

2. The Project Area

2.1 Location

The site proposed for the setting up the CETP is located in the Auroville Industrial Zone on a plot of land belonging to the Auroville Foundation of about 6,000 m² located downhill of and adjacent to both Udyogam and Aurobhakti. The site is at a distance of about 40 m and 60 m from the premises of Udyogam and Aurobhakti respectively.

2.2 Physiography

The proposed site for the CETP is sloping gently in a Northwest direction with a gradient of about 2%. The Udyogam and Aurobhakti sites are also gently sloping towards the proposed site for the CETP with a similar gradient. The site for the CETP is flanked by a 1.5-2.0 m deep gully on the southern and western sides.

2.3 Land Use

The proposed site for the CETP is currently a vacant piece of land that is not being used for any purpose. A certain amount of soil conservation and water management work has been undertaken at this site through simple means such as the construction of bunds. The site is at present overgrown with grasses and shrubs.

2.4 Population

The population in the project area can be characterized by a resident population and a floating population. The resident population consists of those people residing at the various units such as unit holders, caretakers and security personnel. The floating population consists of personnel who spend the working hours in the project area. The population at each unit as well as the entire project area is indicated in the table below. At Naturellement the population is expected to increase when it moves to its new unit at Udyogam.

Population at each unit:

	Present			Near Future		
	Resident	Floating	Total	Resident	Floating	Total
Aurosoya	4	5	9	4	5	9
Naturellement	0	13	13	4	20	24
New School Crafts	4	10	14	4	10	14
Aurobhakti	3	120	123	3	120	123
			159			170

2.5 Hydrometeorology

2.5.1 Precipitation

The mean annual rainfall in Auroville is about 1,227 mm with about 65 % of the precipitation taking place during the Northeast monsoon, i.e. October to December.

2.5.2 Temperature

The maximum and minimum temperatures recorded in Auroville were 43,8°C in May, 1976, and 14,9°C in February, 1974, respectively.

2.5.3 Potential Evapotranspiration

The Mean Potential Evapotranspiration has been calculated to be 1,732 mm/year.

2.7 Freshwater resources

2.7.1 Availability

Groundwater occurs in the lateritic soil under phreatic conditions, as well as in the older formations of the Mio-Pliocene to the Cretaceous periods. This water can be tapped under the phreatic conditions with the depth to the water table varying from less than a metre to 5,20 m bgl. The range of seasonal fluctuation in the water table is from 2,4 to 12,4 m.

2.7.2 Supply, distribution and consumption

Udyogam

Freshwater to Udyogam is supplied from the tube well at “Silence” community. The water is stored in an underground sump of about 40,000 liter capacity. An overhead tank of about 12,000 liter capacity is planned for the distribution of freshwater.

As there are no commercial units operating yet at this site, there is no water consumption data for this place. Most of the freshwater is at present being used for construction purposes.

Naturellement

Naturellement is at present located at the Bharat Nivas complex and receives its freshwater from a water supply system that is shared by several other users in this complex. As the freshwater used in Naturellement is not metered it has not been possible to quantify the amount of freshwater used by this unit. Moreover, toilet facilities and several freshwater outlets are also shared by other users making it more difficult to accurately estimate the freshwater consumption in this unit.

Nevertheless, the management at Naturellement have estimated that their current freshwater consumption for production purposes is about 850 liters per day. In addition to that it is estimated that approximately 520 liters per day is used by the workers at present for various purposes. Thus, the total estimated current freshwater demand is about 1,370 liters per day. This is detailed in the table below. When Naturellement moves to its new location at Udyogam and its production capacity increases, it is estimated that the freshwater demand in this unit is likely to increase by around 230%.

