Initial Environmental Examination

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SRI: Conflict-Affected Region Emergency Project

Prepared by
National Water Supply Board for the Asian Development Bank.

ASIAN DEVELOPMENT BANK ASSISTED

CONFLICT AFFECTED REGIONS EMERGENCY (CARE) PROJECT

COMPONENT 'B'- WATER SECTOR

ADB LOAN NO: 2626 - SRI

INITIAL ENVIRONMENTAL EXAMINATION (IEE)

Contract No. ADB-CARE/EP/IEE/01/2010

FINAL REPORT

EACHCHILAMPATTU WATER SUPPLY SCHEME

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EXECUTIVE SUMMARY

The main objective of the IEE was to identify the environmental Impacts which may likely to crop up during planning**,** designing and Implementation stages of the proposed drinking water supply project and then suggest strategies for minimizing their negative impacts. When Environmental consultants started working on IEE, to begin with they were provided with some information on their TOR, Feasibility report prepared by Implementing Agency and ADB guidelines on types of information to be included in the final IEE report. During the time of feasibility report preparation, the National Water Supply and Drainage Board (NWSDB), which is the Implementing Agency of the project, has had detailed discussions with relevant Agencies, project beneficiaries and all other Stake holders about the proposed water supply project. Hence, although the consultants had number of formal and informal meetings as well as field excursions with relevant officials, beneficiaries and affected people the main purpose of those interactions was not so much to discuss about implementation strategies of the project but to identify negative environmental impacts likely to cause during different stages of the project and what remedial measures to be adopted in order to negate their harmful effects. However, at the meetings attended by community members of whom majority belonged to most vulnerable group, importance of self organization and collective responsibility in effective implementation and sustainable management of the project was explained in detail.

The chapter 1 of the report at the very beginning describes the geographical settings of Verugal D.S. Division and then goes on to explain severity with which the area has been affected due to both natural and human induced calamities. According to the Vulnerability classification compiled by UNICEF 13 out of 22 villages are found to be in “highly vulnerable to poverty” category which very clearly manifest the seriousness of the damage caused by above calamities. Although this area is affected by wide range of limitations, scarcity of drinking water was found to be the No: 1 limitation in the ranking list because most of the wells from which people draw water are either affected by salinity or go dry immediately with the onset of dry season. As such NWSDB has proposed Drinking water supply project by tapping raw water of Verugal river for catering present population of about 21,000 and additional 7,000 people expected to be settled in future.

The second chapter explains the environmental policy of ADB stressing the necessacity of addressing all environmental issues related to project activities in order to ensure social and environmental sustainability of the project. It also provides information on other related Acts and Ordinance of the Government of Sri Lanka to enable the consultants make sure that the Project Proponent strictly adheres to regulations and recommendations mentioned in those documents.

The Chapter 3 provides brief description of the nature and scope of the project and justification for its implementation in Eachchalampattu area. It also describes the major components of the proposed project.

The Chapter 4 discusses the existing environmental setting in the project area paying more attention to Geology, Soils and Climatic conditions. Using Rainfall Histogram which depicts protracted dry period extending from February to September every year, the seriousness of water scarcity with which people are faced is clearly elaborated. The comprehensive description of the existing hydrological environments where in their low potential in terms of ground water yield is highlighted further consolidates the need of providing drinking water facilities to this area.

The Chapter 5 identifies all possible Environmental impacts likely to crop up with the implementation of the project and what precautionary measures to be adopted in order to negate their bad effects on Environment, project beneficiaries and other stake holders.

The outcome of the meetings the consultants had with line Agencies, Concerns expressed by stakeholders and affected people and strategies adopted by consultants for Community mobilization are explained in Chapter 6.

The Chapter 7 is the Environmental Management Plan which provides comprehensive description detailing the possible impacts of project activities undertaken at different stages of the project, severity of those impacts, Mitigation measures to be adopted and Institutions responsible along with some time frame for monitoring of activities.

The Chapter 8 explains the grievance and redress mechanism to be adopted in order to look in to problems encountered by people during project implementation while Chapter 9 provides information on proposed monitoring programme. Finally conclusions and recommendations are included in Chapter 10.

ABBREVIATIONS

ADB	-	Asian Development Bank
CEA	-	Central Environmental Authority
CIRM	-	Centre for Information Resources Management
D.S.	-	Divisional Secretary
dia	-	Diameter
EIA	-	Environmental Impact Assesment
G.N.	-	Grama Niladhari (Grame Sevaka Officer)
IDP	-	Internal Displaced People
IEE	-	Initial Environmental Examiation
LB	-	Left Bank (of river or reservoir)
MASL	-	Mahaweli Authority of Sri Lanka
NWSDB	-	National Water Supply and Drainage Board
PID	-	Project Information Document
PE	-	Poly Ethelene (pipes)
PMU	-	Project Management Unit
RB	-	Right Bank (of river or reservoir)
RDA	-	Road Development Authority
TOR	-	Terms of Reference
WTP	-	Water Treatment Plant

CHAPTER 1 : INTRODUCTION

Eachchilampattu (Verugal) is a Divisional Secretariat division falling within the administrative district of Trincomalee, which is the northern most district of the Eastern province of Sri Lanka. It is bound to the north by the Mullaitivu district and to the west by Vavuniya, Anuradhapura and Polonnaruwa districts, to the south by the Batticaloa district and to the east by the Indian Ocean.

In spite of Government's concerted efforts to improve living standard of poor rural communities, and especially of those who were affected by more than 30 years of civil war, the people in Verugal D.S. Division have still been deprived of many basic facilities and of all drinking water scarcity has been the most serious. This area is frequently vulnerable to wide range of natural disasters of which cyclones, floods and more often than not droughts have been the most devastating. Of course there is no need to over emphasize the damage caused by 2004 Tsunami. In fact the geographical location of this particular D.S. Division is such that the flooding during North East Monsoon period followed by protracted dry period extending from February to September are so common that the villagers have taken it for granted that frequent crop losses and other damages caused by above extreme weather vagaries are part of their life.

This D.S. Division consists of 09 G.N. Divisions encompassing 22 villages. According to Vulnerability Poverty Profile classification compiled by UNICEF, 13 of the 22 villages in the D.S. Division fall within Extremely Vulnerability to Poverty category. However, during the field survey it was found that socio economic conditions of the other 09 Villages too do not differ very much from the above 13 villages to be ranked them in to a more improved living standard category in vulnerability classification .

The feasibility report compiled by National water Supply and Drainage Board indicates that all villages in Eachchalampattu entirely depend on well water but the number of wells available is grossly inadequate. Furthermore, large number of these wells is reported to contain water with high conductivity levels indicating the presence of soluble salts in excessive amounts harmful for drinking purposes. The same report highlights that out of 632 dug wells surveyed in 03 Divisions, 251 wells contain water not suitable for drinking purposes.

The information given above provides ample testimony to conclude that the ground water potential in Eachchalampattu is not at all adequate for providing drinking water facilities for about 12,000 inhabitants presently settled in this area. Having already faced with the dilemma of water scarcity, it is also very important to be cognizant of the future problem of providing water to about 10,000 additional people as

the government intends to settle more people totaling to about 22,000 in this area in near future. The National Water Supply and Drainage Board (NWSDB) proposed the Eachchilampattu water supply project to provide clean water for the Verugal Divisional Secretariat (DS) Division under the Conflict Affected Region Emergency (CARE) Project: Component 'B' –Water sector, assisted by the Asian Development Bank. However, in order to ensure sustainability of the proposed water supply scheme the Government has no option but to opt for surface water source.

