

# **PROPOSAL FOR DESIGN, ENGINEERING, CONSTRUCTION AND OPERATION OF A DRINKING WATER PRODUCTION PLANT**

## **GUATEMALA - BUDGET QUOTATION FOR EMPAGUA CANALITOS PROJECT**

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<b>Date</b>	: October 31 <sup>st</sup> 2023
<b>Client</b>	: Empagua
<b>Project</b>	: drinking water production plant
<b>Location</b>	: Canalitos
<b>Revision</b>	:1

## **Contents**

<b>INTRODUCTION.....</b>	<b>2</b>
Local standards and conditions.....	2
Design parameters .....	3
Treatment steps.....	3
<b>SCOPE OF SUPPLY AND FINANCING .....</b>	<b>5</b>
Contract type.....	5
Capital investment .....	5
Operational cost .....	5
Dutch Clean Tech license fee.....	5
Local content .....	6
Land plot .....	6
Interest rate.....	6
Financial model.....	6
Other forms of cooperation.....	6
Financial model.....	7
<b>FINANCIAL PROPOSAL .....</b>	<b>9</b>
Key parameters and assumptions .....	9
<b>COMMERCIAL CONDITIONS.....</b>	<b>11</b>
Transparent cost basis .....	11
Local currency .....	11
Default charge.....	11
Delivery.....	11
Lead time.....	11
Bonds and guarantees.....	11
Legal framework .....	11
Other conditions.....	11

## INTRODUCTION

The river Canalitos is polluted because of the discharge of wastewater and raw sewage from various sources that have not been clearly identified yet.

This problem in itself needs to be solved in the future. The first step is to identify the sources of the wastewater and connect these to new sewage infrastructure.

The second step is to combine sufficient sewage and transfer it to a new sewage treatment plant.

It will take some time to implement these solutions.

However, there is another urgent problem: the provision of drinking water to the people of Guatemala City.

The Canalitos River is one of the sources for drinking water production. The idea is that the river is so polluted that it cannot serve as raw water to produce drinking water. Therefore a pre-treatment plant should be installed at the Canalitos pumping station. After pre-treatment the water can be transferred to the Las Illusiones drinking water production plant. At least, that was the original idea.

According to the study of engineer Julio Ramiro Merida, the pre-treatment plant should consist of:

- Side Socket (with flood sensor)
- Grate channel(desander)
- Grease trap
- Reactor UASB
- Collator Filter
- Secondary clarifier
- Disinfection
- Sludge drying yard
- Discharge

This is basically some sort of wastewater treatment plant.

We are of the opinion that wastewater must be collected separately and treated before it enters the river. That is more efficient than treating a whole river.

Moreover, we have the following observations:

- With an influent COD of 159 mg/l, an anaerobic reactor is not a good idea. According to our experience, a minimum COD of 1000 mg/l is required to make the anaerobic reactor work well;
- With a BOD/COD ratio of 0.28, we don't think a granular biological filter will work well either.

We have reviewed the analyses of the water sample taken in July 2022 and the one taken in August 2023. We conclude that the pollutants are diluted to a large extent. As a result, we can use the raw river water to produce drinking water.

In the 1970s, we built approximately 50 drinking water production plants in Indonesia. Those plants took the raw water from similar rivers. The treated water easily complied with the WHO standards for drinking water.

According to our calculations, we can achieve the same here at the Canalitos pumping station. To remove some more complex pollutants and also to remove any smell, we have added a Granulated Activated Carbon filter as an extra polishing step.

Obviously, we comply with today's WHO standards for drinking water.

The current idea is to transfer the treated water directly to the Colonia los Pinos in Zone 17.

Before we make a final decision on the design, we would like to take and analyze a series of samples. For example, to determine if there is any industrial sewage discharged into the river.

## Local standards and conditions

We have considered local climatic conditions.

All design and engineering documentation will comply with local standards, procedures, and regulations.

### Design parameters

We have used the following basic parameters for our design:

Parameter	Design value	Unit
Design capacity	5,500	m <sup>3</sup> /day
Average air temperature	not specified	°C
Average air pressure	not specified	mm Hg
Altitude	not specified	mamsl

We have based the influent parameters on the sample that was taken in July 2022.

Inlet	Design value	Unit
Oil & grease	<2	mg/l
BOD5	45.0	mg/l
COD	159.0	mg/l
TSS	680	mg/l
TP-P	1.7	mg/l
TKN-N	15.0	mg/l
Turbidity	not specified	NTU
Color	not specified	Pt-Co
Temperature	23.0	°C
pH	7.63	
Coliform bacteria	1,600,000	mg/l

For the treated water parameters, we use the standards as specified by the World Health Organization.

