900,000
Novara Wastewater Treatment Plant – Italy	Acqua Novara VCO S.p.A.	09/2011	09/2013	Works Supervision	45,323	4,101,917
Sewerage and wastewater treatment system in the Locride area – Reggio Calabria, Italy	Costruzioni Dondi S.p.A.	08/2012	09/2012	Preliminary Design	40,000	18,333,000

PROJECT	CLIENT	PERIOD		ACTIVITIES	COST OF SERVICES €	COST OF WORKS €
		FROM	TO			
Completion of the Sewerage Network Scheme and Upgrading of the existing Wastewater Treatment Plant In Civita Castellana - Italy	Talete S.p.A.	05/2012	09/2012	Final Design	59,479	3,798,087
Optimization and upgrading of the wastewater treatment plant in S. Giovanni Lupatoto (Verona) – Italy	Acque S.c.a.r.l.	11/2008	03/2012	Preliminary and Final Design	200,000	3,958,000
Foul sewerage network around Lake Trasimeno and upgrading of the existing wastewater treatment plant in Castiglione del Lago (Perugia) – Italy	Umbracque S.p.A. (Local water authority)	04/2010	05/2010	Preliminary Design	54,000	5,534,001
Foul sewerage network in the town of Todi and new wastewater treatment plant in Porchiano -Todi (Perugia) – Italy	Umbracque S.p.A. (regional water authority)	02/2010	03/2010	Final Design	40,000	5,577,779
Storm water treatment plant for the coal-deposit quay of Vado Ligure harbour (Savona) - Italy	Savona Port Authority	10/2008	02/2009	Detailed Design	50,000	1,619,000
Upgrading works of various Wastewater Treatment Plants in Taranto – Italy <ul style="list-style-type: none"> <li>▪ Taranto Gennarini</li> <li>▪ Mottola</li> <li>▪ Castellaneta</li> <li>▪ Crispiano</li> <li>▪ Faggiano</li> <li>▪ Grottaglie-Montelasi</li> <li>▪ Laterza</li> <li>▪ Lizzano – Fragano – S.Marzano</li> <li>▪ Massafra</li> <li>▪ Palagianello</li> <li>▪ San Giorgio Jonico</li> <li>▪ Palagiano</li> </ul>	Acquedotto Pugliese S.p.A.	10/2007	05/2008	Preliminary Design, Environmental Study	252,870	34,006,138

PROJECT	CLIENT	PERIOD		ACTIVITIES	COST OF SERVICES €	COST OF WORKS €
		FROM	TO			
<b>Restoration of the urban infrastructures of certain islands in Venice lagoon – Italy</b>	<i>Venezia Nuova</i> Consortium for Ministry of Public Works – Water Board – Venice	09/1999	12/2007	Preliminary and Detailed Design	1,230,000	31,500,000
Wastewater and stormwater sewerage network for the island of Lazzaretto Vecchio – Venice – Italy	Venezia Nuova Consortium for Ministry of Public Works – Water Board – Venice	09/1995	12/2007	Preliminary, Final and Detailed Design	179,500	5,021,900
<b>Enhancement of the Savona Area wastewater treatment plant – Liguria, Italy</b>	Consorzio per la Depurazione delle Acque di Scarico	10/2003	01/2007	Final and Detailed Design, EIA, Works Supervision	166,500	2,780,000
<b>Wastewater treatment plant of Salvatronda (Treviso): integration of the filtration and disinfection processes – Veneto, Italy</b>	Municipality of Castelfranco Veneto (Treviso)	01/2004	11/2006	Preliminary and Final Design, Works Supervision	70,500	841,941
<b>Wastewater treatment plant of the island of S. Erasmo (Venice) – Italy</b>	<i>Venezia Nuova</i> Consortium for Ministry of Public Works – Water Board – Venice	07/2004	09/2006	Preliminary, Final and Detailed Design	120,000	3,300,700
<b>Savona waste water treatment plant: deodorization plant following the connection to the Finale Ligure area – Italy</b>	Municipality fo Finale Ligure	07/2003	01/2006	Final and Detailed Design, Works Supervision	20,000	130,500
<b>Waste water treatment plant for the municipalities of S. Agnello, Piano di Sorrento, Meta di Sorrento and Vico Equense (Naples) – Campania, Italy</b>	SLED SpA (Contractor) on behalf of the Government Office for Waste Emergency, Reclamation and Protection of Water in Campania Region	11/2004	12/2004	Detailed Design	45,000	41,057,844
<b>Completion and Upgrading of the Wastewater Treatment Plant of Rozzano (Milan) – Lombardy, Italy</b>	Tutela Ambientale Sud Milanese Spa, Noverasco di Opera, Milan	10/2002	08/2003	Preliminary Design and Final Design	32,400	2,363,300



PROJECT	CLIENT	PERIOD		ACTIVITIES	COST OF SERVICES €	COST OF WORKS €
		FROM	TO			
<b>Ischia wastewater treatment plant – Campania, Italy</b>	SLED SpA (Contractor) on behalf of the Government Office for Waste Emergency, Reclamation and Protection of Water in Campania Region	09/2002	03/2003	Detailed Design	258,000	15,369,434
<b>Enhancement of the waste water treatment plant of Dorgali – Cala Gonone (Nuoro) – Sardinia, Italy</b>	Municipality of Dorgali (Nuoro)	05/1999	05/2002	Final and Detailed Design, Works Supervision	120,000	1,207,950
Phyto-depuration treatment plant of the island of Lazzaretto Nuovo (Venice) – Italy	Venezia Nuova Consortium for Ministry of Public Works – Water Board – Venice	01/1996	12/1997	Detailed Design	108,400	n.a.
<b>INDUSTRIAL WASTE WATER TREATMENT PLANTS</b>						
Waste Water treatment plant of Al Faw – Iraq	Ministry of Transportation of the Republic of Iraq	11/2013	10/2015	Final Design and Tender Documents	120,000	3,051,320
<b>Treatment plant for dredged sediment from the Arno River drainage channel- Province of Pisa- Italy</b>	Pisa Provincial Authority - Land Protection Service	10/2012	01/2013	Detailed Design, EIA	120,000	8,879,300
Assago Waste Water Treatment Plant – Italy	Cap Holding S.p.A.	07/2005	09/2010	Preliminary Design, EIA,	186,780	19,600,000
Adaptation and modernization of wastewater treatment of the industrial area of Ottana - Italy	SIBA SpA	09/2009	10/2009	Final and Detailed Design	20,000	2,651,046
<b>Works for upgrading the Borgomanero wastewater treatment (Novara) – Piedmont, Italy</b>	Municipality of Borgomanero (Novara)	01/2000	04/2007	Preliminary, Final and Detailed Design; Works Supervision	302,000	1,909,994
<b>Wastewater treatment plant of Borgo Padova (Treviso): integration of the filtration and disinfection processes – Italy</b>	Municipality of Castelfranco Veneto (Treviso)	01/2004	11/2006	Preliminary and Final Design, Works Supervision	39,540	470,189

PROJECT	CLIENT	PERIOD		ACTIVITIES	COST OF SERVICES €	COST OF WORKS €
		FROM	TO			
<b>"Cassis" wastewater treatment plant deodorization plant–Porto Torres, Sardinia – Italy</b>	Province of Sassari	06/2003	09/2003	Preliminary and Final Design	51,400	1,483,339
<b>Enlargement of the wastewater treatment plant of Cesano Boscone, Corsico, Buccinasco and Assago municipalities (Milan) - Italy</b>	Tutela Ambientale Sud Milanese Spa Noverasco di Opera, Milan	01/2002	08/2003	Preliminary and Final Design	n.a.	2,647,000
<b>Wastewater treatment plant of the Sub-District No. 2 (Sarno River Basin) – Campania, Italy</b>	Prefecture of Naples, Delegate Prefect, former Premier Ordinance Sarno	05/1998	12/2001	Final and Detailed Design, EIA, Works Supervision	1,092,700	39,681,130
<b>POTABILISATION and DESALINATION PLANTS</b>						
Construction Supervision Services for Water supply Treatment Plant and network for Phase 1 Konza Techno City - Kenya	KoTDA (Konza Technopolis Development Authority)	08/2018	Ongoing	Works Supervision	2,516,000	41,000,000
<b>Engineering Design Services for Water supply Treatment Plant and network for Phase 1 Konza Techno City - Kenya</b>	KoTDA (Konza Technopolis Development Authority)	08/2018	07/2021	Concept/Preliminary, Detailed Design	1,177,740	41,000,000
Rehabilitation of the Potabilizer of Boara Polesine – Italy	Acque Venete	03/2020	10/2020	Detailed Design	271,643	693,921
Al Faw Desalination Plant – Iraq	Ministry of Transportation of the Republic of Iraq	11/2013	10/2015	Final Design and Tender Documents	200,000	4,970,000
<b>Upgrading and enhancement of the clarification and conditioning plant and related distribution conduits at Megara – Sicily, Italy</b>	SLED SpA (Contractor) on behalf of the Office of the Delegate Commissioner for Water Emergency – Palermo	01/2004	12/2004	Detailed Design, EIA	53,200	6,269,000
<b>Enhancement of the Consortium water treatment plant and related collectors and distribution conduits at Priolo – Sicily, Italy</b>	SLED SpA (Contractor) on behalf of the Office of the Delegate Commissioner for Water Emergency – Palermo	07/2004	09/2004	Detailed Design, EIA	87,000	10,320,000

## Appendix A – Company’s Experience



## Waste Water Treatment Plants

# PRELIMINARY AND DETAILED DESIGN OF THE WASTEWATER TREATMENT SYSTEM OF GANVIÉ

Location:	Ganvié (Sô-Ava), Benin
Client:	ANPT (Agence Nationale de promotion des Patrimoines et de développement du Tourisme)
Services:	Preliminary Technical Study, Preliminary Design, Detailed Design, Environmental and Social Impact Study (ESIA), preparation of Bidding Documents
Period:	12/2020 – 03/2022
Construction cost:	approx. 22.600.000 €

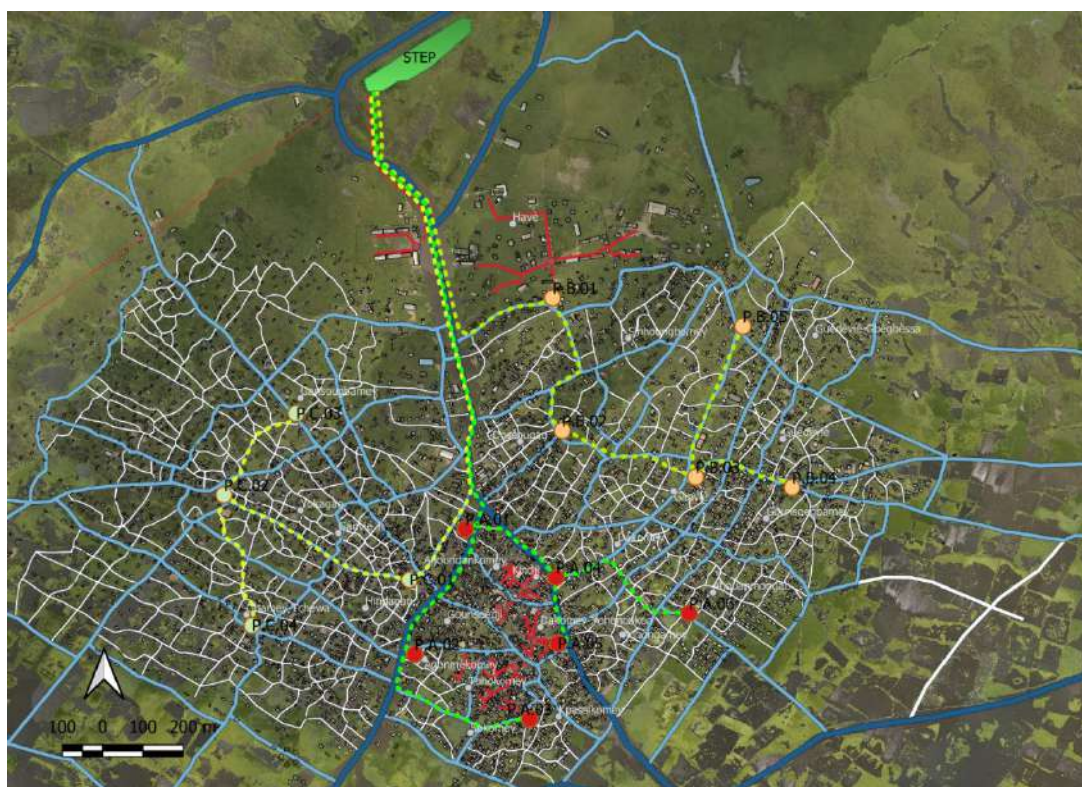
## Project Description:

The project "Reinventing the Lake City of Ganvié" is part of the Government's action plan as one of the top priority projects of Benin in the tourism sector. Nowadays, the city of Ganvié consists mainly of stilted houses with a population of around 37.000 inhabitants. The project's objective is the identification of a wastewater treatment system with reference to the future scenario with a resident population of 73.000 inhabitants in 2038, along with a fluctuating tourist population estimated in approximately 11.000 people. The designed works are the following:

Centralised Wastewater Treatment Plant (WWTP): complete treatment system (73.000 PE) with elimination of organic materials and nutrients and final disinfection in compliance with legally binding emission limits. The water line has been designed to minimize the energy consumption and the sludge production. It is structured as follows: Fine screening; Grit removal; Equalisation-homogenization and pumping; Anaerobic treatment UASB; Nitrification, denitrification and dephosphatising with activated sludge; Secondary sedimentation; Chemical disinfection. The sludge line is structured as follows: Pre-thickening; Anaerobic digestion; Post-thickening; Dehydration with belt filter press. The biogas generated through the anaerobic treatment UASB and through the anaerobic digestion of the activated sludge and of the sewage sludge is stored in a gasometer and, after a proper pre-treatment (elimination of humidity, hydrogen sulphide and siloxane), is used for energy recovery (production of electricity and heat) in a co-generation plant.