Freshwater use at Naturellement

	Present			Future		
	No.	litres/day	Total Litres/day	No.	litres/day	Total Litres/day
<i>Production related uses:</i>						
Freshwater consumption:			850			1700
Freshwater used in process:			0			0
Sub-total:			850			1700
<i>Other uses:</i>						
Workers:	13	40	520	20	40	800
Residents:	0	150	0	4	150	600
Sub-total:			520			1400
TOTAL:			1370			3100

Aurosoya

Aurosoya is at present located at the Bharat Nivas complex and receives its freshwater from a water supply system that is also shared by several other users in this complex. As the freshwater used in Aurosoya is not metered it has not been possible to quantify the amount of freshwater used by this unit. Moreover, toilet facilities and several freshwater outlets are also shared by other users making it more difficult to accurately estimate the freshwater consumption in this unit.

Nevertheless, the management at Aurosoya have conducted a detailed audit of their freshwater consumption for production purposes. This detailed information is provided in [Annex ?](#).

From the water consumption calculations it was found that Aurosoya uses approximately 530 liters of freshwater for its production purposes. In addition to that it is estimated that approximately 800 liters per day is used by the workers for various other purposes. Thus, the total estimated current freshwater demand is about 1,330 liters per day. This is detailed in the table below.

Freshwater use at Aurosoya

	Present		
	No.	litres/day	Total Litres/day
<i>Production related uses:</i>			
Freshwater consumption:			460
Freshwater used in process:			69
Sub-total:			529
<i>Other uses:</i>			
Workers	5	40	200
Residents	4	150	600
Sub-total:			800
TOTAL:			1,329

New School Crafts

New School Crafts is at present located at Aurobhrindavan and receives its freshwater from a well on the site. A separate water supply and distribution system is existing for this unit. However, the consumption of freshwater is not metered. Moreover, the water distribution system has several outlets that makes it difficult to accurately monitor and estimate the freshwater consumption in this unit.

Nevertheless, the management at New School Crafts has estimated that their current freshwater consumption for production purposes is about 1,000 liters per day. In addition to that it is estimated that at present approximately 1,600 liters per day is used by the workers for various purposes. Thus, the total estimated current freshwater demand is about 2,600 liters per day. This is detailed in the table below.

Freshwater Use at New School Crafts

	Present		
	No.	litres/day	Total Litres/day
<i>Production related uses:</i>			
Freshwater consumption:			900
Freshwater used in process:			100
Sub-total:			1,000
<i>Other uses:</i>			
Workers:	10	100	1000
Residents:	4	150	600
Sub-total:			1,600
TOTAL:			2,600

Aurobhakti

Freshwater to Aurobhakti is supplied from the tubewell at “Svedam” community. A pump of about 8,000 liter/hour capacity is used for 38 hours every month to supply water to Aurobhakti. Thus, it is estimated that on the average about 11,700 liters of freshwater per day are supplied to and consumed at Aurobhakti.

Freshwater at Aurobhakti is first stored in an underground sump of about 12,000 liters. Water is then pumped from the sump to an overhead water tank whose volume is not exactly known, but is estimated to have a storage capacity of about 15,000 liters. Freshwater from the overhead tank is distributed to the entire Aurobhakti site and is used by all of the units operating at Aurobhakti.

As the units at Aurobhakti are producing merchandize that does not require water in its production process, freshwater is used mostly for activities that are not related to production. However, as the use of freshwater is not metered, it is estimated that the workers and residents use about 5,250 liters of water per day. This is detailed in the table below.

Freshwater use at Aurobhakti			
	Present		
	No.	litres/day	Total Litres/day
Non-process uses:			
Workers:	120	40	4,800
Residents:	3	150	450
Other uses:			6,450
TOTAL:			11,700

2.8 Wastewater production

2.8.1 Existing wastewater management system

The existing wastewater management systems at all of the concerned units at present provides at best only some form of primary treatment to the wastewater. No designs or detailed information on the existing systems were available. Only verbal descriptions and superficial and visual observations of the wastewater management systems were recorded as trying to obtain more detailed and accurate information would have involved the partial dismantling of some of the systems and structures which was beyond the scope of this exercise and not essential for this study.

Udyogam

As the site is currently being developed there is no wastewater-related infrastructure yet and it is the purpose of this study to suggest appropriate wastewater management systems for this site.

