

PN-ABY-884

**INITIAL ENVIRONMENTAL EXAMINATION**

**of the**

**PROPOSED INDUSTRIAL ESTATE**

**at**

**TAMMANAKELE**

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**Prepared for the Ministry of Industrial Development**

**by**

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The findings and recommendations contained herein represent the best professional judgement of the study team only.

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**TAMMANAKELE  
PROPOSED INDUSTRIAL ESTATE  
SUMMARY ENVIRONMENTAL REPORT**

**I. GENERAL SITE DESCRIPTION**

This proposed industrial site of 27 hectares (67 acres) is situated along the Bangadeniya-Anamaduwa secondary road (B33) about 8 km from the Puttalam-Colombo road in the Arachchikattuwa Divisional Secretary Division, in close proximity to the proposed Manaweriya industrial estate. Both the Tammanakele and Manaweriya sites are part of a larger tract of land known as the St. Martin's Estate. The Tammanakele site is currently a coconut plantation managed by the National Livestock Development Board (NLDB), and is located on high ground. There are no existing structures on the site other than a few simple watchers' huts. See Annex A for regional and site maps of this area.

**II. PHYSICAL ENVIRONMENT**

**A. Weather**

This site is at the boundary of the wet and intermediate zones of Sri Lanka. It is approximately 10 km from the proposed Manaweriya industrial estate site. Chilaw, which is approximately 5 km from the site, receives about 1850mm of rainfall annually. Most rainfall (an average of 1210mm/yr) is received from October to March which is the Maha season. Average rainfall during the Yala season from April to September is 640mm. Wind direction is predominately SW or S during the southwest monsoon (May to September); the prevailing direction is NE during December to February, which is the Northeast Monsoon period. Average wind speed in this region is about 11.5 km/hr.

**B. Topography, Soils, Groundwater**

A Perimeter Survey of the proposed site done in 1994 shows the site to be a trapezoidal block of land of 27 ha bordering the B33 road. The land is at an approximate elevation of 20m msl (above mean sea level). The slope of the site reaches up to 1% with even downward slopes from a smooth central hump, and could be considered as nearly flat. Approximately half of the surface water from the site drains in the direction of Elvitiya Wewa and the rest drains towards the Kumarakattuwa Wewa.

Soils at the site are generally sandy, but patches of clayey soil were observed on the eastern side of the site. Tests done during the study indicated that the soil has excellent permeability and water-holding capacities. At the entrance to the site on the northern edge bordering the main road there is a pit of approximately 140m<sup>2</sup> which has been dug to a depth of about 2.5m to extract gravel. See Annex B for more detailed soil analysis.

A well within the site had water at a depth of 6m while a well just outside the boundary on the NE side had water at a depth of about 3.6m. A tube well close to the well outside the NE boundary has been dug to a depth of about 7.6m, according to the landowner. No groundwater observations other than the above were done at this site during the study.

### **C. Surface Water Hydrology**

There are no well-formed streams or valleys within the site. The flowing water body at closest proximity is the Deduru Oya, which flows within an approximate distance of 2.0 km from this site. The average annual flow of the Deduru Oya at Chijaw (Hydrological Annuals, Irrigation Department 1992/93, 1993/94) is 3022 MCM. The river's average annual maximum and minimum flows at this point range from 460 MCM (November) to 168 MCM (March). In Deduru Oya there are ongoing sand mining operations.

Reservoirs close to the site are Kumarakattuwa Wewa (at  $\approx 0.5$  km), Ihala Palugas Wewa (at  $\approx 0.5$  km), Elivitiya Wewa (at  $\approx 1.0$  km) and Bombiwila Wewa (at  $\approx 2.0$  km) which have approximate capacities of 40,000, 75,000, 390,000 and 420,000 m<sup>3</sup> respectively. The water in these reservoirs is used mainly for irrigation and domestic purposes. Water collected within the tanks is sufficient to cultivate the lands below them for only one (Yala) season per year. These small tanks were holding very little water during the site visits (in July and August).

