PN-ABY-885

INITIAL ENVIRONMENTAL EXAMINATION

of the

PROPOSED INDUSTRIAL ESTATE

at

SENAPURA

December 1995

Prepared for the Ministry of Industrial Development

by

NAREPP/IRG

Colombo, Sri Lanka

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

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SENAPURA
PROPOSED INDUSTRIAL ESTATE
SUMMARY ENVIRONMENTAL REPORT

I. GENERAL SITE DESCRIPTION

This proposed industrial site of 4 hectares (10 acres) is part of a former rehabilitation camp located adjacent to the Senapura-Kagama road in the Ippologama Divisional Secretary Division in Anuradhapura District. Eppawela is the nearest town at a distance of approximately 13.5 km from the site. The land within the site is relatively flat, sloping downward to the southeast, and is covered with secondary growth. The site contains numerous abandoned buildings. The Maha Illupallama Wewa (tank) is on the northwest side of the site. See the regional and site maps in Annex A for more detail.

II. PHYSICAL ENVIRONMENT

A. Weather

The site is situated within the dry zone of Sri Lanka. Ambient temperature varies between 21-37°C during the year (Meteriological Annual, 1993/94). Mean annual rainfall at Maha Illuppallama farm (about 1 km from the site) amounts to 1447mm/yr (Meteriological Annual, 1993/94). Most of this rainfall (an average of 990mm) is received during the Maha season, from October to March; the Yala season average rainfall (April to September) amounts to 457mm. A maximum monthly average rainfall of about 268mm (Nov) and a minimum of about 17mm (June) is received at Maha Illuppallama.

Wind direction is predominantly NE during the months of December to February and SW during the period May to September. Average wind velocity in the region is about 7.75 km/hr.

B. Topography, Soils, Groundwater

A perimeter survey done in 1995 for the proposed site shows the land area to be 3.96 ha. with a rectangular shape. The site is scattered with abandoned buildings. The land is flat with the southern portion sloping towards the SE direction; the slope is up to 1.25%. Surface water on the site drains towards the valley in a southeast direction, and is finally intercepted by the D13 irrigation canal. The soil of the site is clayey; see Annex B for more detailed analysis of soil samples.

A well at the western boundary of the site had water at a depth of ≈6m from the surface; in a well outside the eastern boundary of the site, the water level was ≈3m from the surface. The water in both wells was said to be hard. No site-specific ground water measurements were done during this study.

C. Surface Water Hydrology

Surface runoff drains towards the valley at the southeast edge of the site. There are no continuously-flowing streams within the site. Flowing water bodies close to the site are: 1) irrigation canal D13 at the site's southeast boundary, 2) Maha Illuppallama Wewa LB canal, and 3) the Kalawewa Old Yoda Ela.

The most significant surface water body near the site is the Maha Illuppallama wewa which is located at about 0.5 km from the northwest edge of the site. Maha Illuppallama Farm officials stated that this tank does not run dry because it receives drainage waters from the Mahaweli Project. The approximate volume of this tank is 1.6 x $10^6 m^3$.

The same officials said that water was taken to the rehabilitation camp formerly located at the same site from this tank using a 3" diameter pump. The remnants of the pipe network and pump are still in to be seen near the sluice of the Maha Illuppallama wewa. Other uses of the water in this tank are fishing and domestic purposes including drinking.

D. Water Quality

In order to assess the quality of water found in and around this area, water samples were taken from the following water bodies. (Detailed water quality analysis for these locations is presented in Annex C.)

1. Maha Illuppallama Wewa, near the intake point for the old water supply scheme, which is by the sluice on the left bank of the Wewa.

2. Well found at the premises of the centre for disabled people (at the periphery of the proposed site)

3. Canal (D13) fed by the Kala Wewa Old Yoda Ela release.

Generally the quality of water analysed appears to be reasonably satisfactory, except that fluoride levels are at a significantly elevated level. According to Dissanayake and Weerasooriya, the composition of rocks of the area coupled with climate conditions are the key factors for the abundance of fluoride in the dry zone (Eastern and north-central region) of the country (Dissanayake and Weerasooriya, 1985). It also appears that well-water quality is below that of the surface water. People of the area expressed an unwillingness to utilize the well water for domestic purposes, saying that the water is hard.