Collective sanitation system: composed of main collection points (15) equipped with pumping stations which, through successive lifts, are capable to convey the wastewater to the WWTP. The collection points are designed so as to ensure easy construction and adequate integration in the typical local landscape.

Phyto-purification system for individual treatment: including a pre-treatment unit (septic tank) and a treatment unit (phyto-purification with submerged flow, with filter beds or floating beds).



# ENGINEERING DESIGN SERVICES FOR WASTEWATER RECLAMATION FACILITY FOR PHASE 1 KONZA TECHNO CITY

Location:	Machakos County, Kenya
Client:	KoTDA (Konza Technopolis Development Authority)
Services:	Concept/Preliminary, Detailed Design
Period:	08/2018 – 05/2020
Construction cost:	€ 23,000,000

## Project Description:

The Konza Technology City (KTC) is a project of the Government of Kenya (GoK), implemented through EPCF (Engineering, Procurement, Construction and Finance) by the Konza Technopolis Development Authority (KoTDA), under the Ministry of Information and Communication Technology (MOICT). Konza City will be constructed over a 5000 acre land, located approximately 60 Km south of Nairobi Center. The city is designed to allow phased development, and Phase 1 includes various types of land uses and infrastructures that would support future phases of development. The project, implemented through EPCF (FIDIC Silver Book), concerns the development of a new smart technology city of about 28'000 inhabitants.

The Wastewater Reclamation Facility (WRF) is designed for a 28'000 equivalent population in compliance with discharge quality requirements set out by the National Environment Management Agency (NEMA) in the 2006 Kenyan Environmental Management and Coordination (Water Quality) Regulations.

The treatment system includes influent pumping, screening, grit removal, secondary treatment (reactors and clarifiers capable of removing nitrogen), effluent filtration, and both ultraviolet (UV) and chlorine disinfection.

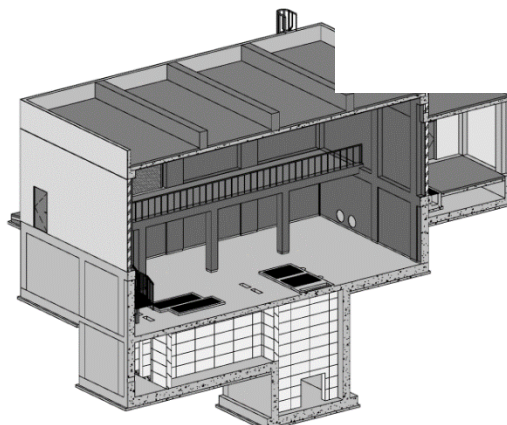
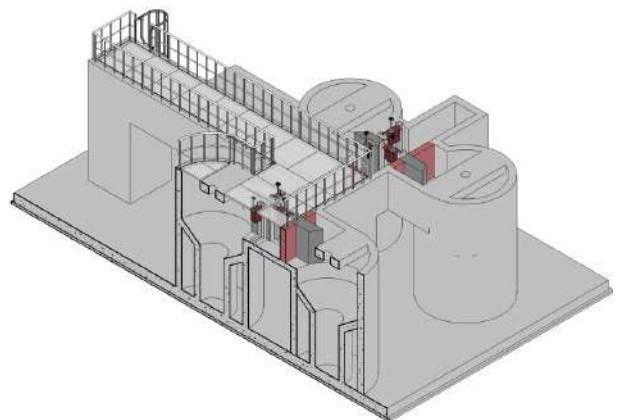


The treatment facilities are based on implementing secondary treatment using moving bed biofilm reactor (MBBR) technology.

The WRF includes the following units:

- inlet pumping station
- preliminary treatment building
- MBBR tanks distribution chamber
- clarifiers distribution chamber
- MBBR tanks
- clarifier
- disc filters
- disinfection building
- treated effluent pumping station
- waste sludge pumping station
- thickened sludge pumping station
- gravity thickener
- sludge dewatering building
- metallic salt coagulant storage
- blower building
- electrical building
- administration building
- maintenance & storage buildings
- guard house
- return liquors pumping station
- filter feed pumping station.

The instrumentation and control system is integrated into the smart-city concept for Konza.





# UPGRADE WORKS ON THE WASTE WATER TREATMENT PLANT THAT SERVES THE TERRITORY OF CASTRO (LECCE)

Location:	Castro (Lecce), Italy
Client:	Acquedotto Pugliese SpA
Services:	Final and Detailed Design
Period:	02/2016 – 03/2020
Construction cost:	€ 5,927,334

## Project Description:

This project consists of the enhancement of the purification plant from 24,496 AE (equivalent inhabitants) to 28,700 AE. The Castro Plant is subject to summer and winter seasons. Works foreseen include plant adaptations, empowerment of some existing sections, demolition of others, construction of new ones. Activities of this project foresee the destruction of some operational units of the process chain which are not functional anymore, in order to recover areas to be commuted into new sections of the treatment plant.

Upgrading and new construction works involve both the water line and the sludge line. The pretreatment sector is completely new and is planned inside a shed, to allow the treatment of odorous emissions.

The project interventions provide structures to confine odors, to be installed on some sections of the Castro plant, namely: equalization / lifting, aerobic stabilization, post-thickener.

For the organic sector, the construction of 2 new independent biological lines in separate reinforced concrete tanks is envisaged. They have been built for both conventional operations (activated sludge process and operations according to the advanced Alternating Cycle process in a single reactor (CA).

The design covers the installation of a remote control system for some sections of the treatment of the plant: biological lines; reagent dosing stations for phosphorus removal by chemical precipitation; extraction of biological excess sludge; aerobic sludge stabilization lines.

The project of the plant has implemented the adaptation to the Regional Regulation N.13 of 22.5.2017, which requires:

- grilling enhancement to treat up to 5 times the average daily flow rate;
- check on the existing equalization tank, which must contain at least 1/3 of the average daily volume;
- construction of a general by-pass which gives the surplus volume to the drain after a specific final disinfection.

This solution allows to minimize the environmental impact, the effect of the civil works cost and the duration of construction and installation. This design involved also the adaptation of the electrical system, including automation and control. Furthermore, the enhancement of the plant included the adaptation of the final delivery, currently made of n° 4 very extensive drain dugouts, not sufficient anymore to clear out the purified capacity; therefore, the increasing of the draining surface through the construction of a new dugout has been planned.





# UPGRADE WORKS ON THE WASTE WATER TREATMENT PLANT THAT SERVES THE TERRITORY OF SAN SEVERO (FOGGIA)

Location:	San Severo (Foggia), Italy
Client:	Acquedotto Pugliese SpA – Bari
Services:	Final and Detailed Design
Period:	02/2016 – 12/2019
Construction cost:	€ 5,144,103

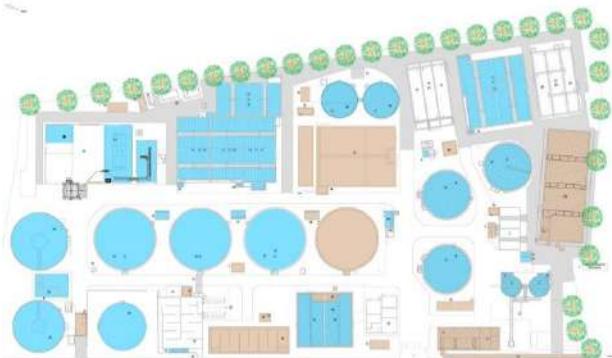
## Project Description:

The design aim was to upgrade the waste water treatment plant from 88,000 AE to 104,227 AE foreseen by the Water Protection Plan. The upgrading and new construction works involve both the water and the sludge process lines.

The pretreatment sector is completely new and the treatment of odor emissions is expected. The project interventions therefore provide for the supply and installation of covers to contain odors, to be installed on some sections of the plant (beyond the pretreatment sector, namely: equalization/lifting, primary sedimentation tanks, pre-thickeners. Odor treatment is being carried out by biofiltration.



The design interventions consist of plant adaptation, upgrading and/or demolition of some existing compartments and creation of new compartments.



The design interventions envisage the demolition of the operational units of the process chain that are no longer functional in order to allow the recovery of areas to be used for new treatment sections of the plant. The design solution allows for the minimization of the environmental impact, of the impact of the cost of civil works, of the construction time and installation.

The design also involved the upgrading of the electrical, automation and control systems.

The treatment plant, with a potential of more than 100,000 AE, required the drafting of an Environmental Impact Study.



Following the numerous interventions that have taken place, the San Severo plant is divided into 3 biological process lines. This project has been conceived in order to build a fourth line (reinforced concrete tank), designed for operation in a conventional activated sludge mode. The new line is divided into two parallel sublimes.

The size of the new operating unit makes it possible to treat the average black flow of 4168 m<sup>3</sup> / d.

On the existing organic process lines the project includes: the replacement of the existing diffuser membranes preceded by thorough cleaning of the tanks; replacement of existing pumps for recirculation of the aerated mixture; insertion of meters and probes for process control.

The project of the plant has implemented the Regional Regulation N.13 of 22.5.2017, which provides:

- strengthening of the grilling to treat up to 5 times the average daily flow rate;
- equalization able to contain at least 1/3 of the average daily volume;
- realization of a general by-pass which gives the surplus volume to the drain after a specific final disinfection.

For this purpose, a new equalization tank of considerable size has been designed.

The narrowness of the spaces in the area of the plant on which the interventions are supposed to be carried out requires the realization of part of the excavations through the driving of sheet piles, to avoid interferences between the works and the existing works.

Finally, the project includes the layout of the plant area by means of green works, asphalted of the new areas that will be covered by the vehicles, and an upgrade of the rainwater network in the newly asphalted areas.

# SEWAGE NETWORK AND WASTE WATER TREATMENT PLANT IN VICENZA

Location:	Vicenza - Italy
Client:	Viacqua S.p.A.
Services:	Detailed Design, EIA
Period:	09/2015 – 09/2017
Construction cost:	€ 75,965,000

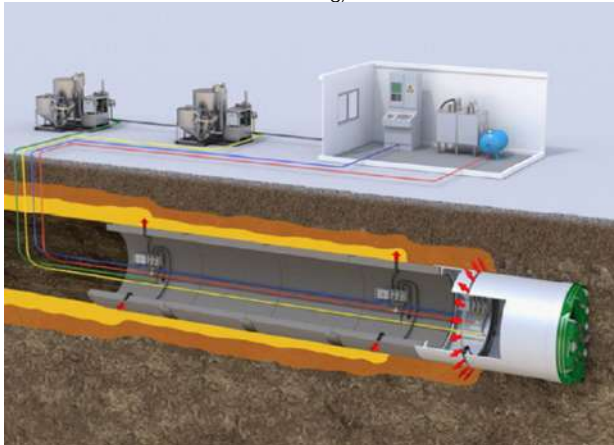
## Project Description:

The project is for the rationalization of the sewage system and centralization of the waste water treatment of the city of Vicenza in the north of Italy.

The project includes:

- (i) the expansion of the waste water treatment plant (WWTP) of Casale (City of Vicenza), from 92,000 equivalent inhabitants to 240,000 equivalent inhabitants;
- (ii) the conversion of the WWTP S. Agostino (100.000 equivalent inhabitants), with adjustment of the electromechanical works of the existing water-pump and the construction of a new interception device for the incoming collectors and a new primary treatment and pumping system (up to 3Qm = 3,350 m<sup>3</sup>/h) to Casale, and the treatment of overflow water;
- (iii) the connection between S. Agostino and Casale with a 5.5 km pressure forcemains (double pipeline ductile iron DN 600);
- (iv) the decommissioning of n. 6 minor WWTPs (from 1,100 AE to 22,000 AE), with the construction of the same number of pumping stations (plus 3 intermediate) to the existing network: pipelines in ductile iron (6.5 km DN 400 / 500) and in HDPE (5.7 km from DN 200 / 225).