As suggested by NWSDB, tapping of waters of Verugal river which is a perennial tributary of the Mahaweli river is the best option available. According to the flow measurement carried out by NWSDB on 28th June 2010, the discharge rate of Verugal Aru on this particular date was estimated to be about 272,401 cubic meters per day. Although this discharge could get further reduced during August which is usually the driest month of the year, extracting 6,000 cubic meters per day, which is the anticipated water requirement of proposed water supply scheme will not pose any problem on bio diversity or downstream water users. This Initial Environmental Examination (IEE) report is being prepared in response to the condition of Central Environmental Authority (CEA) act b (ii) Regulation No; 1 of 1993.

1.1. Objective of the Project

The objective of Eachchilampattu water supply project is to supply portable water to the residents of Verugal DS division area. This project is designed to supply water to about **28,390** dwellers with satisfying daily water demand 6,000 m^3 by year 2028.

The proposed water supply project consists of following components:

- Provision of intake facilities including low lift pump house at Verugal river at Patchchalthurai in Kallarippu to abstract raw water including provision for a micro strainer.
- Installation of three number low lift pumps (two working and one standby) each of approximately with a discharge capacity of 157 m^3/hour against a 25m head.
- Approximately 3,600m length of raw water conveyance main of 315mm dia. PE 100 (PN 10) from intake to treatment plant to transmit 6,600 m^3 of raw water per day.
- Comprehensive treatment plant of capacity 6,000 m^3 per day of fully treated water.
- A clear water tank with twin compartments and a total storage capacity of approximately 1500 m^3.
- High lift pumping station installed with two sets of centrifugal pumps, of 137m^3/hour against a 45m head to draw water from the 1,500m^3 capacity clear water sump at WTP.
- An elevated storage tank of capacity 750m^3 at Eachchilampattu .
- Approximately 4,000m of 315mm dia.PE 100(PN10) Transmission main to feed the elevated water tower.

- Distribution network to Eachchilampattu town and its suburbs, approximately 60km.
- Extension of 3.5 km of electric power supply line.
- Standby power generators (2 nos.) at intake and WTP.
- Service quarters 7 nos.
- Power supply to intake, WTP and Tower site.

1.2. Objective of the IEE report

This Initial Environment Examination (IEE) report is being prepared as per the terms and reference given by the NWSDB (Copy of TOR is in Annex -1)

The objective of the IEE report is to examine the impacts of the proposed project activities on the environment as a whole. This IEE report highlights the salient features of the project and makes an assessment of the probable impact on Physical, Biological and Social environment caused by the construction and operation of the project. Moreover, it suggests suitable mitigation measures to minimize these impacts, thus the project proponent can implement the project in such a way that the adverse environmental impacts due to the project implementation are minimum.

The information of the project and the environment had been obtained from reports prepared by NWSDB, Data supplied by the Mahaweli Authority of Sri Lanka (MASL), Irrigation Department, Divisional secretariat and other societies. In addition to that, site visits, interviews, discussions were made with officers, other stake holders and farmers as well.

1.3. Extent and scope of the study

The project covers a considerable area of Echchalampattu and Seruwila DS divisions. This water supply scheme is designed to cater for the estimated 2028 year population of 28,390 obtaining raw water supply from Verugal River.

Screening of project activities for potential environmental impacts based on project sighting design, construction and post construction operation and maintenance, any pollution due to the project will have to be mitigated by project design. Negative impacts of the project on resources, local population infrastructure, vegetation, animal and birds in the area are to be considered. The study will also include

benefits enjoyed by the human and animal populations. Preparation of the Environmental Management Plan and monitoring those of is a part of study.

1.4. Main beneficiaries and expected socio economic effects

The proposed water supply project is planned to serve Verugal DS Division (Fig.01). This area has been identified and prioritized on the basis of opinions collected from the Government officers, Health Department, NGOs and beneficiaries. Total projected population of 28,390 will be supplied with water from this project.

1.4.1. Population coverage by the proposed project

Table 1: Service Zones by the proposed project

Grama Niladhari Division	**2008 population**	**2028 project design**
Anaithivu	1,456	2,035
Poonagar	1,468	2,050
Llangaithurai	532	740
Illangaithurai Muhathuwaram	1,944	2,715
Verugal	1,619	2,265
Poomarathadichenai	798	1,115
Karukkamunai	923	1,290
Eachchalampattu	690	960
Verugal Muhathuwaram	1,969	2,750
Upparal	772	1,080
Community managed Rural WSS (CWSP) in Seruwila DS area.	8,456	11,390
Total	**20,627**	**28,390**

Population growth rate in Verugal DS division had been estimated on the basis of past population growth rate as referred in the Verugal DS office statistical publications. The present growth rate of Verugal DS Division is adopted as 1.5 based on the past growth rate and influence of ethnic conflict.

This project is expected to yield direct significant and lasting benefits to the population in Verugal DS division, particularly women. Improved quality of water in terms of improved taste, smell, colour and reduced hardness will be the most immediate benefits experienced by users. In the long term a reduction in water related diseases should be experienced as long as health and hygiene behaviors are forthcoming. For this reason strong emphasis must be placed an intensive public awareness programmes to increase understanding of water related health and hygiene issues and to promote improved hygienic practices.
The increased availability of water will result in increased consumption for washing, cleaning and latrine use with direct positive impacts on family health. It was identified with the informal discussion with the beneficiaries, they spend considerable time in a day to fetch water, and piped water connections will significantly reduce the burden of this task, benefitting female family members in particular.

1.5. Methodologies and Technologies adopted in IEE report preparation

a. Discussion with this Project's Project Management Unit (NWSDB) and Project Implementation Unit (NWSDB) officials.
b. Discussion with Regional Irrigation Department and MASL officials.
c. Discussion with Divisional Secretary and Assistant Director of Planning of this division.
d. Informal discussion with stakeholders at the field.
e. Field inspection of project area.
f. Desk study of feasibility report on the water supply scheme.
g. Various working papers in ADB websites related to this project.

1.6. Trends in conservation and development of natural resources in the area

There are five major types of vegetations in this area. First in the shrub jungle with scattered dry tropical perennial trees (this jungle inundates at maximum water level during monsoonal times) around 10 meters width along the embankment of the Verugal river. Followed that, around 300 meters width cultivation lands along the river, where maize, groundnut, chillie and vegetables are being mainly cultivated. Followed that, vegetation found similar to the river embankment. Then a scattered shrub jungle and paddy field with scattered settlement up to the A15 road. Between the A15 road and sea, paddy fields,

highland cultivation, home gardening with perennial fruit trees and palms, marshy lands and mangroves observed.
(Topographic map is attached as Annex-02)

Elephants, wild boar, deer, and wild rabbits occur in upstream and those are making frequent visits to the downstream shrub jungle. It was made by the displacement of people due to the war and the observation of wild animals is considerably reducing with time after the resettlement and cultivation. Various reptiles and indigenous and migratory birds are found near the water bodies. The fresh water fishes also observed in irrigation canals, Verugal river and other water bodies.

