Politecnico di Torino

Department of Environment, Land and Infrastructure Engineering

Master's Degree Thesis

Drinking water and sanitation master plan for the Avant-Monts community of communes (CCAM)

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Abstract

This report presents the implementation approach of an intermunicipal master plan for drinking water supply and sanitation, particularly in its initial phase. This first phase, consisting of the establishment of an exhaustive situational analysis, developed for the commune of Neffiès, is the object of the internship and is detailed in this document. This allowed getting a better knowledge of the current state, to raise possible problems (resources, treatments, leaks, regulations...) and to analyse precisely the sectors requiring work.

The commune studied has a network that is generally in good condition, yet some drilling work will be necessary. The treatments implemented on the network remain satisfactory. The study is currently awaiting the last field visits concerning the municipalities managed by public service delegation (SUEZ operator) before launching the metrology phase.

Key words:

Master plan
Drinking water
Sanitation
Tank
Catchment work
Environmental assessment
Diagnosis work
Water quality analysis

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Introduction

The management of drinking, waste and rain waters in urban areas is an important issue in the planning and development of a territory. The proper functioning of all water collection, distribution and treatment systems helps to protect the environment, preserves certain uses and saves money.

However, all these systems may present operational problems; design dysfunctions and coherence between networks, alterations over time, intrusion of parasitic clear water, undersizing works, treatment not meeting regulatory requirements, etc.

In order to optimise these urban hydraulic systems, several types of studies can be carried out. These later can take the form of master plans for drinking water, sanitation or rainwaters. Their main interest is to improve the knowledge of hydraulic systems, to suggest solutions in order to reduce the various dysfunctions and to allow an adequacy with future needs.

As part of the end-of-study internship, the trainee took part in the first phase of the Drinking Water Supply and Sanitation Master Plan for the Community of Avant-Monts Municipalities (CCAM). This major project, which will extend over several years, includes 18 communes for the sanitation competency and 13 for the drinking water one.

In order to carry out his mission, and thus meet the specifications imposed by the intermunicipality, the trainee has been entrusted with data collection missions as well as their exploitation in order to implement a report in the form of summary sheets. The study also includes work diagnostics on the communes.

This internship was carried out over a period of 6 months, between March and August 2020, within the ENTECH Engineers Consulting office.

1 THE STUDY CONTEXT

1.1 Company presentation

1.1.1 Sector of activities

ENTECH Consulting Engineers is a consultancy firm specialising in the water field and particularly carries out the following missions:

- Diagnosis of Drinking Water Supply (DWS), sanitation, rainwater and irrigation networks,
- Water supply, sanitation and rainwater master plans,
- Regulatory studies: administrative regulation of water catchments, water law authorisation file, impact studies,
- Asset management of the networks,
- Resource conservation and irrigation studies,
- Network modelling,
- Project management :
  - Collection and transfer network
  - Washing area and treatment of phytosanitary products
  - Construction and rehabilitation of wastewater treatment plants (WWTP)
  - DWS works: water catchments, reservoirs, treatment, networks, etc.
  - Irrigation network, pumping
  - Restoration and development of aquatic environments
- Project management assistance for the management of public water and sanitation services,
- WWTP audit and operational assistance.

1.1.2 Company background

The Société d'Economie Mixte (SEM) Ecosite (public structure) has been present on the site of the Mèze lagooning station since 1985. One of its main activities is research on water purification by natural lagooning.

ENTECH (public limited company) was created as a subsidiary group of Ecosite's company in 1999. The group gradually detached itself from the public structure when Yves COPIN, its director, bought out most of the shares in 2002. Thus, in 2005 the company becomes totally independent due to the liquidation of the SEM Ecosite.

In 2015, according to the will of the director and in order to ensure the durability of the company, the company is bought by SEGIC, a SAS (Simplified stock company). The latter is an independent company with more than seventy-five employees, including about fifty engineers, which has been developing its research and project management activities for 45 years in the fields of urban development, roads, road equipment, environment and landscape. These activities have been supplemented over the years by those of Traffic-Circulation,

Information Systems and various road networks, enabling it to offer all the skills in the field of infrastructure engineering.

1.1.3 Company organisation

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The company is made up of different divisions:

- The production unit, made up of about fifteen engineers, divided into 4 teams
- The drawing unit, made up of two draftsman-projectors
- The administrative unit, composed of three assistants
- A R&D (Research and Development) unit, composed of a R&D contributor

The organisation chart for the company can be found in Appendix 1.

2 SPECIFICATIONS AND METHODOLOGY

2.1 Specifications

The trainee will oversee the first phase of a drinking water and sanitation master plan. This will be the master plan of the Community of Avant-Monts Municipalities (CCAM).

More precisely, the trainee will have the following missions:

- ✓ Collect, analyse and use existing data: regulatory and environmental context, system performance (volume and performance indicators), quality data, urban planning aspects, etc., in order to identify information deficits
- ✓ Establish a preliminary diagnosis of the works by visiting them accompanied by engineers or technicians; catchments, reservoirs, booster stations for the drinking water supply part but also wastewater treatment plants, discharge stations, and storm overflows for the sewage part.
- ✓ Define the needs in terms of additional equipment in order to launch the measurement campaigns but also in terms of repair work if necessary,
- ✓ Location of the network as part of the diagnosis to identify the most obsolete sections,
- ✓ Make projections of population and future needs,
- ✓ Write intermediary reports on the current situation

The trainee's first mission will therefore be to accomplish a complete inventory of the drinking water network in all the municipalities of the CCAM and its operation.

For this, given the large number of municipalities to be treated, it was decided to use the data processed in the form of various summary sheets in order to obtain a more concise report and subsequently facilitate the understanding by the various project stakeholders.

2.2 General methodology of a master plan

The purpose of this long-term study is to draw up a communal drinking water and sanitation master plan on the scale of the inter-municipality in order to homogenise the problems and to have a global view of the whole territory. However, the analysis will be framed for each commune to maintain a sufficient level of detail and to take into account the specificities of each one. It is therefore an inter-municipal scheme with a communal level of detail.

2.2.1 Drinking Water Supply Master Plan

A drinking water master plan is a process, generally initiated by the communes themselves, which aims:

- To take stock of the regulatory, technical and financial conditions to supply a community with drinking water
- To point out the existing problems, both regulatory and technical, both quantitative and qualitative, both at the level of the resource and at the level of the production and distribution systems
- Estimate future needs and determine the right balance between the resource capacity and the consumer needs
- To develop a programme of work over the short, medium and long term adapted to the needs of the community and its means.

The master plan is a programming and management tool for the community that should enable it to have a global vision of the needs and possible solutions. It is an essential prerequisite for carrying out structural works and developing urbanisation: the coherence of the plan with current urban planning documents must be ensured.

A master plan is made up of different phases:

- PHASE I: Inventory, collection, analysis and synthesis of existing data
- PHASE II: Future needs and adequacy of current infrastructures
- PHASE III: Study of possible solutions, comparative analysis of the different scenarios.
- PHASE IV: Precise study of the selected scenario and drinking water supply scheme.

2.2.2 Wastewater Master Plan

The collective sanitation master plan is a multi-annual and prioritised programme of actions designed to improve the knowledge, management and operation of the collective wastewater sanitation system, which includes the network and the treatment plant. It thus aims to :

- Protecting aquatic environments by reducing pollution discharges into the natural environment
- Preserving uses by improving the efficiency of the sanitation system as a whole
- Guaranteeing the effectiveness of the treatment over time
- Optimising operating costs

In order to elaborate a sanitation master plan, a diagnostic study must be carried out upstream. This study is divided into several phases, which are described at the end of this section. The objectives of these different phases are governed by the ministerial decree of 21 July 2015 relating to collective sanitation as well as some guidelines of the master plan for water development and management of the territory.
The different phases lead to the production of the master plan. As for the drinking water master plan, this document is a programming and management tool.
When the collective sanitation master plan is combined with collective/non-collective zoning, it becomes the wastewater sanitation master plan.

The methodologies of the schemes may vary according to the calls for tenders, according to the data on the sanitation system already available. However, the following methodology can be given as an indication;

- PHASE I - Inventory of the available data and pre-diagnosis of the sanitation system
- PHASE II - Campaigns to measure flows and pollutant loads
- PHASE III - Precise location of network anomalies and malfunctions
- PHASE IV: Assessment of the functioning of the sanitation system - diagnosis

3 CCAM STUDY

3.1 Presentation of the community of communes

The CCAM is an intermunicipality located on a dynamic territory, in the north of Béziers and south of Bédarieux, in the department of Hérault (34) in the Occitanie Region, as it can be seen in the *Figure 1* below. It includes 25 communes representing a total permanent population of around 25 000 inhabitants.

On 1st January 2017, the Orb and Taurou Community of Communes and Les Avant-Monts of the Center Hérault Community of Communes merged to comply with the NOTRE law (which gives new powers to the regions and redefines the powers attributed to each territorial authority).

Its name is inspired by its topographical situation, its communes being located in the heart of the Hérault, on the southern and very Mediterranean side of the Avant-Monts du Languedoc, low mountains making the transition between the plains and the south of the Massif Central.

The vocation of these villages is essentially viticultural, at the crossroads of the Languedoc, Faugères, Saint Chinian, Côtes de Thongue, Pays d'Oc and Pays d'Hérault.

Figure 1: The studied area located over a France map

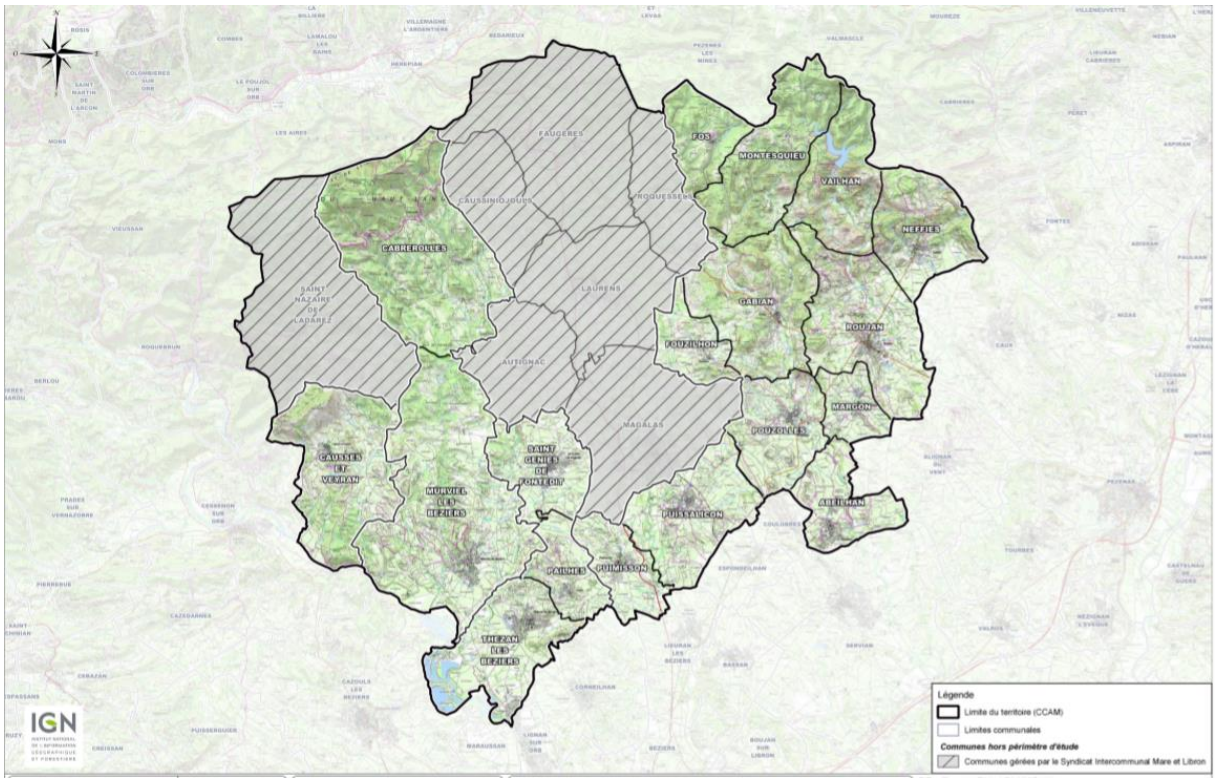


Figure 2 : CCAM territory delimitation

The map above delimits the territory under scrutiny (the CCAM territory) with black outlines. Inside of it, the communes striped in grey are not concerned by the study, as they are managed by another syndicate.

3.2 Structure and management of the territory

It is important to underline the diversity of management methods for local public services. Indeed, local authorities and their groupings have the freedom to choose the management method for operating their public services. This freedom derives from the constitutional principle of free administration of local and regional authorities. The latter can then decide:

- either to manage the service directly (direct management).

- or to entrust its management to a third party through a public service concession or delegation.

Leasing is a type of Public Service Delegation contract in which the community of municipalities entrusts the operation of its facilities to a farmer. The farmer is remunerated from the proceeds of the farm and pays the owner a lease, the amount of which is agreed in advance and is independent of the operating results.

3.2.1 Sanitation structure over the territory

Sanitation in a few figures:

→ Sanitation competence in 18 of the 25 municipalities of the territory (direct management)
→ 10 500 subscribers
→ 21 wastewater treatment plants
→ 160 km of network

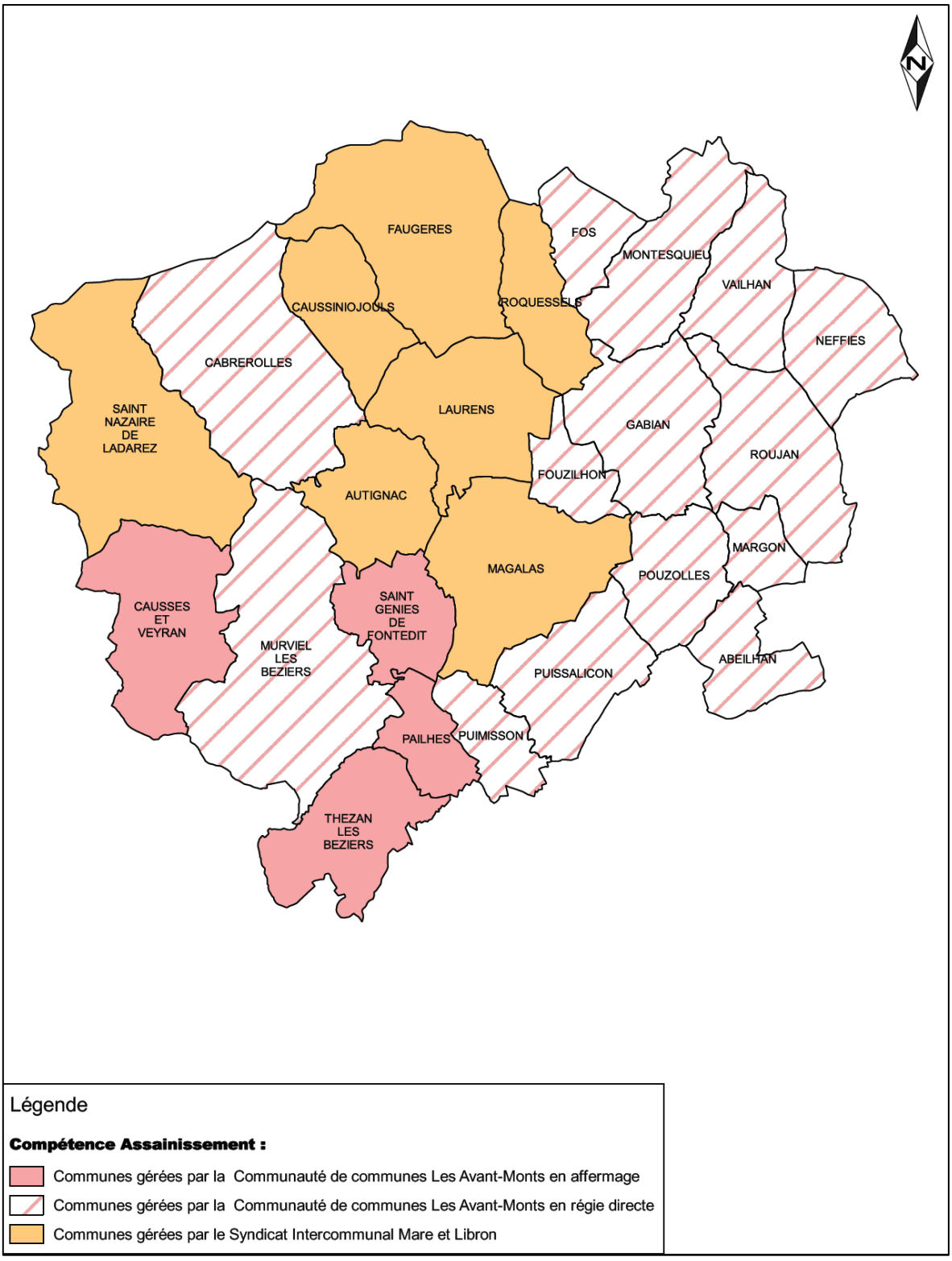


Figure 3: Mapping of the different modes of sanitation management of the CCAM

The scope of the study that is the subject of these specifications only concerns the 18 municipalities for which the CCAM is responsible for wastewater treatment : Abeilhan, Cabrerolles, Causses et Veyran, Fos, Fouzilhon, Gabian, Margon, Montesquieu, Murviel Les Béziers, Neffiès, Pouzolles, Puimisson, Puissalicon, Roujan, Saint Geniès de Fontedit, Pailhes, Thézan Les Béziers et Vailhan.
They are represented in pink on the map above (striped and filled pink in the legend).