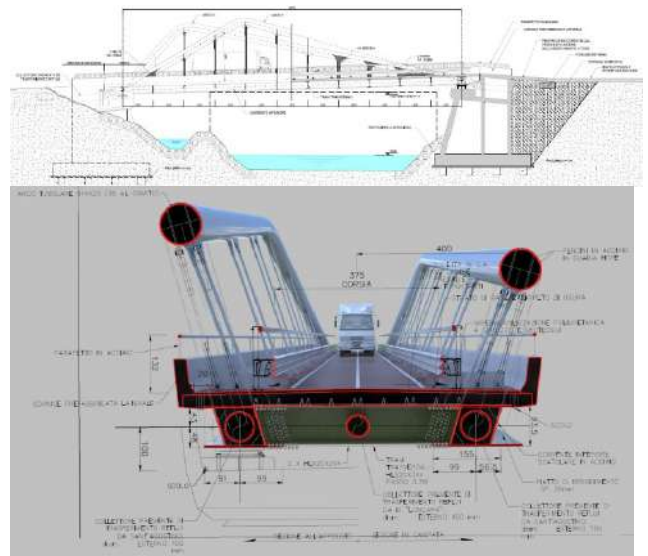
The design has dealt with the physical constraints of the morphology of the territory (8 crossings of watercourses, 770m micro-tunneling DN 2500 mm of the Berici hills, 480m of double DN 600 Horizontal Directional Drilling).



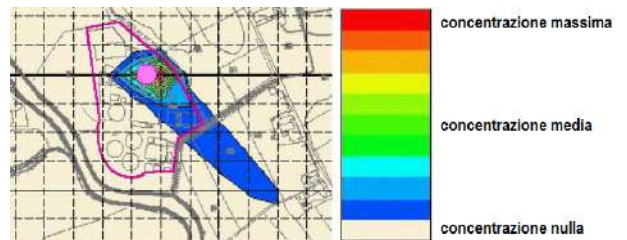
The design has also dealt with the anthropic infrastructures (2 crossings of the A4 motorway, 4 crossings of regional roads and provincial, 2 rail crossings) and resolution of different interferences (storm drainage, sewage, aqueduct, gas, military oil pipeline, liquid oxygen pipeline, telecommunications, power lines).



The main objectives included the optimization of pipeline tracks, in terms of: pipeline length, constraints, expropriation / occupancy charges, access during execution and maintenance, curves and special pieces minimization; technical-economic optimization of pumps / pressures; improvement of hydraulic functioning; analysis of piezometric profiles and water hammer analysis and mitigation.



The company has also carried out the Environmental Impact Assessment (EIA) of the extension of the City of Vicenza WWTP. The EIA has included the programmatic reference frameworks, project reference and environmental reference, with the evaluation of the impacts on the atmosphere, soil and subsoil, surface and underground waters, noise, vegetation, flora, fauna and ecosystems, landscape, socio-economic aspects.





# ENLARGEMENT AND UPGRADING OF THE ROZZANO WASTE WATER TREATMENT PLANT

Location:	Rozzano (Milan) – Lombardy, Italy
Client:	Tutela Ambientale Sud Milanese Spa Noverasco di Opera, Milan
Services:	Preliminary Design, Technical Specifications, Environmental Impact Assessment, works supervision
Period:	07/2005 – 11/2013
Construction cost:	€ 14,214,700

## Project Description:

Due to the new design and engineering regulations, it was necessary to carry out a new project able to comply with both the growth of population served to 135,000 Equivalent Inhabitants and the latest waste limit values established by Regione Lombardia, which required the adoption of efficient waste removal plants not only of suspended solids and organic substances but also nutrient substances (nitrogen and phosphorous).

The project focused on a purification system that was able to combine and integrate all existing works with the new scheduled ones, therefore not taking up other external areas to the surface already occupied by the existing facility.

Around half of the required purification capacity is provided by means of a suspended hybrid moving bed and biomass system (also known as “MBBR” – Moving Bed Biological Reactor). The remaining half capacity is provided by a suspended biomass system with biomass separation through micro-filtration membranes (“membrane bioreactors, or “MBR”).

The work was completed with the upgrading of preliminary treatment stations, phosphorous removal, upgrading of the sludge treatment line and the creation of a final lifting station.



# OPTIMIZATION AND UPGRADING OF WASTEWATER TREATMENT PLANT

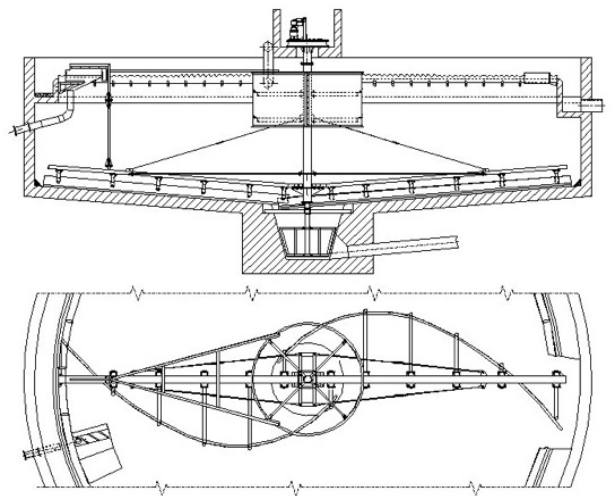
Location:	S. Giovanni Lupatoto (Verona) – Italy
Client:	Acque Veronesi Scarl (Local Water Authority) -Verona, Italy
Services:	Preliminary and final design
Period:	11/2008 – 03/2012
Construction cost:	€ 3,958,000

## Project Description:

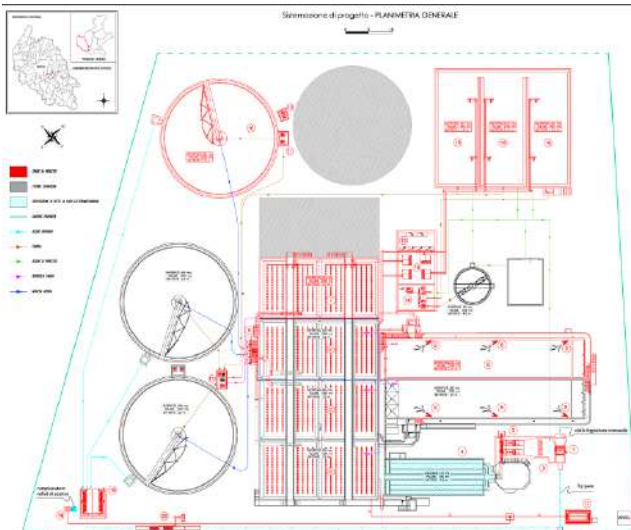
The project regards the works of the complete optimization of the existing wastewater treatment plant of San Giovanni Lupatoto, an important and populous town near Verona. At the present time, the discharge directed to the plant corresponds to that of 24,000 equivalent inhabitants. The project envisages the upgrading of the plant to 50,000 equivalent inhabitants.



- *Denitrification:* in this stage, anoxic conditions are provided, so that heterotrophic bacteria can convert nitrates to nitrogen gas  $N_2$ .
- *Secondary sedimentation*



The principal sections of the plant and the works provided are:



- *Initial pumping station:* demolition of existing station and re-construction with new geometric dimensions and a new by-pass system with plane gate and ultrasonic system of hydraulic measure;
- *Nitrification:* this aerobic stage provides the biological oxidation of nitrogen, from ammonia ( $NH_3$ ) to nitrite compounds ( $NO_2$ ). The transformation process is due to the activity of Nitrosomonas bacteria colonies. To complete the biological treatments, Nitrospira bacteria colonies convert the nitrite ( $NO_2$ ) to nitrate compounds ( $NO_3$ ).

- *Disinfection:* in order to discharge back to the environment the treated water, the removal of micro-organism is provided by disinfection. The effectiveness of disinfection depends on the quality of the water being treated (e.g., cloudiness, pH, etc.), the type of disinfection being used, the disinfectant dosage (concentration and time), and other environmental variables. Ultraviolet (UV) light can be used instead of chlorine, iodine, or other chemicals. Because no chemicals are used, the treated water has no adverse effect on organisms that later consume it, as may be the case with other methods.





# FOUL SEWERAGE NETWORK AROUND LAKE TRASIMENO AND UPGRADING OF THE EXISTING WASTEWATER TREATMENT PLANT IN CASTIGLIONE DEL LAGO

Location:	Province of Perugia , Italy
Client:	Umbracque S.p.A. – Regional water authority
Services:	Final design
Period:	04/2010 - 05/2010
Construction cost:	€ 5,534,001

## Project Description:

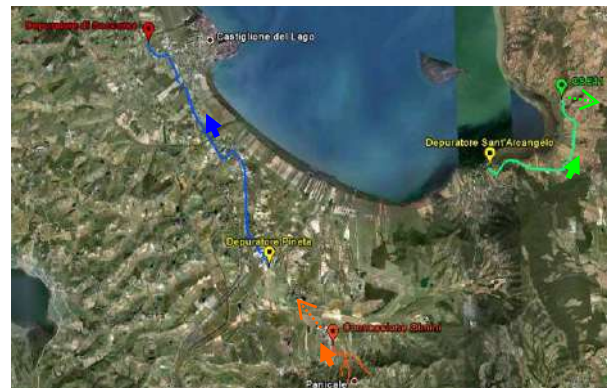
The area surrounding the southern part of Lake Trasimeno was partially provided with many small and old treatment plants discharging the outfall directly into tributary streams of the Lake. In other parts of the area such as the town of Panicale, there was no sewerage network at all, with direct outfalls into the ground. The entire area is located inside the Trasimeno Nature Park and it requires high efficiency for the treatment plants in order to preserve the environment of Trasimeno Lake. This situation required the design of new and more complete parts of the foul sewage network bypassing the existing treatment plants and directing the urban wastewater towards the new treatment plants.



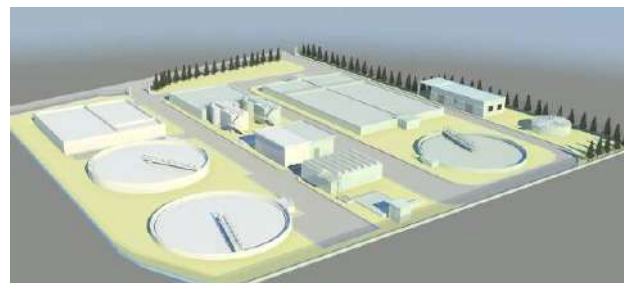
The entire area of intervention was limited to three main zones, denoted as "Sant'Arcangelo", "Panicale" and "Pineta-Soccorso". In particular, it was necessary to design a completely new foul sewage network (total length of about 19 km), thus connecting the towns or the existing plants with the new treatment plants.

The zones were designed to host a single gravity or pressure pipeline system: since Lake Trasimeno and the surrounding towns are situated in a hilly area, the gravity sewerage system (made of PVC pipes) is preferred in order to save energy. When the ground is almost flat or the slope is negative, for long distances and interferences such as roadway, railways and rivers or streams, a pressure sewerage (made of stainless iron or HDPE pipes) system was adopted: new pumping stations were realized and, furthermore, the existing treatment plants (Sant'Arcangelo and Pineta), were partially demolished and converted in pumping stations. For the biggest length, the pipelines were set along principal or secondary streets; in any cases the pipelines crossed private properties such as fields or orchards; interferences such as railway or principal roadways were sub-passed using a micro tunnelling technology.

The existing wastewater treatment plant needed an enhancement up to 35.000 P.E. by the building of a new line of 22.000 P.E. treatment capacity, a new sludge line treatment for the entire 35.000 P.E. and the revamping of existing parts and instruments. Furthermore, before the effluent discharge in the Fosso Paganico, a tributary stream of Lake Trasimeno, a double membrane filtration unit and disinfection with UV light of the entire flow was adopted.



The site assigned to the extension was adjacent to existent plant site, in a flat area confined by Fosso Paganico. Since the entire Trasimeno Lake is classified as a sensible area the values in concentrations and the removal degree of nutrients and suspended solid parameters had to be lower than the limits requested from the Italian water treatment regulations.