CHAPTER 2 : POLICY AND LEGAL AND ADMINISTRATIVE FRAMEWORKS

2.1. ADB safeguard policy and expectations of IEE

ADB's Environment Policy requires the consideration of environmental issues in all aspects of the ADB's operations. The requirements are defined in the Safeguards Policy Statement (2009), which covers issues of environment, involuntary resettlement, and indigenous peoples and supersedes former policies in these areas. The new safeguard policy affirms that ADB considers environmental and social sustainability as a cornerstone of economic growth and poverty reduction in Asia and the Pacific and is committed to ensuring the social and environmental sustainability of the projects it supports.

Safeguards in this context are operational policies that seek to avoid or reduce to acceptable levels adverse environmental and social impacts, including protecting the rights of those likely to be affected or marginalized by the development process. The objectives of ADB's safeguards are to:

a. Avoid adverse impacts of projects on the environment and affected people, where possible;
b. Minimize, mitigate and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
c. Help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

In the field of environment the principal tool for achieving these objectives is environmental assessment, which is a generic term for the process of environmental analysis and planning to avoid or reduce the environmental impacts and risks associated with a project. The nature of the assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project, the sensitivity, scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures.

Projects are screened for their expected environmental impacts and are assigned to one of the following categories:

Category A: Projects likely to have significant adverse environmental impacts, which are irreversible, diverse or unprecedented and may affect an area larger than the location subject to physical works. An Environmental Impact Assessment (EIA) is required.

Category B: Projects with adverse environmental impacts that are less significant than those of category A projects, are site-specific, generally not irreversible, and in most cases can be mitigated more readily than for category A projects. IEE is required.

Category C: Projects likely to have minimal or no adverse environmental impacts. No environmental assessment is required, although environmental implications are reviewed.

According to the Rapid Environment Assessment (Annex 03), this project falls in to Category B. This is mainly because, its environmental and social impacts will be largely beneficial; any negative impacts of location, design, construction, or operation are expected to be minor; and avoidance, mitigation, or compensation for negative impacts should to be relatively straightforward. An IEE was therefore conducted and the results are presented in this document.

2.2. Related legal acts and regulations of GOSL

2.2.1. National Environmental act and regulations

The requirement for Environmental Assessment in Sri Lanka is established by the National Environment Act (1981), and the procedures are defined in the EIA Regulations (1993). The regulations specify activities for which environmental assessment is mandatory, and those that could occur within this project.

- Groundwater extraction of over 500,000 m3/day;
- A Water Treatment Plant with a capacity of over 500,000 m3/day;
- Projects that involve relocation of more than 100 people; and
- Projects that fall within sensitive area(s).

Sensitive areas are defined in the EIA Regulations as:

- Any erodible area declared under the Soil Conservation Act (1951, 1953);
- Any Flood Area declared under the Flood Protection Ordinance (1924, 1955) and any Flood Protection Area declared under the Sri Lanka Land Reclamation and

Development Corporation Act (1968, 1982);

- Any reservation beyond the Full Supply Level of a reservoir;
- Any archaeological reserve, ancient or protected monument as defined or declared under the Antiquities Ordinance (1965);
- Any area declared under the Botanic Gardens Ordinance (1928, 1973);
- Areas within, or less than 100 m from the boundaries of, any area declared under the National Heritage and Wilderness Act (1988): the Forest ordinance;
- Areas within, or less than 100 m from the boundaries of, any area declared as a Sanctuary under the Fauna and Flora Protection Ordinance (1937);
- Areas within, or less than 100 m from the high flood level contour of, a public lake as defined by the Crown Lands Ordinance (1947, 1949, 1956) including those declared under Section 71 of the Ordinance;
- Areas 60 m or less from the bank of a public stream as defined in the Crown Lands Ordinance, with a width of more than 25 m at any point.

Therefore, in terms of environmental sensitivity the proposed project is falling within only one sensitive class, as it is located within the areas of 60 m or less from the bank of a public stream as defined in the Crown Lands Ordinance, with a width of more than 25 m at any point.

The requirement for IEE and the level of study required are determined by the Central Environment Authority (CEA) after submission by the proponent of a Project Information Document (PID), plus supporting information if relevant. There are two possible outcomes:

Categorical Exclusion: the activity is not on the list of prescribed projects in the EIA regulations, is not in or near a sensitive area, has not been the subject of public protest, and it is clear from the PID and supporting information that the project will have no significant environmental impacts. Environmental Clearance is granted (with or without conditions) and the project may proceed;

All other projects require Environmental Assessment and the CEA establishes a Scoping Committee to decide on the level of study (IEE or EIA) and prepare Terms of Reference (TOR). Alternatively, if the project lies wholly within the jurisdiction of a single Government agency, CEA may refer the project to this authority (as the Project Approving Agency) to administer the EIA process. A Technical Review Committee reviews the completed IEE or EIA

report and recommends whether Environmental Clearance should be granted. The final decision is made by CEA.

The project infrastructures are relatively small as those are designed for provision of 6,000 m^3/ day of treated water to a population of 28,390 people. Water abstraction and water treatment will not be of the scale quoted in the EIA regulations as requiring Environmental Assessment. Components will not be located in protected or sensitive areas and no people will be relocated.

It is likely, therefore, that CEA will require an Environmental Assessment Study, and as previous IEE reports prepared according to ADB procedure have been accepted by CEA as fulfilling the requirements of national law, it is anticipated that that will also be the case for this document.

In addition to environmental clearance, NWSDB will also need to obtain approval from the local authorities and CEA for site clearance and they should inform and obtain consent from relevant *Pradeshiya Sabha* and Divisional Secretary before construction begins. In addition to those clearances, the Project Proponent will have to take necessary steps to get the clearances from the Department of Irrigation for water intake from Verugal Aru which is under the authority of the said department. Moreover, since the water distribution network is running along the road network, the approval or clearances from the Road Development Authority should be taken as the distribution lines are to be buried within "*Road Shoulders*". Since the intake site is in a Forest area which belongs to the Forest Department, approval from them before commencing any construction work too becomes a prerequisite. The Proponent will also need to obtain Environmental Protection License (EPL) from Central Environmental Authority (CEA) for the operation of the completed facilities, in particular the water treatment plant.

CHAPTER 3 : DESCRIPTION OF THE PROPOSED PROJECT

3.1. Type, aim and scope of the proposed project

The project aims to enhance the domestic water supply service in these areas to improve the quality of life of the inhabitants by restructuring the adverse impacts on human health caused by present services, and improving environmental quality and living standard of people.

Regarding the ADB environmental guidelines, this project can be included in Category B due to the water source, substructures of the project and the negative impacts on Environment, Natural Ecosystem, Culture and Society are very low by this project (Refer Annex 03).

3.2. Location

The Verugal (Eachchilampattu) Divisional Secretary (DS) division is lying in the southern most part of Trincomalee district with sea in eastern border. It is situated along the A15 high way (Fig-01). Surrounding DS divisions are Seruvila and Koralai Pattu North (Vaharai) DS division of the Batticaloa district. It is predominantly agricultural area and the main source is Branches of Mahaweli River.