### **D. Water Quality**

Samples from two water bodies in and around the Tammanakele division of St. Martins Estate were obtained in order to determine their water quality: a) Deduru Oya, at the bridge on the Chilaw-Puttalam highway ( $\approx 11.0$  km from the site, although the closest point of the river to the site is a further 12 km upstream from this measurement point); b) a well at the proposed Tammanakele site, near the watcher's hut built by National Livestock Development Board (NLDB).

Water quality measurements indicate the presence of very high salinity in the river water at the point of measurement, and to a lesser extent in the groundwater. This high salinity may be due to a combination of the following reasons:

- (1) Rate of ground water abstraction exceeding the ground water recharge rate;
- (2) Significant sand mining taking place in the river bed;
- (3) Large-scale ponding of saline water for prawn cultivation.

The fluoride concentrations in both the surface and ground water are at levels causing concern, and the BOD/COD ratio pertaining to waters of Deduru Oya indicates that

these waters contain mostly refractory (non-biodegradable) elements. The nutrient level of the river water is also high, indicating significant input of agricultural chemicals in runoff water from nearby farming operations. More detailed water quality results are given in Annex C.

Although there is an existing gravel pit on the northern border of the site, its suitability for a solid waste landfill is questionable due to the high permeability of the underlying soil and the relatively high local water table; both of these conditions could lead to ground-water contamination if the pit were to be used to dispose of solid wastes.

#### **E. Air Quality and Noise**

No site-specific air quality data are available. There are no existing emission sources on site or adjacent to the site except from vehicles passing on the highway. Other than these vehicles there are also no significant noise emission sources.

### **III. CURRENT AND PLANNED FACILITIES AND SERVICES**

#### **A. Water Supply and Wastewater Disposal for Industries**

Possible sources of water for industrial uses are given below for the proposed site at Tammanakele:

1. Deduru Oya - Detailed water quality analysis of Deduru Oya water is given in Annex C. From these data it is apparent that a water supply treatment process will be needed to obtain water of sufficient quality for industrial use. NOTE: Advice of the Irrigation Department and the National Water Supply and Drainage Board should be sought to ascertain whether a sufficient quantity of water could be extracted from the river for an industrial estate at this site without adversely affecting other water uses of the river. It is particularly noteworthy that Deduru Oya provides potable water to the towns of Kurunegala and partially to Chilaw.
2. Ground Water - Detailed pumping tests to estimate the ground-water yield should be carried out with the assistance of either National Water Supply and Drainage Board (NWSDB) or Water Resources Board (WRB). The high salinity observed in the nearby Chilaw water supply (obtained from tube wells) indicates that ground water extracted at this site might have high salt content.

Possible liquid effluent disposal locations (after appropriate wastewater treatment) for the industries are:

- Nearby surface water tanks: Disposal of liquid waste must be treated to the

appropriate water quality standard and continuously monitored to avoid conflicts with other users of water in these tanks.

- Deduru Oya: Liquid effluent from the site, if treated up to the required inland surface water quality level, could be discharged to Deduru Oya with the approval of the C.E.A. and the Irrigation Department, provided that the river flow is sufficient to achieve the necessary dilution factor throughout the year.

## **B. Infrastructure**

1. Power and Telecommunications: Electric power lines and telephone lines go by the estate. The local power supply, however, is highly unstable. Theft of telephone wires has occurred in the area, and could cause difficulties in the future. The site itself does not have easy access to a transformer unit or telecom unit; thus all necessary support of this nature would have to be provided to the site from external connections.
2. Transportation: The estate borders the Bangadeniya-Anamaduwa secondary road (B33), which is a side road from the main Colombo-Chilaw road. The road is not particularly well constructed although it appears to be stable; the road was built to support the Anamaduwa (Gam Udawa) site. Both private and public bus services are available along this road. There are no roads on the other three sides of the estate.

The nearest rail access to the site is the Bangadeniya Rail Station, about 8 km from the site. However it should be noted that rail transportation to the area could be disrupted during the rainy season due to flooding of the railway line. The Katunayake International Airport is about 30 km to the southwest by road.

3. Other Public Services: The Anamaduwa District Hospital (Puttalam Health Region) and Anamaduwa Police Station are within about 13 km. Alternatively, workers at the site may have to make use of services in Chilaw town, which is about the same distance from the site.