3.2.2 Drinking water structure over the territory

Drinking water in a few figures:
→ Drinking water competence in 13 of the 25 municipalities of the territory
→ 8,000 subscribers
→ About twenty resources
→ About fifteen tanks
→ 150 km of network

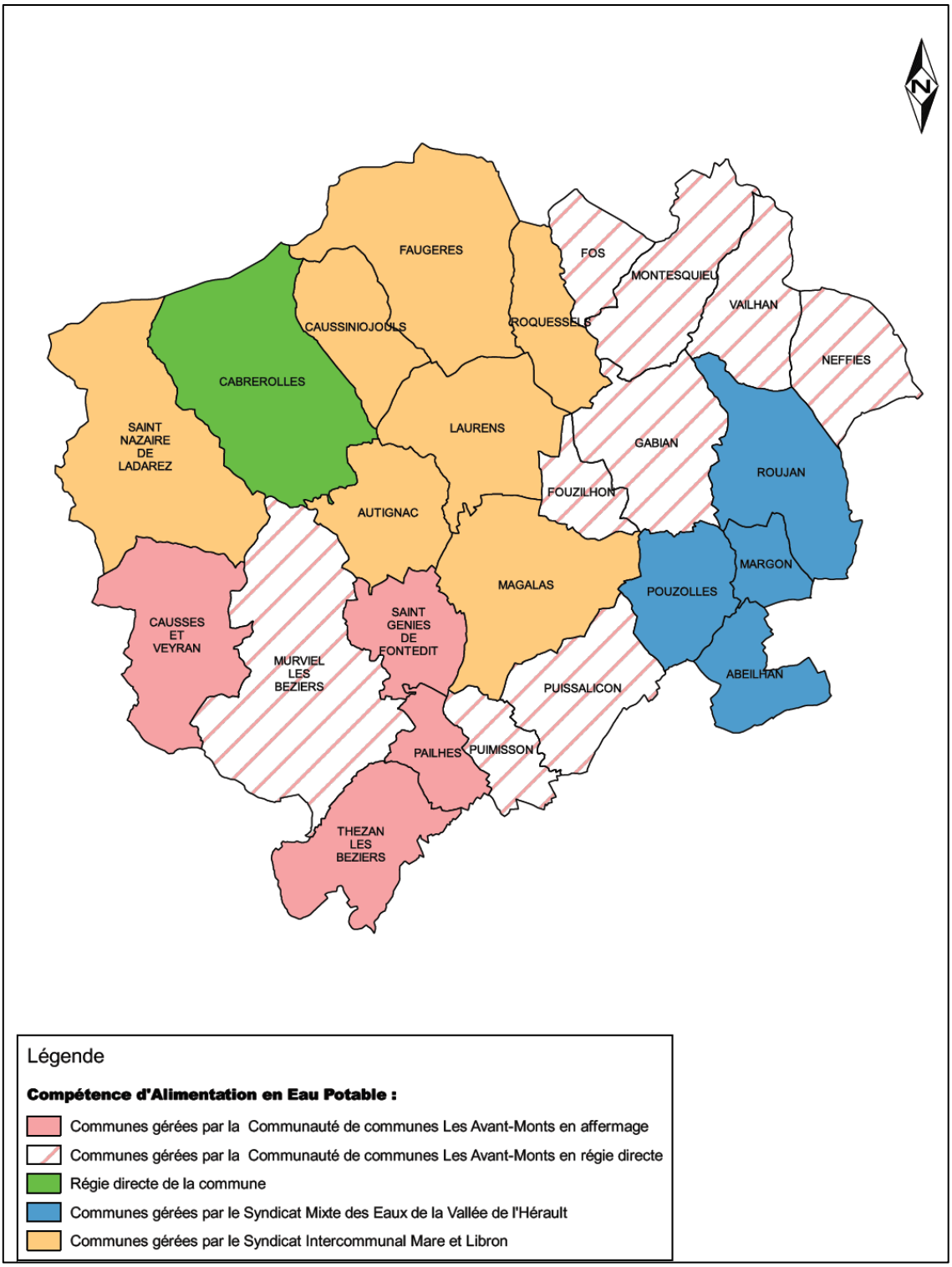


Figure 4: Mapping of the different modes of drinking water management of the CCAM

The scope of the study that is the subject of these specifications only concerns the 13 municipalities for which the CCAM is responsible for drinking water supply : Fos, Fouzilhon, Gabian, Montesquieu, Murviel Les Béziers, Neffies, Puimisson, Puissalicon, Vailhan, Causses et Veyran, Pailhes, Saint Geniès de Fontedit, Thézan Les Béziers.
They are represented in pink on the map above (striped and filled pink in the legend).

3.3 Public tender and objectives set out in the technical and specific clauses book

In August 2019, the intermunicipality is launching a public tender with the aim of drawing up a master plan for water supply and sanitation in its territory, updating the old plans and integrating the current ones. The assistance to the contracting authority is the CCAM itself. ENTECH design office has been selected, as the project manager (PM), to carry out this task.

By drawing up this plan, the project owner (the CCAM) wishes to meet several challenges:

- Initiate investigations and draw up a diagnosis of the operation of the works.
- To improve knowledge of the heritage with, in particular, the updating of all the data including network plans, performances, hypotheses of evolution of urbanisation and future needs;
- To study, in the light of the changes planned in the programming documents (Local Urbanism Plan, Territorial Coherence Scheme, etc.), communal solutions and inter-communal solutions that enable needs to be pooled;
- Establish a prioritised and costed programme of improvement and extension works taking into account intermunicipal solutions;
- Through this intermunicipal drinking water plan, provide decision-making tools for the next 20 to 30 years.

In the territory of CCAM, the Drinking Water Supply Master Plans are to be adopted in their entirety, as well as for Sanitation ones.

3.4 First phase expectations

Objective: Getting to the most complete and reliable possible representation of the state and functioning of the existing service, in particular:

- To have a perfect knowledge of the DWS infrastructures and the functioning of the whole system.
  - ✓ Existing infrastructures (supply, distribution) ;
  - ✓ Existing abstraction points ;
  - ✓ Other water supply points ;
  - ✓ Treatment works, storage, booster works;
- Acknowledge the history and organisation of the community in charge of managing the drinking water supply service;
- Analyse the operation of existing infrastructures, their management and service methods;
- Determine the shortcomings (structural, regulatory, operational, management, environmental, safety) of the existing infrastructure in relation to the current situation, to specify the means to remedy them and the deadlines;
- To be able to verify subsequently (subsequent phases of the study) the adequacy of the existing system and to indicate the means and investments to be planned;
- Provide the necessary elements to be attached to the regulatory file to enable existing catchments to be brought into compliance and to obtain authorisation for distribution and treatment:
  - ✓ Justification of needs ;
  - ✓ Justification of the adequacy of existing or planned treatments with the quality of the

raw water;
  - ✓ Justification of the conformity of the supply and distribution network with the regulations in force;
  - ✓ Taking into account a balanced management of the resource;
- Having a perfect knowledge of the sectors not served by public drinking water supply networks.

3.4.1 The different steps

Several stages must be carried out upstream of the study in order to complete the first phase of the master plan:

- Information collection: a stage which is essential in order to take stock of the existing situation, thanks to preliminary interviews with the elected representatives and technicians in charge of each municipality,
- Field investigations: field visits were organised in order to make an inventory of the works, in comparison with the data transmitted, but also to understand the current communal water supply and sanitation system,
- Implementation of additional inspections: following the identification of missing data, plans for additional investigations were set up.

Once all of these steps had been completed, the interpretation of data and the drafting of sheets could begin. A distinction will be made between the two components (drinking and sewage waters) when drafting the framework for the final report.

As part of his mission, the trainee first participated in the field inspections following the processing and use of existing data, but also in the drafting of the summary sheets, supervised by the engineers in charge of the study.

3.4.2 Addressed aspects throughout the study

3.4.2.1 Environmental aspects

Within the framework of the master plan and taking into account the issues related to the current resources and the natural environment, an inventory of the environmental constraints of the municipal territory was carried out in order to highlight the current and future objectives and constraints.
This inventory was carried out on the basis of a bibliographical synthesis of the data available from the various stakeholders (Health National Agency, Water Agency, Departmental Directorate of Territories, Geology and Mining Research Institute, Regional Directorates for the Environment, Planning and Housing...) but also on the basis of an analysis of the framework documents (Water Development and Management Master Plans, River Contract...) and existing studies.
More specifically, the points addressed are the following:

- Climatological context: it allows to analyse the periods of high and low rainfall, which have an impact on water resources.
- The topographical context: it plays a role in the structure of the drinking water network

(positioning of reservoirs for gravity distribution, sector requiring overpressure, etc.).

- The geological context: it has an impact on the water collected (mineralisation, hardness, etc.) and on the possibility of drilling.
- The hydrogeological context: it enables the analysis of groundwater and surface water bodies, the communication between them and the available water resources.
- Natural environments: analysis of natural areas (Inventory of Natural Areas of Ecological, Faunistic and Floristic Interest, Important Bird Conservation Areas, Natura 2000, sensitive natural areas, etc.) that may be present on the municipal territory and may have an impact on the drinking water network.
- The hydrographic context and flood zones: to define the impact of flood zones on the drinking water network.
- The regulatory context: analysis of the framework documents of the catchment area (SDAGE, river contract, PGRE, departmental water resource management plan, SAGE, etc.) to highlight the objectives and orientations in terms of water resource management.

3.4.2.2 Urbanism and demography

It is important to assess the constraints linked to urban planning and their impact on the operation of the networks and structures of each community.
This inventory has been carried out based on the synthesis of available INSEE (National Institute of Statistics and Economic Studies) data, current urban planning documents and data provided by the town halls.
This assessment made possible to carry out a prospective demographic study which will subsequently allows to draw up an assessment of the adequacy of current infrastructures, future needs and regulatory constraints.
More specifically, the points addressed in this study are as follows:

- Current and planned urban planning document
- Study of the different types of housing present in the territory
- History of the urban development of the municipality and current situation for the permanent and seasonal population
- Study of economic activities within the municipality
- Study of drinking water consumption

Once this research has been carried out, a document is sent to the assistant project manager so that the latter can choose the demographic development approach that is most consistent with its objectives for 2050. This document is called a population note.
The rest of the scheme should then be based on the population objectives chosen to match future needs.

3.4.3 Works and equipments

3.4.3.1 Drinking water

An inventory of the facilities providing drinking water to the community is then carried out. This complete analysis not only provides an understanding of the operation of the network, but also identifies the shortcomings and the improvements to be made.

The study of each structure is carried out on the basis of existing documents, supplemented by field visits and interviews with the commune's water department.
The geographical location, characteristics, regulatory and administrative situation, withdrawal methods, hydrogeological context and vulnerability of the resource are described for each of the catchments present in the commune, as well as for the reservoirs.

In addition, a diagnosis of the works is carried out through field visits. A valve booklet is also produced using field trips to identify all the valves and other equipments (plungers, draining, pressure reducers, fire hydrants, etc.), to locate them and check their operational state. Following this diagnosis, the GIS plans are updated if necessary.

Then the state of the network is described by analysing the supply and distribution pipes (linear, nature and diameter of the pipes, age of the pipes, existence of lead connections, state of the meters, etc.). The understanding and management of the municipality's drinking water networks is described using indicator P103.2B. Indicator P103.2B assesses, on a scale of 0 to 120, both:
- The level of knowledge of the network and connections
- The existence of a multi-year renewal policy for the drinking water service

The synthesis of this part allows conclusions to be drawn as to the work to be envisaged at the level of the works and the network.

3.4.3.2 Collective sanitation

Within the framework of the master plan, it is important to make an inventory of the facilities for the community's wastewater treatment. Indeed, this complete analysis not only enables the operation of the network to be assessed, but also identifies the shortcomings and the improvements to be made.

The study of each structure making up the municipality's collection network was carried out on the basis of existing documents, supplemented by field visits and interviews with the project owner.

More specifically, the points addressed in phases 1 and 2 for this study are as follows:

- Presentation of the functioning of the sanitation system
- Study of the collection network
- Study of wastewater treatment plants
- Study of existing wastewater lifting units and rainstorm outfalls
- Presentation of the equipment works needed within the framework of the wastewtarer master plan

3.4.3.3 Non-collective sanitation (ANC)

The ANC competence is managed by the CCAM itself for all municipalities.
A census of facilities has been carried out on the basis of:

- Data from the Non-Collective Public Sanitation Service (SPANC),
- Exchanges with the project owner
- The analysis of the location of the dwellings in relation to the collective sewerage network.

The analysis of the existing situation was accomplished through the diagnoses made by the SPANC of the Avant-Monts community of municipalities. The installations were visited between 2006 and 2019.

3.4.3.4 Quantitative aspects

Within the framework of a master plan, it is important to establish a complete analysis of production and consumption data in order to understand the functioning of the commune's network.
Moreover, this analysis makes it possible to estimate the consumption habits of the inhabitants, the peak coefficients and to calculate the various consumption and leakage indices specific to the network. These elements will make it possible to calculate consumption and production needs up to 2050.
The different indices mentioned above are described below:

Linear consumption index:
The linear consumption index (LCI) is the ratio of total daily consumption to the length of the distribution network. It is defined in m3/d/km.

The Rhone-Mediterranean-Corsica Water Agency classifies water supply networks according to their linear consumption index:

Table 1 : Type of network according to the LCI

Network type	LCI
Rural network	LCI < 10 m3/d/km
Intermediary network	10 < LCI < 30 m3/d/km
Urban network	LCI > 30 m3/d/km

Network performances:
There are several types of performance. The most representative are primary (or gross) and net returns:

- **The primary return**
  - √ It only takes into account the volumes recorded in terms of consumption, which are related to the volumes put into service (i.e. produced).
  - √ It can vary significantly between two networks with different configurations. More than its absolute value, it is essentially its evolution that is interesting to analyse.

- **The net return**
  - √ It gives a more accurate account of the actual situation, since it takes into account all the volumes consumed and parasites on the network in relation to the volumes commissioned.
  - √ Nevertheless, it should be taken with caution, since it is partly the result of estimated volumes on which a degree of uncertainty persists.

The value of the yield will enable us to assess the state of the network based on the following criteria (new departmental objectives defined in accordance with Decree No. 2012-97 of 27 January 2012):

Table 2: Network performance ranking

Network categories	Deadlines	Rural LCI < 10 m3/d/km	Intermediary 10 < LCI < 30 m3/d/km	Urban LCI > 30 m3/d/km
Good	2030	> 70	> 75	> 85
Acceptable	2025	65-70	70-75	75-85
Poor	/	50-65	55-70	65-75
Bad	/	< 50	<55	<65

Linear loss index:

The linear distribution loss index (DLI) is the ratio of lost volumes to the length of the network in linear kilometers. It allows the volume of losses to be related to the size of the network. It is defined in m3/d/km.

The linear loss index will enable us to assess the state of the network on the basis of the following criteria (new departmental objectives defined in accordance with Decree No. 2012-97 of 27 January 2012):

Table 3: Classification of the network according to the DLI and the LCI

Network categories	Deadlines	Rural LCI < 10 m3/d/km	Intermediary 10 < LCI < 30 m3/d/km	Urban LCI > 30 m3/d/km
Good	2030	DLI < 2	DLI < 3	DLI < 7
Acceptable	2025	2 < DLI < 3	3 < DLI < 5	7 < DLI < 10
Poor	/	3 < DLI < 5	5 < DLI < 8	10 < DLI < 16
Bad	/	5 < DLI	8 < DLI	16 < DLI

This analysis is carried out on the basis of the data made available by the client for the last few years. The analysis of the production, distribution and consumption data depends on the meters present and read on the network, it is sometimes difficult due to the lack of data.

This study of the data provided by the project owner is supplemented by measurement campaigns in the field and night sectorizations in order to locate leaks in the network and then forecast the sectors requiring rehabilitation work.

- **Security, contingency plan, alert plan**

This part lists the measures planned to make the drinking water network safe and the alerts put in place in the event of malfunction or pollution of the resource.

This part also defines the existence of a network monitoring plan.

- **Water quality**

The purpose of this paragraph is to draw up a complete assessment of the quality of the water resource and the water distributed. The impact of the works and the efficiency of the treatment system are also studied.

Tap water is water intended for human consumption in accordance with article R. 1321-1 of the Public Health Code.

Water intended for human consumption must meet three conditions:

- ✓ It must not contain a number or concentration of micro-organisms, parasites or any other substances constituting a potential danger to human health.

- ✓ Comply with the quality limits defined in I of Annex 13-1 of the Public Health Code
- ✓ Satisfying quality references

When we talk about water quality we distinguish:

- **The « quality limits »:** regulatory values set for parameters whose presence in the water induces immediate or more or less long-term risks for the health of the consumer. These quality limits concern on the one hand microbiological parameters and on the other hand about thirty chemical parameters. In the light of the scientific and medical knowledge available, these quality limits guarantee a very high level of health protection for consumers. The water must comply with values lower or equal to the quality limits.

- **The « quality references »:** regulatory values set for about twenty quality indicator parameters which are indicators of the operation of water production and distribution installations. These substances, which do not have a direct impact on health, may highlight a malfunction in treatment installations or be the cause of discomfort or inconvenience for the consumer. **When the characteristics of the water deviate from these reference values, special investigations and checks must be carried out to understand the situation and assess the possible health risks.**

The analysis of water quality is carried out on raw water in order to estimate its capacity for drinking water treatment and possibly to raise problematic parameters, and on distributed water in order to analyse the conformity of water intended for human consumption and to check the effectiveness of treatments.
The parameters analysed are presented below:

Bacteriological parameters:

The parameters of revivifiable aerobic bacteria and total coliforms on the distributed water are to be monitored as they are representative of the quality of the distributed water:

- Revivifiable germs are considered to be indicators of the proper operation and maintenance of distribution works.

- The presence of coliform bacteria is a sure sign of contamination, but insofar as their origin is not solely faecal, this contamination should be studied according to its repetition over time, its extent and its dissemination. The discovery of coliform bacteria should lead to a search for the presence of E. Coli.

- The detection of E. Coli in treated water is a clear indication of contamination of faecal origin, which must give rise to a serious suspicion of the presence of other pathogenic microorganisms.