E. Air Quality and Noise

No site-specific air quality data were available. At present the site is not heavily used in any activity that discharges significant emissions. One building serves as a social service department (North Central province) Training unit for handicapped children, and could be adversely affected by increased levels of dust and noise. The medical (Ayurvedic) unit to the south of the site grows medicinal plants that have a characteristic smell. In general the site appears to be free of significant air pollutants or noise emissions.

III. CURRENT AND PLANNED FACILITIES AND SERVICES

A. Water Supply and Wastewater Disposal Options

Following is the list of some potential sources for the supply of water to the proposed industrial estate.

i) Maha Illuppallama Wewa: a surface water tank formerly used to supply water to the old rehabilitation settlement (1972-1977) that was located at the site. Currently water from this tank is used to supply the requirements of the Maha Illuppallama farm and also the irrigation requirements of the surrounding paddy cultivation area. There is potential for this tank to be fed by the Kala wewa if required.

ii) Ground water: A number of wells were located in and around this proposed site, but as mentioned above, people of the area generally prefer not to utilise the ground water for their domestic needs.

The site has no natural rivers or streams that have a continuous flow adequate to receive wastewater discharges. One possible liquid effluent disposal option is to treat the waste effluent to a level compatible with irrigation use and then to discharge it to Maha Illuppallama Wewa (preferably via soakage lines). Since water from this tank is predominantly used for agricultural purposes, it is imperative that any industries that use toxic and/or refractive chemicals or materials and/or inorganic salts and acids/alkalis not be allowed in this site.

B. Infrastructure

Since the site formerly served as a rehabilitation camp supplying basic needs for about 3000 people for several years, it has had access in the past to public utilities and services. Current infrastructure access/availability is summarized below.

1. Power: A three phase electric power supply is available to the site. There is no on-site transformer; the closest grid station is at Anuradhapura (approx. 42 km away).

2. Telecommunications: Access to telephone lines is available adjacent to the site. Telecom exchange service is provided from Anuradhapura.

3. Transportation: The site itself is on a poor-quality secondary road; however, there are two main roads nearby: the Kakirawa-Talawa road and the Kakirawa-Anuradhapura road. To reach the site from the Kakirawa-Talawa road, turn at the Konapathirawa junction and proceed for 4 km; then take the by-road (gravel) 200 meters to reach the site. The closest railway stations are 16 km away at Kakirawa (Maho-Galoya line) and approximately 27 km away at Talawa (Colombo-Anuradhapura line). The site is not easily accessible by rail.

4. Other public services: There are both a rural hospital and an Ayurvedic hospital at Senapura the latter is adjacent to the site. Kakirawa district hospital, a larger facility, is 20 km away. There are police stations at Kakirawa and Kagama (42 km away).

   Local schools within a 2 km radius include Senapura Central College, Illuppallama Central College, Maha Illuppallama Crop Research Station School, and Narangallegama Vidyalaya.

C. Existing Structures and Industrial Activities

The site includes 14 buildings of approx. 20' x 100', apparently first built during the 1930s, which appear quite firm. There are altogether 36 such buildings in and around the site; only a section of the former rehabilitation camp has been allocated for the industrial estate (see map). There is also a 20' dia. 50' depth well (solidly constructed) on the site, and two overhead tanks to receive pumped water from the Maha Illuppallama Wewa. Pipelines and open surface drainage lines are also present - though the latter are overgrown with shrub.

The land surrounding the site, other than the remainder of the old camp, is mainly agricultural, occupied by many small farmers. There are two paddy mills in the vicinity, and a building containing a co-operative salt packing facility.

At the time of the site visit, no query from an industrial applicant regarding potential use of this site had been received by M/ID. .