### C. Existing Structures and Industrial Activities

There are no existing significant structures except for a few watchers' huts on the site and adjacent to it. No industrial proposals for this site had been received by the Ministry of Industrial Development at the time of the site visit.

## IV. BIOLOGICAL ENVIRONMENT AND NATURAL RESOURCES

### A. Significant Flora

The site is situated in the dry and arid lowland floristic region of Sri Lanka in close proximity to northern and intermediate lowlands. At present the site is a productive coconut plantation; no significant natural vegetation was observed within the proposed site.

There are two small fresh-water tanks situated within a 1 km radius from the site -- Ihalapalugas wewa and Kumarakattuwa wewa. Several aquatic plants were observed in those two tanks; *Nymphae* spp., *Nelumbo* spp., and *Salvinia* were predominant.

### B. Significant Fauna

The common Garden Lizard (*Calotes versicolor*) and Green Garden Lizard (*Calotes calotes*) were observed within the site. Several species of common birds were also present. In and around the nearby tanks the common Cattle Egret, Large Egret, Median Egret, Indian Shag, Little Cormorant, Common Kingfisher and Indian Pond Heron were also observed during the site visit.

According to local fishermen and/or team observations, several fish species are found in both tanks: Murrel (*Channa striata*), Climbing Perch (*Anabas testudineus*), Orange Chromide (*Etroplus maculatus*), and Snakeskin Gourami (*Trichogaster pectoralis*). All of these species are commonly found in dry zone tanks.

## V. SOCIAL AND CULTURAL ENVIRONMENT

### A. Human Settlements

This site is situated in the GSD of Elvitiya, encompassing the old (Purana) village of the same name and the new villages of Tambana and Thukkithiyagama which are legalised settlements of encroachers. About 1 km to the north of the site is the GSD of Kumarakattuwa consisting of two old (purana) settlements, one also called Kumarakattuwa and the other Mandalana, whilst the two new settlements are Erunwela and Akkaravissa.

To the east is the GSD of Diganwewa, consisting of the old village of Diganwewa together with the new settlements of Palugaswewa watte, Alikatuwa, and Morekele. Dematapitiya GSD is on the far south, and consists of the old village of the same name and another six villages.

The total population in 1989 for the four GSDs was estimated at over 4400, with each GSD accounting for over 1000 people. Kumarakattuwa, which had the highest population (1210), had only 249 houses of which 136 were temporary whilst Dematapitiya, with 964 people, had 247 houses of which 103 were temporary. The Elvitiya GSD had a total population of 1062, with 540 males and 522 females, residing in 230 houses of which 157 were temporary or semi-permanent structures. The majority of housing in all four GSDs is in need of improvement, reflecting the relatively high levels of unemployment and under-employment in this region.

Limited health care for the local populace is available at Bangadeniya and Arachchikattuwa rural area clinics, within 7-10 km.

#### **B. Labour Force**

Elvitiya GSD, where the site is located, has recorded the lowest employment -- 131 of a labour force of nearly 500, with comparatively few opportunities for self-employment. The labour force of Diganwewa accounted for 58% of the total GSD population of 1180, whilst in the other GSDs it was between 41%-48%; however, nearly 50% of those listed as employed are underemployed, according to the Resource Profile of Arachchikattuwa for 1990.

#### **C. Local Economic Activity**

In both Diganwewa and Dematapitiya employment in agriculture is minimal, whilst in Kumarakattuwa the majority are involved in agricultural occupations. In all the GSDs in this region employment is primarily either in the government or the private sector; the highest number of government employees (180) was recorded for the Diganwewa GSD. Agriculture and forestry are unlikely to be affected by development of this site, as there is no local forestry, and agricultural areas to the north of the site are provided with a natural buffer by a coconut plantation. Fishing for a living is not a major activity in the GSDs of the vicinity.

#### **D. Religious and Cultural Features**

A remnant of a dagoba (pagoda) attributable to the second century BC, said to be constructed by a General of the legendary King Dutugemunu, is visible at Veherakelle on the way to Tammanakele from Bangadeniya (3 km). There is a Catholic Church and a Buddhist temple at Kumarakattuwa, each of which are important local religious sites.