Turbidity:

Turbidity is an organoleptic parameter that measures the cloudiness of water. It is due to colloidal or suspended particles in the water. Apart from the modification of the organoleptic properties of the water that it causes, turbidity is not dangerous from a sanitary point of view. Moreover, its appearance has an importance on the other parameters defining water quality, especially on the bacteriological aspect.

Indeed, high turbidity is conducive to bacteriological contamination, since the presence of TSS facilitates the development of microorganisms that can adhere to the particles. It is therefore also necessary to eliminate turbidity, even if only occasional, from raw water.
Turbidity is also an indicator of the possible presence of parasitic cysts such as Cryptosporidium and Giardia. In fact, it has been shown that these parasitic cysts accompany turbid events. Chlorine makes it possible to inactivate Giardia, but not Cryptosporidium.
Monitoring and treatment of turbidity thus make it possible to free oneself from these parasitic cysts and to protect oneself from the associated water-borne diseases.

Today, French regulations :

- Requires a quality limit of 1 NFU (Nephelometric Turbidity) at the point of distribution.
- Recommends a quality reference of
  - ✓ 0.5 NFU is desirable at the point of distribution.
  - ✓ 2 NFU on distributed water

The calco-carbonic balance :

According to the circular of 23rd January 2007 (DGS/SD7A/2007/39), water intended for human consumption must be in calco-carbonic balance or slightly encrusting. The water category classes are defined as follows:

Table 4: Classification of the calco-carbonic balance of water

Class	Water balance
0	Encrusting water
1	Slightly incrusting water
2	Balanced water
3	Slightly aggressive water
4	Aggressive water

Water hardness :

Water hardness is an indicator of the mineralisation of water, it is representative of the concentration of calcium and magnesium ions in the water. The hardness is generally expressed using the Hydrotimetric Title (HT) in °F (French degrees).
The table below shows the water hardness as a function of HT:

Table 5: Water hardness as a function of HT

HT (°F)	0 à 7	7 à 15	15 à 30	30 à 40	+ 40
Water hardness	Very soft	Soft	Rather hard	Hard	Very hard

Lead dissolution potential:

The quality limit for lead in water intended for human consumption was lowered to 25 µg/l on 25 December 2003. This value must be respected at taps normally used for human consumption until 25 December 2013, when the quality limit of 10 µg/l will apply in application of decree n°2001-1220 of 20 December 2001 relating to water intended for human consumption.

The French Higher Council of Public Hygiene and the French Food Safety Agency recalled, in their respective opinions of 9 December 2003 completed on 9 November 2004 and 10 December 2003, that only the elimination of lead pipes at the level of public connections and internal networks will make it possible to comply with the quality limit set for lead at 10 µg/l at the end of 2013.
The assessment of the lead dissolution potential is based on field pH measurements carried out in situ during sampling.
The pH reference value is defined on the basis of all available analyses from the health control and monitoring carried out by the public or private person responsible for water distribution.
It corresponds to:

- The 5th percentile when the total number of analyses is greater than 20,
- At the 10th percentile when the total number of tests is between 10 and 19,
- At pH min when the number of tests is less than 10.

Thus, according to the table provided in the appendix to the decree of November, 4th, 2002:
"The pH reference value makes it possible to assess the potential for dissolution of lead in water at points considered to be representative of the quality of the water in the distribution unit."
This pH reference value is to be transferred to one of the pH reference classes as defined in the following interpretation grid:

Table 6 : Lead dissolution potential as a function of pH

pH classes	Lead dissolution potential
pH ≤ 7	Very high dissolution potential
7 < pH < 7.5	High dissolution potential
7.5 < pH < 8	Medium dissolution potential
8 ≤ pH	Weak dissolution potential

Water mineralisation:
The mineralisation of water is evaluated here on the basis of conductivity. The conductivity at 25°C must be between 200 and 1100 µS/cm (quality reference).

The chlorine residual:
French regulations (Public Health Code) set the obligation of results (0 faecal contamination control germ / 100 ml). The only constraint with regard to chlorine levels in the network is that of the Vigipirate plan (red level at present, since 7 July 2005) and corresponds to an obligation to maintain a minimum free chlorine concentration of 0.3 mg/l at the outlet of the reservoirs and to aim for a concentration of 0.1 mg/l at any point in the distribution network.

Other chemical parameters:
Other parameters are also monitored, these are the following products:

- Aluminium
- Ammonium
- Arsenic

- Barium
- Bore
- Bromates
- Copper
- Iron
- Fluorides
- Manganese
- Nickel
- Nitrates
- Nitrites
- Lead

3.4.3.5 Daily management

The monitoring of installations and their operation is generally the first step towards a rational management of water resources. The purpose of this paragraph is to present the maintenance, monitoring and intervention procedures in the event of a problem on the network. This part details in particular whether or not there is remote monitoring on the network, as well as an assessment of the adjustments to be made to the works.

4 RESULTS ACHIEVED IN THE FIRST PHASE

In this part, it has been chosen to process and exploit the data of a single commune, Neffiès one, for which the level of information is the most consequent. This choice was made to ensure a follow-up for the reader so as not to disorientate him coping with the large number of communes studied simultaneously.

4.1 General presentation

4.1.1 The community

The commune of Neffiès is in the north-east of the territory concerned by the CCAM, in the Hérault department (34), 23 kilometres north of Béziers and 45 kilometres west of Montpellier, as the crow flies. Its neighbouring municipalities are Vailhan, Fontès, Caux and Roujan.
Its territory covers an area of 11 km² and has an average altitude of 110m.
The centre of the commune is crossed on both sides by several streams: the Louvières, Font de Garot, Marelle and Bayèle streams. Its main access is from three departmental roads:

- the RD n°15, linking Neffiès to Roujan,
- the RD n°30E4 leading to Caux,
- the RD n°174 leading to Fontès.

4.1.2 Operation and characteristics of the drinking water system

Since 2014, the commune of Neffiès has been supplied with drinking water thanks to the Falgairas catchment field: the Falgairas North (F2) and South (F3) boreholes.

Currently, only the F2 borehole is being exploited because the F3 borehole has turbidity problems. The latter is currently only operated on an episodic basis, as a back-up to F2, but also to ensure a sanitary flow in the network. Furthermore, during rainy episodes, the F2 borehole can also be affected by this turbidity problem.

During these episodes of turbidity peaks, the water supply of the commune of Neffiès is ensured by an interconnection with the Drinking Water network of the Inter-municipal Water Syndicate of the Hérault Valley (SIEVH) thanks to the reservoir located in the commune of Caux. This additional resource can also be used in periods of drought, as was the case in the summer of 2014, when production from the Falgairas F2 borehole was at the limit of the possible withdrawal (approximately 300 to 350m3/d).

The principle of the commune's water supply network is then as follows:

1. Water is pumped from the F2 borehole,
2. The water is then pumped into a 30 m3 buffer tank, placed at 204 mNGF, attached to the pump room.
3. Chlorination with chlorine gas is carried out via an injection point directly at the buffer tank in the technical room of the pumping station.
4. A gravity pipe connects this tank to the municipal reservoir, placed at 156 mGF, with a volume of approximately 500 m3 (2 x 250 m3).
5. The distribution network of the commune, placed at 145 mNGF, is fed from the reservoir by gravity
6. The main distribution network consists of cast iron pipes with a nominal diameter of 125mm.

7. The secondary loops are made of cast iron or PVC with diameters of 60, 63, 100, 110 and 125 mm,

There are many meshes in the network in the historic centre. The rest of the municipality is fed by branched secondary antennas.
The total length of the network is about 15 km. The distribution network is being extended due to the development of the municipality. The supply of drinking water to the commune of Neffiès is therefore only by gravity throughout the village.

The commune ensures the operation and maintenance of its Drinking Water supply infrastructures (production, adduction, distribution), in particular for the emptying and cleaning of the tanks, electromechanical maintenance etc.... Sanitary controls are regularly carried out by the Regional Health Agency to verify the quality of the water distributed.

The synoptic of the Drinking Water supply network presented below shows the organisation of the network and its altimetry:

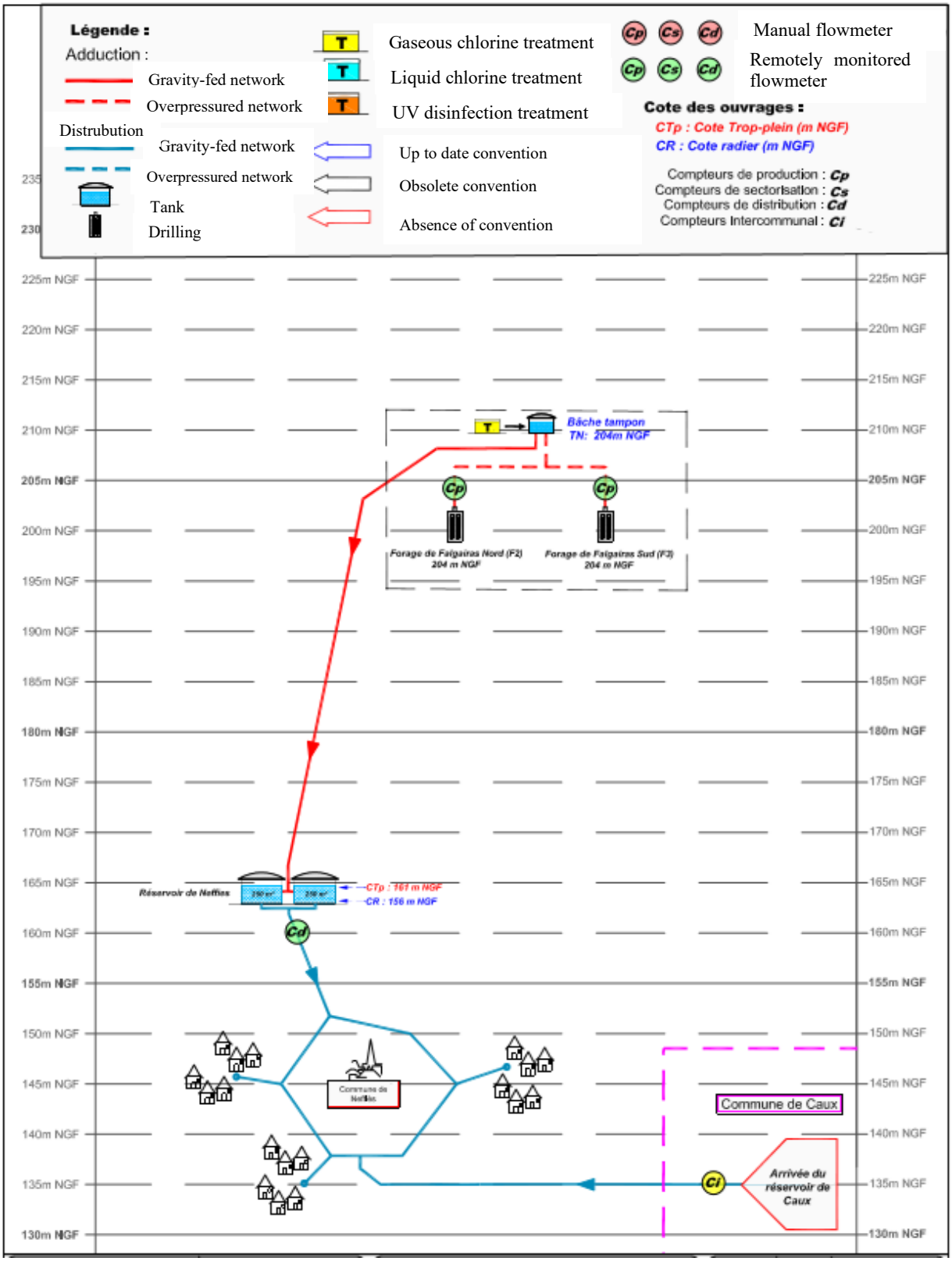


Figure 5 : Elevation diagram of Neffiès drinking water network

As regarding the flow measurements, 'Cp' stands for the production flowmeter, 'Cs' for the sectorization flowmeter, 'Cd' for the distribution flowmeter and 'Ci' for the intercommunal one.

Plus, the altimetry of tank is represented by CTp: the overflow level (161 mNGF, where NGF stands for the France national levelling) and CP: the concrete foundation flour level (156 mNGF).

4.1.3 Functioning of the wastewater network

The commune of Neffiès has a vertical system of filter planted with reeds type of WWTP, including a lifting station at the entrance to the WWTP and a storm overflow.
Its inhabitants are served by a separate wastewater collection network, essentially gravity-fed, with a 12 km long line. It collects wastewater from the entire village (apart from a few houses in the non-collective sanitation outside the collection perimeter).
The water is then conveyed to the discharge station at the entrance to the plant. This station ensures that the conditions for feeding the filter bins planted with reeds on the first treatment stage of the plant are respected.
As with the Drinking Water supply components, the municipality is responsible for the operation and maintenance of its wastewater treatment infrastructure under municipal control.

The synoptic of the sanitation network presented below shows the organisation of the network and its components altimetry:

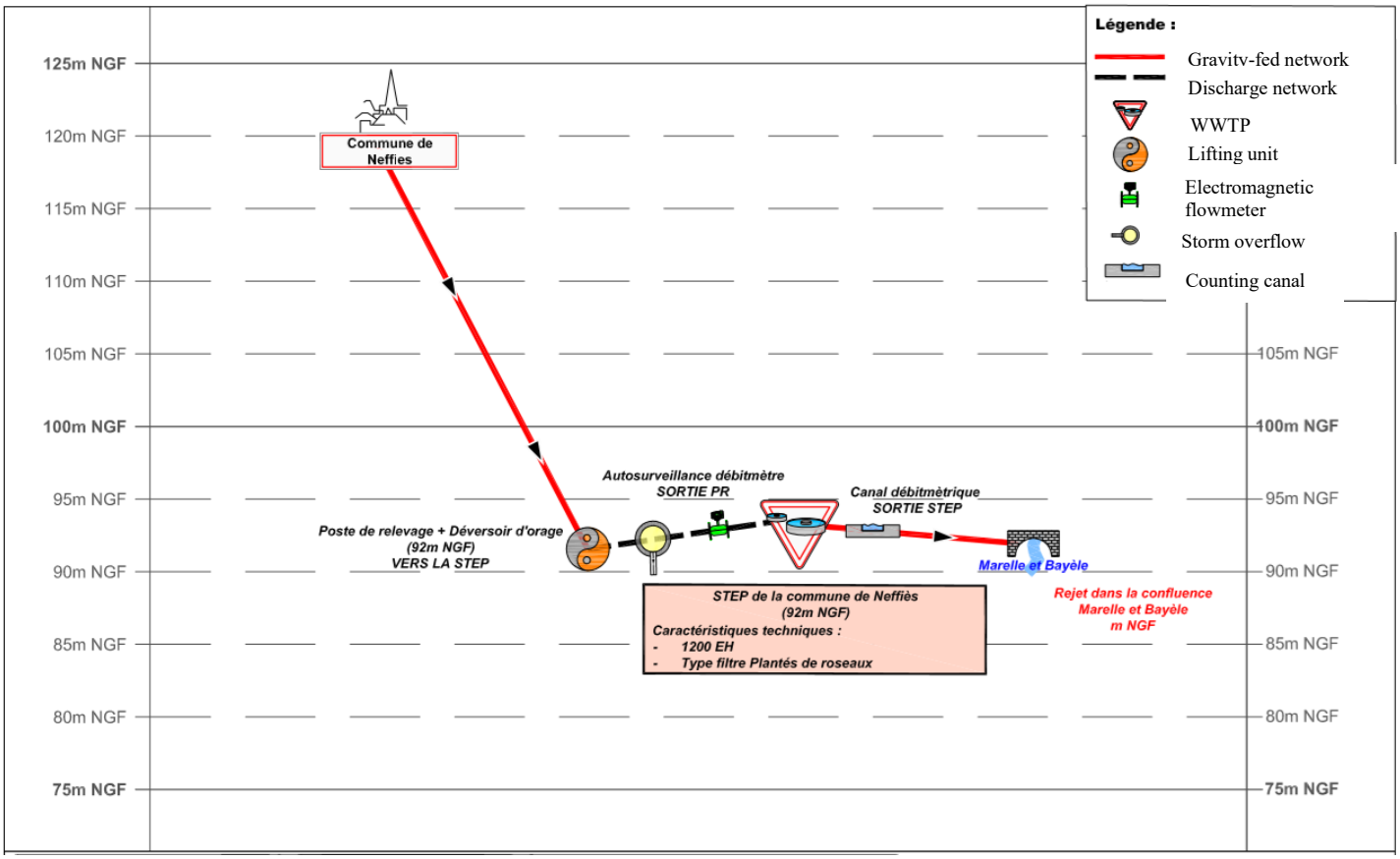


Figure 6 : Elevation diagram of Neffiès sanitation network

4.2 Study of the environmental aspects

4.2.1 Climatologic context

The reference climatological data were used from the weather station located in the commune of Cabrières, about 10km north of the commune. Indeed, it is the closest geographically to Neffiès as there are other sectors of the CCAM.

- The **average annual rainfall over the last ten years** has been 701.7 mm, with heavy rainfall in autumn and spring (93 rainy days) and low rainfall in summer.