IV. BIOLOGICAL ENVIRONMENT AND RESOURCES

A. Significant Flora

Within the site, the land in between abandoned buildings and roads is mostly scrub vegetation. Eupatorium species are dominant. Numerous Mango trees are present along the internal roads. This site is surrounded by irrigation canals, paddy lands, and the Maha

Illuppallama tank. A few common aquatic plants (Nymphae and Nelumbo species) were observed in the tank.

B. Significant Fauna

Five common fresh-water fish species were observed in the tank and canal during the site visit: Three amphibian species and two mammals -- Wild Boar (Sus scrofa) and Grey Mongoose (Herpestes edwardsi) were also identified on the site during the team's visit. Several common birds at the site and 7 aquatic birds at the tank were recorded. Those are -

1. Common Babbler
2. Common Mynah
3. Blue-faced Mal Koha
4. Black Headed Oriole
5. Purple Romped Sunbird
6. White-breasted Kingfisher
7. Cattle Egret
8. Pond Heron
9. Common Kingfisher
10. Little Grebe
11. Indian Shag
12. Purple Heron
13. Little Cormorant

C. Sensitive Habitat

No rare or endangered species were observed during the field visit. The land surrounding the site has largely been converted from natural to agricultural systems; the rice and annual crops being grown on this farmland could be affected by sedimentation or other changes in water or air quality if the site is developed as an industrial estate and pollutants are discharged off-site.

V. SOCIAL AND CULTURAL ENVIRONMENT

A. Human Settlements

The proposed Senapura industrial site is situated within Kagama, which is an area colonized as a pioneer scheme before 1940. The buildings within the site are a part of the complex that the colonists occupied prior to settlement. The original settlers were each allocated five acres for paddy and 2.5 acres for housing and highland crops. Senapura, Illupallama, and Aluviharegama are three villages closest to the site that were formed by communities of settlers; at present these three contain about 2000 people, including over 600 families. Other adjoining villages formed in the same manner include Narangollegama, Wedenigama, Aludambewalane, and 2nd and 5th canal sections of Kagama which accommodate over 1000 families.

Housing in these villages is inadequate and crowded. In Senapura 159 families live in 129 houses whilst in Illuppallama 380 families live in 227 houses. In Aluviharegama 78 families live in 65 houses. Only 15% of the colonists are considered successful and 5% marginally so, as is revealed by their generally substandard housing.

The Senapura Rural Hospital is the primary health facility available for colonists. Both Senapura and Illupallama villages have a schools each with a total student strength of 1784, tutored by 69 teachers.

B. Labour Force

The local labor force of the Ipologama Divisional Secretariat (DS) is approximately13,300 of which over 12,300 are employed; about 1/3 of these persons are employed in agriculture. The female labor force, however, is employed in at least three garment factories close to the site. The total population of the Ipologama DS is 30,286, of which 14,713 are male and 15,713 are female. Of the total population, 21, 109 have had an education up to Grade 10, 5011 have G.C.E. OL/AL, and 62 have a higher qualification.

C. Local Economic Activity

Agriculture and garment manufacturing are the primary local income-generating activities of the work force. The income derived from paddy cultivation is inadequate, yielding an average of about Rs. 10,000 net from 2.5 acres per season every 6 months. There are two rice mills at Senapura and the Paddy Marketting Board has two paddy storage depots as well. There is an apatite deposit at Eppawela, approximately 14 km from the site. The deposit is being mined to a limited extent to produce phosphate, but there is potential for the industry to be expanded, since phosphate is the raw material for fertilizer industry.

D. Religious and Cultural Features

There are no important archaeological sites known in the vicinity of the site. There are two Buddhist temples at Maha Illuppallama and Aluviharagama, and a Jumma Muslim mosque in Senapura.

E. Aesthetic and Recreational Features

The nearby Maha Illuppallama tank and its bund offers some pleasing aesthetic and recreational features. There are no organized local recreational facilities.

F. Local Customs, Aspirations, and Attitudes

The local populace are largely descendants of earlier colonists; their households are generally poor, and they are eager to have opportunities for alternative employment.