## **E. Aesthetic and Recreational Features**

The aesthetic character of the site is principally that of a sprawling coconut plantation. There are no local public recreational facilities or organized recreational activities at close proximity to the site.

## **F. Local Customs, Aspirations, and Attitudes**

Most residents in the vicinity of this site are relatively new settlers, either business and government workers in the highland or paddy cultivators in the Kumarakattuwa area. They have no distinct articulated aspirations, but rather carry on their chosen work and lifestyles, while also attending to their different religious practices.

# **VI. MAJOR ENVIRONMENTAL AND REGULATORY ISSUES**

## **A. Sensitivity of the Affected Environment**

The biological environment at the site is highly altered from the natural state, and does not appear to contain significant wildlife habitat or unusual native plant or animal species. The two small nearby reservoirs (tanks or wewas) mentioned above do provide habitat for numerous aquatic plant species, fish, and birds, and thus have some environmental and economic significance. Care should be taken to ensure that any development and operation of industrial activities at this site does not degrade the water quality or deplete the volume of these tanks, especially during dry seasons.

## **B. Regional Water Resource Limitations**

This site appears to have limited access to sustainable supplies of either surface or ground-water resources. Therefore, before approval is given to industries to develop this site, the potential demand of each industry for water should be assessed relative to other existing and planned water uses in the same region. The maximum sustainable withdrawal volume from Deduru Oya should be determined and compared to the estimated demand to determine feasibility.

If ground-water withdrawal is to be considered for industrial use, further on-site analysis of ground-water quality and sustainable quantity should be undertaken to ensure that such withdrawals are feasible, particularly during the dry season. As stated above, the high salinity and fluoride levels in both surface and ground water may also limit industrial use unless the water is treated before use to reduce the level of these minerals.

Noise and air pollutants from construction and operation of industrial facilities at this site could cause conflicts with the nearby temple and school. Care should be taken to design appropriate buffers and emission controls to minimize this potential problem.

### C. Regulatory Issues

Approval of plans for surface or ground-water use for this estate should be coordinated with the Irrigation Department, the Water Supply and Drainage Board, the C.E.A., and local authorities.