The new wastewater treatment line was composed of:

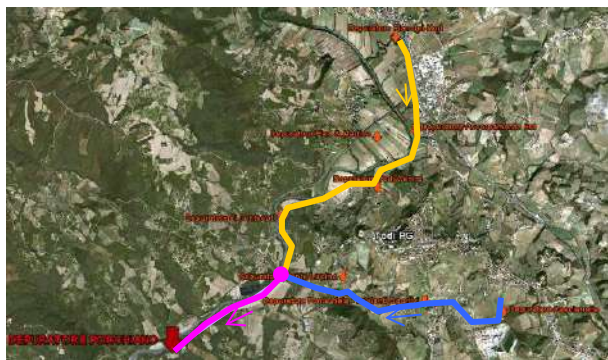
- *preliminary treatment:* fine screening and circular air lifted grit removal and equalization tanks
- *secondary or biological treatment:* nutrients removal using activated sludge in mixed and aerated tanks operating in a total oxidation – long aeration system (denitrification, oxidation/nitrification steps) and secondary sedimentation in order to separate liquid from sludge phase
- *tertiary treatment:* membrane filtration and disinfection with UV light
- *sludge treatment:* gravity thickening tanks and centrifuging.

# FOUL SEWERAGE NETWORK IN THE TOWN OF TODI AND NEW WASTEWATER TREATMENT PLANT IN PORCHIANO-TODI

Location:	Province of Perugia , Italy
Client:	Umbracque S.p.A. – Regional water authority
Services:	Final design
Period:	02/2010 - 03/2010
Construction cost:	€ 5,577,779

## Project Description:

The town of Todi and the surrounding area was provided with many small treatment plants discharging the outfall directly in the Tevere river or in its tributaries streams. The whole area is situated into the Tevere Natural Park and it required high efficiency treatment plants. Many parts of the towns into the Todi depuration district were not provided with an adequate foul sewage network, or, in any cases, the network is completely absent giving direct outfalls in the ground. This state of being required the design of new and more complete parts of the foul sewage network linking the small treatment plants and directing the urban wastewater towards the new treatment plant.



The entire area of intervention was restricted up to two main zones, denoted as “Northern part” and “Southern part”. In particular, it was required to design a completely new foul sewage network, thus connecting the existing plants with the new treatment plant, for a total length of 18 km, with 9 pumping stations. Both the zones were designed to host a single gravity or pressure pipeline system: since Todi and the surroundings towns are situated in an hilly area, the gravity sewerage system (made of PVC pipes) was preferred in order to save energy.

When the ground was almost flat or the slope negative and interferences such as roadway, railways and rivers or streams had to be over or sub-passed, a pressure sewerage (made of stainless iron or HDPE pipes) system was adopted: the existing small plants, usually made of one circular concrete tank, were converted in pumping stations.

The site assigned to the new plant was inside the Tevere River Natural Park, on the lee side of a hill close to the river.

This particular conformation of the site needed a reconfiguration, in order to create a flat area and to limit the digging quantities. For this reason the new plant, receiving the wastewater directly from the last pumping station of the pressure pipeline system, is set in two different levels, at different elevations: the water treatment line was higher than the sludge line, situated below. The quantities of ground excavated from the lowest area were used to make banks all around the plant, offering the possibility of cover the plant with shielding trees.

The wastewater treatment line was composed of:

- *preliminary treatment*: fine screening and horizontal aerated grit removal and equalization tanks;
- *secondary or biological treatment*: nutrients removal using activated sludge process in mixed and aerated tanks operating in a total oxidation – long aeration system (denitrification, oxidation/nitrification steps) and secondary sedimentation in order to separate the liquid from the sludge phase;
- *tertiary treatment*: membrane filtration and disinfection with UV light;
- *sludge treatment*: gravity thickening tanks and centrifuging.

Since the effluent from the plants was directly discharged into the Tevere river, within the Natural Park, and the dried sludge could be re-used for agricultural purposes, the values in concentrations and the removal degree of nutrients were lower than the limits required from the Italian Water Treatment Regulations.





# STORM WATER TREATMENT PLANT IN THE COAL-DEPOSIT QUAY OF VADO LIGURE HARBOUR

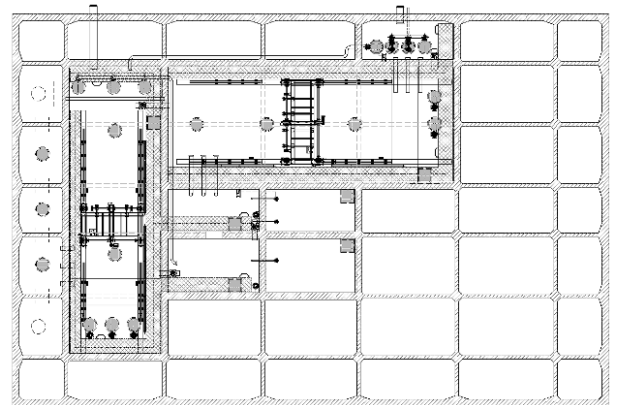
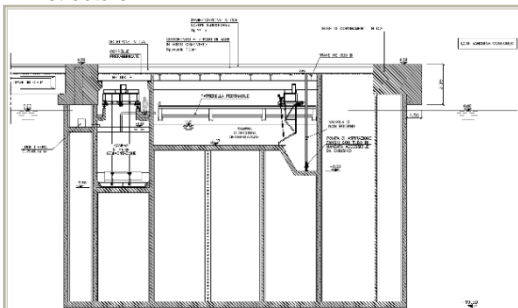
Location:	Vado Ligure (Savona) – Italy
Client:	Savona Port Authority
Services:	Detailed Design
Period:	10/2008 – 02/2009
Construction cost:	€ 1,619,000

## Project Description:

The coal-deposit quay of Vado Ligure harbour hosts 3 different types of coal: the *steel coal*, for steam production, the *coking coal*, for cast-iron production, and a residual coal deriving from the coking process. In case of precipitation, all the runoff water washing the quay must be treated before being discharged into the sea, as it contains high concentrations of coal.



The rainwater treatment plant is built inside the very structure of the quay, which is composed of inter-connected hollow prestressed-concrete caissons: each tank comprising the treatment plant has been designed to be connected with the other tanks, and lodged inside one of the caissons comprising the quay-structure.



The treatment plant has the following structure:

- *First sedimentation tank*: it receives the coal-polluted runoff water, and allows the suspended coal solids to deposit on the tank floor: these solids will be gathered successively on one side of the tank, and pumped outside by a sludge uncloggable pump. On the other side of the tank, water will be pumped to the clarifying and coagulation tanks.
- *Coagulation tank*: in normal conditions, it's not necessary to clarify the water coming from the sedimentation tank, so that it is directly sent to the coagulation tank, where the polyelectrolyte (sodium carbon) is added, in order to chemically separate the remaining suspended coal from water, and maintain the water pH at average levels (7-8).
- *Secondary sedimentation tank*: after coagulation, a secondary sedimentation is provided, identically to the first sedimentation stage.
- *Turbidity tank*: in this stage, a turbidity analyser measures water quality: in case of concentrations higher than 60 ppm, the water is directly pumped back to the first sedimentation tank, and then treated with polychloride aluminium coagulant in the clarifying tank.



# UPGRADING WORKS TO THE WASTEWATER TREATMENT PLANT OF TARANTO GENNARINI (TARANTO) – PUGLIA

Location:	Taranto, Italy
Client:	Acquedotto Pugliese SpA, Bari
Services:	Preliminary Design, Topographic Survey, Environmental Study
Period:	10/2007 – 05/2008
Construction cost:	€ 12,027,270

## Project Description:

The project includes the carrying out of works for upgrading the existing waste water treatment plant that serves the municipalities of Taranto Gennarini (Taranto) for a population of 400,000 Equivalent In-habitants. Works were carried out to make the purification facility comply with current environmental (Decree 152/2006) and safety regulations, and to upgrade electrical systems in accordance with the law 46/90.



The works include:

- building of an automated coarse screening station;
- replacement of water suction machines for rain- waters;
- replacement of the three existing fine grates;
- installation of a sand classifier-cleaner that serves the sand catcher-separator section;
- creation of an equalization basin;
- reconditioning of scraper bridges of the primary decanter section;
- building of denitrification sections;
- building of a denitrification and nitrification line;
- replacement of existing surface aerators with fine bubble diffusers;
- building of a continuous dynamic pre-thickening station;
- building of a new primary heated anaerobic digester;
- overhauling of the whole existing network for bio- gas transport;
- enhancement of the mechanical dehydration section by means of a high capacity centrifuge;
- several coverings for coarse screening, initial lifting, fine screening, equalization, primary decantation, and sludge pre- and post-thickening sections and bad smelling air treatment by means of dry adsorption deodorizers;
- electrical system upgrading and connection of all new installations to the control board.



# UPGRADING WORKS TO THE MOTTOLA (TARANTO) WASTE WATER TREATMENT PLANT – PUGLIA

Location:	Mottola (Taranto) – Puglia, Italy
Client:	Acquedotto Pugliese SpA, Bari
Services:	Preliminary Design, Topographic Survey, Environmental Study
Period:	11/2007 – 01/2008
Construction cost:	€ 1,963,210

## Project Description:

The project includes the carrying out of works for upgrading the existing waste water treatment plant that serves the municipalities of Mottola (Taranto) for a population of 17,000 Equivalent Inhabitants. Works were carried out to make the purification facility comply with current environmental (Decree 152/2006) and safety regulations, and to upgrade electrical systems in accordance with the law 46/90.

### The Project:

Works include:

- building of a septic tank station;
- emptying and cleaning of the equalization basin;
- demolition of the structure destined for flocculation and reutilization of the area for building a septic tank receiving station;
- building of a station for the collection of supernatants and waters coming from dehydration and their conveyance to the equalization basin;
- demolition of the digester and gasometer and building of an aerobic stabilization basin;
- removal of the asbestos covering of the sludge dehydration room in accordance with current laws;
- building of a concrete drainage pipeline;
- electrical system upgrading.



# WORKS FOR UPGRADING THE CASTELLANETA (TARANTO) WASTEWATER TREATMENT PLANT

Location:	Castellaneta (Taranto) – Puglia, Italy
Client:	Acquedotto Pugliese SpA, Bari
Services:	Preliminary Design, Topographic Survey, Environmental Study
Period:	10/2007 – 01/2008
Construction cost:	€ 1,063,834

## Project Description:

The project includes the development of works for upgrading the existing waste water treatment plant that serves the town of Castellaneta (Taranto), for a population of 20,500 Equivalent Inhabitants. Works were carried out in order to upgrade the purification plant to comply with current environmental (Decree 152/2006) and safety regulations, and to upgrade electrical systems in accordance with the law 46/90.

The works include:

- building of a new automated fine screening station;
- building of a system for collecting oils and greases from the surface of primary decanters;
- development of a new denitrification basin equipped with submerged agitators;
- enlargement of the nitrification section by modifying the volume of the existing aerobic stabilization basin;
- new bottom diffusers in the nitrification basin;
- development of a new circular section final decantation basin;
- new filtration bed made of gravel and quartz sand for the two final gravity filters;
- pressurized submerged aerators to replace porous diffusers in the aerobic stabilization section;
- electrical system upgrading.





# UPGRADING WORKS TO THE CRISPIANO WASTEWATER TREATMENT PLANT

Location:	Crispiano (Taranto) – Puglia, Italy
Client:	Acquedotto Pugliese SpA, Bari
Services:	Preliminary Design, Topographic Survey, Environmental Study
Period:	10/2007 – 01/2008
Construction cost:	€ 875,077

## Project Description:

The project includes the carrying out of works for upgrading the existing waste water treatment plant that serves the town of Crispiano (Taranto) for a population of 15,000 Equivalent Inhabitants. Works were carried out to make the purification facility comply with current environmental (Decree 152/2006) and safety regulations, and to upgrade electrical systems in accordance with the law 46/90.

The works include:

- transfer of the septic tank station from its current position to the flocculation basin;
- creation of a drainage channel;
- building of a grated channel and grate by-pass;
- restructuring and reutilization of the flocculation basin for storage of septic tanks.
- installation of an air blowing plant to the bottom of the oxidation and aerobic stabilization tank;
- deodorization of the air coming from the primary decantation, aerobic stabilization and equalization basin;
- electrical system upgrading.





# UPGRADING WORKS TO THE FAGGIANO (TARANTO) WASTEWATER TREATMENT PLANT

Location:	Faggiano (Taranto) – Puglia, Italy
Client:	Acquedotto Pugliese SpA, Bari
Services:	Preliminary Design, Topographic Survey, Environmental Study
Period:	10/2007 – 01/2008
Construction cost:	€ 1,172,206

## Project Description:

The project includes the carrying out of works for upgrading the existing waste water treatment plant that serves the town of Faggiano (Taranto) for a population of 8,000 Equivalent Inhabitants. These works were carried out to make the purification facility comply with current environmental (Decree 152/2006) and safety regulations, and to upgrade electrical systems in accordance with the law 46/90.

The works include:

- building of a new automated fine screening station;
- replacement of submerged pumps for initial lifting from the equalization basin;
- installation of a tank for storage of chemicals and metering pumps;
- rising of water level in the basin and replacement of the scraper bridge;
- new de-nitrification basin;
- building of a secondary settler;
- building of a post-thickener fitted with bridge crane;
- installation of an air blowing plant to the bottom of the oxidation and aerobic stabilization tank;
- deodorization of the air coming from the primary decantation, aerobic stabilization and equalization basin;
- electrical system upgrading.