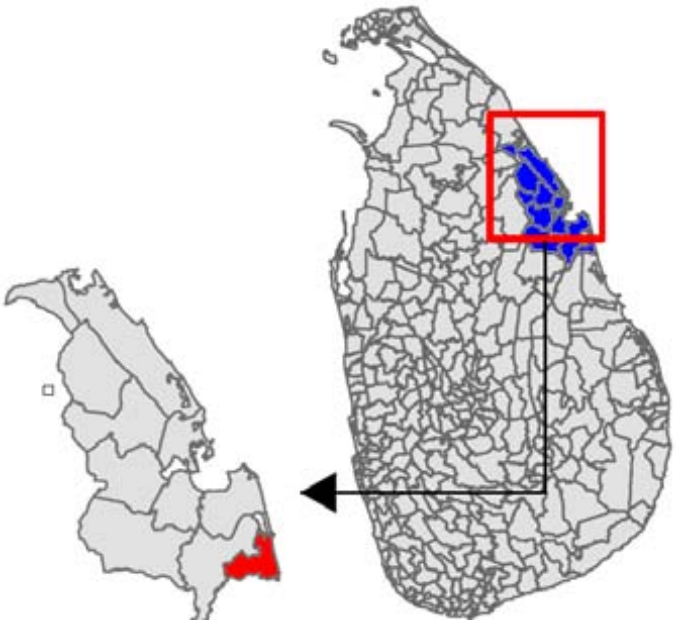


Figure 1. Verugal (Eachchilampattu) DS division

3.3. Justification of the Project

As mentioned in the "Introduction" of the report there is adequate grounds to conclude that the ground water potential in Eachchalampattu is not at all adequate for providing access to drinking water facilities for about 12000 inhabitants presently settled in this area. In addition, the most of the shallow water wells are inherently saline and in the coastal area, and those had been affected though contamination by Tsunami disaster in 2004. The situation was aggravated due to the ethnic conflict prevailed for the past three decades of which there hasn't been essentially no investment in social and physical infrastructural development. Even though, the Government is keen in building up the infrastructure facilities (eg. Hospitals, School), the development is slow because of the water crisis. Finally, the economic decline caused by the war has resulted severe drops of family incomes in the area, and thereby hygienic situation is low. Low hygienic situations are very closely associated with scarcity of quality water, thus providing drinking water facilities for those communities should be dealt with high priority.

3.4. Nature of Proposed Project

3.4.1 Construction activities

The proposed project obtains water from Verugal river at Kallarippu and serves a population of 17,000. This project will comprise the following components.
(Locations showing map is attached as Annex-4)

- Provision of intake facilities including low lift pump house at Verugal river at Patchchalthurai in Kallarippu to abstract raw water including provision for a micro strainer.
- Installation of three number low lift pumps (two working and one standby) each of approximately with a discharge capacity of 157 m^3/hour against a 25m head.
- Approximately 3,600m length of raw water conveyance main of 315mm dia. PE 100 (PN 10) from intake to treatment plant to transmit 6,600 m^3 of raw water per day.
- Comprehensive treatment plant of capacity 6,000 m^3 per day of fully treated water.
- A clear water tank with twin compartments and a total storage capacity of approximately 1500 m^3.
- High lift pumping station installed with two sets of centrifugal pumps, of 137m^3/hour against a 45m head to draw water from the 1,500m^3 capacity clear water sump at WTP.
- An elevated storage tank of capacity 750m^3 at Eachchilampattu .
- Approximately 4,000m of 315mm dia.PE 100(PN10) Transmission main to feed the elevated water tower.
- Distribution network to Eachchilampattu town and its suburbs, approximately 60km.
- Extension of 3.5 km of electric power supply line.
- Standby power generators (2 nos.) at intake and WTP.

- Service quarters 7 nos.
- Power supply to intake, WTP and Tower site.

3.4.2 Any other support facilities

Most of the proposed construction sites (Eg. Tower site, treatment plant site) are potentially going under water during heavy showers and during peak rainy period. Therefore, filing sites with gravel will be a utmost necessity. Gravelly Reddish Brown Earths around a nearby source should be looked into the purpose.

The incorporation of river embankment management and planting suitable trees and grasses will enhance the environment and prevent soil erosion.

3.4.3 Work Force

Locally available force will be used for excavation of trenches for pipelines and masonry works at other construction sites. However, skilled workers such as plumbers, machine operators have to be brought from outside. This may be obligated by contractor; however, it has to be notified that the availability of local labor is seasonal as they are occupied in their farming during cropping seasons.

As per the contract conditions, the contractor has to arrange temporary accommodation for the work force. Hence, the contractor should plan in such a way that, he can utilize the available labor fully, thus the activities should be carried out during off cropping seasons.

CHAPTER 4: DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1. Physical Environment

4.1.1 Topography and Geology

The area of the Verugal DS division is 93 sq km and it has a 10 Km long beach front and this area is fairly flat with very few rock outcrops. At the southern border of the DS division lays a tributary of the Mahaweli River, the Verugal Aru, which is a large reliable perennial source of water. The areas is basically the flood plain of Verugal River and part of it is highly vulnerable to inundation during Monsoonal periods.

The Division's geology comprises essentially Pre-Cambrian gnesis and granitic rocks of Vijayan complex. The amphibolites facies of Vijayan complex occurs east of Highland Complex and consist of granitoid gneisses, magmatites and minor metasedimentary enclaves of qurtzites and calc-silicate rocks.

The dominant soils are Non Calcic Brown and Saline, with very narrow stretch of Alluvial soils occurring on Verugal River levee along with sandy Regosols and a few scattered pockets of gravel deposits along the sea coast. A few small pockets of soils suspected to be Alkaline based on some physical characteristics too could be found in small depressions in the landscape. Along the coastal strip, it consists of a thin layer of sandy regosols and gravels and low coastal dunes.