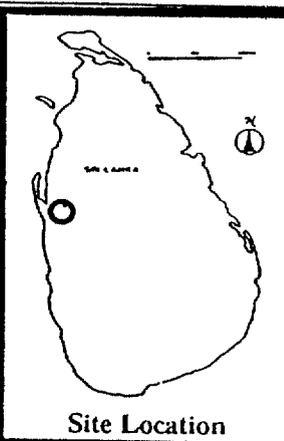
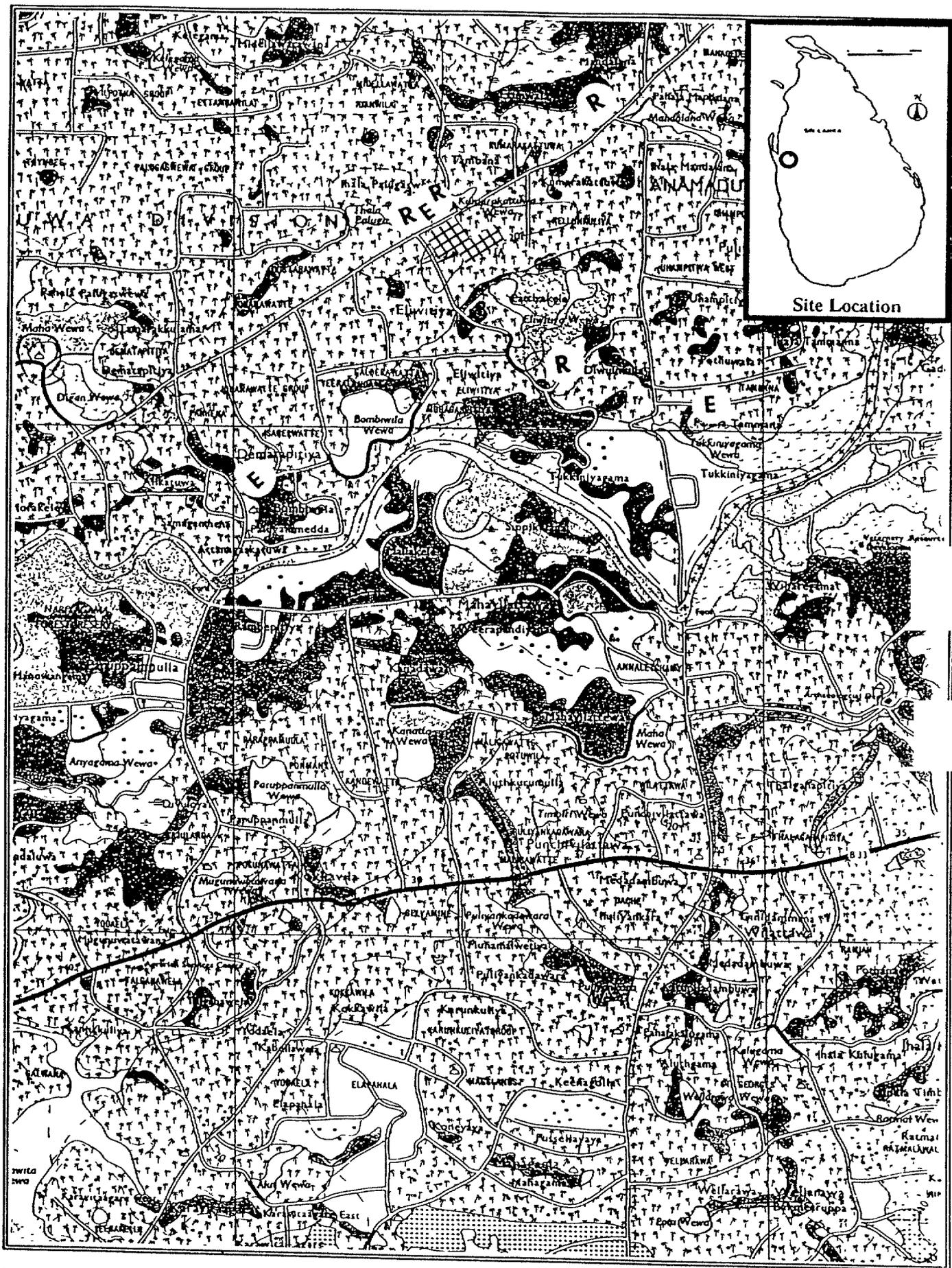
This site is located in a rural area, and as such lacks community infrastructure, housing, shops, or other basic amenities for construction workers and their families, and later the industrial workers themselves, who will be drawn to this area if this site is developed as an industrial estate. In order to avoid substantial adverse secondary effects from unplanned development of the adjacent lands, M/ID will have to involve local and regional authorities in developing and administering an area land-use plan before allowing industries to use this estate.

## VII. GENERAL CONCLUSIONS AND RECOMMENDATIONS

This site was rated by the study team as having **medium to high pollution assimilative capacity and medium to high local resource availability**. The site is considered to be generally suitable for industries of medium pollution potential and local resource needs. The principal environmental constraints on the development of this site for industries of higher pollution potential and/or resource needs are:

- The limited quantity and questionable quality of local surface and ground-water resources;
- Lack of an existing solid waste disposal facility on-site or nearby;
- Limited availability of local skilled labour.

The site could, however, be used by several types of manufacturing and/or product assembly industries that require a relatively large area but do not use a large amount of water or generate substantial volumes of wastewater needing off-site disposal. Improved access to power and other public utilities and upgrading the quality of the access road would help to make the site more attractive to potential industrial users.



Location Map of Proposed Industrial Estate - Tammanakele

Scale Produced using 1:50,000  
Topographic Map

- A - Archeological
- E - Schools
- H - Important Habitats
- I - Industries
- M - Medical Facility (Hospital)
- P - Percolation Measurement Point
- Q - Water Quality Sampling Point
- R - Religious (Temple, Church, Kovil/Mosque)
- S - Soil Sampling Point
- W - Water Point

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A. Proposed Industrial Estate Site at Tammanakele in Archchikattuwa.



B. Burrow Pit located in the NW corner of the proposed site. Soil from the pit was used to construct the Bangadeniya - Anamaduwa Road (Anamaduwa Gam Udawa).