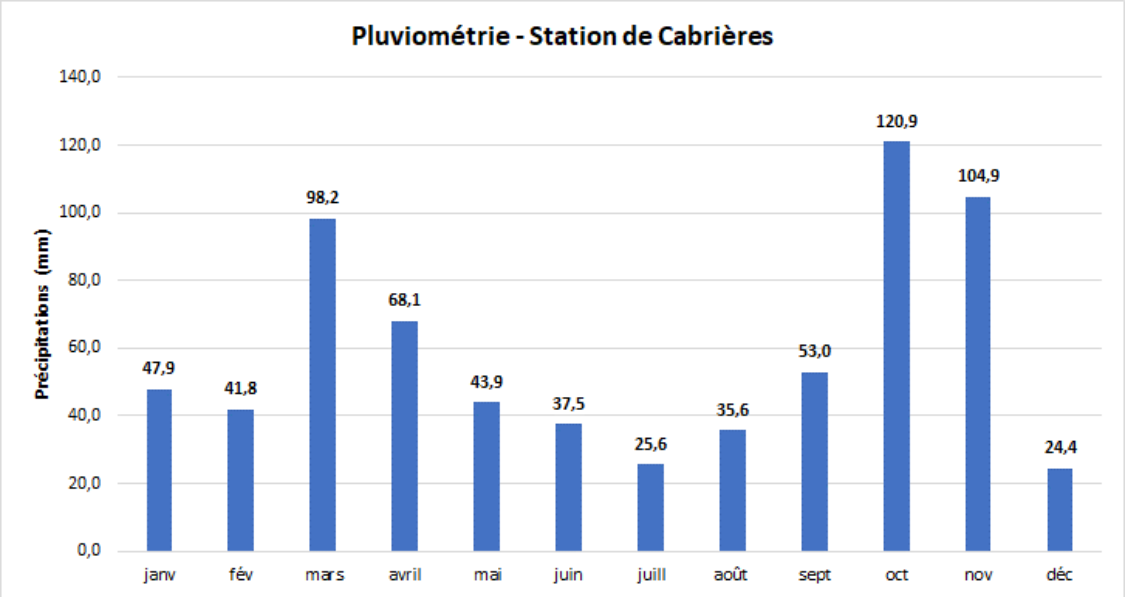


Figure 7: Analysis of the average annual rainfall over the last ten years at Cabrières

- **Seasonal summer/winter temperature variations are marked** with a hot summer with a maximum of 32°C in July and August, and a mild winter of around 3°C. The average temperature is 16.03°C all year round.

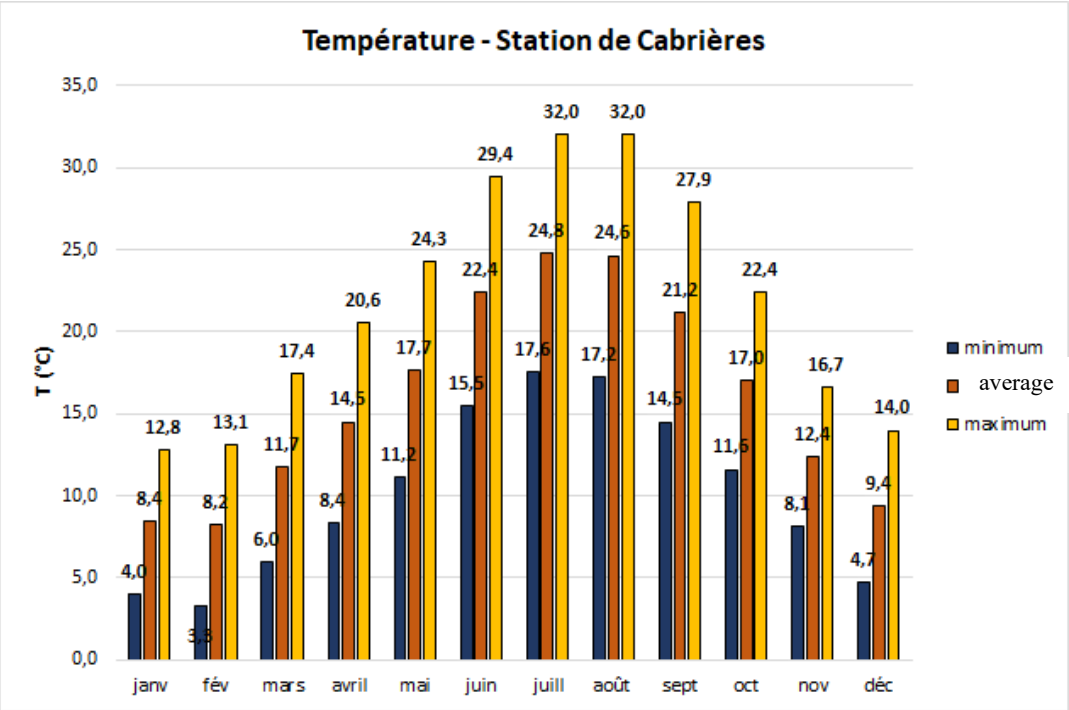


Figure 8: Analysis of average annual temperatures over the last ten years at Cabrières

In addition, there are few days of frost per year and overall minima close to zero.

The climate of the region is Mediterranean, with a characteristic aridity in the summer season and localised rainfall, sometimes violent in autumn and spring.

4.2.2 Natural environment

Concerning the environmental aspects, it appears from the consultation of the Regional Directorate for the Environment, Planning and Housing (DREAL) in the Languedoc Roussillon site that the commune has a not very restrictive environmental heritage, with the presence of:

- A type 2 Natural Zone of Ecological, Faunistic and Floristic Interest (ZNIEFF), with the following characteristics:

Table 7: Type 2 ZNIEFF features

Commune	Involved work(s)	Type 1 and 2 ZNIEFF					
		ZNIEFF type	National identification number	Name	Area	Number of distinct habitats listed	Number of distinct species listed
Neffiès	Falgairas Sud (F2) borehole	Type 2c	910030603	Massif of Mourèze and the agricultural plain of guarrigues (scrubland) of Péret	8126.4 ha	87	32

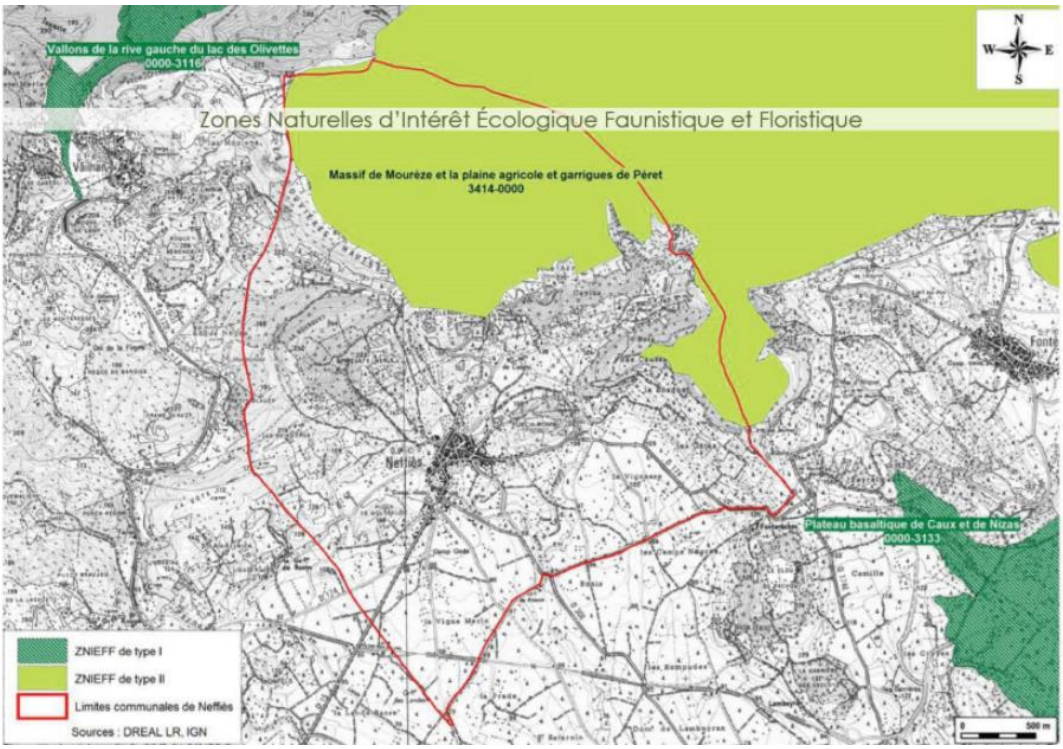


Figure 9 : Representation of the ZNIEFF on the IGN base map*

**National Geographic Institute*

- A Natura 2000 area, with the following characteristics:

Table 8: Natura 2000 area features

Commune	Involved work(s)	Natura 2000				
		ZNIEFF type	National identification number	Name	Area	Number of distinct species listed
Neffiès	Falgairas Sud (F2) borehole	Type A (ZPS)	FR 9112002	ZPS Salagou	12,794.20 ha	20

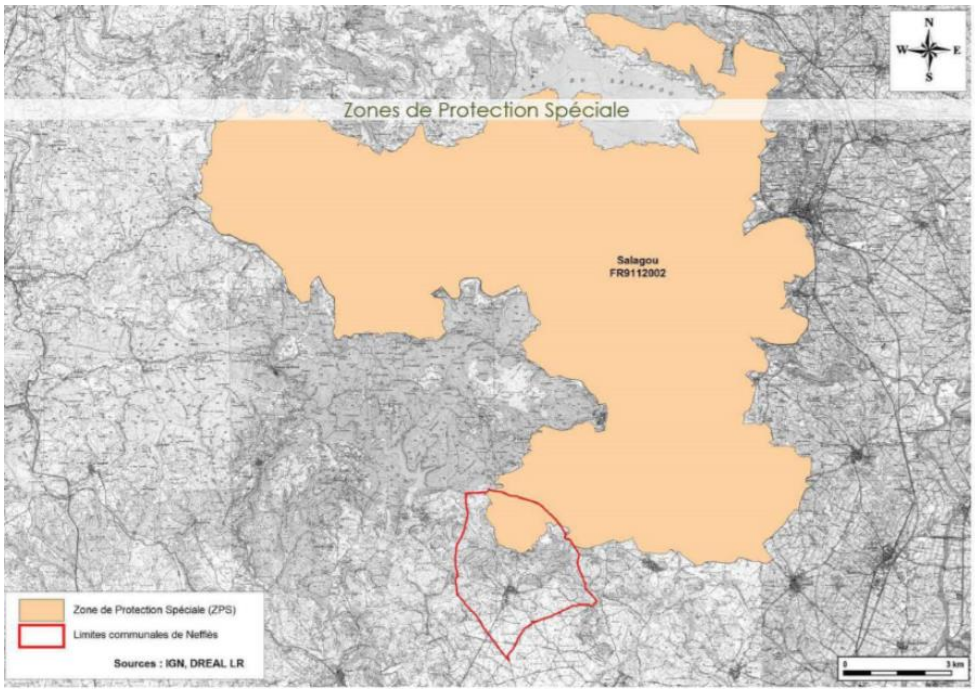


Figure 10: Representation of the Natura 2000 area on the IGN base map

The designation of the « ZPS du Salagou » (special protection area) is motivated by the presence of twenty-one species listed in Annex I of the Birds Directive. It is primarily aimed at the conservation of a pair of Bonelli's Eagle, extending over its entire home range. This territory also includes the cultivated Salagou valley, the Cabrières hillsides and the Péret and Aspiran wine-growing plains.

4.2.3 Hydrographic context

The WWTP discharges directly into the Marelle river, joining the Bayèle river, both tributaries of the La Peyne river. The latter flows further downstream into the Hérault, at the level of the commune of Pézénas.
The municipal territory is included in the catchment area of the "upstream La Peyne river" water mass (water mass code: FRDR164).

The objectives of good ecological and chemical status cited by the Rhone-Mediterranean Water Development and Management Master Plan (SDAGE RMC) for the period 2016-2021 were already achieved in 2015.

4.2.4 Hydrogeological context

There are 3 types of areas in the territory of the municipality:
- low vulnerability zone of mainly schist formation
- vulnerable area of locally karstified porous limestone
- low-vulnerability area with stringers

The catchment site is exploited on a producing fault at a depth of 44m. The resource, thus of karstic type, occasionally presents turbidity problems.

4.2.5 Flood-prone area

The commune has a Plan for the Prevention of Natural Flood Risks (PPRI); that of the Peyne catchment area. Indeed, the Peyne, with its relatively well-branched hydrographic network,

receives several major tributaries, especially in its downstream part, both on the right and left banks: the Baume, the Bayèle and the Marelle, where the WWTP is evacuated.

4.2.5.1 General presentation of the Peyne catchment area

La Peyne has its source in the commune of Pézènes les Mines, on the edge of the commune of Bédarieux. The river is about 34 km long and drains an area of about 120 km² at the confluence with the Hérault, in the commune of Pézenas. One of its main characteristics is the lengthening of its catchment area, which is no more than 8 km or even 2 km wide, in the commune of Vailhan.
It is worth noting the presence of the Olivettes dam in Vailhan which, depending on its degree of filling, can play a significant role in the curbing of current floods.

There are 2 works concerned in Neffiès:

Table 9: PPRI characteristics

Commune	Involved work(s)	PPRI			
		Name	Approbation date	Work implementation area (regulation)	Highest waters quota in the vicinity of the structure
Neffiès	Falgairas Sud (F2) borehole	Plan for the prevention of natural flood risks, Peyne catchment area	03/07/2008	Red zone	-
	WWTP			Red zone	-

The works concerned are the F2 well, as well as the WWTP. They both are delimited by red zones, according to the regulation: red zones (prohibitions) correspond to a strong or very strong hazard in urbanised sectors (strong risk) or to an undifferentiated hazard in non-urbanised sectors (flood expansion fields).

4.2.5.2 Flooded areas mapping

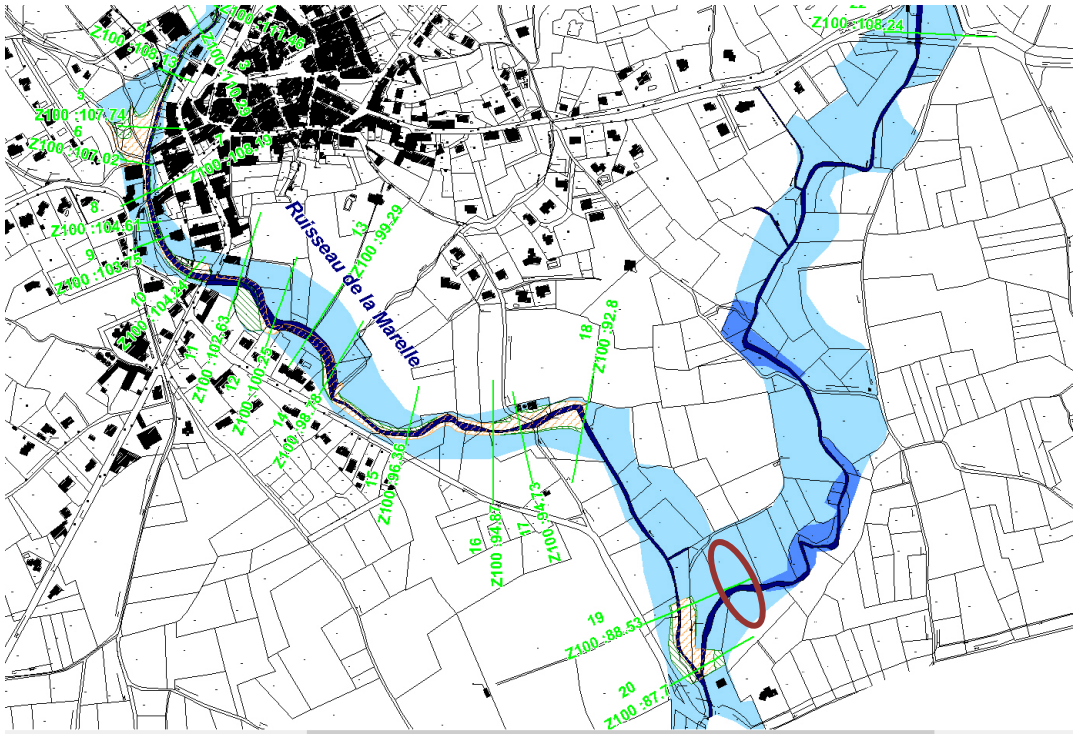


Figure 11 : Site of the WWTP on the Marelle riverbed

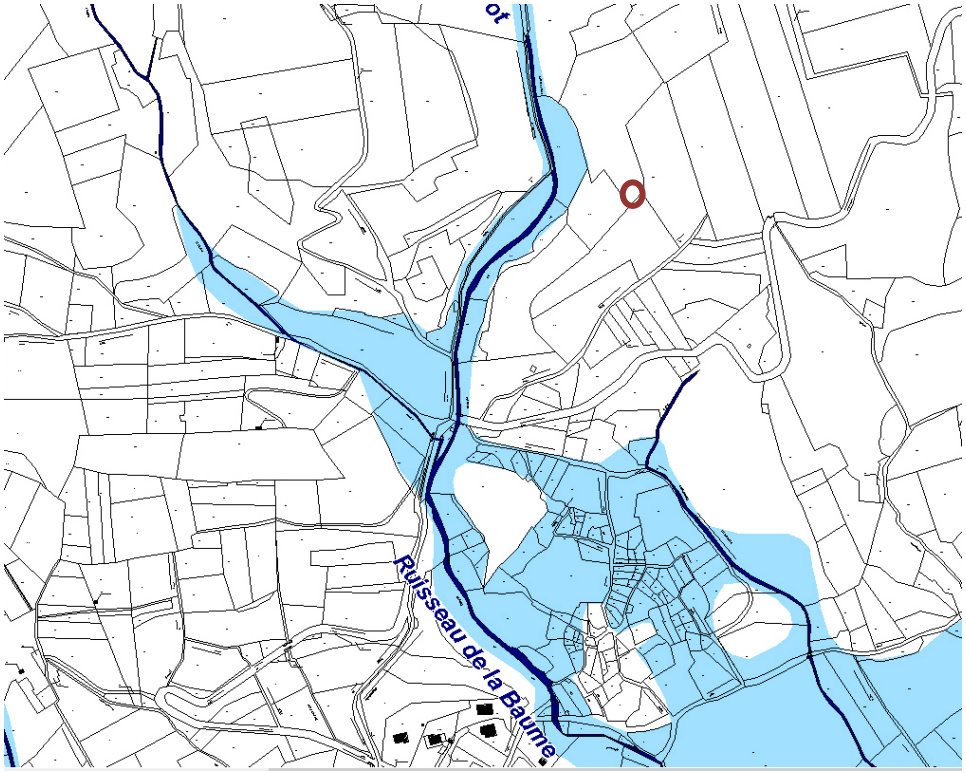


Figure 12: Capture site on the bed of the Font de Garot

The diminutive "Z100" means centennial flood, which has a one in one hundred chance of occurring each year.