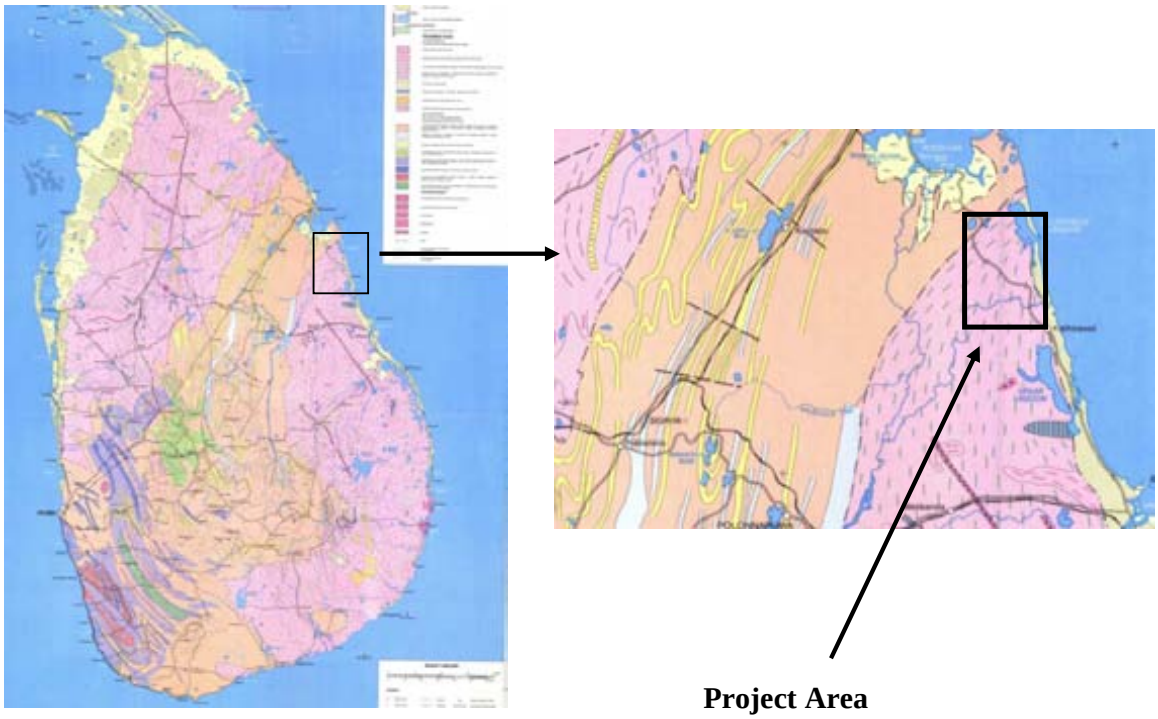


Figure 2. Geology of Project Area

4.1.2 Climate

According to the Agro Ecological Map of Sri Lanka published by the Natural Resource Management Centre of the Department of Agriculture, this area falls in the Low Country Dry Zone (DL2b) Agro Ecological Region where the annual rainfall is about 1500 mm (Fig 3). The rainfall pattern is distinctly Uni-modal with only one rainfall season during North-East monsoonal period from October to February. The South East Monsoon is not at all effective and hence there is prolonged dry period extending from March to September when most of the water sources Either dry up or become brackish.

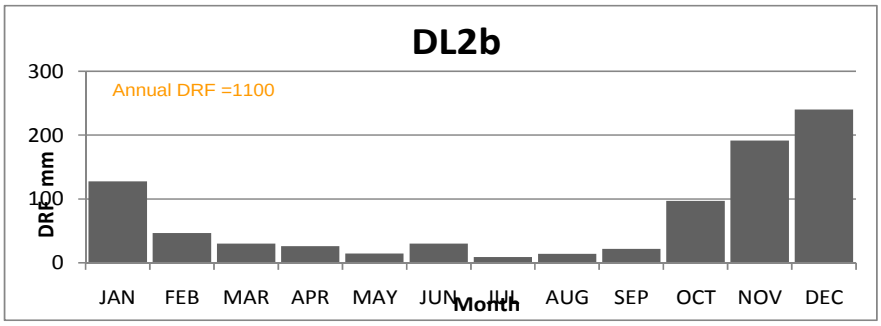


Figure 3. Rainfall Histogram of DL2b

The average daytime temperature is around 30-35°C and nights having an average temperature of 25°C-30°C. The maximum temperature can go up to 39°c in April.

4.1.3 Hydrology

The Study area broadly represents following three hydrological environments amongst which groundwater yielding capacity and its quality seem to vary considerably.

1. The coastal belt of Verugal D.S. Division consists of Regosols (Entisols) soils, which are inherently coarse textured and have high infiltration rates. Hence wells located in this area are blessed with aquifers with relatively higher water yielding potential. However, according to water users most of these wells have turned saline immediately after Tsunami. Although there are some wells still in usable condition, over extraction of ground water during peak dry periods and consequent sea water intrusion has resulted in salt water laden conditions making them unsuitable for human consumption. With the (influx of new) increase of IDPs expected to be settled in near future this situation very likely would get further worsened.

2. In terms of ground water yield, the aquifers found on better drained slightly elevated positions in the landscape is considered to have the lowest potential. Except during the period when North East Monsoon is active, most of these wells remain dry for more than 06 to 07 months in year. However, the water available during wet periods is generally free of harmful salts and suitable for all domestic needs.

3. Flat to almost flat valley bottoms with poorly drained LHG soils represent the 3rd Hydrological Environment in Eachchalampattu area. The paddy lands and high land immediately above paddy area subject to inundation during wet season fall within this category of Hydrological Environment. The water bearing capacity of aquifers located within this area is somewhat better compared to that of the Hydrological condition described under Item 2. However, depending on the location of well site the available water could either have high saline or alkaline condition thus making it unsuitable for any use.

4.1.4 Water Quality

Samples taken from the river at various locations were tested for various water quality parameters including Phytoplankton (Algae) heavy metals and pesticides. The all tests results are satisfy International and Sri Lankan Standards. Details are given at Annex - 05.

4.1.5 Surface Water Potential

Water source for this project is Verugal river, one of tributaries of the Mahaweli rivers tail end and join to Bay of Bengal at Verugal Muhaththuvaram. The upstream of this river has a balancing tank named as

Mavilaru which is under the control of the Irrigation Department. Mavilaru is used to control the water flow for Yala cultivation at Allai scheme.

Mavilaru has a head sluice (Fig.03) which feed for paddy cultivation at Allai scheme via RB and LB sluices, two numbers of radial gates (Fig.04) which prevent the water flow to Verugal river when closed, Verugal Anicut (Fig.05) which gives water to Verugal river when overflow times.

Sluice Gate of Mavilaru

Fig.04: Water leaks through the Radial Gates of Mavilaru

Fig.05: Water flow and leaks through the Verugal Anicut at Mavilaru

The Irrigation Department closes the radial gates during the period of April to Mid August for Yala cultivation of paddy under Allai scheme. During this period, radial gates for Verugal river is opened once a week. However, even during the period when radial gates of Verugal River remain closed, at the intake point there appear to be adequate water storage to ensure uninterrupted water supply for the proposed project. However, the irrigation Engineer in-charge of this area when contacted was somewhat apprehensive of this observation because he is under the impression that the large volume of water observed at the intake point probably may be due to the back effect of sea, since there is no significant elevation difference between sea and the intake point but not because of the continuous water flow in Verugal river. However, during the discussion the Irrigation Engineer also admitted that there is no quantitative data available with him to substantiate this argument. The NWSDB officials on the other hand argue that they are in possession of some flow measurements to prove that there is continuous water flow towards intake point from upstream area (Table 1) and they are now contemplating to increase the frequency of discharge measurements in order to further verify their point of view.

Some of the upland crops fed by irrigation water extracted from locations below the intake point of the river do not seem to have affected by salinity even during Yala season which further proves the stand taken by the NWSDB and rule out the idea of sea water intrusion.

Table 1 : Flow measurements near intake point at Verugal Aru

No	Date/Month	Flow/ (m^3/day)
1	5-Jun-2010	272,401.00
2	10-Aug-2010	475,505.00
3	15-Nov-2010	600,895.00
4	25-May-2011	1,223,856.00
5	21-Jun-2011	600,895.00
6	28-Jun-2011	254,401.00

The NWSDB officials are of the opinion that perennial flow observed in Verugal river may be either due to water leak through the radial gates of Mawil Aru Anicut (See fig 02 & 03) or due to some inflow added to River from an area between Mawil Aru Anicut and Intake point. By placing more emphasis on the assumption that continuous replenishment of water flow in Verugal Aru is mainly due to Water leak from the above Anicut, the Engineers and Environmental Officer attached to NWSDB highlight that in spite of these regular water losses from the Anicut during the period of last 20 years, no incidence of crop losses has been reported by the farmers in Allai- Kantalai irrigation Scheme.