### Treatment steps

To achieve the required results, you need the following main treatment steps:

- Pre-settling channels;
- Feed pumps;
- pH correction/ coagulation dosing/pre-chlorination in the feed line;

- Skid-mounted treatment units for flocculation, clarification and sand filtration;
- Sludge storage tank;
- Clean water basin;
- GAC filter;
- Post chlorination.

See also the attached block flow diagram.

In the pre-settling channels, we want to intercept all solids particles of 50 microns and larger.

The feed pumps transfer the water to the actual treatment units. In the feed line, we dose chemicals to correct the pH. This is important because, for efficient coagulation, you need a certain pH value.

The next step is dosing a coagulant to let the smaller particles agglomerate into larger ones.

And, of course, we pre-chlorinate the water to protect the lines and treatment units from bacteria growth.

In the actual treatment units, we dose a flocculant to form larger flocs that easily settle. As a catalyst, we recycle part of the separated sludge. For proper mixing, we use corrugated plates

Subsequently, the flocs settle, also using corrugated plates to increase the separation surface and reduce the residence time.

Thirdly, the clarified water passes through a sand filter.

The separated sludge is partly recycled. The waste sludge is sent back to the river.

The treated water is stored in a clear water basis before it is pumped to the Granulated Activated Carbon Filters, which act as a polishing step.

Downstream of the filters, the water is again chlorinated.

In the attached brochures, you can find more information about our technologies.



## SCOPE OF SUPPLY AND FINANCING

### Contract type

We believe in water treatment as a service. That means that we invest in the treatment plant and take care of operation and maintenance. We hire local staff and we provide them with all the training they need.

You pay a transparent monthly fee and we take care of the rest.

You don't pay the fee during the construction period. We will start invoicing you after successful start-up of the plant.

*If we don't perform, you don't pay. This is our commitment*

Delivery and financing are based on a lease contract for 20 years with the option to renew.

Once the contract period ends, we can transfer the ownership, at the depreciated value to you. We can also transfer operation and maintenance to you or extend the contract for these activities.

We renew the interest period every 5 years, based on actual market rates.

### Capital investment

The total CAPEX consists of the following components:

- Design
- Engineering
- Procurement
- Project management
- Tests and inspections
- Documentation
- Site preparation
- Civil structures
- Containers or plant building
- Main process equipment
- Rotating equipment
- Piping
- Valves
- Control and safety valves
- Instruments
- Electrical equipment

- Automation
- Site construction and installation
- Commissioning & start-up

Dutch Clean Tech is responsible for the process design, detail engineering and adaptation of all documentation to local standards and regulations.

We are also responsible for the complete turnkey construction, installation and start-up of the treatment plant.

The depreciation and interest payments are transparent because we charge the actual costs.

### Operational cost

As part of our proposed 'water for service' contract type, we have included long-term (20 years) operation and maintenance in our scope of supply.

This includes the following:

- Power consumption
- Plant water consumption
- Chemical consumption
- Disposal cost of waste sludge
- Personnel
- Housing cost
- Transportation cost
- Office cost
- Laboratory cost
- General cost
- Maintenance of tanks, steel structures, rotating equipment, piping, valves, instruments, lighting, plant building, site facilities and utilities

The operating costs are also transparent because we charge the actual costs.

### Dutch Clean Tech license fee

Dutch Clean Tech's profit is the yearly license fee of 6% of the invested capital. Included in the license fee is the use of our control system, software, upgrades, remote monitoring, intuitive maintenance, training of operators, access to operating data, 24/7 technical support and guaranteed availability of spare parts.

The license fee must be paid throughout the financing period. And after that, as long as the treatment plant is operated using Dutch Clean Tech technology, intellectual property rights and software.

Our license fee is subject to yearly indexation based on inflation in the Euro zone.

#### **Local content**

We will procure as many items as possible from local contractors and suppliers. And, of course, we will hire and train local operators.

#### **Land plot**

We have assumed that you will make available a land plot of sufficient size for us to construct the wastewater treatment plant.

See also the attached plot plan.

#### **Interest rate**

Dutch Clean Tech finances its water treatment plants by issuing bonds. Private and institutional investors buy our bonds which have a duration of 5 years.

Currently, the interest rate is 9%. We renew the interest period every five years, based on actual market values.

#### **Financial model**

Dutch Clean Tech brings communities together. We attract capital from private and institutional investors in Western Europe. With this money, we construct water treatment plants, which we then lease to municipalities and private clients, including operation and maintenance.

Our investors make a fair profit, while our clients don't have to invest. Instead, they pay a transparent monthly fee.