The different coastlines shown in green are the result of modelling the level (in mNGF) that the water would reach during a centennial rainfall.

However, it should be noted that the WWTP site is built on a slope leaving the bed of the Marelle River a few metres below, which does not represent a major issue in terms of the consequences that a flood could generate. As far as the drilling is concerned, it is located in a well sealed building and the drilling head is raised accordingly.

4.3 Urbanism and demography

The municipality has a Local Urban Plan (PLU), dating from May 2017. It is also the subject of a Territorial Coherence Scheme (SCOT), the Bitterois Scheme, a territorial project aimed at bringing coherence to all sectoral policies, particularly in terms of housing, mobility, commercial development, the environment and landscape.

The following table summarises the population data for the municipal territory in 2019:

NEFFIES	Permanent population	Seasonal population	Total population
Total population (2016)	1 062	365	1 427

The municipality has a permanent population of 1062 inhabitants (legal population 2016 in effect on 1 January 2019). The seasonal population has been determined using the INSEE hypothesis of 2.3 inhabitants per second home, 161 in 2018.

The distribution of the housing stock and its evolution can be seen in the following graph:

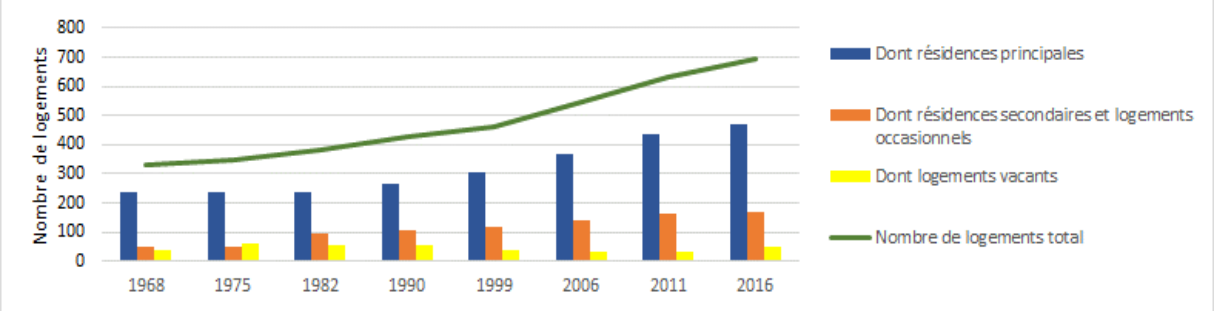


Figure 13: Housing development in Neffiès from 1968 to 2016

The blue chart represents the main residences, the orange one sets for secondary residences and casual accomodations and the yellow chart for the vacant houses.

Following the global trend, the permanent population of Neffiès has increased by 1.22% on average from one year to the next. Compared to 1968, the population in 2016 evolved positively by 1.1%. As for the housing splitting:

- concerning the main residences, their figures gradually increased from the nineties,
- the number of secondary houses has increased following the same trend as the main residences evolution over the years,
- regarding the vacant ones, their number have remained quietly constant and is now at their lowest.

In sum, the total housing number (the green line) has rised up.

4.3.1 Population and future needs

The horizon for the master plans for water supply and sanitation for the entire CCAM, including the commune of Neffiès, is 2050. Nevertheless, as the population scores are currently being validated by

the Assistant to the Contracting Authority, a need and resource adequacy assessment has been drawn up based on the previous drinking water master plan of Neffiès, initially carried out in 2006 for 2025 projections.

A main demographic development approach was therefore studied for the estimation of the future permanent and seasonal population. This approach is the global method: hypothesis of a population increase based on interannual evolution rates, using INSEE census data.

It will be taken as a reference:

Table 10: Annual evolution rate of the permanent population from 1968 to 2016

	1968	1975	1982	1990	1999	2006	2011	2016
Population permanente	632	578	563	620	697	819	1 022	1 062
Taux d'évolution annuel (%)	-	-1,27%	-0,37%	1,21%	1,31%	2,33%	4,53%	0,77%

Note: the INSEE data and those transmitted by the municipality differ for 2006 (by 6 individuals).

The following table summarises the results obtained, highlighting the theoretical production needs (m3/year):

Table 11: Study and forecasting of theoretical production needs

Denomination	Unit	2006	2014	2025
Total permanent population		813	1037	1294
Permanent population supplied by the network		813	1037	1294
Total seasonal population		375	100	609
Seasonal population supplied by the network		375	100	609
Average day consumption	m3/d	142	180	269
Peak day consumption	m3/d	199	319	451
Annual needs in consumption	m3/y	65126	65686	98116
Average per capita consumption ratio	L/in/day	170	162	200
Network performance (supply and distribution)	%	73	76	75
Linear index of average network loss	m3/d/km	7	5	9
of the average day	m3/d	189	237	358
of the peak day	m3/d	277	419	600
Theoretical annual production needs	m3/y	71 830	86 388	133 300

This information will make possible the study of the adequacy of the outlooks with the current drinking water supply system during the phase II of the schemes.

4.3.2 Economic activities

The economic activity of the commune is mainly based on winegrowing. In Neffiès there are the following shops and services: restaurant, bakery, café, hairdresser, cheese maker, cooperative cellar and eight private cellars. There are therefore no commercial or artisanal activity zones in the commune, only a few small craftsmen and local shops.

The private wine cellars and the cooperative cellar are potential large consumers. However, as most of them have private boreholes, they only partially influence the commune's drinking water consumption.

5 WORKS AND EQUIPMENTS

5.1 Network description

The characteristics of the network are listed in the following diagram:

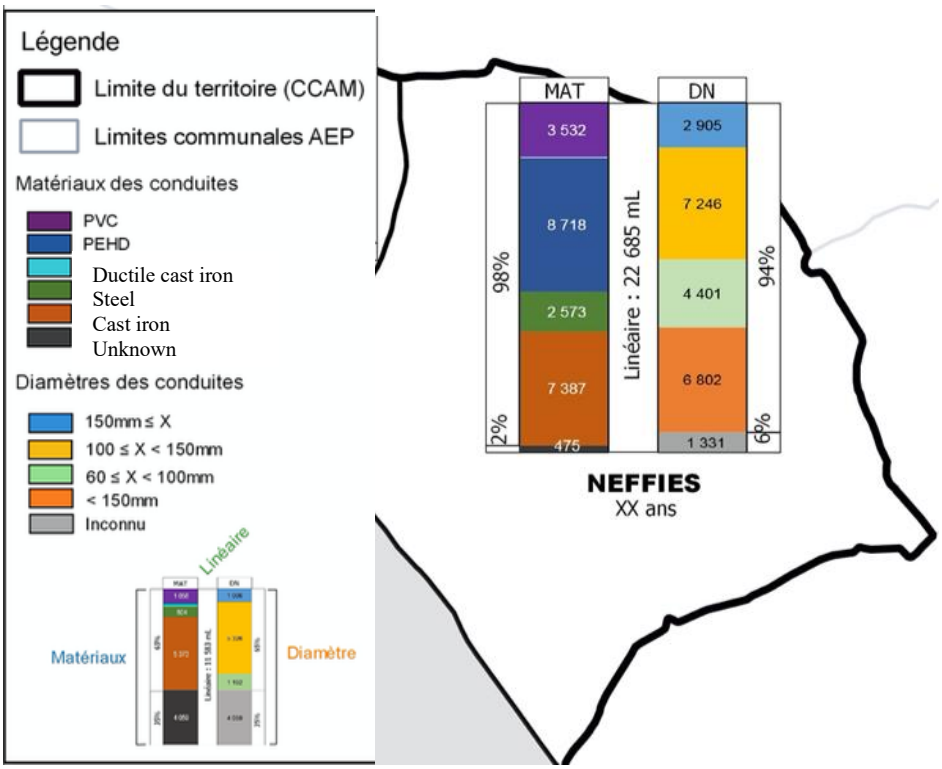


Figure 14 : Distribution of drinking water pipe materials according to their nominal diameter

5.2 Drinking water works

5.2.1 The tank

The commune is supplied by a twin-tank semi-buried reservoir (2*250m3 each), for a total useful volume of 380m3. Indeed, a 120m3 storage for fire protection has been prescribed. Following the field visit carried out by the trainee, the "storage works" sheet for the commune of Neffiès was completed more precisely and can be found in Appendix 2.

Below is a sectional view of the tanks to give a general representation of the storage facility:

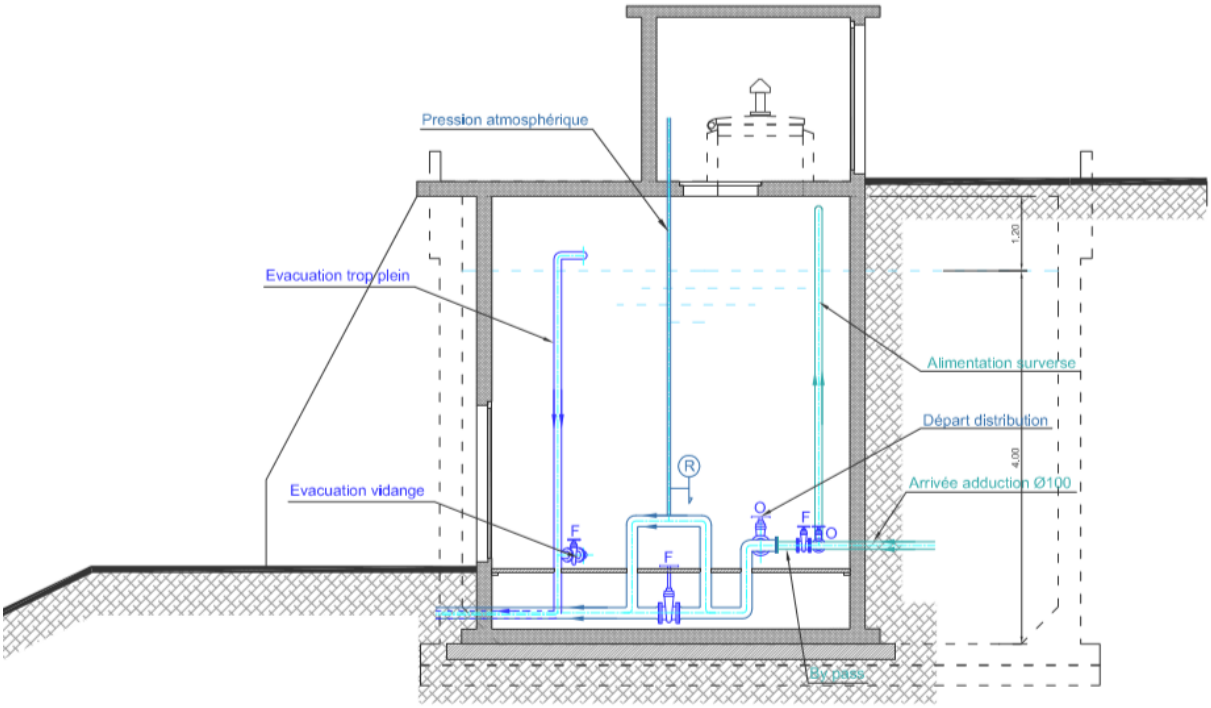


Figure 15: Sectional view of the tanks, scale 1/50

5.2.2 Boreholes and the replenishment reservoir

Below is a sectional view of the borehole structure to give a general representation of the layout of the structure (details of the diameters and materials, which are not very visible in this section, are shown in the data sheet).

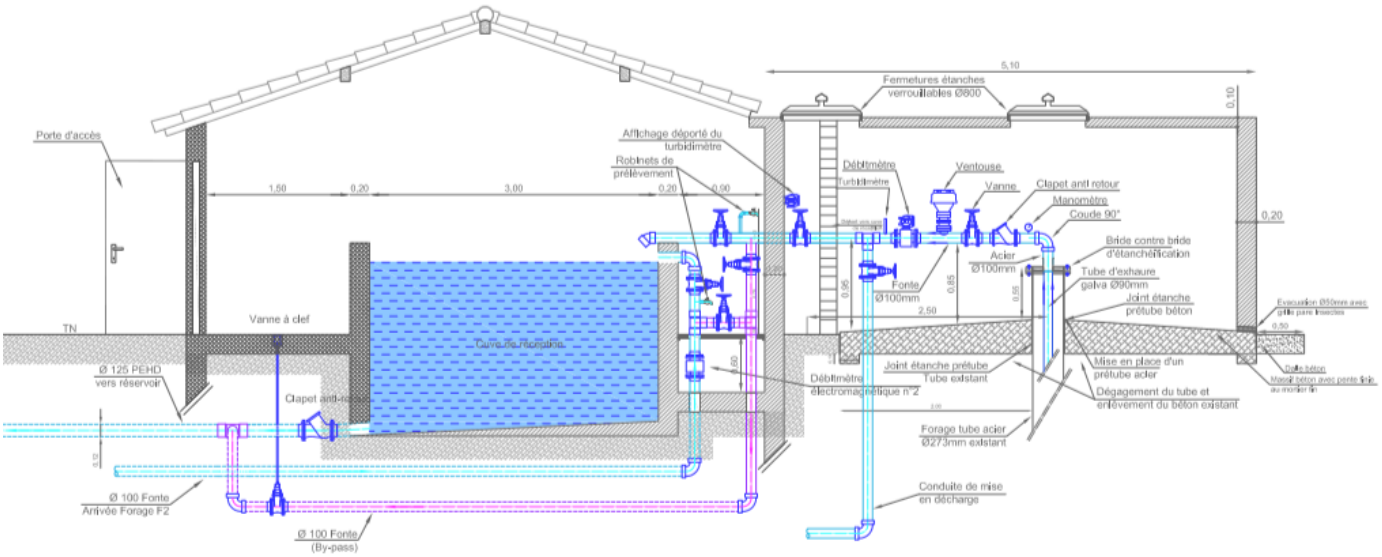


Figure 16: Sectional view of the Falgairas receiving tank and catchment area, scale 1/40

Following the field visit carried out by the trainee, the "catchment work" sheet for the commune of Neffiès was completed more precisely and can be found in Appendix 3.

5.2.3 Processing unit

The water taken from the catchment area is then disinfected by gas chlorination, using a dosing pump, on the same site. In fact, the flow control device is coupled to a flow meter placed on the pipe at the outlet of the tank and towards the reservoir. Also, if the "treatment fault" alarm is triggered, the automatic switch takes a sample from the back-up bottle.
In addition, a turbidimeter has been installed in order to monitor the evolution of turbidity over time and to discharge the water if necessary. This turbidimeter was installed upstream of the water discharge pipe, which also serves as a drain for the water reception tank of the two boreholes.
Finally, in order to avoid recurring turbidity problems in borehole F3 (south) and during rainy periods in borehole F2 (north), a turbidity treatment system is planned.

5.2.4 Valves and special organs in the network

The books of the technical specifications and particular ones requested, following the field visits, the establishment of a valve book with the aim of listing all the relevant valves to be operated, as well as their operating status, in order to sectorise the network. The purpose of this action is to have a precise representation of these bodies if the municipality has to launch a detailed search for leaks on its network. The sheet of valves on Neffiès can be found in Appendix 4.

In addition, the project manager was asked to list on a serie of plans the particular network components (plungers, drains, keyed outlets...) with their type and their operating mode as well as the fire hydrants with information on the type and the available flow rate.

5.3 Sanitation works

5.3.1 The WWTP

The wastewater treatment plant of the commune of Neffiès is a reed-planteds beds one, characterized with 2 vertical drained floors, located along the RD30 (avenue de Caux) in the south-east of the village. It was commissioned in June 2007 and has a capacity of 1,200 p.e.

The network does not include a delivery station. Wastewater is mainly collected and conveyed to the treatment plant by gravity. There is only a discharge station at the entrance to the plant.

The nominal capacity of the treatment works has now been reached.

Each of the three filters of the first stage is made up of three racks or purification units (circled in red in the following figure).
The general supply to each rack is made, thanks to a set of solenoid valves, by a pressure pipe located below the surface level of the first gravel layer, from where six pipes of smaller diameter are connected to it (6 supply points are provided so as not to exceed the value of 40m² per supply point). Each of these six pipes emerges at the surface of the filter, ensuring an even distribution over the entire surface.

Figure 17 : The wastewater treament plant seen from a satellite view

The water is then recovered by the drains placed at the bottom of the bed and is directed to the self priming drains placed upstream of the filters of the second stage:


Figure 18 : Secondary stage reed beds

For both stages, the compliance with the resting and feeding phases of each of the three racks is ensured by the installation of manual valves at the inlet of each of the three racks constituting a filter. These valves are operated by the operating staff. Each of the three racks of each filter will be supplied in turn for 2 days of feeding for 4 days of rest.

The watertightness of the primary and secondary filters is ensured by the installation of a geomembrane sealing device, the objective of a permeability of less than 10-7 m.s-1 being largely achieved.
This geomembrane is made up from bottom to top seal:
- A geotextile
- A gas drainage system
- A geomembrane planting of macrophytes; with a density of 4 plants / m².

The summary sheet concerning this work can be found in Appendix 5. The missing information will be completed by the company GAXIEU, hired by the CCAM for the diagnosis of the sewerage network.

5.4 Quantitative aspects

5.4.1 Analysis of the telemonitoring data

5.4.1.1 Volumes distributed by the tank

The exploitation of the telemonitoring data has been carried out over the last 3 years; the results are summarised in the following table and graphs:

Table 12: Monthly and daily volume data over the past two years

Données mensuelles		**2018**	**2019**	**2020**
Volume moyen mensuel	**m3/mois**	**6824,33**	**7128,25**	**5449,60**
Volume min mensuel	m3/mois	5155,00	4795,00	967,00
Volume max mensuel	m3/mois	10592,00	10788,00	8640,00
Cp mensuel	-	1,55	1,51	1,59
Volume annuel	**m3/an**	**-**	**85539,00**	**-**
Données journalières		**2018**	**2019**	**2020**
Volume moyen journalier	**m3/j**	**276,04**	**250,14**	**219,22**
Volume min journalier	m3/j	158,00	146,00	170,00
Volume max journalier	m3/j	427,00	410,00	367,00
Cp journalier	-	1,55	1,64	1,67

The 'Cp' coefficient represents the ratio between the maximum daily volume and the average daily volume.