Naturellement

At the current production facility of Naturellement there is no proper wastewater collection, treatment and disposal system. The wastewater produced at this unit flows into several wastewater streams two of which could be identified. One stream flows to a concealed underground receiving structure that was reported to be a septic tank and soak away system located next to the eastern side of the building. The other stream flows to an open unlined earthen pit about 1.5m x 1.5m x 1.0m (depth) located about 20.0m west of the building. There are no toilets at this facility and the toilets of the Bharat Nivas Auditorium are used by this facility.

Aurosoya

At the current production facility of Aurosoya there is no proper wastewater collection, treatment and disposal system. The wastewater produced at this unit flows into several wastewater streams two of which could be identified. One stream flows to a concealed underground receiving structure that was reported to be a septic tank and soak away system located next to the north-western side of the building. The other stream flows to a manhole which would appear to connect to the open unlined earthen pit about 1.5m x 1.5m x 1.0m (depth) located about 20.0m west of the building. There are no toilets at this facility and the toilets of the Bharat Nivas Auditorium are used by this facility.

New School Crafts

The current syrup production facility of New School Crafts is served by a drainage systems that conveys the wastewater to an underground tank located close to the building that was reported to consist of a sedimentation chamber and a gravel filter. During the time of inspection the underground wastewater tank was found to be overflowing indicating that some blockage had probably occurred. The toilets are located at another location and are served by a separate septic tank and soak away system.

Aurobhakti

At Aurobhakti it was reported that a septic tank and soak away system receives all of the wastewater from the toilet block located to the West of the building. The cover of the above septic tank system is visible as it is slightly raised above ground level. A concealed soak pit system located close to the southern entrance of the building was reported to receive wastewater from the kitchen and a toilet in the main building. Wastewater from the “Dining Room” building was reported to flow into another concealed soak pit system located between the building and the boundary fencing.

2.8.2 Wastewater production

Data on volumes and quantities of wastewater produced at each of the above units were not available. Due to the extremely fragmented nature of the wastewater drainage system and unclear division of the various wastewater streams it was not possible to collect any significant information on wastewater flows. In this instance too, trying to obtain more detailed and accurate information would have involved the partial dismantling of some of the systems and structures that was beyond the scope of this exercise and not absolutely essential for this study. Under these circumstances freshwater consumption data can and shall be used to provide significantly accurate estimates on volumes of wastewater produced per day.

From the freshwater consumption data we find that the derived estimated wastewater production is at present about 17,000 liters per day and in the near future about 19,000 liters per day.

Estimated wastewater production per day:

	Present	Near Future
• Aurobhakti	11700	11700
• Aurosoya	1329	1329
• Naturellement	1370	3100
• New School Crafts	2600	2600
TOTAL:	16999	18729

2.8.3 Wastewater quality

Analyses of wastewater to determine the physical and chemical parameters of the wastewater had not been conducted so far at any of the concerned units. Due to the extremely fragmented nature of the wastewater drainage system and unclear division of the various wastewater streams it was also not possible to collect any representative sample of the mixed (“industrial” with domestic) wastewater from any of the units.

However, in order to make a preliminary assessment of wastewater quality, samples from the most visibly polluted streams of wastewater were collected. Three samples of wastewater were collected for the analysis of the physical and chemical parameters.

Sample 1

Sample 1 was collected from the discharge point of the PVC drainage pipe at the unlined earthen wastewater collection pit next to Naturellement at Bharat Nivas. This pit receives wastewater from Naturellement, however, it is suspected that some wastewater from Aurosoya located next to Naturellement may be also draining into this pit.

Sample 2

Sample 2 was directly collected from the vessels used for the manufacturing of TOFU at Aurosoya just before the liquid contained in the vessels was to be disposed off. This sample was prepared in order to create a representative sample of wastewater by mixing the different kinds of liquid wastes produced from the various manufacturing stages in proportion to the volumes of each type of liquid waste produced at the unit as described in the water audit provided by Aurosoya (Annex ?). This sample consisted of:

- 20% - “water with Magnesium Sulphate”,
- 20% - “water with little Magnesium Sulphate”,
- 60% - “clear water” from Soya soaking.