VI. MAJOR ENVIRONMENTAL AND REGULATORY ISSUES

A. Sensitivity of the Affected Environment

As mentioned above, the proposed site itself has been highly altered from its natural state for several decades, and contains no significant natural habitat. When the sensitivity of the surrounding area to off-site effects of industrial development is considered, however, two kinds of potential impact can be identified. The first is possible adverse effects of wastewater discharges on the nearby canals and on the farmlands that receive irrigation water from these canals; the second is possible impacts of air pollutants and noise on the adjacent Ayurvedic hospital and the social services training facility. **If the site is made available for industrial uses, the site development plan should require measures to avoid or minimize these effects, and the site management plan should include monitoring of air and water discharges to assure that such impacts are minimized.**

B. Regional Water Resource Limitations

Neither the quantity nor the year-round reliability of the potential water supply for this site can be determined with any certainty from existing information. **A longer-term water quantity and quality study is needed of local ground water and of potential surface water from the Maha Illuppallama Wewa to allow decisions to be made regarding water availability.** Such a study should assess the possibility that ground-water pumping might lower the local water table, and should also determine whether withdrawing water from the tank might adversely affect other current users of that water. Potential effects of wastewater discharges into nearby water bodies, as mentioned above, should also be further evaluated.

C. Regulatory Issues

Both the water resource study mentioned above and any plans for either surface or ground-water withdrawals to supply water to this site should be reviewed and approved by the Water Supply and Drainage Board, the C.E.A., the Irrigation Department, the Mahaweli Authority, Department of Agriculture, and local authorities.

The area surrounding this site is relatively rural and undeveloped; thus there could be significant adverse secondary effects from unplanned residential and commercial uses of lands adjacent to this site. Therefore **M/ID should involve local and regional authorities in preparing and administering an area land-use plan before allowing industries to use this site.** This plan should designate approved locations for roads, utilities, housing, commercial development, and cultural/recreational activities.

VII. GENERAL CONCLUSIONS AND RECOMMENDATIONS

This site was rated by the study team as having medium capacity for pollution assimilation and medium to low local resource availability. The site is too small to accommodate large-scale industrial development; it is considered by the team to be generally suitable for small-scale "dry" industries, i.e., those that do not need water for industrial purposes. Examples include garment assembly, some types of toy, furniture, agricultural or household appliance fabrication, and some other small-scale manufacturing enterprises.