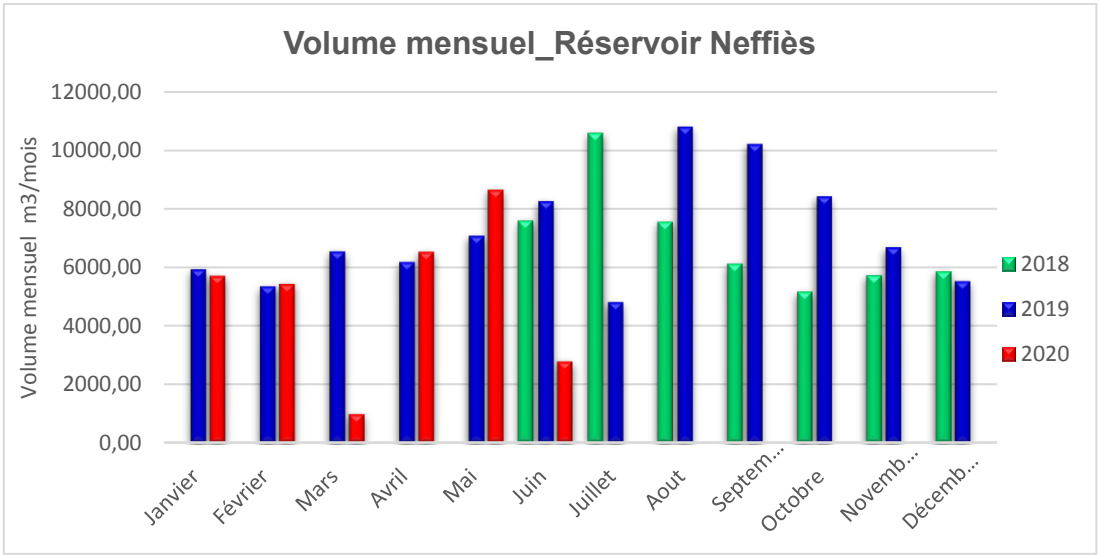


Figure 19: Annual evolution of the monthly volume distributed by the tank

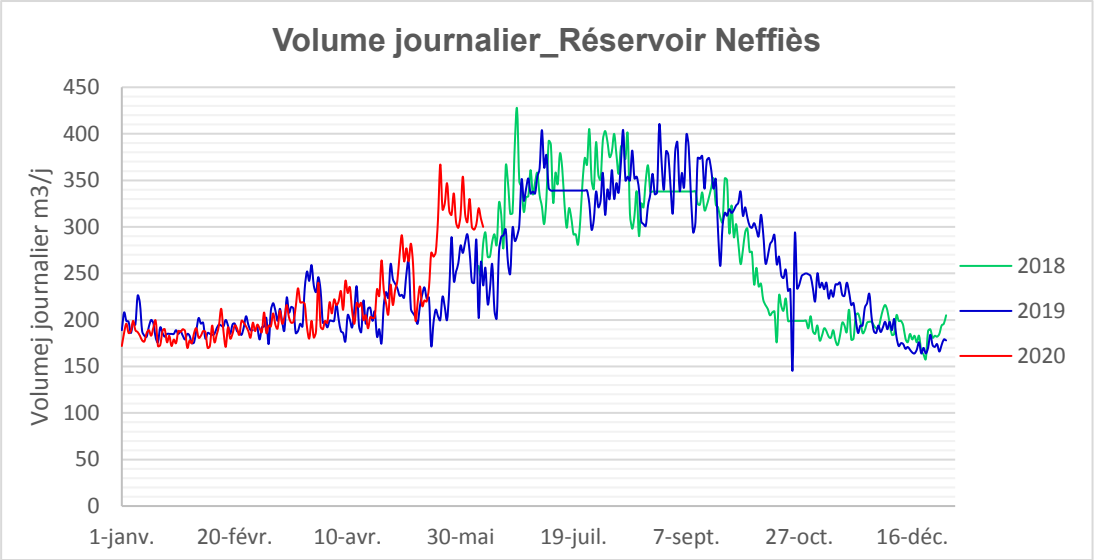


Figure 20: Annual evolution of the daily volume distributed by the tank

These data will then be used to calculate network yields and linear consumption and loss ratios and indices, in comparison with the volumes produced and consumed (still waiting for the report on price and quality of service data).

5.4.1.2 Volumes drawn by the catchment system:

The exploitation of the telemonitoring data has been carried out over the last 3 years; the results are summarised in the following table and graphs:

Table 13: Monthly and daily volume data over the past two years

Données mensuelles		**2018**	**2019**	**2020**
Volume moyen mensuel	**m3/mois**	**8355,20**	**7684,67**	**5679,60**
Volume min mensuel	m3/mois	6072,00	5332,00	973,00
Volume max mensuel	m3/mois	11221,00	10876,00	8840,00
Cp mensuel	-	1,34	1,42	1,56
Volume annuel	**m3/an**	**-**	**92216,00**	**-**
Données journalières		**2018**	**2019**	**2020**
Volume moyen journalier	**m3/j**	**274,52**	**252,65**	**229,24**
Volume min journalier	m3/j	121,00	93,00	-
Volume max journalier	m3/j	441,00	420,00	-
Cp journalier	-	1,61	1,66	-

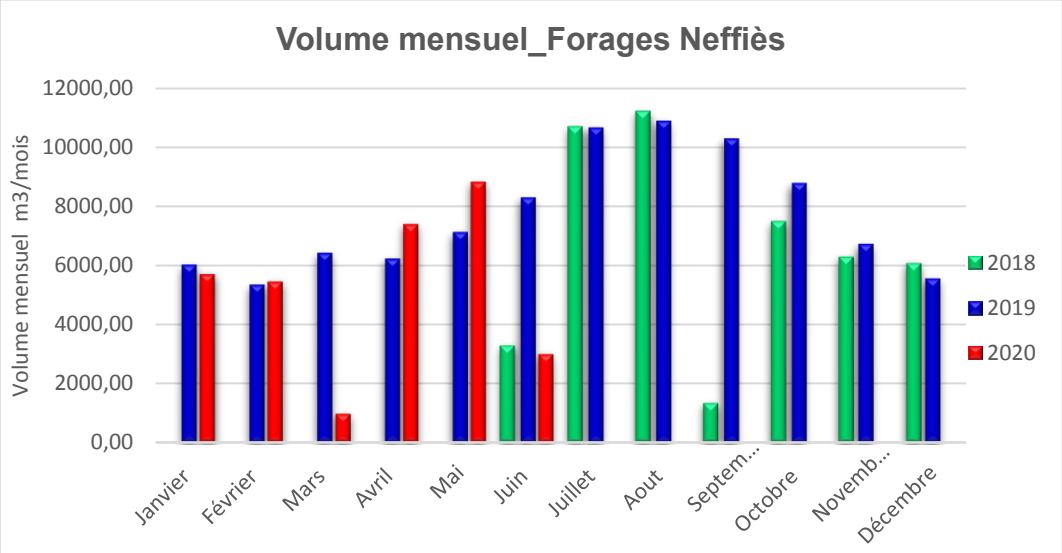


Figure 21: Annual evolution of the monthly volume of water drawn from the catchment area

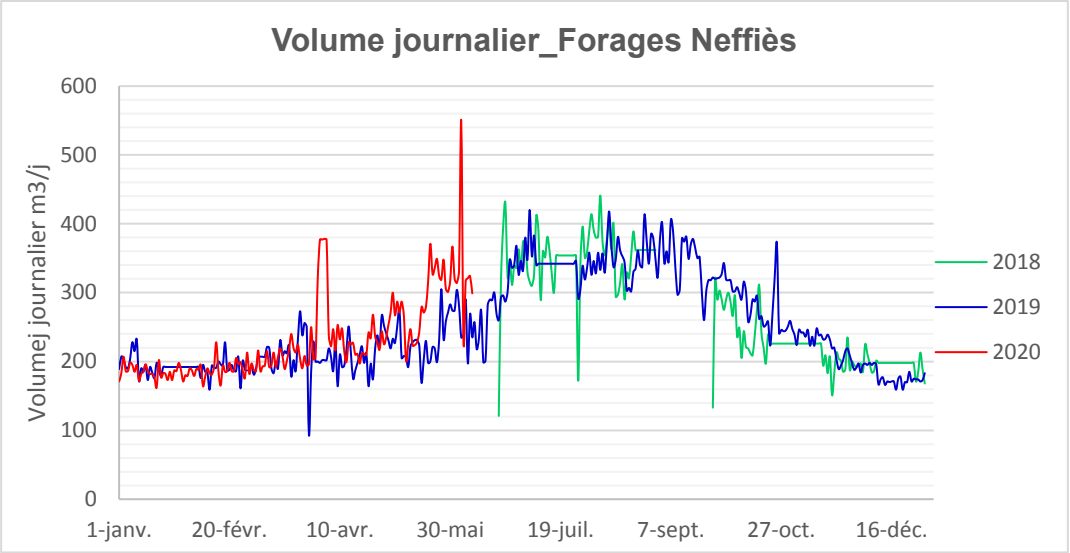


Figure 22: Annual evolution of the daily volume withdrawn by the catchment area

The authorised volumes by the of Public Authority decree of 2011-II-134 of 24 February 2011 relating to Falgairas catchments are as follows:
- 40 m3/h,
- 600 m3/d,
- 133,300 m3/year.

In addition, at present, the maximum daily flow that can be delivered by the connection to the SIEVH, an agreement dating from 1985, is 250 m3/d. This flow rate is limited by the physical characteristics of the connection.

5.4.1.3 WWTP output volumes

The exploitation of the telemonitoring data has been carried out over the last 3 years; the results are summarised in the following table and graph:

Table 14: Daily volume data and clear water infiltration amount over the last two years

Données journalières		**2018**	**2019**	**2020**
Volume moyen journalier	**m3/j**	**184,20**	**127,54**	**147,87**
Volume min journalier	m3/j	85,00	27,00	27,00
Volume max journalier	m3/j	1675,00	1813,00	724,00
Cp journalier	-	9,09	14,22	4,90
Volume annuel	**m3/an**	**-**	**46434,90**	**-**
		2018	**2019**	**2020**
ECP	**m3/j**	**331,40**	**176,00**	**275,65**

The clear water infiltration (ECP), calculated using the 95% percentile method, allow to assess rainwater intrusions into the sewerage network, which can have several origins: incorrect connections of gutters or other structures (garage downspouts, private courtyard

gates, etc.), incorrect connections of gullies and gates of the rainwater network under public domain.

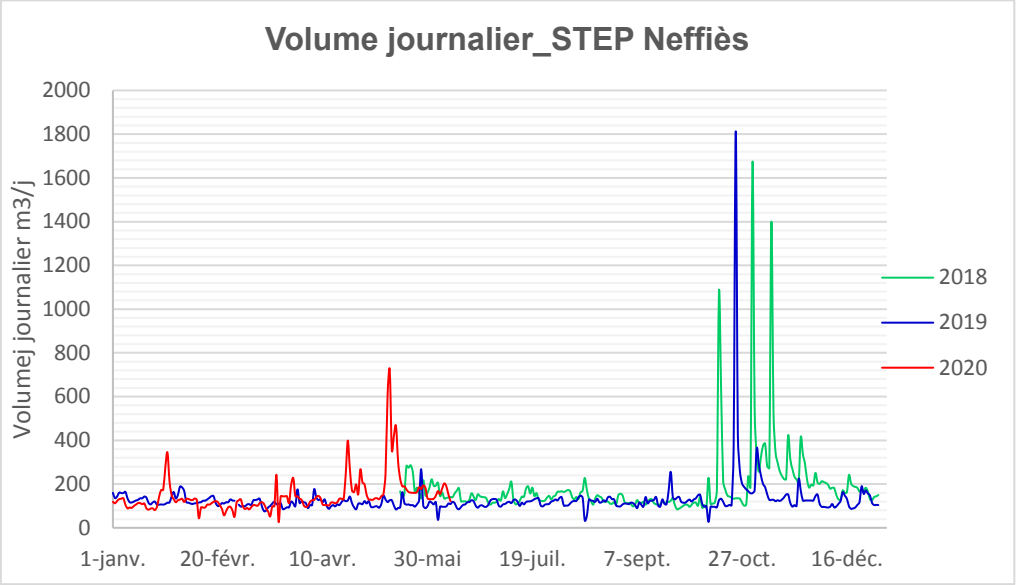


Figure 23: Annual development of WWTP's outgoing daily volume

5.5 Qualitative aspects

5.5.1 Drinking water analysis

5.5.1.1 Withdrawn water

An analysis of the quality of the water taken from Neffiès over the period 2007/2019 has been carried out, as shown in the following summary table:

Table 15: Exploitation of raw water quality analysis parameters at the Falgairas catchment area

Paramètres	Unité	Nombre de mesures	Minimum	Moyenne	Maximum	Valeurs réglementaires	% de conformité
Température	°C	2	14,4	14,5	14,6	25	100%
Conductivité à 20 °C	µS/Cm	2	703	717	731	/	-
pH	pH	2	7,3	7,6	7,9	/	-
Turbidité	NFU	2	0,12	0,1	0,14	/	-
TAC	°F	0	-	-	-	/	-
TH	°F	0	-	-	-	/	-
SO4	mg/l	2	20,8	21,25	21,7	/	-
COT	mg/l	2	0,2	0,3	0,3	/	-
Nitrates	mg/l	2	10,8	10,95	11,1	100	100%
Arsenic	µg/l	2	0	0	0	/	-
Fer	µg/l	0	-	-	-	/	-
Manganèse	µg/l	2	0	0	0	/	-
Bactéries Aer Rev 36°C / 22 °C	u/ml	0	-			/	-
Colifomes totaux	u/100mL	0	-	-	-	/	-
Entérocoques	u/100mL	2	0	0,0	0,0	10 000	100%
E.Coli	u/100mL	2	0	0	0	20 000	100%
Pesticides	µg/l	2 campagnes de mesure pour un total de 288 analyses réalisées	Détection systématique d'Atrazine déséthyl déisopropyl et de Terbuthylazin déséthyl			2	100%
Pesticides totaux	µg/l	2	0,13	0,14	0,14	5	100%
Equilibre calco-carbonique	-	2	2 - Eau à l'équilibre			/	-
Activité Alpha Globale	Bq/L	0	-	-	-	< 0,1	-
Activité Béta Globale	Bq/L	0	-	-	-	< 1	-
Activité Tritium	Bq/L	0	-	-	-	< 100	-
Activité Radon	Bq/L	1	-	11,70	-	< 100	100%

The water pumped by the Falgairas catchment area complies with quality requirements.

5.5.1.2 Distributed water

According to the analyses of the first adduction carried out at the catchment installation, in June 2005, the water was declared safe for human consumption.

An analysis of the quality of the water on the entire distribution unit, over the period 2017/2019, has been carried out in Neffiès as shown in the following summary table:

Table 16: Exploitation of water quality analysis parameters on the Neffiès distribution unit

Paramètres	Unité	Nombre de mesures	Minimum	Moyenne	Maximum	Valeurs réglementaires	% de conformité	Commentaire
Mesures sur place								
Température	°C	120	7,8	18,5	153,0	25	93%	8 dépassements (maximum observé en 2014)
Conductivité terrain à 25 °C	µS/Cm	118	443	785	871	200 ≤ - ≤ 1100	100%	
Chlore libre (au point de mise en distribution)	mg/LCl2	26	0,00	0,29	0,90	0,3	42%	15 valeurs non réglementaires dont 1 valeur = 0
Chlore libre (en tout point du réseau)	mg/LCl2	90	0,00	0,2	0,47	0,1	89%	10 valeurs non réglementaires dont 3 valeurs = 0
Paramètres microbiologiques								
bact aer revivifiables à 36° - 44h	n/mL	116	0	7	300	/	-	Nombre de dénombrements non nuls : 43
bact aer revivifiables à 22° - 68h	n/mL	116	0	11	300	/	-	Nombre de dénombrements non nuls : 47
Bactéries coliformes	n/(100mL)	116	0	0	0	0	100%	
Eschérichia Coli	n/(100mL)	116	0,00	0,0	0,00	0	100%	
Entérocoques	n/(100mL)	116	0,00	0,0	1,00	0	99%	1 dépassement observé le 26/11/2014
Bacté et spores sulfito-réductrices	n/(100mL)	25	0,00	0,0	0,00	0	100%	
Caractéristiques organoleptiques								
Turbidité (au point de mise en distribution)	NFU	26	0,00	0,27	1,90	0,5 | 1	96%	1 dépassement observé le 04/03/2010
Turbidité (en tout point du réseau)	NFU	90	0,00	0,2	1,60	2	100%	
Equilibre calco-carbonique								
TAC	°F	26	23,1	38,0	41,0	/	-	TAC élevé
TH	°F	26	23,6	41,8	45,0	/	-	Eau très dure
Equilibre calco-carbonique	-	12	Eau majoritairement à l'équilibre			les eaux ne doivent pas être agressives	-	Eaux majoritairement à l'équilibre, Parfois incrustante ou légèrement incrustante
Potentiel de dissolution du plomb	-	7	Potentiel de dissolution élevé			/	-	-
Minéralisation								
Na	mg/L	13	8,7	9,7	11,0	200	100%	
Chlorures	mg/L	26	13,0	22,2	27,0	250	100%	
Sulfates	mg/L	26	19	22,3	28,1	250	100%	
Fer et Manganèse								
Fer total	µg/l	26	0,0	0,6	8,0	200	100%	
Manganèse	µg/l	13	0,0	0,0	0,0	50	100%	
Pesticides								
Pesticides	µg/l	13 campagnes de mesures soit 3357 analyses réalisées	Présence de : Atrazine déséthyl déisopropyl, Hydroxyterbuthylazine, Terbuméton-désethyl, Terbuthylazin déséthyl, Anthraquinone (pesticide)			0,1 µg/l pour chaque pesticide individuellement et de 0,03 µg/l pour les pesticides suivants : aldrine, dieldrine, heptachlore, heptachlorépoxyde.	-	4 dépassements d'Atrazine déséthyl déisopropyl sur 21 mesures de ce composé Valeurs max : 0,16 µg/l le 01/04/2015
Pesticides totaux	µg/l	34	0,00	0,09	0,20	0,5	100%	
Paramètre azotés et phosphorés								
Ammonium	mg/L	116	0,00	0	0,08	0,1	100%	
Nitrates	mg/L	26	4,70	11,37	16,00	50	100%	
Nitrites (au point de mise en distribution)	mg/L	26	0,00	0	0,00	0,1	100%	
Nitrites (en tout point du réseau)	mg/L	13	0,00	0	0,03	0,5	100%	
Autres paramètres								
Aluminium total	µg/L	13	0,00	7,23	28,00	200	100%	
Arsenic	µg/L	13	0,00	0,00	0,00	10	100%	
Baryum	mg/L	13	0,02	0,14	0,21	0,7	100%	
Bore	mg/L	13	0,00	0,01	0,02	1	100%	
Carbone Organique Total (COT)	mg(C)/L	26	0,00	0,36	2,00	2	100%	
Cuivre	mg/L	13	0,00	0,04	0,09	1	100%	
Fluorures	mg/L	13	0,00	0,03	0,07	1,5	100%	
Mercure	µg/L	13	0,00	0,00	0,00	1	100%	
Nickel	µg/L	13	0,00	0,08	0,60	20	100%	
Plomb	µg/L	13	0,00	2,55	15,00	10	92%	1 dépassement le 04/09/2019
Radioactivité								
Activité Alpha Globale	Bq/L	3	0,00	0,01	0,04	0,1	100%	
Activité Béta Globale	Bq/L	3	0,00	0,00	0,00	1	100%	
Activité Tritium	Bq/L	3	0,00	0,00	0,00	100	100%	

The red boxes represent the quality limits and the yellow ones the quality references.