*We don't work with bank loans.*

*Banks usually ask for extensive guarantees and lack flexibility*

As a private company with our own investment funds, we can act fast. Moreover, we are flexible and independent.

In this quotation, we propose to cover 100% of the investment.

We establish a local SPV (Special Purpose Vehicle), which owns the wastewater treatment plant and invoices you for water treatment as a service.

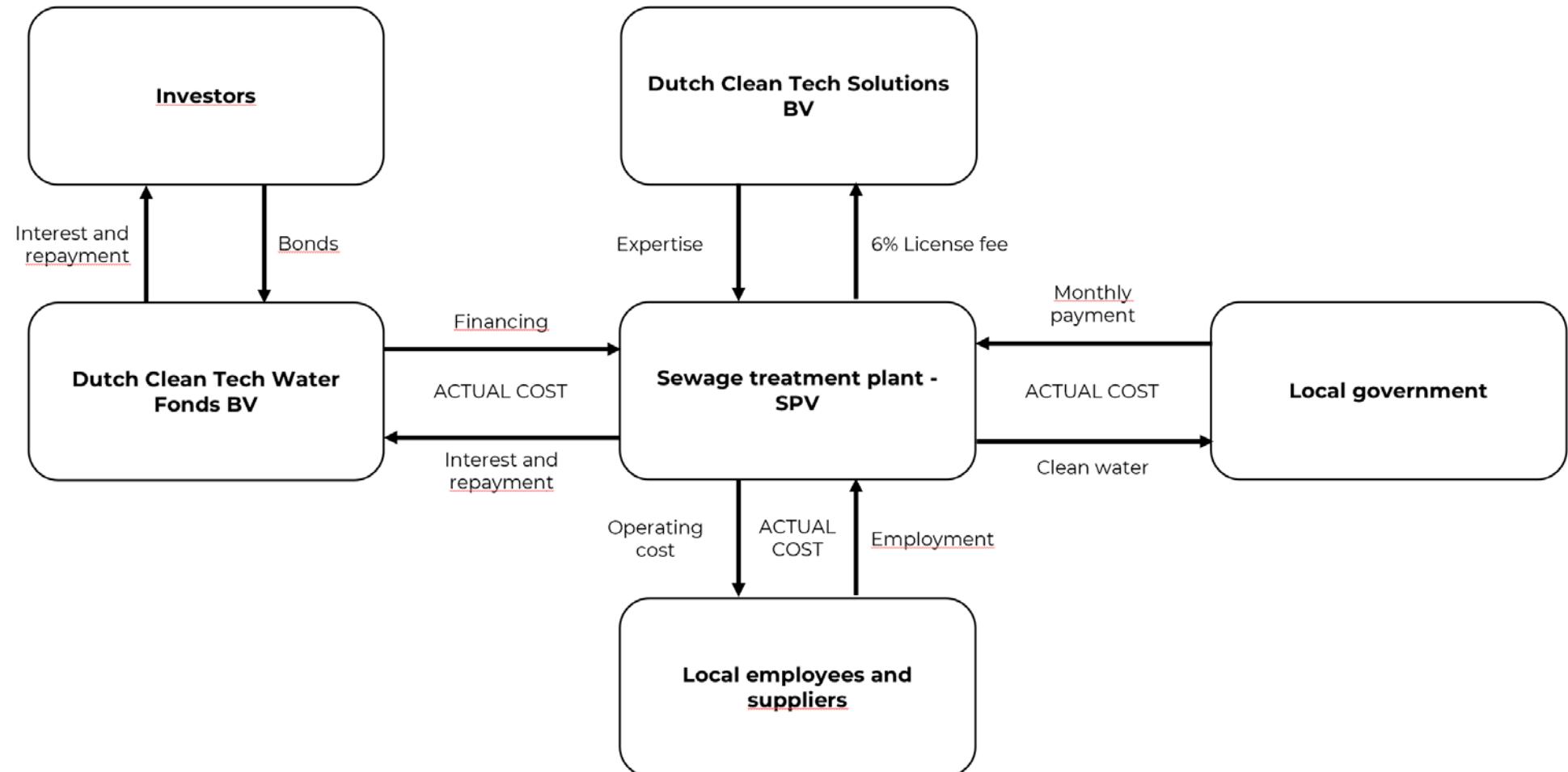
The SPV attracts funding from the Dutch Clean Tech finance company. And the SPV procures the water treatment plant from the Dutch Clean Tech EPC contractor.

This way, we control the whole process, and we can guarantee the highest quality and standards.

#### **Other forms of cooperation**

We are open to other forms of cooperation, like a BOT model or a joint venture.