It is also very important to evaluate the impact of the proposed project on high land crop cultivation in both up and down stream areas of the intake site. According to data available about 20 acres at upstream and 240 acres at downstream areas are reported to be under upland farming. Of this extent around 20 acres are used for rain fed cassava cultivation during Maha season and the balance 240 acres totally depend on irrigation water supply of Verugal River. As per observations made by the Department of Agriculture, the total volume of water extracted using water pumps for irrigation of upland crops is estimated to be about 6000m^3/day. Nevertheless, according to river discharge measurements available, river flow still used to be constant indicating that Verugal River has good potential as a source of drinking water and there is no severe impact by diverting part of its flow for the proposed water supply project in Eachchalampattu area.

4.2. Ecological Recourses

The natural Habitat in the project area has the following ecological set up:

a. Slightly elevated Arugal river levee and immediately adjacent flood plain vulnerable to temporary inundation during monsoonal period. The predominant land uses include Medium

to Tall Dry Mixed Evergreen trees and scrubs but part of the area has been exploited for upland crop cultivation.

b. Shrub jungle on immediate upper slopes adjacent to flood plain on either side of the river and formerly cultivated with highland crops but later became abandoned due to displacement of the land users.
c. Shrub jungles, livestock consists of cattle, goats and their grazing lands, agricultural (paddy) lands, canals from Allai scheme, settlements within the inter space in between Verugal river and A15 road.
d. Sparsely used salinity affected highlands with palm trees, perennial fruit trees, and wild trees between settlements and paddy lands in old and new settlements in between the sea and A15 road.
e. Scrub Jungle and highland crop cultivated island at the river mouth which is also a resting place for migratory birds and cattle.

(Map is attached as Annex-02)

4.3. Socio Economic Aspects

This D.S. Division consists of 09 G.N. Divisions encompassing 22 villages. The survey carried out in July 2011 shows that there are 5539 families, predominantly of Tamil origin with a total population of 12,557. The paddy and upland crop cultivation and fishing are the three main sources of their income. According to field survey carried out by Centre for Information Resources Management (CIRM) based on Vulnerability Poverty Profile classification compiled by UNICEF, 13 of the 22 villages in the D.S. Division fall within Extremely Vulnerable poverty category. However, during the field survey it was found that socio economic conditions of the other 09 Villages too do not differ very much from the above 13 villages to be ranked them in to better category in vulnerability classification . According to CIRM, nearly 1300 families from the 07 coastal villages were directly affected by Tsunami in 2004. All of the villages in Verugal were again displaced during the conflict in 2006.

The socio-economic profile includes details about the household, demographic pattern of the population, occupation & household income. In regards to drinking water status it describes the available sources for drinking water in each villages, storage capacity of the households, time for fetching water etc., in the sanitation status area it provides detailed information about the possession of private toilets by the households, the problem people face regarding usage of toilets, etc.

4.3.1 Household Composition and Social Conditions

The Tables no 2 and 3 indicate the profile of the heads of households classified by gender and age category.

Table 2: Age of Chief Occupant in Verugal Division

Age group	Count	%
Less than 18 years	51	1.80%
18 – 64 years	2585	91.34%
65 years & over	194	6.86%
Total	2830	100%
Less than 18 years	51	1.80%

Nearly 2% of the chief householders are under 18 years of age. Most of them are orphans; these households are supported by relatives. Few households represent couples who were married before the age of 18, and nearly 7% of the chief household are over 65 years of age.

It needs to emphasize that only 11 out of 70 “child-heads” are attending school. They earn a livelihood working as child labourers after school hours

Table 3: Repartition of heads of households by gender

Gender	Count	Percentage
Female	598	21.13%
Male	2232	78.87%
Total	2830	100%

It was observed that 21% of the households are headed by females. These families are highly vulnerable to poverty.

4.3.2 Household incomes and Assets

95% of the families subsist marginally on a monthly income of less than 5 000 LKR. Majority of them are either farmers or labourers. In the coastal villages, fishing is also an occupation of many. The 'others' category includes mainly unskilled labourers who find occasional employment.

Table 4: Income of Households in Verugal DS division (2010)

S. No	G.N .Division	No. of Families	No of Samurdhi Families	%	Family Income (Monthly)					
					Less than Rs.5,000	%	Between Rs.5,000 - 10,000	%	More than Rs.10,000	%
1	**Eachchalampattu**	198	147	74%	150	76%	16	8%	32	16%
2	**Verugal**	463	338	73%	398	86%	42	9%	23	5%
3	**Poonagar**	414	384	93%	396	96%	-	-	18	4%
4	**Ilangaithurai**	150	147	98%	147	98%	-	-	3	2%
5	**Anaithevu**	382	365	96%	368	96%	-	-	14	4%
6	**Verugal Mugathuwaram**	564	491	87%	558	99%	-	-	6	1%
7	**Ilangaithurai Mugathuwaram**	501	488	97%	488	97%	3	0.6%	10	2%
8	**Karukkamunai**	286	251	88%	282	88%	-	-	4	1%
9	**Poomarathadichenai**	239	215	90%	236	90%	-	-	3	1%
10	**Uppooral**	213	198	93%	213	93%	-	-	-	-
	Total	3410	3024	89%	3236	89%	61	1.8%	113	3.3%

4.4. Existing Water supply sanitation situation

4.4.1 Present source of water for drinking

Table 5: Sources for drinking water by household

Source of drinking water	Count	Percentage
Own well	255	8
Safe Private well	431	14
Unsafe Private well	778	25
Hand pump (tube well)	33	1
Bowser	227	7
Unsafe common well	167	5
Safe common well	883	29
Tap in yard (common)	93	3
Pond/ river	190	6
Total	3057	100

4.4.2 Sources of drinking water available

The villages usually rely on more than one source for drinking purposes. The table below details the frequencies for the different combinations of the drinking water sources used by the villages surveyed in the three divisions.

Table 6: Source of drinking water by village

Common Wells and Private wells	Sooranagar, Muttuchchenai, Valaithottam, Kallady, Punnaiyadi, Ilangaithurai, Muhathuvaram, Vattavan
Common Wells, Private wells & River	Ilangaithurai, Vinayagapuram, Mavadichenai, Eachchalampattu, Poonagar
Common Wells, Private wells & Over head Tank	Poomarathadichenai
Common Wells, Tube Wells	Chenaiyoor
Common wells and Water Bowser	Karukamunai

All villages depend fully on the well water which has very high conductivity levels. In these villages there are no other sources of water.

CHAPTER 5: ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Anticipated environmental impacts due to the proposed project can be assessed under two broad categories of positive and negative impacts.

5.1. Positive environmental impacts

Most important positive impact due to the proposed project is the improved health condition of the project beneficiaries. At present, they are highly affected due to scarcity of good quality drinking water, and with the implementation of the project, their drinking water requirement could be met and this will definitely pave the way, especially for most vulnerable group of the community to live happy and healthy lives. Furthermore, an improved hygienic condition of a society greatly enhances the living standards, quality and productivity of the people. On the other hand, drinking of unsafe or pollutant laden water is considered to be one of the main causes for various abdomen related diseases reported in the Dry Zone of Sri Lanka and providing clean water will therefore to a great extent allow the government to save colossal amount of its funds which otherwise would be spent on health care of these people. It is also not necessary to over emphasize the contribution, a society can make towards development, once they are healthy and happy.

Moreover, the project will provide employment opportunities for local people, particularly during the construction period, and to a lesser extent during the operational period.