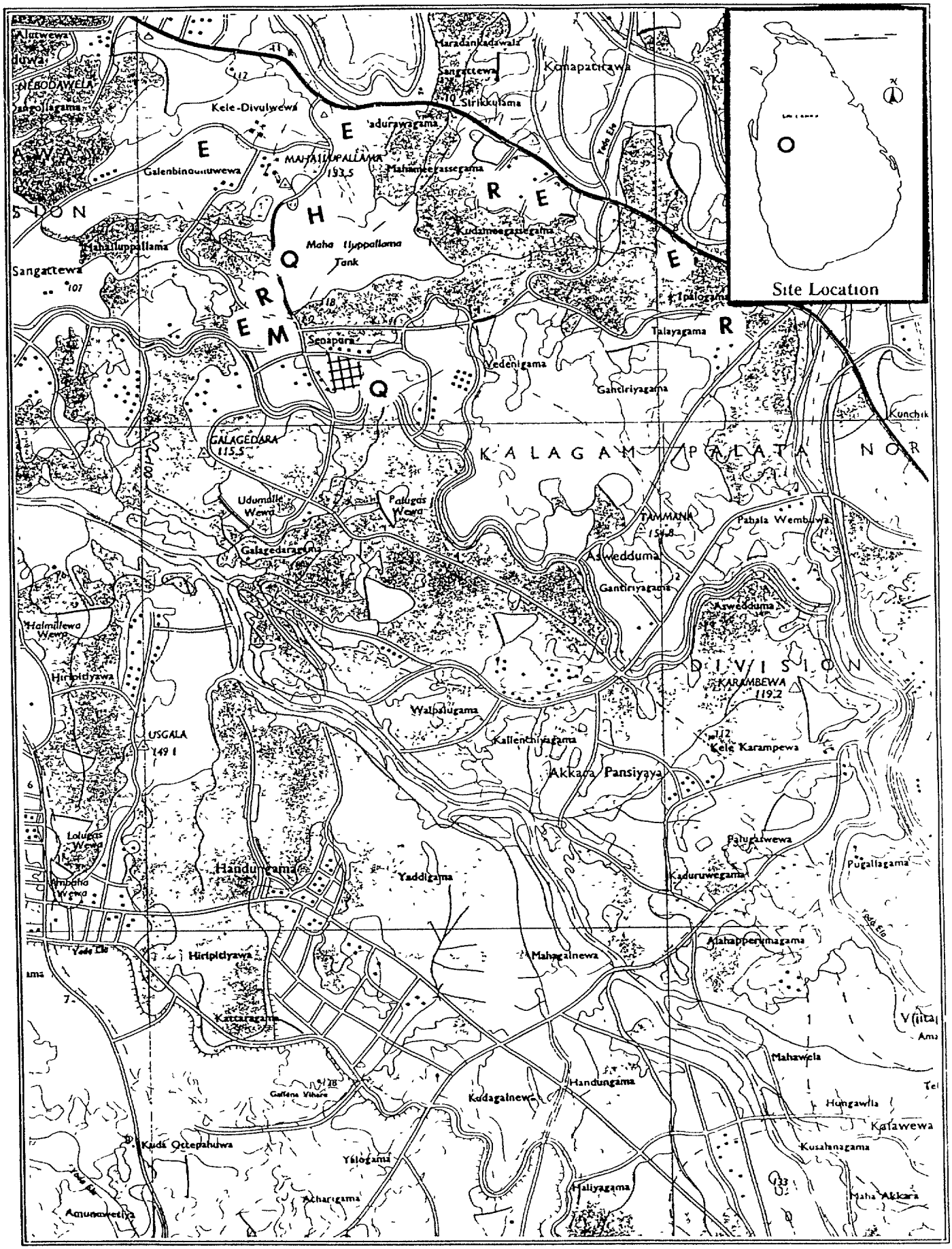
The principal environmental constraints at this site are:

- Small size and limited capacity for expansion;
- Uncertain availability of surface or ground water;
- Lack of a suitable water body for wastewater discharge;
- Currently poor access by road or rail.

If additional studies show that adequate year-round sources of water can be assured without causing adverse environmental impacts, and if the site is expanded and road access is improved, the site would very likely become more attractive for a wider range of industrial uses.

REFERENCES

Dissanayake, C. B. And S.V. R. Weerasooriya, The Hydrogeochemical Atlas of Sri Lanka, Natural Resources Energy and Science Authority (NARESA) of Sri Lanka, 1985.