# WORKS FOR UPGRADING THE GROTTAGLIE-MONTEIASI (TARANTO) WASTEWATER TREATMENT PLANT

Location:	Grottaglie-Monteiasi (Taranto) – Puglia, Italy
Client:	Acquedotto Pugliese SpA, Bari
Services:	Preliminary design, Topographic Survey, Environmental Study
Period:	10/2007 – 01/2008
Construction cost:	€ 5,528,745

## Project Description:

The project includes the carrying out of all works for upgrading the existing waste water treatment plant that serves the area of Grottaglie-Monteiasi (Taranto) for a population of 62,000 Equivalent In-habitants. Works were carried out to make the purification facility comply with current environmental (Decree 152/2006) and safety regulations, and to up-grade electrical systems in accordance with the law 46/90.

Works include:

- building of a new automated fine screening station;
- installation of a sand catcher;
- increase of equalization volume;
- building of new denitrification basins;
- development of a new ultraviolet disinfection channel system;
- installation of a dynamic thickener system for waste sludge;
- building of anaerobic digesters;

- installation of an energy recovery system by means of gas turbines;
- building of a new gasometer;
- electrical system upgrading.





# UPGRADING WORKS TO THE LATERZA (TARANTO) WASTEWATER TREATMENT PLANT

Location:	Laterza (Taranto) – Puglia, Italy
Client:	Acquedotto Pugliese SpA, Bari
Services:	Preliminary Design, Topographic Survey, Environmental Study
Period:	10/2007 – 01/2008
Construction cost:	€ 1,571,753

## Project Description:

The project includes the carrying out of all works for upgrading the existing waste water treatment plant that serves the area of Laterza (Taranto) for a population of 15,000 Equivalent Inhabitants. Works were carried out to make the purification facility comply with current environmental (Decree 152/2006) and safety regulations, and to up-grade electrical systems in accordance with the law 46/90.

The works include:

- building of a new automated fine screening station;
- installation of a sand catcher and separator system;
- replacement of submerged pumps for initial lifting;
- reconditioning of scraper bridges of the primary decantation basin;
- replacement of the central agitator of the denitrification section;
- new air blowing plant for the nitrification section;
- replacement of the two sludge recirculation pumps;
- replacement of the three existing sand filters;
- installation of a new network for the fermentation gas generated by digesters;
- building of a new prefabricated structure for the storage of the apparatus for sludge dehydration;
- electrical system upgrading and connection of all new facilities to the control board.





# UPGRADING WORKS TO THE WASTEWATER TREATMENT PLANT OF LIZZANO - FRAGAGNANO - S. MARZANO (TARANTO)

Location:	Province of Taranto – Puglia, Italy
Client:	Acquedotto Pugliese SpA, Bari
Services:	Preliminary Design, Topographic Survey, Environmental Study
Period:	10/2007 – 01/2008
Construction cost:	€ 2,248,000

## Project Description:

The project includes the carrying out of works for upgrading the existing waste water treatment plant that serves the municipalities of Lizzano – Fragagnano - S. Marzano (Taranto) for a population of 25,000 Equivalent Inhabitants. These works were carried out to make the purification facility comply with current environmental (Decree 152/2006) and safety regulations, and to upgrade electrical systems in accordance with the law 46/90.

The works include:

- installation of a new automated fine screening station;
- building of a sand catcher and separator system;
- building of a new pre-treatment station of effluents from septic tanks;
- replacement of central agitators of de-nitrification sections with submerged agitators;
- new air blowing plant for nitrification stage;
- new bottom diffusers in nitrification basins;
- building of an aerobic stabilization tank;
- new high-capacity centrifuge fitted with dissolution system;
- electrical system upgrading.





# WORKS FOR UPGRADING THE MASSAFRA (TARANTO) WASTEWATER TREATMENT PLANT

Location:	Massafra (Taranto) – Puglia, Italy
Client:	Acquedotto Pugliese SpA, Bari
Services:	Preliminary Design, Topographic Survey, Environmental Study
Period:	10/2007 – 01/2008
Construction cost:	€ 3,069,626

## Project Description:

The project includes the carrying out of works for upgrading the existing waste water treatment plant that serves the municipalities of Massafra (Taranto) for a population of 31,000 Equivalent Inhabitants.

Works were carried out to make the purification facility comply with current environmental (Decree 152/2006) and safety regulations, and to upgrade electrical systems in accordance with the law 46/90.



The works include:

- building of a new automated fine screening station;
- building of a concrete sand catcher system;
- installation of a group of lift pumps in the biological treatment section in the equalization basin;
- development of a hydraulic bypass connection from the sand catcher outlet to the equalization basin;
- building of denitrification tanks;
- replacement of the rotary bridge installed in the pre-thickener system;
- installation of gas turbines for energy recovery;
- building of a gasometer made of balloon synthetic material;
- supply and installation of a new torch to burn bio- gas in excess;
- electrical system upgrading.

# UPGRADING WORKS TO THE PALAGIANELLO (TARANTO) WASTEWATER TREATMENT PLANT

Location:	Palagianello (Taranto) – Puglia, Italy
Client:	Acquedotto Pugliese SpA, Bari
Services:	Preliminary Design, Topographic Survey, Environmental Study
Period:	10/2007 – 01/2008
Construction cost:	€ 1,018,530

## Project Description:

The project includes the carrying out of works for upgrading the existing waste water treatment plant that serves the municipalities of Palagianello (Taranto) for a population of 10,000 Equivalent Inhabitants. Works were carried out to make the purification facility comply with current environmental (Decree 152/2006) and safety regulations, and to upgrade electrical systems in accordance with the law 46/90.

Works include:

- development of a drainage channel;
- replacement of the existing inefficient sand catcher with a stainless steel sand catcher and automatic sand classifier;
- building of a dedicated basin and conveyance of rainwater to treatment;
- installation of a dynamic pre-thickener;
- electrical system upgrading.





# WORKS FOR UPGRADING THE SAN GIORGIO JONICO (TARANTO) WASTEWATER TREATMENT PLANT

Location:	San Giorgio Jonico - Carosino (Taranto) – Puglia, Italy
Client:	Acquedotto Pugliese SpA, Bari
Services:	Preliminary Design, Topographic Survey, Environmental Study
Period:	10/2007 – 01/2008
Construction cost:	€ 2,012,154

## Project Description:

The project includes the carrying out of works for upgrading the existing waste water treatment plant that serves the municipalities of San Giorgio Jonico - Carosino (Taranto) for a population of 26,000 Equivalent In-habitants. Works were carried out to make the purification facility comply with current environmental (Decree 152/2006) and safety regulations, and to upgrade electrical systems in accordance with the law 46/90.

The works include:

- building of a grated channel and a by-pass for grate;
- renovation of the existing vegetation water basin and changeover to an accumulation basin for water from septic tanks;
- cleaning of the nitrification tank and structural renovation;
- installation of a new centrifuge;
- electrical system updating.





# UPGRADING WORKS TO THE PALAGIANO (TARANTO) WASTEWATER TREATMENT PLANT – PUGLIA, ITALY

Location:	Palagiano (Taranto) – Puglia, Italy
Client:	Acquedotto Pugliese SpA, Bari
Services:	Preliminary Study
Period:	10/2007 – 01/2008
Construction cost:	€ 1,455,733

## Project Description:

The project includes the carrying out of works for upgrading the existing waste water treatment plant that serves the municipalities of Palagiano (Taranto) for a population of 16,000 Equivalent Inhabitants. Works were carried out to make the purification facility comply with current environmental (Decree 152/2006) and safety regulations, and to upgrade electrical systems in accordance with the law 46/90.

### Works include:

- modification of the two rectangular section basins currently destined to primary decantation into equalization basins;
- enhancement of final filtration stage;
- enhancement of water disinfection section;
- installation of a dynamic thickener upstream to the aerobic stabilization basin;
- new high-capacity centrifuge;
- restructuring of the service building;
- electrical system upgrading and connection of all new installations to the control board.



# RESTORATION OF THE URBAN INFRASTRUCTURES AND BUILDINGS OF CERTAIN ISLANDS IN VENICE LAGOON

Location:	Venice, Italy
Client:	Consorzio Venezia Nuova for Ministry of Public Works
Services:	Surveys and investigations, preliminary and detailed design
Period:	09/1999 - 12/2007
Construction cost:	€ 31,500,000

## Project Description:

In the context of the vast programme of works to save Venice from flooding and restore the natural environment of the Venice lagoon, for which TECHNITAL is the sole designer, are numerous projects to protect the various islands and townships of the lagoon. Among these are the projects for the restoration and protection of the islands of Lazzaretto Vecchio and Chioggia

### *Lazzaretto Vecchio*

The island is located in the eastern part of the lagoon behind the Lido littoral. In ancient times it was used as place of confinement for plague victims and has since been used for various purposes. The Municipal council of Venice has now decided to turn it into a Museum and Conference Centre.



The project envisages the architectural recovery of all the existing buildings which are in masonry with wooden trusses. The walls have either been replaced or reinforced. The foundations presented serious problems of stability due to the low bearing capacity of the underlying clay and hydraulic underthrust caused by the variations in the tide level. The foundations therefore had to be consolidated with micro-piers and grouting.

The project included a new system for rainwater drainage and raw sewage, and an activated sludge sewage treatment plant with sludge oxidation by means of a prolonged aeration system. The rainwater drainage system included a drainage network and pumping station with sea discharge.



### *Chioggia:*

The works envisage the rehabilitation of all the canal banks and quay walls, and the consolidation of the foundations of the overlying buildings. The project also includes the reinforcement of the bridge "Ponte Vigo", a rainwater drainage system discharging into the Vena and Lombardo canals, and the renewal of the paving of the main street "Corso del Popolo".





# ENHANCEMENT OF THE SAVONA AREA WASTEWATER TREATMENT PLANT

Location:	Savona – Liguria, Italy
Client:	Consorzio per la Depurazione delle Acque di Scarico
Services:	Final Design, Detailed Design, Environmental Impact Assessment, Topographic Survey, works supervision
Period:	10/2003 – 01/2007
Construction cost:	€ 2,780,000

## Project Description:

The plant is currently used for the treatment of urban waste water from Varazze, Celle Ligure, Albissola Marina, Albisola Superiore, Savona, Quiliano, Vado Ligure, Bergeggi, Spotorno and Noli municipalities (conventionally defined “urban waste water from the Savona area”).

The ITR plant (Effluent Treatment Plant), for the pre-treatment of special non dangerous liquid effluents, which are conveyed to the station by means of tankers (“special pre-treated waste”), also started operation recently.



The project provides for the enhancement of the plant on the whole to make it fit also for the treatment of urban effluents from Finale Ligure, Borgio Verezzi, Calice Ligure, Rialto, Orco Feglino and, partially, Vezzi Portio (conventionally defined “urban effluents from the Finale Ligure area”).

The plant has a maximum potential capacity of 305,000 Equivalent In-habitants; the maximum acceptable share of special waste amounts to little less than 80,000 Equivalent In-habitants.

The project included the following works:



- new final filtration of effluents;
- new dynamic thickening station for waste sludge;
- new mechanical dehydration section with high capacity centrifuges.





# WASTEWATER TREATMENT PLANT OF SALVATRONDA (TREVISO): INTEGRATION OF THE FILTRATION AND DISINFECTION PROCESSES

Location:	Salvatronda (Treviso) - Veneto, Italy
Client:	Municipality of Castelfranco Veneto (Treviso)
Services:	Preliminary Design, Final Design, Geotechnical Investigations, Topographic Survey, works supervision
Period:	01/2004 – 11/2006
Construction cost:	€ 841,941

## Project Description:

The existing plant dates back to the 1980s and subsequently underwent an enhancement project, still underway, aimed to increase its potential capacity to 73,300 Equivalent Inhabitants, resulting from the need to process pre-treated civil and industrial waste from Asolo, Fonte and Paderno del Grappa.

The plant discharges treated waste into the Venice lagoon through the Zero river and therefore is required to comply with the stringent limits introduced by the "Ronchi-Costa" decree, including prohibition to use chloride gas and hypochlorite for disinfection. In this framework, it was necessary to provide for a disinfection phase through ultraviolet rays preceded by an upstream final filtration phase on sand bed.