The water distributed is hard water, mostly with a calco-carbonic balance. The percentages of conformity of this water, with regard to the quality requirements, are maximum. Nevertheless, it should be noted that the pesticide content is occasionally exceeded in relation to the quality limit, but not the sanitary value. This water can be consumed but a reinforced control must be implemented.

5.5.2 Wastewater analysis

It is reminded that the nominal capacity of the WWTP is 1,200 p.e. Thus, the resulting nominal capacities are as follows:

Table 17: Ratios and loads according to the waste parameters

Parameters	Ratios	Loads
BOD	60 g/p.e/d	71 kg/d
COD	140 g/p.e/d	166 kg/d
SM	90 g/p.e/d	107 kg/d
ATK	15 g/p.e/d	17.8 kg/d
Total Phosphorus	4 g/p.e/d	4.8 kg/d
Average daily flowrate	180 g/p.e/d	178 kg/d

Under these conditions, the treated effluent must comply with the required discharge level. The following graph shows the evolution of the flows measured at the plant entrance during the technical assistance service for wastewater treatment plant operators (SATESE) assessments:

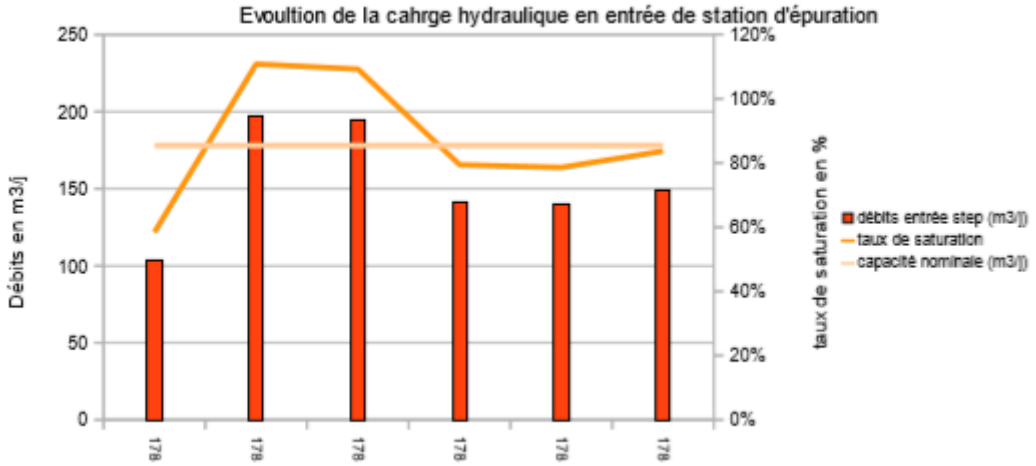


Figure 24:Hydraulic charge evolution in the WWTP entrance

The daily flows measured at the inlet of the treatment plant are around 150 m3/d. According to SATESE volumetric data, in dry weather, the plant is saturated at 90% on average. The maximum capacity of the plant is therefore reached. In fact, it can be seen that the saturation rate of the plant sometimes exceeds 100%.

5.6 Security, contingency plan and alert plan

According to a first approach to the analysis of the state of the DWS network and the works, the maintenance of the current system of use of the Falgairas catchment, as well as the interconnection with the SIEVH was highlighted in order to be able to secure the water supply in case of drought or in the event of pollution of the main resource.

In addition, a turbidity treatment system must be put in place to ensure a better quality of the resource.

Conclusion

An inventory of the water supply and sewerage network in the commune of Neffiès was therefore carried out.
It can be concluded by this inventory of fixtures:

- A tank in good condition not requiring any repair work (civil engineering good, regulation and measuring devices in service, intrusion alarm in place...)
- Of the 2 existing boreholes (F2 and F3), only F2 is exploited (F3 episodically) due to turbidity problems. During rainy episodes F2, also affected by turbidity and having to be shut down, the interconnection to the SIEVH is then requested. Nevertheless, it turns out that the flow rate of the SIEVH pipe is limited to about 10 m3/h (250 m3/day), which is not enough to take over the entire flow in the summer period according to the return of the town hall. (Peak day consumption would currently be > 440 m3/d). Work is underway to reinforce and widen the pipeline (current diameter 110 PVC by 200 cast iron).
- In terms of sanitation, the nominal capacities of the WWTP have been reached.
  In view of the relatively recent maintenance and diagnosis of the treatment plant, the works are in a good condition. In addition, the various inspections carried out by SATESE (1 to 2 per year), accompanied by a service agent, have made it possible to identify the operating constraints and malfunctions of the station.
  To compensate for the repeated blockage of the screen by stones from the network, a stone trap was installed upstream of the screen.
  For now, there are no future improvements to be planned.

The measurement campaigns will be launched in a second phase and will make it possible to estimate the residual night-time flows. A night sectorisation will then be carried out in order to determine precisely the leaking sectors. These campaigns will make it possible to draw up a prioritised work programme. This will constitute Phase II.

On a personal note, this internship enabled me to understand the different missions of a consultancy firm specialising in the water sector. Having had the opportunity to take part in other projects: feasibility studies, identification of constraints in the field, preliminary project file, analysis of a bid response and prioritisation of candidates... it allowed me to appreciate the importance and the value of the role of this core business for day-to-day water management and in supporting municipalities in their "Water and Sanitation" competence.

Moreover, the diversity of existing studies and their specificity does not allow one to be bored and favours a rather wide field of experience.

My prospects for the future are now more concretes because this has reinforced my desire to deepen my project management, which consists in studying technical solutions but above all in monitoring the design and implementation of networks and works on site. Having to constantly deal with the client's wishes and the various skateholders is a real challenge that I would like to face.

Bibliography

The documents sent by the town hall that were used to prepare this first phase are listed below:

- Former SDAEP and SDAEU reports produced by Entech (2006 and 2013)
- Prefectorial DUP orders for collection (Falgairas F2 and F3, 2011)
- Opinion of the certified hydrogeologist for the catchment (Phillipe CROCHET, Final opinion May 2008)
- Book of technical and special clauses
- Regional Health Agency water quality analyses (years 2007-2018)
- Remote monitoring of meter data for the various structures between 2018 and 2020
- All the declarations of works taken from / wells / boreholes for domestic use
- Set of execution plans for the works in the Dossier of Executed Works
- GIS map of the networks (network layouts and pipe characteristics)

The links to the information found on the site are listed below :

Geological context :	http://infoterre.brgm.fr/
Climate context :	Météo France pour l'Hérault - https://www.infoclimat.fr/
Inventory of nature, biodiversity and listed sites :	General viewer- https://carto.picto-occitanie.fr
Drought prevention plan :	Dynamic map of flood risk zoning on the Hérault River- http://carto.geo-ide.application.developpement-durable.gouv.fr
Water development and management scheme :	https://www.gesteau.fr/
Urbanism :	https://www.geoportail-urbanisme.gouv.fr/
Environnemental context :	https://inpn.mnhn.fr/accueil/index
Master plan for water development and management :	SDAGE Rhône-Méditerranée 2016-2021- https://rhone-mediterranee.eaufrance.fr
Population :	Data base - https://insee.fr/fr/accueil
Water bodies :	http://carmen.carmencarto.fr/74/sierm.map
Data from hydrometric stations :	http://www.hydro.eaufrance.fr/selection.php?consulte=rechercher

Glossary

AEP = Drinking Water Supply (DWS)

SDAEP= Drinking Water Supply Master Plan

EU= Wastewaters

ANC= Non-Collective Sanitation

SDAEU= Sanitation and Wastewater Master Plan

STEP= Wastewater Treatment Plant (WWTP)

PR= Discharge station

DO= Storm Overflow

DUP = Declaration of Public Utility

HA = Registered Hydrogeologist

ILC = Linear Consumption Index

ILP = Linear Index of Losses

PLU = Local Urbanistic Plan (municipal scale)

RPQS = Price and Quality of Service Report

SAGE = Water Development and Management Scheme (at the local level of a river basin or a water table)

SATESE = Technical assistance service for wastewater treatment plant operators

SCOT = Territorial Coherence Scheme (intermunicipal scale)

SDAGE = Master plan for water development and management (on the scale of the 12 major basins of the French territory)

SIEVH= Inter-municipal Water Syndicate of the Hérault Valley

ZNIEFF = Natural Area of Ecological, Faunistic and Floristic Interest

ZPS= Special Protection Zone

Sustainable Development / Ethics / Health and Safety at Work section

The company is at the origin of the construction of several lagoon treatment plants (e.g. in Mèze); founder of several treatment processes such as
- The aerated lagoon,
- Bacterial decontamination by means of a filter dam,
- The coupling of aerated lagoon and reed beds optimising performances on carbon and nitrogen,
- The coupling of aerated lagoon and bacterial bed optimising performances on nitrogen and phosphorus,
- Activated sludge in earthen structures and,
- The regulation of the mixed liquor in activated sludge for the optimisation of dimensioning.

With regard to health and safety at work, the wearing of PPE (personal protective equipment) in the field and on building sites is scrupulously respected (safety shoes, yellow waistcoat, helmet, etc.). In addition, some of the company's employees are trained in Occupational Health and Safety.

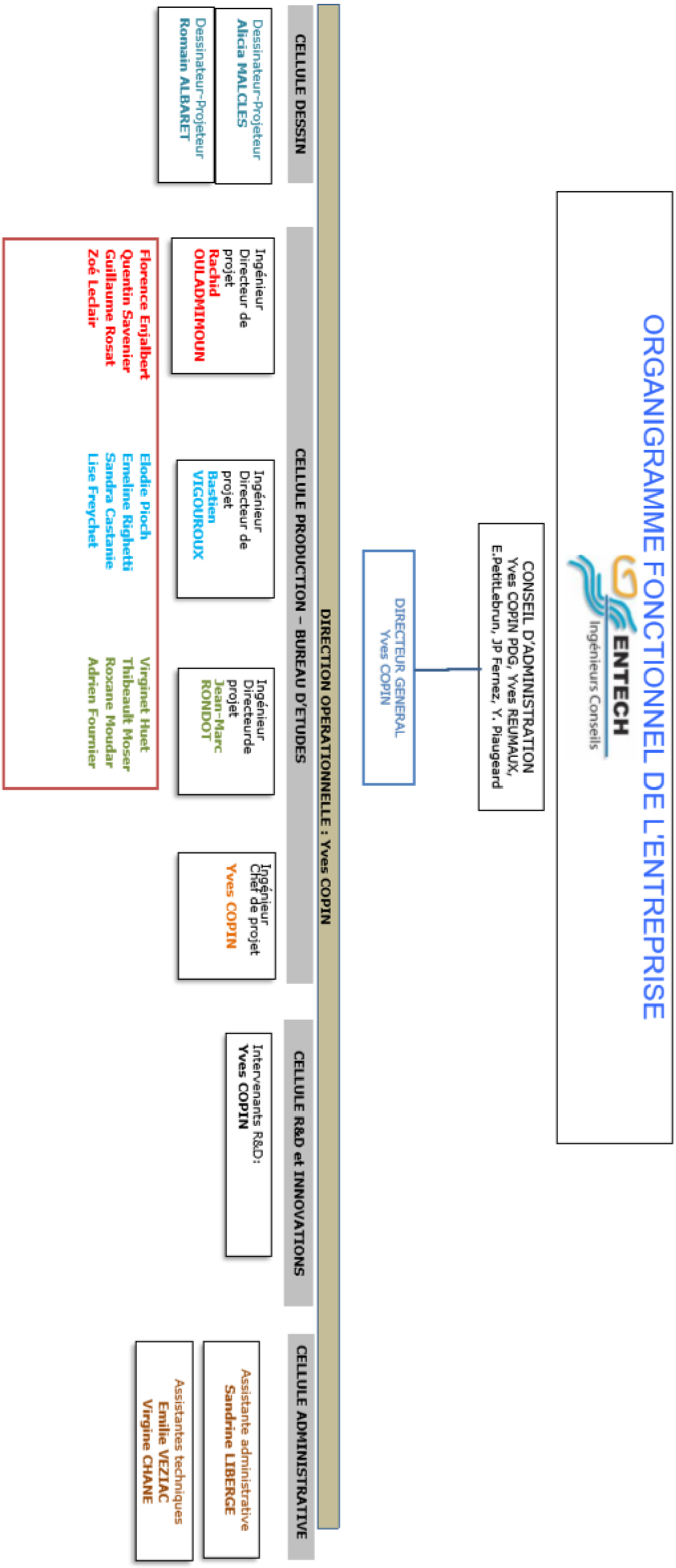
In terms of ethics, ENTECH is a company that listens to its employees and has a human scale, which facilitates communication and support between its employees. The company promotes respect for the personalities of each individual and ensures complementarity and parity within the team.

Appendix

Appendix 1: Functional organisation chart of ENTECH design office
Appendix 2: "Storage work" summary sheet
Appendix 3: "Catchment work" summary sheet
Appendix 4: Valve book
Appendix 5: "WWTP" summary sheet

Note: The data highlighted in yellow are still to be completed with the operator.

Appendix 1 :


ORGANIGRAMME FONCTIONNEL DE L'ENTREPRISE
ENTECH
Ingénieurs Conseils
CONSEIL D'ADMINISTRATION
Yves COPIN PDG, Yves REUMAUX,
E.PetitLebrun, JP Fernez, Y. Piaugeard
DIRECTEUR GENERAL
Yves COPIN
DIRECTION OPERATIONNELLE : Yves COPIN
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Assistante administrative
Sandrine LIBERGE
Assistantes techniques
Emilie VEZIAC
Virginie CHANE

Appendix 2 :

ENTECH Ingénieurs Conseils

Neffiès

Ouvrage de stockage : Réservoir de Neffiès

Maitre d'ouvrage : CCAM — **Date : Juin 2020**

Communauté de Communes Les Avant Monts

DESCRIPTION GENERALE										
Type de réservoir	Tour		Enterré		Semi-enterré	x	Hors-sol			
	Monocuve		Bicuve	x						
Références cadastrales	N° :75		Section :B		Commune : Neffiès					
Propriété	Publique		Privée		si privée : achat		expropriation			
Coordonnées	Lambert 93 :		X = 726.96 m		Y = 6271.33 m		Z = 166.2 m NGF			
Accès à la parcelle	accès public	x	accès privé		si privé : servitude					
	route		chemin	x	avec véhicule	x	à pied	x		
	accès facile	x	accès compliqué		Remarque: état moyen du chemin					
Environnement immédiat	RD15									
Alimentation électrique	oui	x	non							
Alimentation téléphonique	oui	x	non							
DESCRIPTION DE LA CUVE										
Forme et nombres de cuves	Nb de cuve :	2	Cylindrique	x	Cubique					
Volume du réservoir	Volume total (m3) :		2*250		Défense incendie (m3) :		120			
	Volume utile (m3) :		380							
Mode d'accès aux cuves	chambre de vanne		extérieur	x						
Sécurisation des accès	porte verrouillée	x	capot verrouillé							
Altitudes / côtes caractéristiques	Arrivée d'eau :		m		Départ distribution :		m			
	Lyre Incendie :		158 m		Trop plein :		161 m			
	Radier:		156 m							
Dimension de la cuve (diamètre ou côté)	diam 9m, hauteur 3m20 (bassin Est)									
Cheminée d'aération	oui	x	non							
Crépine de prise d'eau	oui	x	non							
DESCRIPTION DE LA CHAMBRE DES VANNES										
Type de chambre des vannes	accolée à la cuve	x	souterraine		dans la tour					
Mode d'accès	porte verrouillée	x	capot verrouillé							
Aération / ventilation / fenêtre	ventilation haute	x	ventilation basse		fenêtre		dispositif anti-intrusion	x		
Armoire électrique	oui	x	non							
Conduites	Nature		Diamètre (DN, mm)		Vanne de fermeture		Couleur			
Alimentation	inox		100			x	gris			
Distribution	inox		125			x	gris			
Vidange	fonte		100			x	bleu			
Trop plein	fonte		100				bleu			
By-pass	oui	x	non							
Trop-plein	exutoire :		Ruisseau de la Font de Garrot		clapet anti-retour	x	grille anti-intrusion			
Vidange	exutoire :		Ruisseau de la Font de Garrot		clapet anti-retour	x	grille anti-intrusion			
Dispositif de traitement	oui		non	x	type :					
Robinets de prélèvement	eau brute :		oui		non	x	position :			
	eau traitée :		oui	x	non		position : conduite d'arrivée sur lyre incendie			
Équipements hydrauliques divers	clapet anti-retour	x	ballon anti-bélier		filtre		compteur	x		
	débitmètre		manomètre		turbidimètre		chloromètre	x		
Autres										
TELESURVEILLANCE / ASSERVISSEMENT										
Télégestion existante	oui	x	non		Transmetteur :		SOFREL			
Alarmes	anti-intrusion :		oui	x	non					
	défaut traitement :		oui	x	non					
	niveau bas :		oui	x	non					
Modalités d'alerte										
Données télésurveillées	volume distribués :	x	départ 1		départ 2		volume entrant			
	défaut traitement		turbidité		taux de chlore		marnage			
	autres :									