5.2. Negative environmental impacts and their mitigation

Any development program is obviously associated with negative impacts. Correct project design and implementation will address those adverse or negative impacts adequately and thereby mitigation measures can be recommended.

5.3. Impacts during construction period

The activities during construction would not result any harmful environmental impacts at national or regional level. Compared to other development activities, projects of this nature are not demanding extensive development activities but most of the activities are localized. Hence whatever the negative

impacts associated with this project could be minimized by adoption of simple mitigation measures. Anticipated Environmental impacts and Mitigation measures are described below.

5.3.1. Impacts due to construction of Intake related structures

The raw water is obtained from perennial Verugal river and, intake location of the river has been selected in such a way so that there is least disturbance to agricultural activities and Flora and Fauna communities in surrounding area. Moreover, the proposed site is an uncultivated, uninhabited state land, hence the question of land acquisition or displacement of people does not arise during project implementation. According to the feasibility report prepared by the NWSDB, Thuraipachchal, Kallarippu is found to be the best location for the construction of the intake point. During the construction work of the intake point to a certain degree of soil erosion in the stream banks could be anticipated. However, with the adoption of proper mechanical and biological conservation measures the harmful effects of it could be reduced to very low level.

Mitigation Measures

- Construction of intake structures during the period when dry weather flow is at its lowest (June, July and Early August). Construction work should be completed before the onset of Maha rains but making sure that the quality of the work is of the desired standard.

- Adequate precautions should be taken to avoid river bank erosion at the intake site during the period of construction (and also after the construction) due to scouring effect of water. The most effective and sustainable method for control of possible river bank erosion at the intake site would be the adoption of mechanical conservation measures, but because of the high cost involved, it could be coupled with vegetative conservation measures, such as improving the plant density along the river bank with suitable, locally available species. Combination of Mechanical and Vegetative conservation is the best option as it is low the cost and sustainable; On the same hand, Combine conservation method will cause least disturbance to Ecosystem (i.e: No impact to Ecosystem by vegetative conservation, but it is less effective as well as not sustainable method for all season, on the other hand, mechanical conservation is effective for all seasons but it may disturb the Riverine Ecosystem). This conservation will be carried out gradually by the project with the coordination of divisional staff of CEA and MASL

- In order to reduce sedimentation at the intake site, it is also very important to make sure that upstream river banks are protected very carefully. To a certain extent this could be achieved by the adoption of vegetative control measures but the most important aspect of this activity would be the awareness creation of the community. Although, this river is the longest river and washing many paddy fields of the country, pesticide residues are not detected (absent) in the proposed intake point (Refer Annex-05). This because of water stagnation at the balancing tank, here most of the sediments are settled. Sedimentation at the intake may be caused by the highland cultivation at the immediate upstream of the river. As these cultivations are seasonal (less usage of Agro

chemicals), farmers are using water pump for irrigation. It is the only possible reason for anthropogenic sedimentation other than the natural sedimentations. Educate the farmers through awareness programme to use water without destroy the riverbank.

5.3.2. Impact of Access road construction to Intake and Treatment plant

There is no proper access road leading to Intake Site and Treatment Plant and therefore earthen Road is now being constructed by the Divisional Secretary with participation of the community. Thus, there are no impacts due to land acquisition. Continuous travelling of heavy vehicles to and from the Intake site during construction may cause damages to this road. Hence, the implementing Agency will construct this road by Concrete or DBST to withstand the stress of frequent heavy vehicle transportation and effect of rain / floods. The project and project will take the full responsibility of proper maintenance of this road. The impacts would be; damages to the existing road, soil erosion and dust during heavy vehicle transportation.

Mitigation measures

- There will be less amount of soil cutting & filling for construction of access road, thus measures such as compacting, performing earth works on rainless periods, road bank stabilization by mechanical and / or vegetative means are essential. The road construction standards should be strictly adhered to. The access roads should be tarred to minimize erosion.
- Spraying of water to prevent forming of dust during vehicle transportation
- Use covers for the vehicles, during sand, cement, or gravel transportations.
- Avoid transportation of such materials during heavy traffic periods or most populated time periods.

5.3.3. Impacts due to construction of Water Treatment Plant and Distribution Tower

These two constructions will not create extensive adverse impacts as those are highly localized. However, these two sites where Water Treatment Plant and Distribution Tanks are proposed to be constructed are found to be vulnerable to water logging during rainy periods, thus precautions are required.

During the construction of tower, mosquito breeding is anticipated in the basement of towers. Curing water and rainwater will be accumulated inside of the tower basement and provide a habitat for mosquito larva.

Mitigation measures

- In order to avoid water logging, an effective runoff water disposal plans should be designed and developed for both sites. Runoff disposal drains should be constructed and those should be connected to the nearest natural drainages. If scouring and erosion is taking place, step should be taken to line masonry protections.
- The depressions of the above sites should be back filled using quartz gravel excavated from a burrow Pit consisting Reddish Brown Earth soils, probably located outside of the project area and for which it may perhaps be necessary to obtain approval either from the District Secretary or Divisional Secretary.

- Turfing and landscaping of the immediate neighborhood to avoid soil erosion

- Spraying of water to prevent forming of dust during vehicle transportation, use covers for the vehicles, during sand, cement, or gravel transportations. Avoid transportation of such materials during heavy traffic periods or most populated time periods

- Dewatering of tower basement is mandatory at least once a week to avoid mosquito breeding.

- During the sheet pile works in construction of Distribution tower , using of ***Silent pile driver*** (working by hydraulic force) instead of vibro hammer is preferable to avoid noise pollution and vibration

  (Layout maps are attached as Annex-06,07&08)

5.3.4. Impacts due to laying out of distribution layout

This is comparatively an extensive activity, totaling approximately 60 Km in length. The pipe lines would be buried approximately 60 cm below the ground level. Impacts are mainly, soil erosion, creating traffic congestions, dust, disturbances for the road network, noise and vibrations. However, though rare damages to existing structures / building are anticipated in situations where unavoidable.

Mitigatory measures

- Avoid peak rainy period for laying of pipe lines

- Use small or medium size trenching equipments and use adequate number of such equipments to complete the task within a shortest possible time period. Once trenches are done, immediately lay pipes and compact to a reasonable degree.
- Avoid damages to existing structures / building as much as possible. In unavoidable situations, prior notice and compensation for the affected parties
- Avoid peak traffic hours, Communicate with Police regarding traffic plans if and when roads are closed ; Give alternative roads and their directions
- Spray water if dust is forming extensively
- Repair roads immediately, if and when those are damaged due to trenching
- Suitable barricade must be applied at unfilled trenches and arrange warning light during nights.
- During the laying of pipelines at main roads, traffic must be regulated by contractor in order to avoid accidents.

(Distribution area map is attached as Annex-04)

5.3.5. Impacts due to construction of other buildings / officer quarters

Main impact would be the soil erosion and blockage of storm water drainage systems. If these are not addressed properly enhanced soil erosion and temporary water stagnation during showers can be experienced.