### Project Figures:

Maximum delivery at filtration	$\text{m}^3 \text{h}^{-1}$	450	
Incoming suspended solids	$\text{mg l}^{-1}$	35	
Outgoing suspended solids	$\text{mg l}^{-1}$	$\leq 10$	
Maximum delivery at filtration	$\text{m}^3 \text{h}^{-1}$	611	
Outgoing escherichia-coli	$\text{UFC } 100 \text{ ml}^{-1}$		$\leq 5,000$

# CIVIL WASTEWATER TREATMENT PLANT OF THE ISLAND OF S. ERASMO – VENICE LAGOON

Location:	Venice, Italy
Client:	Venezia Nuova Consortium for the Water Board (MoPW) - Venice
Services:	Preliminary, Final and Detailed design
Period:	07/2004 – 09/2006
Construction cost:	€ 3,300,700

## Project Description:

In the context of the vast programme of works to save Venice from flooding and restore the natural environment of the Venice lagoon, for which TECHNITAL is the sole designer, are numerous projects to protect the various islands and townships of the lagoon. One of these regards the locality of S. Erasmo.



The island of S. Erasmo presented an extremely discontinuous sewage system, and a total absence of a complete wastewater treatment system, except for a small area downtown, which was provided with a local primary treatment system.

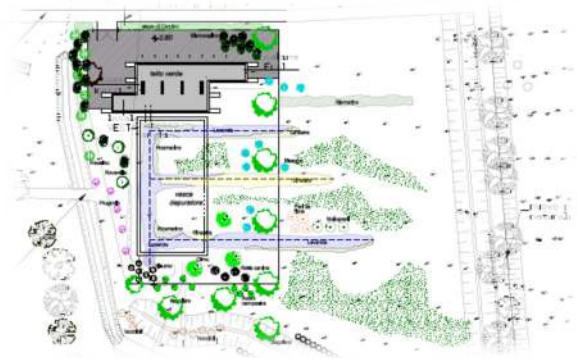
The purpose of the project was to design and realize a complete civil wastewater treatment plant, serving the entire area of S. Erasmo.

Civil sewages will be collected and pumped by a depression sewerage system, directly to the treatment plant, which is of the MBR type (Membrane Batch Reactor).

The treatment plant is designed to be provided with the two main biological treatments (as prescribed by law for centres of more than 1000 equivalent inhabitants, as in this case):

- **Nitrification:** this aerobic stage provides the biological oxidation of nitrogen, from ammonia ( $\text{NH}_3$ ) to nitrite compounds ( $\text{NO}_2$ ). The transformation process is due to the activity of Nitrosomonas bacteria colonies. To complete the biological treatments, Nitrospira bacteria colonies convert the nitrite ( $\text{NO}_2$ ) to nitrate compounds ( $\text{NO}_3$ ).
- **Denitrification:** in this stage, anoxic conditions are provided, so that heterotrophic bacteria can convert nitrates to nitrogen gas  $\text{N}_2$ .

The last part of the non-physical treatments is the chemical precipitation of the phosphate compounds in the sewage coming from the biological treatments.



For physical treatments, the MBR plant type uses membranes to eliminate suspended materials from the sewage, instead of the usual sedimentation stages. The resulting sludge is sent to the sludge line, for the final digestion procedure.



The now treated water is conveyed to the irrigation aqueduct network, in order to be re-used.





# SAVONA WASTE WATER TREATMENT PLANT: DEODORIZATION PLANT FOLLOWING THE CONNECTION TO THE FINALE LIGURE AREA

Location:	Liguria, Italy
Client:	Municipality of Finale Ligure (Savona)
Services:	Final Design, Detailed Design, works supervision
Period:	07/2003 – 01/2006
Construction cost:	€ 130,500

## Project Description:

The plant includes a horizontal-type wet scrubber with three washing stages (sulphuric acid, sodium hypochlorite + caustic soda and caustic soda) with capacity of  $16,000 \text{ Nm}^3 \text{ h}^{-1}$ , made in

polypropylene, with centrifugal aspirator fitted with soundproofing cabin, and chimney stack for the outlet of deodorized air into the atmosphere.





# WASTE WATER TREATMENT PLANT FOR THE MUNICIPALITIES OF S. AGNELLO, PIANO DI SORRENTO, META DI SORRENTO AND VICO EQUENSE

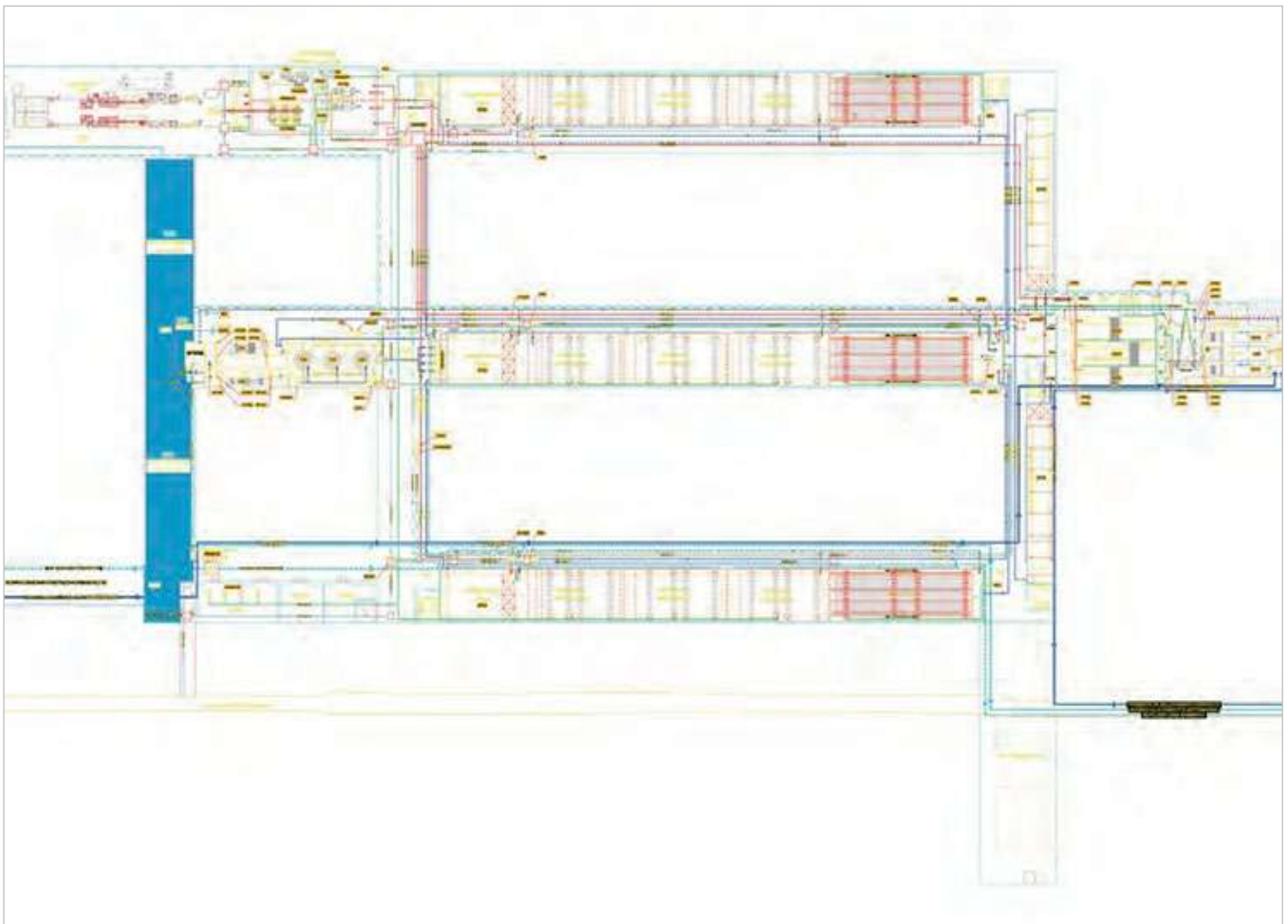
Location:	Province of Naples – Campania, Italy
Client:	SLED SpA (Naples), on behalf of Government Office for Waste Emergency, Reclamation and Protection of Water in Campania Region
Services:	Detailed Design
Period:	11/2004 – 12/2004
Construction cost:	€ 41,057,844

## Project Description:

The project was developed to serve a potential number of 137,000 Equivalent Inhabitants.

The project was carried out by building the plant in- side communicating tunnels.

The type and size of purification units were chosen taking into account the limits established by the decree 152/1999 for waste water discharged into the sea through underwater piping (discharge into surface water) and those provided for by the environment Ministerial decree 185/2003 about water destined to be reused.



# COMPLETION AND UPGRADING OF THE WASTEWATER TREATMENT PLANT OF ROZZANO

Location:	Milan – Lombardy, Italy
Client:	Tutela Ambientale Sud Milanese Spa Noverasco di Opera, Milan
Services:	Preliminary Design, Final Design
Period:	10/2002 – 08/2003
Construction cost:	€ 2,363,300

## Project Description:

The conventional plant, based on activated sludge, was built in several steps between the 1970s and 1986 to serve 75,000 Equivalent In-habitants, with a 50% share of industrial effluents.

If, on the one hand population growth in the past 20 years made it necessary to upgrade the facility for 95,000 Equivalent Inhabitants, on the other hand the decree 152/99 also requires the upgrading of the treatment cycle to comply with the new stricter limits.

The project includes:

- doubling of the sand catching/separation phase;
- enhancement of the activated sludge biological treatment with the adoption of a moving bed adhered biomass treatment and modification of the aeration system;
- new final disinfection stage;
- new final filtration on textile.





# WASTEWATER TREATMENT PLANT OF ISCHIA

Location:	Ischia and Barano D'ischia (Naples) – Campania, Italy
Client:	SLED SpA, Naples, on behalf of the <i>Commissario di Governo per l'emergenza Rifiuti, Bonifiche e Tutela delle Acque nella Regione Campania</i> .
Services:	Detailed Design
Period:	09/2002 – 03/2003
Construction cost:	€ 15,369,434

## Project Description:

The plant was designed to treat urban waste water from the sewage system that collects all waste effluents of Ischia and Barano d'Ischia municipalities as well as rain waters coming from a white water collecting unit of the drainage basin of the town of Ischia, for a global served population of 61,000 Equivalent Inhabitants

The complex nature of this work, which was to be integrated in an extremely delicate tourist and environmental area, required accurate and systemic comparative analysis between several alternative solutions in order to find the one that could grant the required purification degree with minimum impact on the economic and social activities of the concerned area. Therefore the project included the building of the plant in a completely closed environment.

The following treatments are provided for effluents:

- preliminary screening and sand catching-separation treatments;
- moving-bed adhered biomass treatment for the removal of organic substances and nitrogen;
- chemical phosphorous precipitation;
- ultraviolet final filtration and disinfection treatment.



# ENHANCEMENT OF THE WASTEWATER TREATMENT PLANT OF DORGALI

Location:	Cala Gonone (Nuoro) – Sardinia, Italy
Client:	Municipality of Dorgali (Nuoro)
Services:	Final Design, Detailed Design, works supervision
Period:	05/1999 – 05/2002
Construction cost:	€ 1,207,950

## Project Description:

Considering the importance of tourism for the area, the plant was designed for a maximum potential of about 25,000 Equivalent Inhabitants in the summer season, with a minimum of some 2,000 Equivalent Inhabitants in winter.

The plant capacity complies with the waste limits established by the law 152/99 and subsequent modifications and integrations.

The project includes the following sections:

- screening and Imhoff tank;
- equalization-homogenization;
- chemical precipitation;
- adhered biomass biological treatment;
- disinfection;
- aerobic sludge digestion;
- mechanical sludge dehydration (centrifuge);
- odour emission control;



Works for a first functional lot are concluded.





## Industrial Waste Water Treatment Plants

# TREATMENT PLANT FOR DREDGED SEDIMENT FROM THE ARNO RIVER DRAINAGE CHANNEL

Location:	Pisa, Italy
Client:	Province of Pisa - Servizio di Difesa del Suolo
Services:	Detailed design and Environmental Impact Assessment
Period:	10/2012 – 01/2013
Construction cost:	€ 8,879,300

## Project Description:

The dredging operations foreseen for the restoration of the original hydraulic conditions of the Scolmatore d'Arno Channel, required to preserve the surrounding areas from flooding, generate a flux of sediments of 600,000 m<sup>3</sup>. The grain size of the sediments, and the presence of pollutants change along the Channel; a treatment plant is necessary for maximizing the reutilization of the dredged material. In particular, the purposes of the treatment plant are mainly directed to the dewatering of the incoming dredged material, in order to reuse it for dikes re-profiling works and beach nourishment, to the minimization of the disposal of the contaminated fraction and to allow the discharge of the treated water into the Channel, according to the national legal standards.