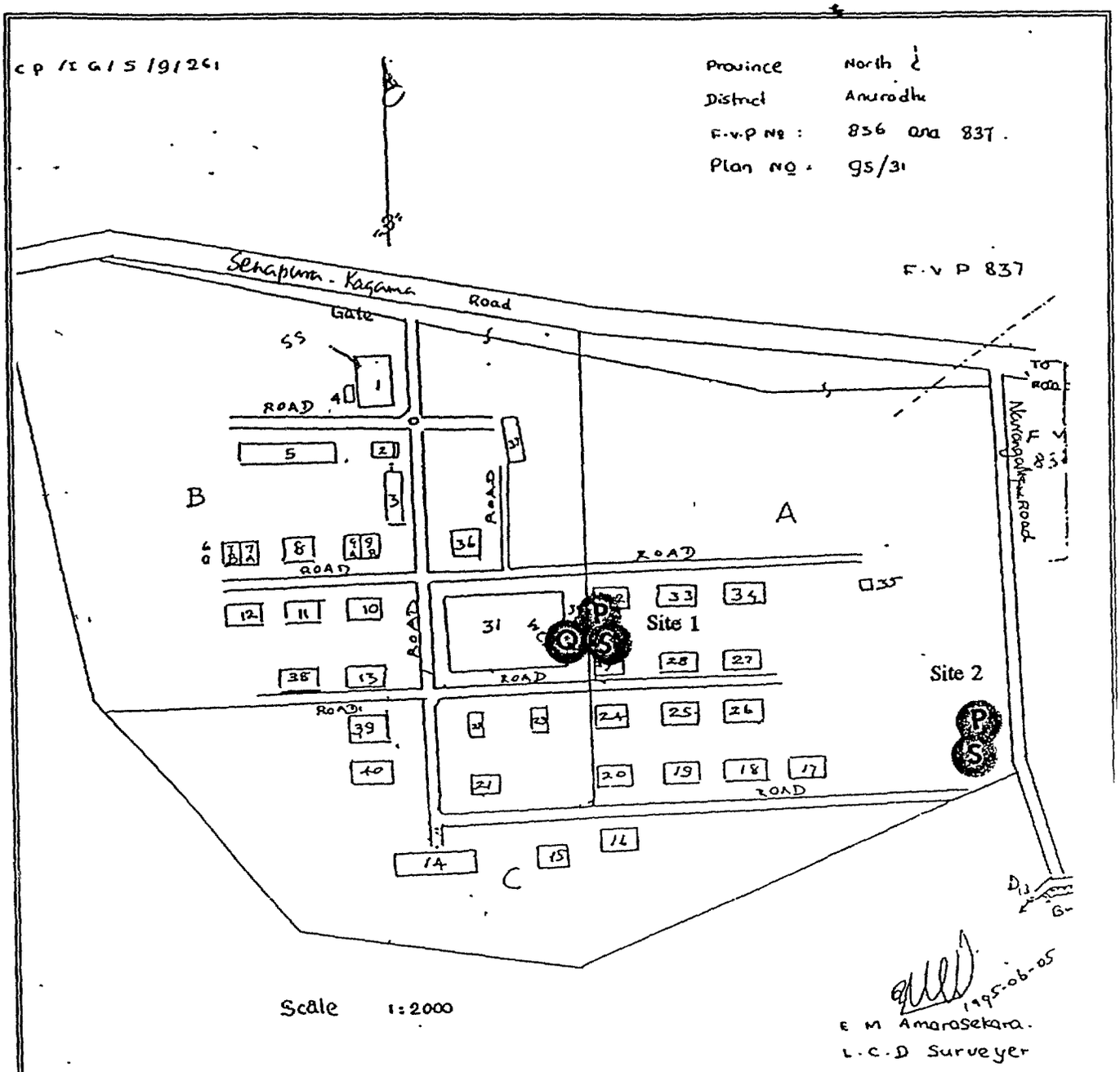
Location Map of Proposed Industrial Estate - Senapura.

Scale Produced using 1 50,000 Topographic Map

A - Archeological
E - Schools
H - Important Habitats
I - Industries
M - M...

P - Percolation Measurement Point
Q - Water Quality Sampling Point
R - Religious(Temple, Church, Kovil/Mosque)
S - Soil Sampling Point
W - W...