Vue aérienne

Localisation cadastrale

Photos de l'ouvrage (intérieur et extérieur)

Photos de l'ouvrage (intérieur et extérieur)

FONCTIONNEMENT									
Origine de l'alimentation		Forages du Falgairas Nord (et Sud)							
Nature d'alimentation		gravitaire		refoulement	x				
Alimentation du réservoir		par surverse	x	par le bas		position / départ : plus haut			
Niveau d'eau dans le réservoir		robinet flotteur	x	poires de niveau		sonde Ultra-Sons	x		
Marnage		marnage haut :		xx m		marnage bas :		xx m	
Instrument de mesures de débits		Localisation		Marque		Type et diamètre		Année	
	Adduction	conduite adduction							
	Distribution	après la lyre incendie, sur la conduite de distribution		ELSTER					
Remarques instruments de mesures									
USAGE DU RESERVOIR									
Réseau desservi (insee, 2016)		unité de distribution :		Neffiès					
		population desservie : 1427		hivernale : 1062		en période touristique : 365			
Volume distribué		jour moyen :		250,14 m3/j		jour de pointe :		410 m3/j	
		annuel :		xxx m3/an					
Autonomie		jour moyen (h) :		Alerter si > 5j		jour de pointe (h) :		Alerter si < 24h	
ENTRETIEN									
Fréquence de nettoyage cuve		1 fois par an 1 bassin à la fois							
Continuité du service lors du nettoyage		bypass							
Entretien accès et parcelle		ok							
HISTORIQUE									
Date de création de l'ouvrage									
Travaux effectués (extension, réhabilitation...)		rénovation en 2008: intérieur et extérieur des cuves, toiture, mise en place chloration, sécurisation du site							
Incidents techniques survenus									
Réponses apportées									
Alternatives en cas de dysfonctionnement									
DIAGNOSTIC DE L'OUVRAGE									
Etat genie civil		bon	x	moyen		mauvais		Remarque: muret de soutènement fissuré	
État revêtement cuve		bon	x	moyen		mauvais			
Conformité du revêtement de la cuve		oui		non					
Etat de la crépine		bon	x	moyen		mauvais			
État revêtement chambre de vannes		bon	x	moyen		mauvais			
État des échelles et garde-corps		bon	x	moyen		mauvais			
Etat canalisations		bon	x	moyen		mauvais			
Aération / ventilation		oui	x	non					
Protection insectes aux entrées possibles		oui	x	non					
Appareils de régulation		en service		hors service					
Appareils de mesures		en service	x	hors service					
Vannes de fermeture		en service	x	hors service					
Sécurisation des accès		clôture :		oui	x	non			
		portail verrouillé :		oui	x	non			
Sécurisation de la chambre de vannes		accès verrouillé :		oui	x	non			
Sécurisation alimentation électrique		oui	x	non					
Si chloration, lieu du stockage du chlore		Forages du Falgairas Nord							
Améliorations à apporter / travaux à réaliser		oui		non	x	nature:			
CONTRAINTES ENVIRONNEMENTALES									
Zone inondable		oui		non	x	côte PHE : m			
Natura 2000		oui		non	x	noms :			
Sites classés ou inscrits		oui		non	x	noms :			
Autres		PNA Lézard d'Ocellé, Pies-grièche méridionale et à tête rousse							
PLANS DISPONIBLES									
Plans		plan de masse		coupes	x	plan de localisation	x		
Schémas		synoptique		schéma altimétrique					

Appendix 3 :

ENTECH Ingénieurs Conseils	Neffiès Points de prélèvement et adduction : Forage du Falgairas Nord (F2) Maitre d'ouvrage : CCAM	Date : Mai 2020

GENERALITES										
Nature du captage	Principale	x	Appoint		Secours					
Nom(s) du captage	Forage du Falgairas Nord (F2)									
Propriété	Publique	x	Privée		si privée :	achat		expropriation		
Références cadastrales	N° : 527		Section : A		Commune : Neffiès					
Coordonnées	Lambert 93 :		X = 727144 m		Y = 6271905 m		Z = 203,87 m NGF			
Code BSS	BSS002JANN									
Accessibilité au site	accès public	x	accès privé		si privé : servitude					
	route	x	chemin	x	avec véhicule		à pied			
	accès facile	x	accès compliqué							
	Observations :									
OUVRAGE DE CAPTAGE										
Type de captage	Forage	x	Source		Puits					
Dates de création et d'exploitation de l'ouvrage	Création : 2004				Exploitation :					
Source / Forage	crépine	x	trop-plein	x	vidange	x				
	bac de décantation									
	pompe		débit nominal : m3/h		HMT : m		profondeur : m			
Bâti	Dimension :		longueur : 6,60m		largeur : 10,70m		hauteur : 5m			
	porte verrouillée	x	ventilation haute	x	ventilation basse	x	évacuation des eaux	x		
	dispositif anti-intrusion	x	électricité	x						
Généralités	UDI desservie :		Neffiès		réservoir alimenté :		réservoir de Neffiès			
Robinet de prélèvement eaux brutes	oui	x	non		position : conduite de refoulement					
Equipements hydrauliques	Vanne	x	Clapet A/R	x	Mise en décharge	x				
Etat des ouvrages	Génie civil :		bon	x	moyen		mauvais			
	Canalisations/équipements :		bon	x	moyen		mauvais			
	Protection :		bon	x	moyen		mauvais			
TELESURVEILLANCE / ASSERVISSEMENT										
Asservissement pompage	niveau d'eau dans le réservoir :		robinet flotteur	x	poires de niveau		sonde Ultra-Sons			
Appareils de mesure	compteur	x	débitmètre	x	sonde piézométrique		sonde manque d'eau			
	turbidimètre	x	sonde température		taux de chlore					
Nature du suivi	télérelevé		manuel		mixte	x				
Données télésurveillées	débit horaire		débit journalier	x	niveau piézométrique		tps de fct des pompes			
	turbidité	x	température		taux de chlore	x				
	Autres : alarme défaut alimentation (microcoupures), volumes distribués relevés manuellement toutes les semaines									
Alarmes	Anti-intrusion	x	Défaut traitement	x	Défaut pompage	x	Manque d'eau	x		
MODALITES DE PRELEVEMENT										
Fonctionnement du prélèvement	Pompage	x	Gravitaire		Destination :		réservoir			
							bâche de reprise			
							bâche de stockage	x		
	caractéristiques bâche de stockage:		Volume: 30 m3		Dimensions: 5x2.3m (int)		Distribution: gravitaire			
Capacité de prélèvement	Q actuels des pompes :		m3/h		m3/j					
	potentialité ressource :		m3/h		m3/j					
Débits autorisés (DUP)	en moyenne :		débit horaire : m3/h		débit journalier :	m3/j				
	en pointe :		débit horaire : 40 m3/h		débit journalier :	600 m3/j				
	volume annuel : 133 300 m3/an									
Volumes prélevés (2019)	en moyenne :		débit horaire : m3/h		débit journalier :	253 m3/j				
	en pointe :		débit horaire : m3/h		débit journalier :	420 m3/j				
	volume annuel : 92 216 m3/an									
Débit réservé / droit d'eau	débit réservé : m3/h				droit d'eau : m3/j					
HYDROGEOLOGIE ET VULNERABILITE										
Aquifère	code : BDLISA 681AB02 /BDRHFV1 558b- Massif central sud / haut minervois		nom : Calcaires primaires de la nappe charriée des Monts de Faugères et des écailles de Cabrières		nature : karstique					
Masse d'eau souterraine	code : FRDG409		nom : Formations plissées du Haut Minervois, Monts de Faugères, St Ponais et Pardailhan							
Etat quantitatif de l'aquifère	Bon	x	Médiocre		Objectif bon état SDAGE :		2015			
Vulnérabilité	faible		moyenne	x	forte					
Liaison hydraulique	traçage réalisé		liaison avec :							
Gestion équilibrée	existence d'un PGRE		autres documents :							
Essais de pompage	existence d'essais par pompage : oui/non			oui	dates : *nov 2014*					

Localisation vue aérienne

Localisation cadastrale

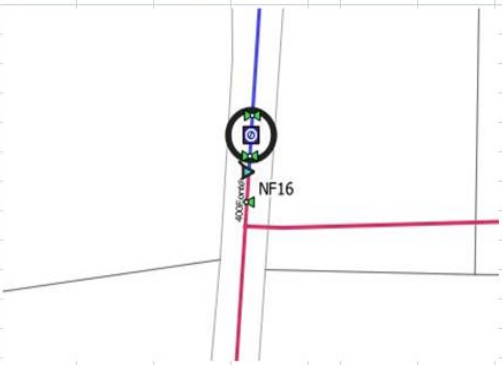
Photos du captage et des différents équipements

CONTRAINTES REGLEMENTAIRES								
Code de l'environnement	Création :		rubrique :			document existant		
	Exploitation :		rubrique :			document existant		
DUP	oui	x	non			date :	24/02/2011	
Avis d'hydrogéologue agréé	oui	x	non			date :	28/05/2008	
	auteur :		Philippe CROCHET					
Conformité de l'ouvrage / DUP	oui		non		Remarques :			
PPI	clôture	x	fermeture	x				
Conformité PPI / DUP	oui		non	x	Remarques : distance au PPI et entre les forages non respectées par contraintes techniques (absence d'eau, talus rocheux, présence ruisseau)			
Maîtrise foncière	oui	x	non					
Analyse de 1ère adduction	oui	x	non		Remarques : conforme			
Problème spécifique de qualité								
CONTRAINTES ENVIRONNEMENTALES								
Zone inondable	oui	x	non		côte PHE : m			
Natura 2000	oui	x	non		noms : FR9112002- Salagou			
Sites classés ou inscrits	oui		non	x	noms :			
Autres								
INTERVENTIONS ET TRAVAUX								
Historique des travaux antérieurs	oui	x	non		nature : - aménagement et la protection des forages et du piézomètre - mise en place du traitement raccordement et mise en service des équipements (2012/2013)			
Travaux / Actions d'urgences	oui		non	x	nature :			
Programme de travaux (prévu dans la DUP)	oui		non	x	nature :			
Programme d'amélioration (prévue dans le SDAEP)	oui		non	x	nature :			
Acquisition foncière	oui		non	x	parcelles :			
Régularisation administrative	oui		non	x	nature :			
Autres								
DOCUMENTS DISPONIBLES								
Plans	plan de masse				plan de localisation	x		
Coupes	lithologique				technique	x		
Schémas	ouvrages	x			principe			
ENVIRONNEMENT PROCHE								
Points d'eau et captage	puits	x	piézomètre	x	forage de reconnaissance		forage privé	
	source							
Présence d'habitations	oui		non	x				
Stockage de produits toxiques	oui		non	x				
Décharges / dépôts sauvages	oui		non	x				
Installations à risques (ICPE, CET…)	oui		non	x				
Présence d'animaux / élevage	oui		non	x	Précisez:			
Culture	oui	x	non		Précisez: Vignes			
Cours d'eau, ruisseau, fossé	oui		non	x				
Avens, cavité, grottes	oui		non	x				
Réseau routier	oui	x	non					
Autres								
Pollutions accidentelles antérieures	oui		non	x				

Appendix 4 :

Rue : D30E4	Coordonnées GPS :	Ouvrage n° NF16	Date : 23/07/2020
		X (Lambert 93) 727325,469 m	
		Y (Lambert 93) 6269718,7 m	

Implantation sur réseau



Localisation ouvrage

Type d'ouvrage

Sectionnement	Robinet-vanne		Robinet 1/4 de tour	
	RV papillon		RV papillon démultiplié	
Protection	Ventouse		Clapet anti-retour	
	Brise charge		Anti-bélier	
	Décharge / vidange			
Régulation	Réducteur		Stab amont	
	Stab aval		Stab amont et aval	
Comptage	Compteur	X	Débitmètre	
Divers	Fontaine		Colonne sulfatage	
	Poteau incendie		Bouche incendie	
	Bouche d'arrossage			
Autres				

Informations spécifique vannes

Sens fermeture :	FAH		FSH	
Fonction :	-			

Observations / Travaux à prévoir

Emplacement

Canalisation :	Matériau :	PVC	Diamètre :	DN110	Add ou dist :	distribution
Implantation :	RV sous chaussée	X	RV sous trottoir		Bouche à clé	
	Ch. Des vannes		Ch réservoir		RV sous TN	

Caractéristiques ouvrage / équipement

	Diamètre :	NC	Marque :	NC	Année :	NC
Etat :	Manoeuvrable		Dure		Fuite	
	Non étanche		Cassée		Décalée	
	Autres :					
Accessoires :	Filtre		Clapet			

Informations spécifiques organes de régulation

	Pression amont :		Pression aval :		

Informations spécifiques vidange

Rejet :	Pluvial		Eaux usées		Cours d'eau	
	Rue		Autres :			

Informations spécifiques gestion des données

Equipable ?	Non	Controlable ?	
Télégestion ?	Non	Si oui quel modèle ?	
Nb de pilote :		Si oui quel modèle ?	

Appendix 5 :

ENTECH Ingénieurs Conseil

Neffies

STEP de Neffiès

Maître d'ouvrage CCAM | **Date :** juillet 2020

Communauté de Communes Les Avant Monts

Photo Station

Caractéristiques de la station d'épuration

capacité	1 200 EH			
année de mise en service	2007			
type de filière	Filtres Plantés de Roseaux			
charges de référence	Charge hydraulique		178 m^3/j	
	Charge organique		71 Kg DBO5/j	
norme de rejet (arrêté du 31 juillet 2015)	DBO5	DCO	MES	NGL
	25 mg/l	125 mg/l	- mg/l	-
ou rendement min	60%	60%	50%	-
Population raccordée	1015			

Caractéristiques du rejet

Autorisation	Niveau de rejet	Milieu récepteur	Bassin versant	Localisation rejet
		La Marelle	Hérault	

Emplacement géographique

Localisation	Éloignement habitation la plus proche	Piste d'exploitation	Chemin d'accès	Remarques
Neffiès - parcelles n°67, 68, 69 section D	> 100 m	gravier	route carrossable	

Comptage des effluents en entrée de station

Type	Marque	Dimensions	Télésurveillance	Fonctionnement

Les prétraitements

Ouvrage	Dimensions	Fonctionnement	Etat visuel	Remarques
Piège à cailloux			en charge	
Dégrilleur automatique vertical			bon	

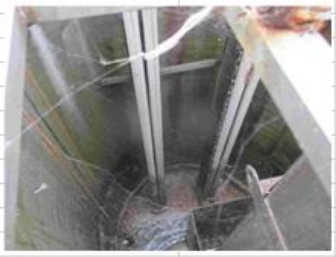
Filière eau : Filtres Plantés de Roseaux

Ouvrage	Géométrie	Dimensions	Volume utile (m^3)	Etat visuel	Remarques
Lit primaire	rectangulaire			bon	3 casiers , changement de fréquence de décharge des lits 2 fois par semaine 2 vannes manuelles par casier
Lit secondaire	rectangulaire			bon	2 casiers, divisés en 2 chacun sur la longueur

Comptage de l'eau traitée en sortie de station

Type	Marque	Dimensions	Télésurveillance	Fonctionnement
Canal Venturi				compteur situé dans le regard de la canalisation de sortie (pvc 200)

PR Entrée



Dégrilleur

Chambre de vannes en sortie du PR

Lit primaire

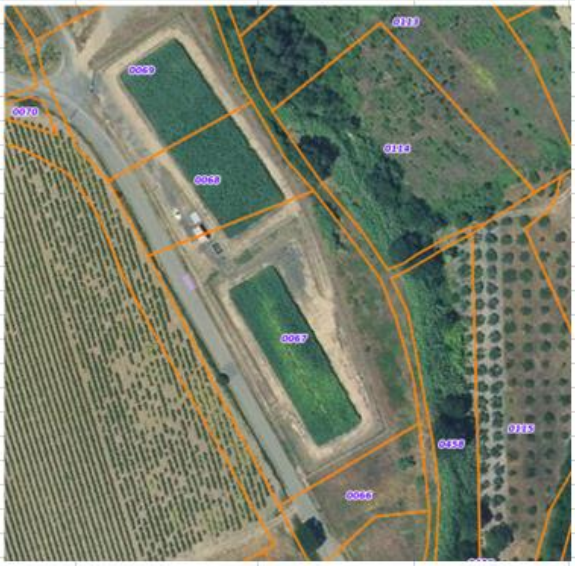
Comptage nombre de bâchée

Système de chasse

Lit secondaire

Comptage sortie

Localisation



Remarques/ observations

Le dernier bilan SATESE (07/2019) fait état d'une surcharge organique de la station (117 % sur la DBO5). La charge hydraulique reçue représente 86 % de la capacité nominale de la STEP.