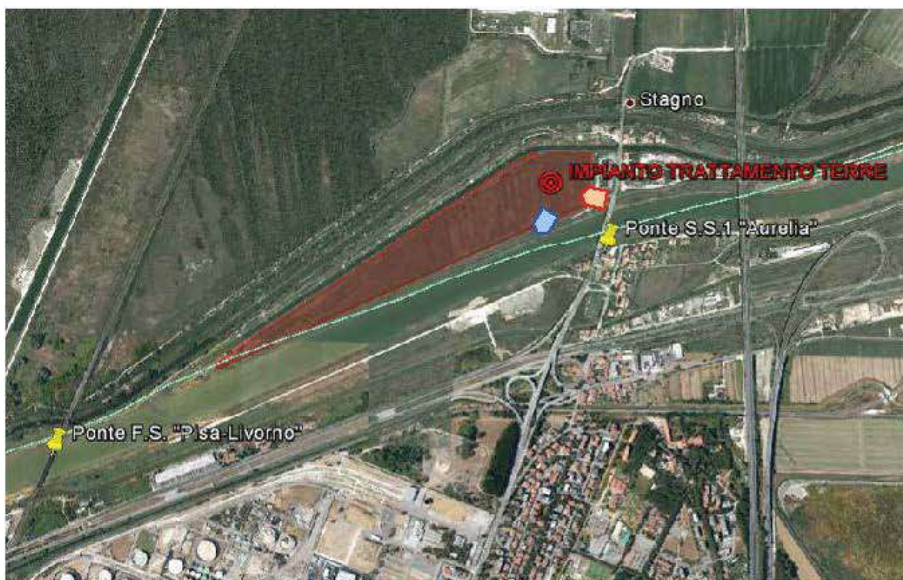
The dredged material will be transported by barges and then pumped to the treatment plant; it can be divided in two main fractions: the fine-pelitic one (silt-clay) is widely spread along the inland part (465,000 m<sup>3</sup>), while the sand fraction one (135,000 m<sup>3</sup>) comes mainly from the estuary of the Channel.

The main pollutants are HCs, PCBs and PAHs; the concentration varies along the Canale Scolmatore, with the higher values in the deeper layers of the riverbed, in close proximity to the estuary and the surrounding industrial areas such as refineries and port terminals.

The following sediment treatment processes foreseen depend on the nature of the incoming material and two different approaches have been considered, both based on physical methods such as natural desiccation, for the fine-pelitic fraction and soil separation, classification for sandy material.

The first process is based on the realization of 4 desiccation ponds in which the fine material is arranged in thin layers, in order to assure a natural evaporation, in a time lapse of 3 weeks.

This solution primarily characterized by a very low energy impact, has been adopted in view of the significant quantities of material to be treated, the high availability of surfaces and "medium-long" process times. At the same time, a volume reduction of the contaminated fractions that will be identified and quantified by soil analysis during the dredging operations and the treatment process is assured. For these fractions, if the degree of contamination results higher than the national legal standards for reuse also after the dilution, the contaminated material will be disposed to landfill. For the sandy fraction a sand recovery unit has been foreseen: the unit, based on the separation of the material with hydrocyclones, assures high values of classification, concentrating the contaminated parts in the overflow that will be treated into a chemical-physical water treatment plant: the treated water is stored and reused in the treatment processes. The sludge resulting from the clariflocculation process is mechanically dewatered and disposed to landfill.





# WORKS FOR UPGRADING THE BORGOMANERO WASTEWATER TREATMENT PLANT

Location:	Borgomanero (Novara) – Piedmont, Italy
Client:	Municipality of Borgomanero (Novara)
Services:	Preliminary Design, Final Design, Detailed Design, works supervision
Period:	01/2000 – 04/2007
Construction cost:	€ 1,909,994

## Project Description:

The plant, built in the early 1980s, serves a population of 38,000 Equivalent Inhabitants with around 60% of industrial waste.

Apart from the age, the decree 152/99 requires a significant upgrading work planned in two subsequent steps. The first step is now concluded and the second step works are underway.

On the whole, the project includes:

- new screening system with 3 mm spacing;
- restructuring of sand catcher/separator system;
- restructuring of the activated sludge biologic treatment line with subdivision on two lines in parallel and nitrogen removal;
- fine bubble aeration unit to replace turbines;
- final filtration of effluents;
- ultraviolet disinfection section;
- control of odour emissions;
- new mechanical dehydration unit with high capacity centrifuges;
- exhaust air extraction and treatment;
- renovation of structural works.

All works were scheduled and carried out with no interruption of the water purification service.



# WASTE WATER TREATMENT PLANT OF BORGO PADOVA: INTEGRATION OF THE FILTRATION AND DISINFECTION PROCESSES

Location:	Borgo Padova (Treviso) – Veneto, Italy
Client:	Municipality of Castelfranco Veneto (Treviso)
Services:	Preliminary Design, Final Design, Geotechnical Investigations, Topographic Survey, works supervision
Period:	01/2004 – 11/2006
Construction cost:	€ 470,189

## Project Description:

The existing plant dates back to the 1970s and subsequently underwent an enhancement project, still underway, aimed to increase its potential capacity to 40,000 Equivalent In-habitants, of which 75% is accounted for by civil effluents and the remaining 25% by paper mill effluents.

The plant discharges treated waste into the Venice lagoon through the Marzenego river and is therefore required to comply with the stringent limits introduced by the “Ronchi-Costa” decree, including prohibition to use chloride gas and hypochlorite for disinfection. In this framework, it was necessary to provide for inside the existing contact tank for the discarded hypochlorite treatment an ultraviolet disinfection stage preceded by final filtration on cloth.



## Project Figures:

Maximum delivery	$\text{m}^3 \text{h}^{-1}$	450	Outgoing suspended solids	$\text{mg l}^{-1}$	$\leq 10$
Incoming suspended solids	$\text{mg l}^{-1}$	35	Outgoing escherichia-coli	UFC 100 ml <sup>-1</sup>	$\leq 5,000$



# “CASSIS” WASTEWATER TREATMENT PLANT DEODORIZATION PLANT

Location:	Porto Torres (Sassari), Sardinia, Italy
Client:	Province of Sassari
Services:	Preliminary Design, Final Design, Topographic Survey, Technical Specification
Period:	06/2003 – 09/2003
Construction cost:	€ 1,483,339

## Project Description:

The CASSIS waste water treatment plant is housed in the area (around 94.500 m<sup>2</sup>) of ENICHEM facilities of Porto Torres, in the industrial district of La Marinella.

The plant processes all effluents conveyed from facilities, most of which petrochemical waste.

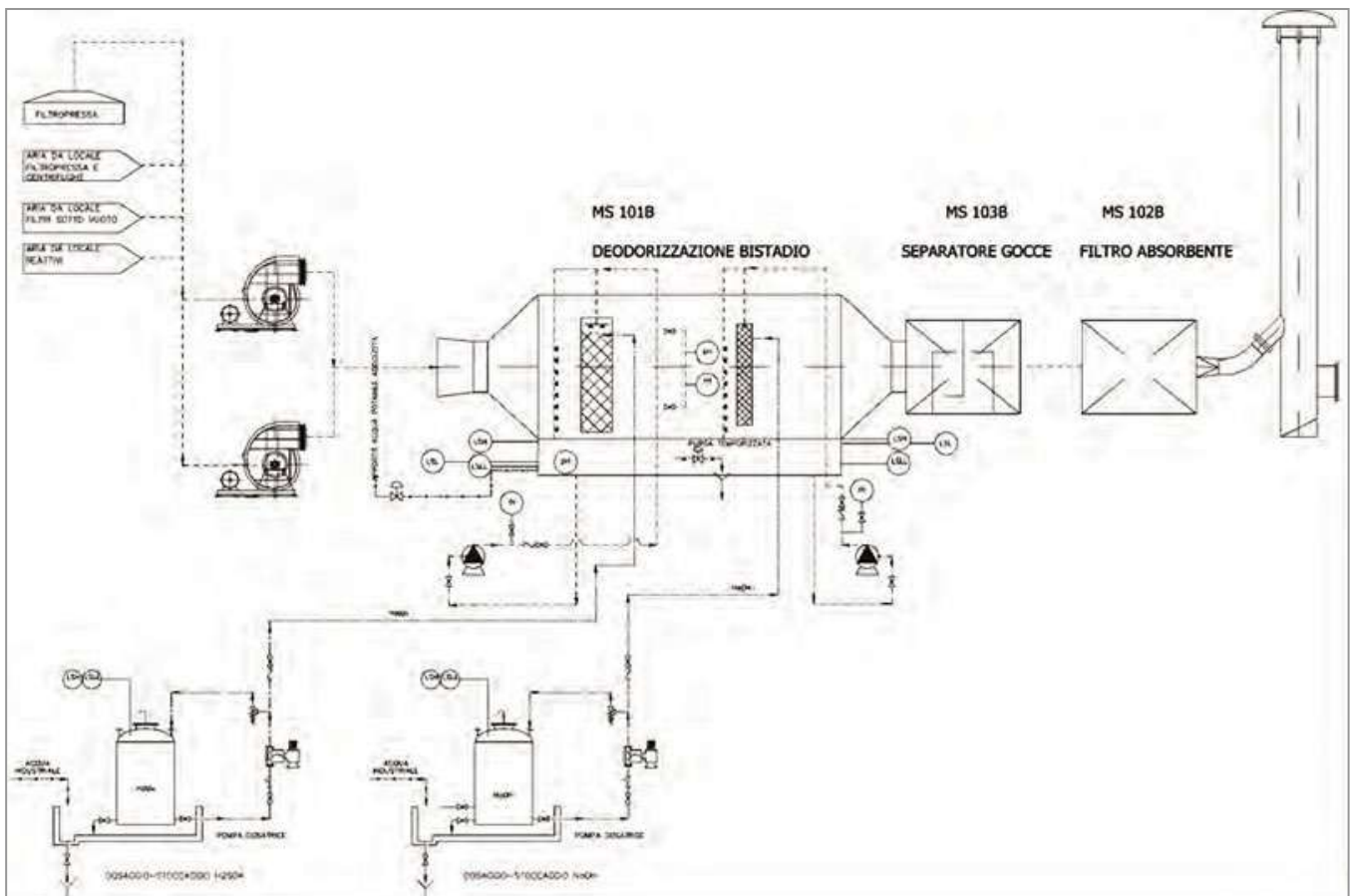
The plant was built for the treatment of:

oily waters	m3/h	1,865
chemical waters	m3/h	1,040
ballast waters from oil tankers	m3/h	600

In the case of meteoric phenomena, up to 450 m<sup>3</sup>/h of polluted meteoric water from processing areas can be added to oily waters.

Pollution load amounts to some 650,000 Equivalent In-habitants.

The project provided for the confinement of foul smelling sources in closed environments with air extraction and treatment in two deodorization plants, each able to treat up to 18,000 m<sup>3</sup>/h air with chemical washing and subsequent adsorption steps.



# ENLARGEMENT OF THE WASTEWATER TREATMENT PLANT OF THE CESANO BOSCONI, CORSICO, BUCCINASCO AND ASSAGO MUNICIPALITIES

Location:	Milan – Lombardy, Italy
Client:	Tutela Ambientale Sud Milanese S.p.A. Noverasco di Opera (MI)
Services:	Preliminary Design, Final Design
Period:	01/2002 – 08/2003
Construction cost:	€ 2,647,000

## Project Description:

The plant was designed and built in the early 1980s to serve 105,000 potential Equivalent In-habitants, with about 20% of industrial effluents.

On one hand, population growth in the last 20 years made it necessary to upgrade the facility for 140,000 equivalent In-habitants; on the other hand, the decree 152/99 also requires the upgrading of treatments to comply with the new stricter limits.