ANNEX A-II : S MAP -



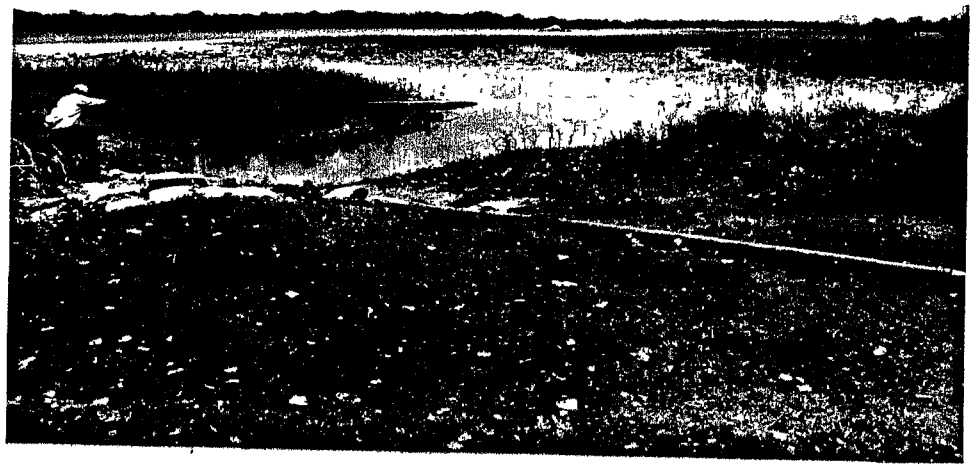
RESERVED FOR	EXTENT (HECTAIN)	REMARK
Industrial Ministry.	3.96	Divided for the letter of the Director of Social Service in North Central Province on 05-06-02 (NO NCP/PC/FC/SS/3/3)
Social Service Department of North central Province	5 00	—
Aurvedic Dept.	2 07	Reserved for Aurvedic Perpo on

Perimeter Survey Map - Proposed Industrial Estate - Senapura

A - Archeological
E - Schools
H - Important Habitats

P - Percolation Measurement Point
Q - Water Quality Sampling Point
R - Religious(Temple, Church, Kovil/Mosque)

A. Proposed site for Industrial Estate at Senapura in Ippologama - structure within site.



B. Maha Illupallama Tank a potential surface water source for the proposed industrial estate.

SENAPURA

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 Senapura

Description	Unit	Site 1	Site 2
Sampling Depth	mm	250	250
Moisture Content	%	3.39	4.45
Organic Matter	%	3.86	5.81
Classification		SW	SW
Cloride Cl^-	mg/gr	0.10	0.30
Nitrates No^-_3 -N	mg/gr	0.010	0.025
Fluoride Fl^-	mg/gr	0.050	0.050
Phospate PO^3_4 - P	mg/gr	N/D	N/D
pH		6.98	6.12
Hydraulic Conductivity (saturated)	cm/hr	0.75	0.18
Sorptivity	$cm/(hr^{1/2})$	5.52	11.02

N/D = Not detected

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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^+	Selective ion electrode	0.01
Cl^-	mg/l	Titrimetry	-
SO_4^2	mg/l	Gravimetry	-
F^-	mg/l	Colorimetry	0.1
NH_4^+ - N	mg/l	Colourization/Spectrophotometer	0.01
NO_3^- - N	mg/l	Colourization/Spectrophotometer	0.01
PO_4^3 - P	mg/l	Colorimetry	2.0
Alkalinity	mg $CaCO_3$/l	Titrimetry	-
Hardness	mg $CaCO_3$/l	Titrimetry	-

.VATER QUALITY ANALYSIS :

ANURADHAPURA DISTRICT

PROPOSED SITE AT SENAPURA

Location	Date of Sample	TSS	TDS	DO	BOD_5	COD	BOD/COD	pH	Temp.	Cl^-	SO_4^{2-}	F^-	NH_3-N	NO_3^- -N	PO_4^{3-} - P	Carb. Alk.	Bicarb. Alk.	Carb. Hard.	Non-Carb. Hard.	Flow rate
Maha Illupallama Wewa	Aug 8-10 1995	20	360	6.5	3.0	48.0	0.07	7.5	28	40	27	1.5	0.16	0.03	ND	Nil	280	150	Nil	-
Senapura Well	-do-	5.0	500	1.4	3.0	20.0	0.15	7.2	28	73	25	3.2	0.40	0.10	ND	Nil	230	180	Nil	-
Canal D_{15}	-do-	2.0	200	8.4	2.7	20.0	0.14	7.3	30 5	19	8.2	4.8	0.02	0.02	ND	Nil	70	70	20	-
Proposed minimum ambient quality	-do-	-	-	3.0	4.0	-	-	5-8.5	-	1200	400	1.5	4.0	5.0	0.7	-	-	600		

ND = Not Detected