Sample 3

Sample 3 was directly collected from the vessels used for the manufacturing of TOFU at Aurosoya from the liquid waste that was described as “water with Magnesium Sulphate” just before it was disposed off.

The results of the wastewater analysis are detailed in the table below.

Wastewater analyses from Samples 1, 2 and 3 from Naturellement and Aurosoya.

	Sample	1		2		3	
		A	B	A	B	A	B
	Date:	15/04/02	16/04/02	16/04/02	16/04/02	15/04/02	16/04/02
1	pH	6.9		4.8		6.0	
2	Ec (µS)	890		2040		3470	
3	Total solids (mg/l)	3198		5266		17450	
4	Total dissolved solids (mg/l)	984		4574		8873	
5	Total suspended solids (mg/l)	2214		692		8577	
6	Total settle able solids (ml/1/hour)	4.5		12		220	
7	Sulphates (mg/l)	250		100		200	
8	Total Kjeldahl nitrogen (mg/l)	27		214		279	
9	Nitrate nitrogen (mg/l)	16		8		36	
10	Ammonium nitrogen (mg/l)	26		12		24	
11	Magnesium (mg/l)	5		61		98	
12	Total phosphorus (mg/l)	0.2		2.4		1.6	
13	Oil and grease (mg/l)		476	36			75
14	COD (mg/l)	4,928	4,576	7,744		18,304	14,784
15	BOD₅ (mg/l)	2,800		5,300		13,700	

From the analysis of wastewater indicated above it can be noted that the wastewater is characteristic of “industrial” wastewater. For comparative purposes, it may be pointed out that typical domestic wastewater has a BOD₅ of 350 mg/l.

For the purpose of this study it shall be assumed that wastewater from other un-sampled wastewater streams originating from areas not related to production processes is similar to typical domestic wastewater.

2.8.1 Derived wastewater data

For the purpose of planning and designing of proposed wastewater-related systems and components basic and essential data is derived and elaborated from the above wastewater related information. For the purpose of this study, hydraulic data pertaining to the volume of wastewater flowing per day and chemical (pollution) data pertaining to BOD₅ and COD shall be taken into account. For convenience in planning purposes these data shall be derived and elaborated from above and converted to Population Equivalents (PE), i.e. the load, both hydraulic and chemical, produced by an equivalent number of persons or population.

From the above data it may be observed that there are two types of wastewater being produced by the concerned units, industrial and domestic. From the results of the wastewater analysis above, it is clear that the wastewater produced from the TOFU manufacturing processes at Aurosoya can be characterized as industrial wastewater.

Given the lack of reliable and representative information on wastewater from other units and wastewater streams and given that no other unit was found to be engaged in production processes resulting in the production of highly loaded wastewater, it shall be safely and conservatively assumed that the contribution of industrial wastewater is principally from soya processing activities at Aurosoya. All other units shall be considered to be producing wastewater similar to domestic wastewater.

2.8.1.1 Pollution load

Domestic

With a daily wastewater production of about 18,000 liters per day considered to be of domestic origin having a BOD₅ and COD of 400 and 500 mg/l respectively, given that 1 PE produces 75 g/d and 60 g/d of COD and BOD₅ respectively, **there is a domestic pollution load of about 120 PE.**

Industrial

From **Annex ?** it can be seen that the maximum quantity of wastewater disposed off from soya processing activities at Aurosoya is about 1,000 liters per day. Given that the mixed sample of wastewater (sample 2) had a COD and BOD₅ of 7,744 and 5,300 mg/l respectively, the equivalent PE is 103 and 88 (given that 1 PE COD = 75 g/d and 1 PE BOD₅ = 60 g/d). **Therefore in this study it shall be considered that the pollution load contained in the industrial wastewater is equivalent to about 100 PE.**

Combined

The combined domestic and industrial pollution load is therefore 120 PE and 100 PE respectively, amounting to **220 PE.**

2.8.1.2 Hydraulic load

With an estimated combined wastewater production of about 19,000 liters from all the concerned units, and given that 1 PE produces about 150 liters per day, **there is a hydraulic load of about 125 PE.**