The project includes the following treatments:

- sand catching/separation stage;
- primary sedimentation;
- activated sludge biological treatment for the removal of organic substances and nitrogen;
- disinfection;
- final filtration on cloth;

Enhancement of sludge treatment line





# WASTE WATER TREATMENT PLANT OF THE SUB-DISTRICT No. 2 (SARNO RIVER BASIN)

Location:	Poggiomarino-Striano (Naples), Campania, Italy
Client:	Prefecture of Naples, Delegate Prefect, former Premier ordinance Sarno
Services:	Final Design, Detailed Design, Environmental Impact Assessment, Topographic Survey, Geotechnical Investigations, works supervision
Period:	05/1998 – 12/2001
Construction cost:	€ 39,681,130

## Project Description:

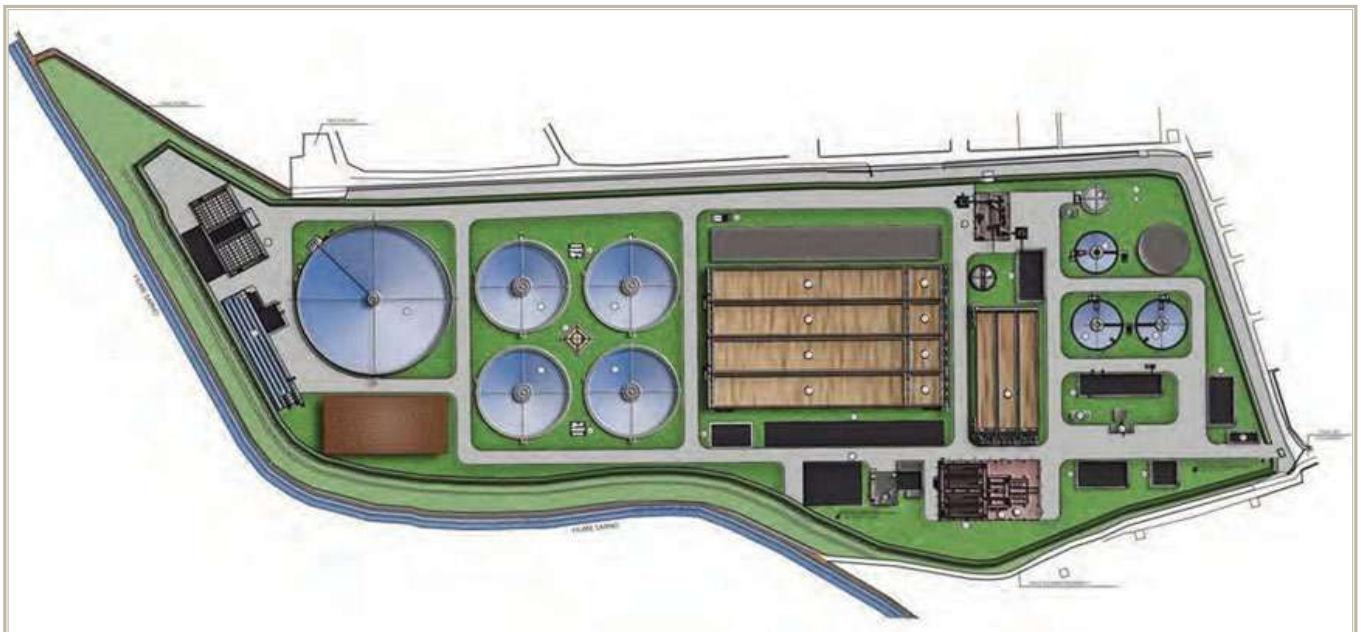
The plant was designed for a maximum potential of about 234,000 Equivalent Inhabitants, for the treatment of civil and industrial waste and receive waste liquors from septic and Imhoff tanks as well as biodegradable industrial sludge conveyed in tankers.

The plant capacity complies with the standards established by the directive 91/271/EEC for waste discharge in sensible areas, with efficient treatments for removal of nitrogen, phosphorous and suspended solids.

The following treatments are included:

- screening and sand catching/separation;
- activated sludge biological treatment for nitrogen and phosphorous removal;
- final filtration of effluents;
- disinfection with chlorine dioxide and UV rays;
- rainwater treatment;

- septic tanks and supernatant treatment;
- sludge thickening and anaerobic digestion;
- mechanical dehydration and thermal drying of sludge;
- treatment and use of biogas;
- odour emission control.



## Potabilisation and Desalination Plants

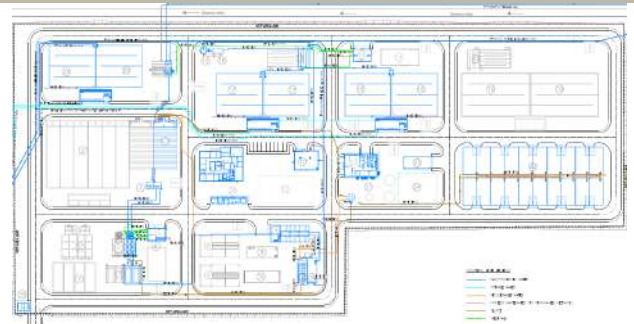


# ENGINEERING DESIGN SERVICES FOR WATER SUPPLY TREATMENT PLANT AND NETWORK FOR PHASE 1 KONZA TECHNO CITY

Location:	Kenya
Client:	KoTDA (Konza Technopolis Development Authority)
Services:	Concept/Preliminary, Detailed Design
Period:	08/2018 – 07/2021
Construction cost:	€ 41,000,000 (WTP € 16 million; water supply network € 25 million)

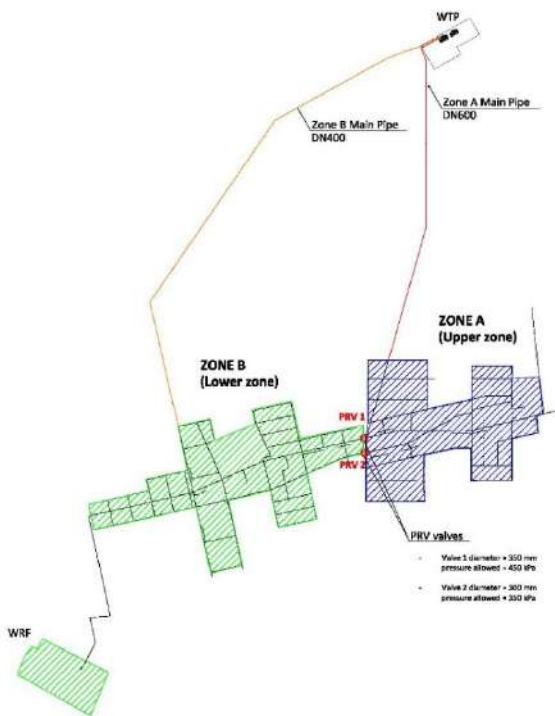
## Project Description:

The Konza Technology City (KTC) is a project of the Government of Kenya (GoK), implemented through EPCF (Engineering, Procurement, Construction and Finance) by the Konza Technopolis Development Authority (KoTDA), under the Ministry of Information and Communication Technology (MOICT). Konza City will be constructed over a 5000-acre land, located approximately 60 Km south of Nairobi Center. The city is designed to allow phased development, and Phase 1 includes various types of land uses and infrastructures that would support future phases of development. The project, implemented through EPCF (FIDIC Silver Book), concerns the development of a new smart technology city of about 28'000 inhabitants.



The WTP includes the following units:

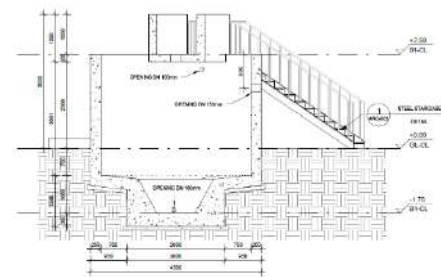
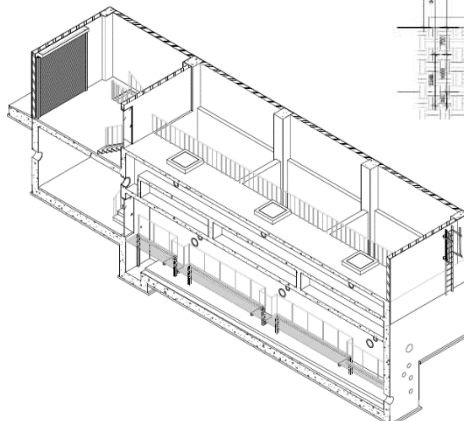
- preliminary treatment building
- pre-sedimentation
- coagulation distribution chamber
- coagulation
- flocculation
- coagulant-flocculant storage building
- sedimentation
- filtration
- fresh backwash storage
- spent backwash storage
- UV disinfection
- chemical disinfection
- disinfectant storage building
- RO feed tank
- RO system
- potable water storages
- non-potable water storage
- gravity thickening
- sludge drying
- dried sludge storage
- electrical building
- administration building
- maintenance & storage guard house



The Water Supply network for Phase 1 comprises two Main Water Lines, from the Water Treatment Plant (WTP), supplying water to the city through approx. 48 km of pipelines spanning from DN160 to DN600 and approx. 2 km of 2" for house connections. Also, it provides water for fire protection too through a widespread network of fire hydrants.

The Water Treatment Plant is designed for Phase 1 (28'000 equivalent population); nevertheless, it allows for future expansion up to the complete development of Konza Techno City (Phase 4 - 182,500 PE). It is designed in compliance with the requirements set out by the National Environment Management Agency (NEMA) in 2006 Kenyan Environmental Management and Coordination (Water Quality) Regulations.

The Water Treatment Plant treats water from different sources: presently from boreholes and Nol Turesh aqueduct, while Thwake Dam will cater for the future development phases. Also, WTP may potentially treat water from the Wastewater Reclamation Facility (WRF).



The instrumentation and control system is integrated into the smart-city concept for Konza.

# UPGRADING AND ENHANCEMENT OF THE CLARIFICATION AND CONDITIONING PLANT AND RELATED DISTRIBUTION CONDUITS AT MEGARA (SICILY)

Location:	Megara – Sicily, Italy
Client:	SLED SpA, Naples (Contractor) on behalf of the Office of the Delegate Commissioner for Water Emergency – Palermo
Services:	Detailed Design, Environmental Impact Assessment
Period:	01/2004 – 12/2004
Construction cost:	€ 6,269,000

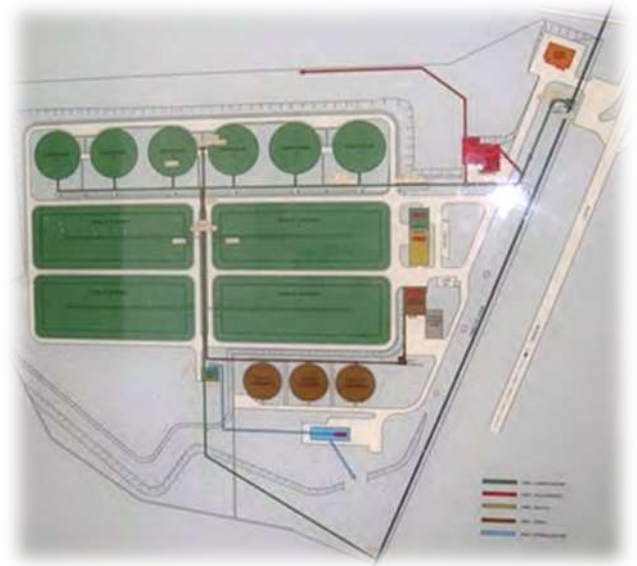
## Project Description:

The project includes upgrading and enhancement of the existing clarification and conditioning plant and the distribution network of treated water for industrial use and drinking use. The building of effluent collectors and the distribution network of treated water for industrial use.



The following works were carried out:

- renovation of the clarification/flocculation section;
- restoration of clarified water accumulation basin;
- new lifting station for the conditioning section;



- new pre-treatment line at the conditioning section (clarification-flocculation/softening, pre-oxidation with ozone, neutralization/flocculation and dissolved air flotation);
- restoration of gravity filtration on sand;
- enlargement of the conditioned water basin and new plant for water release to users;
- renovation of sludge treatment line (thickening and mechanical dehydration).





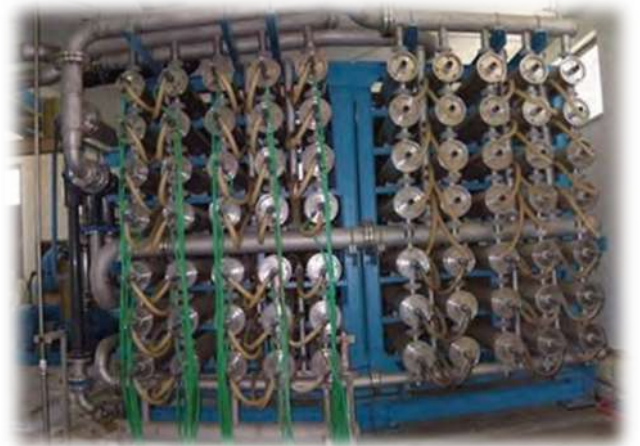
# ENHANCEMENT OF THE CONSORTIUM WATER TREATMENT PLANT AND RELATED COLLECTORS AND DISTRIBUTION CONDUITS AT PRIOLO (SICILY)

Location:	Priolo – Sicily, Italy
Client:	SLED SpA (Naples), on behalf of the Office of the Delegate Commissioner for Water Emergency (Palermo).
Services:	Detailed Design, Environmental Impact Assessment
Period:	07/2004 – 09/2004
Construction cost:	€ 10,320,000

## Project Description:

The project includes the development of waste water collectors, upgrading and enhancement of the existing treatment plant and the distribution conduits of treated waste water for industrial use. The following works were carried out:

- renovation of 3 lines out of 4 of the existing refining section (tertiary treatment) with focus on the flocculation and lamellar clarification steps for a total potential capacity of 1,200m<sup>3</sup>h<sup>-1</sup>;
- the new accumulation (500m) and release (1,200m<sup>3</sup>h<sup>-1</sup>) tank for clarified waters;
- 
- the new desalination section on 4 lines, each of 300m<sup>3</sup>h<sup>-1</sup> capacity, based on the following steps: multilayer filtration (sand and anthracite) under pressure with in-line flocculation, dosing of bactericidal solution, cartridge microfiltration, dosing of anti-precipitant solution, two-stage osmosis process, accumulation, pH adjustment and release of desalted water, concentrated accumulation and release.







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