## ANNEX B: DETAILED SOIL ANALYSIS

### SOIL AND SURFACE WATER : METHODS OF COMPUTATION

- ◆ Site Elevations in MSL are based on Survey Department Topographic Maps or available contour maps for the respective site.
- ◆ Maximum slope values are based on physical measurements during study.
- ◆ Reservoir capacity estimates other than from irrigation department are based on the average depths observed during site visits.
- ◆ Rainfall values are based on data collected from regional institutions during site visits and the historical data from hydrological annuals and Ceylon Electricity Board Water Resources Data Base (July 1987).
- ◆ Maximum, Minimum and Average river flows are based on the historical flow data. In cases where streamflow data were absent, representative runoff ratios from hydrological annuals were used with rainfall in respective regions and watersheds identified using topographic maps.
- ◆ Hydraulic Conductivity Data and Sorptivity data are based on Infiltrometer Tests done at each site fitted to infiltration curve by Philip (1957).
- ◆ Soil moisture contents and the organic matter contents by Gravimetry.
- ◆ Soil quality by liquid (water) extraction and relevant water quality methods.
- ◆ Wind and temperature estimates are based on the information in the National Atlas of Sri Lanka.
- ◆ Soil classification is according to the unified system.

**Soil Data for Proposed Industrial Estate at Tammanakele**

Description	Unit	Value
Sampling Depth	mm	250
Moisture Content	%	0.04
Organic Matter	%	4.97
Classification		SW
Chloride Cl <sup>-</sup>	mg/gr	0.30
Nitrates No <sub>3</sub> <sup>-</sup> -N	mg/gr	0.0005
Fluoride Fl <sup>-</sup>	mg/gr	0.04
Phosphate PO <sub>4</sub> <sup>3-</sup> - P	mg/gr	N/D
pH		6.15
Hydraulic Conductivity (saturated)	cm/hr	3.93
Sorptivity	cm/(hr <sup>1/2</sup> )	13.56

N/D = Not detected

ANNEX C: TREATMENT WATER QUALITY ANALYSIS

INDUSTRIAL ESTATES SITING STUDY, 1995

SUMMARY OF ANALYTICAL METHODS

PARAMETER	UNITS	METHOD	DETECTION LEVEL
TSS	mg/l	Gravimetry	-
TDS	mg/l	Gravimetry	-
DO	mg/l	Titrimetry	-
BOD	mg/l	Titrimetry	-
COD	mg/l	Open - Reflux, Titrimetry	-
pH	-log H <sup>+</sup>	Selective ion electrode	0.01
Cl <sup>-</sup>	mg/l	Titrimetry	-
SO <sub>4</sub> <sup>2-</sup>	mg/l	Gravimetry	-
F <sup>-</sup>	mg/l	Colorimetry	0.1
NH <sub>4</sub> <sup>+</sup> - N	mg/l	Colourization/Spectrophotometer	0.01
NO <sub>3</sub> <sup>-</sup> - N	mg/l	Colourization/Spectrophotometer	0.01
PO <sub>4</sub> <sup>3-</sup> - P	mg/l	Colorimetry	2.0
Alkalinity	mg CaCO <sub>3</sub> /l	Titrimetry	-
Hardness	mg CaCO <sub>3</sub> /l	Titrimetry	-

WATER QUALITY ANALYSIS :

PROPOSED SITE AT TAMMANAKELE

PUTTALAM DISTRICT

Location	Date of Sample	TSS	TDS	DO	BOD <sub>5</sub>	COD	<u>BOD</u> COD	pH	Temp.	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	F <sup>-</sup>	NH <sub>3</sub> -N	NO <sub>3</sub> <sup>-</sup> -N	PO <sub>4</sub> <sup>3-</sup> -P	Carb. Alk.	Bicarb. Alk.	Carb. Hard.	Non-Carb. Hard.	Flow rate
Tammanakele Well	-do-	17	350	5.6	7.0	48	0.15	7.3	30.5	39	14	2.0	0.02	0.05	ND	Nil	60	60	490	-
Proposed minimum ambient quality	-do-	-	-	3.0	4.0	-	-	5-8.5	-	1200	440	1.5	4.0	5.0	0.7	-	-	600		-

ND = Not Detected