Financial model





## FINANCIAL PROPOSAL

### Key parameters and assumptions

CAPEX parameters	
Investment cost	USD 3,169,100.- including interest during construction period
Depreciation	to nil in 20 years
Interest rate	9.0%
Interest rate renewal	Every 5 years, based on actual market rates
Financing structure	Annuity
Construction period	24 months
Contract duration	20 years after commissioning
Technical life-time	30 – 40 years
Land plot required	51.5 x 48 meters

Operating parameters	Cost	Consumption per year
Energy cost	USD 0.12 per kWh	200,000 kWh
Plant water cost	USD 0.38 per m <sup>3</sup>	10,000 m <sup>3</sup>
Coagulant cost	USD 0.28 per m <sup>3</sup>	40,000 kg
Hypochlorite cost	USD 0.38 per m <sup>3</sup>	20,000 kg
Carbonate cost	USD 0.16 per m <sup>3</sup>	40,000 kg

Job description	Salary per year	Number of people	Total staff cost per year
Shift leader salary	USD 19,250.-	2	USD 38,500.-
Operator salary	USD 16,500.-	2	USD 33,000.-
Workers	USD 11,000.-	2	USD 22,000.-
Administrator salary	USD 11,000.-	1	USD 11,000.-
Cleaner salary	USD 8,250.-	1	USD 8,250.-
<b>Totals</b>			<b>USD 112,750.-</b>

The power consumption and consumables are based on typical values and depend on the hydraulic profile of the plant, the altitude of the location, the climate conditions and other local conditions. The prices for energy, plant water, chemicals and the salaries are estimates based on an international average.

Because we charge all costs at actual values, we don't have to include indexation in our estimates, except for our Dutch Clean Tech license fee, which will be indexed based on the inflation in the Euro zone.

All values are stated in United States Dollars.

The prices in the table below are based on a contract duration of 20 years. If required, we can offer different contract periods.

Description	Cost in USD per year
Depreciation and interest	347,164
<b>Sub-total CAPEX part per year</b>	<b>347,164</b>
Power consumption	24,200
Plant water consumption	3,850
Coagulant consumption	11,000
Hypochlorite consumption	7,700
Carbonate consumption	6,600
Staff cost	112,750
Overhead cost	31,691
Maintenance and spare parts	31,691
<b>Sub-total OPEX per year</b>	<b>229,482</b>
<b>Dutch Clean Tech license fee, 6% per year</b>	<b>190,146</b>
<b>Total cost per year</b>	<b>766,792</b>
Total cost per month	63,899
Cost per m <sup>3</sup>	0.38

## COMMERCIAL CONDITIONS

### Transparent cost basis

The above cost estimates are based on:

1. A construction period of maximum 24 months.
2. The client provides a land plot.
3. Because we charge all costs at actual values, we don't have to include indexation into our estimates, except for our Dutch Clean Tech license fee which will be indexed based on the inflation in the Euro Zone.

All costs are net costs and don't include a profit margin. So if the actual prices are lower, we charge less.

At this stage, we have estimated all costs with an accuracy of +/- 15%. Together with you and based on a feasibility study or FEED document (which we can do for you), we will optimize the cost calculation and adapt it to your local circumstances.

### Local currency

We accept local currencies. In case of currency fluctuation of more than +/- 5%, we reserve the right to adjust our monthly rates accordingly for the interest, repayment and license fee.

### Financial guarantees

Dutch Clean Tech brings foreign investment and enters into long-term commitments and obligations. This implies certain risks. To moderate these risks, we require financial guarantees from our clients. As a minimum collateral, the treatment plant itself remains our property for the duration of the contract.

### Default charge

We assume that we cover our investment risk through an investment protection agreement. As such, we don't charge a default percentage.

### Delivery

The prices in this proposal are based on DDP delivery. We have estimated customs duties at 5%. We did not consider VAT nor any other taxes, at this stage.

### Lead time

In case the time of construction exceeds the estimates stated in the table above, we reserve the right to charge additional costs.

### Bonds and guarantees

Dutch Clean Tech doesn't issue bid bonds, performance bonds, advance payment guarantees or other bank guarantees.

### Legal framework

Dutch Clean Tech hires expert local lawyers to ensure that we can implement our business model in accordance with local laws and regulations.

We are happy to engage our lawyers in detailed discussions with you to determine the terms and conditions of our cooperation.

### Confidentiality

We will regard and treat all information submitted by you relating to this proposal as confidential. We shall not disclose any of the information provided to third parties without your written consent.

The technical and commercial information, calculations and drawings provided in this proposal by us are confidential. All rights on the information remain with Dutch Clean Tech.

### Other conditions

During the lease period, all equipment, materials and constructions remain the property of the entity that owns the sewage treatment plant.