Mitigatory measures

- Turfing and landscaping the immediate neighborhood
- Use higher elevations for constructions, and if the sites are in a lower elevation, fill the site with gravel to avoid inundation during heavy rainy period.
- Design and implement a proper storm water disposal system

(Layout maps are attached as Annex-06,07&08)

5.3.6. Impacts on safety of project staff and or parties due to project

Project staff is vulnerable to health hazards, accidents during project activities as there would be constructions of tall structures, usage of machines etc. Moreover, parties other than the project staff also can get affected due to project actives by accidents etc. Therefore the safety of staff and other affected groups should be ensured. In case of an accident, a mechanism for reaching a hospital immediately and rectification of the situation should be dealt with high priority.

Mitigatory Measures

- Awareness creation among staff regarding safely measures and maintaining safety standards of working sites
- In case of an accident due to Project construction activities, immediate steps to direct the affected parties to required and able health care

5.4. Impacts during operational period

5.4.1. Impacts on downstream

Part of the River levee has already been exploited for upland crop cultivation using irrigation water from the Verugal River. The some farmers at the mouth of the river (below the intake point) have complained to Irrigation Engineer that the water they used for cultivation contained harmful soluble salts and hence not suitable for irrigation. However, during field investigations we found that this is not due to high salinity level of irrigation water but instead due to direct influence of sea. As highlighted earlier in this report the chemical characteristics of the River water including that of salinity status was found to be quite satisfactory. However, with the interception of river flow at the intake point, the water flow beyond that particular point towards the sea will be reduced considerably during dry periods. This situation will get further aggravated when downstream farmers start irrigation of their crop lands using water pumps. Hence the amount of dry weather flow at the River below the intake point and the maximum possible amount of water which could be extracted for irrigation during this particular period should be correctly and regularly assessed in order to maintain hydrological equilibrium of the environment. Failing to do so will definitely create a situation where sea water will intrude even beyond the intake point towards up stream area, making the water at the intake point undrinkable.

Mitigatory measures

- Maintaining hydrological equilibrium by assessing the agricultural water requirement (described in 4.1.5) , project intake volume, requirement of environmental flow and river flow (Table .01), particularly during dry weather; this necessitates measuring of river flow, assessing the exact extent under irrigated agriculture.
- If water is limiting to serve above purposes, allocation for each requirement should be controlled
    - Through limiting spread of agricultural activities, and /or increasing their water use efficiencies through awareness creation programs.
    - Further expansion of the project should be based on flow data measurements

- If water is scarce during the dry weather period, increase the storage of water within the geometry of the Verugal river intake point, by adjusting the height of the weir
- Construct a sea water barrier in the downstream, if sea water intrusions are becoming a threat. Bar Mouth operation based on river flow could be a feasible solution.

5.4.2. Impacts on irrigated agriculture

There will not be significant adverse impact on irrigated agriculture which is being carried out along the levee because, agricultural water requirement (described in 4.1.5), project intake volume, requirement of environmental flow are lower than river flow (Table .01); water is amply available even during the dry (June to August) weather period(Table .01). However, under situations where water is scarce, there can be limitations for irrigation water availability. However, field observations revealed that irrigation is being done with low water use efficiencies, thus there is room to increase the same.

- Increase water use efficiencies through introduction of better irrigation methods such as sprinkler, drip etc
- Preventing further expansion / controlling of agricultural activities during low flow periods
- Awareness creation among farming communities on water usage

5.4.3. Impacts on river banks at intake point

During the operation period certain degree of soil erosion and bank collapses can be expected. This will be true not only at the intake point but upstream as well.

Mitigatory measures

- Adequate precautions should be taken to avoid river bank erosion at the intake site due to scouring effect of water. The most effective method would be the adoption of mechanical conservation measures, but because of the high cost involved, it could be coupled with vegetative conservation measures, such as improving the plant density along the river bank with suitable, locally available species.
- Awareness creation of the community on stream bank protection will be conducted by the project with the coordination of Divisional Secretary, divisional staffs of Department of Agrarian Services, Department of Agriculture and local authorities of this division.

5.4.4. Impacts on ecological resources, fauna, flora including aquatic resources

Intake point, treatment plant, distribution tower are placed in lands where no rich floral and faunal compositions are existing. The lands are covered sparsely with characteristic dry zone shrubs which are in abundance. The loss of approximately 6 – 7 ha in three isolated localities for above structures will not

pose any significant impact on such resources. However, under low flow situations, downstream aquatic resources may face with adverse impacts, due to inadequacy of water. According to the available flow data and other proxies, such low flow durations are rare, thus possibilities for such events are rare (refer Table 01 in Page No. 25).

During laying out of distribution network there will be hardly any impact on above resources as those are buried in road shoulders and the activity is limited to a shorter time period in a particular locality.

Mitigatory measures

- Maintaining the environmental flow requirement: This environmental requirement can be decided if accurate and long tern flow data is available. In the absence of long term flow data, the environmental requirement can be met by at least maintaining a water spread which is capable of connecting sinks / depression with water.
- Planting trees in suitable places around above sites

5.4.5. Impacts of treatment plant

Sludge will be generated during the operation of the Water Treatment Plant. The design of Water treatment plant should incorporate the treatment of sludge and backwash water. The detailed designs should be specified along with quantities of sludge generated daily, its chemical composition and appropriate treatment methods. Inappropriate disposal of sludge can be harmful to its immediate environment. Thus it is recommended that any sludge generated during operational period should not be returned to a canal or other water bodies.

Mitigatory measures

- Appropriate treatment of sludge
- Adhering to a standard disposal system

Either mechanical or hydrological sludge removal system will be implemented at the WTP. Wet sludge will allow to dry at the sludge drying beds (refer layout plan of WTP as Annex-07). Then it will be disposed at suitable place without disturbance of Ecosystem and Environment. The place for the disposal of dried sludge will be selected by project with the assistance with Pradesiya Sabha of this division.

5.4.6. Solid waste disposal

During the construction and operational period, solid waste such as unusable left outs of project materials; waste from office quarters etc. can be significant. Unsystematic disposal will be hazardous to the environment and it will affect its aesthetic beauty.

Mitigatory measures

- Disposal sites for project left outs should be decided in consultation with relevant Pradeshiya Sabha and Environmental Officers of the area, and its safe disposal will be ensured.
- The solid waste from office quarters: Separate bio-degradable and non-biodegradable parts and entrust handling bio-degradable component to each and every dweller through compost making. The compost making and using for home gardening should be encouraged and necessary know-how and training may be provided by arranging the services of the relevant officers in the Pradeshiya Sabha, Environmental Authority and or the Provincial Agriculture Department.
- The non-degradable garbage should be left into the Pradehiya Sabha solid waste management system.

5.4.7. Impacts on water quality of Verugal Aru river

According to the data available, the chemical properties of raw water at the intake point and upstream of Verugal River are well within the standard recommended for drinking purposes. However, the raw water of the river is reported to contain some algae. During the field survey it was quite evident that this plant is profusely grown in slow moving and still water bodies. Therefore, regular monitoring of water quality becomes mandatory for sustainable management of the project. It is also very important to address some key issues which promote rapid growth of this plant. The surface water bodies when overly enriched with phosphorous provide highly conducive growing environment for this plant. The Environmental Officer attached to NWSDB attributes this to phosphorous available in Dung released by Stray cattle. Theoretically accumulation of Phosphorous in water bodies proved to be the main reason for the growth of algae, but The Environmental Officer is yet to collect supportive analytical data to prove his explanation. The other most probable explanation any one can think of for Phosphorous enrichment in Verugal River would be the excessive use of chemical fertilizer for agriculture and especially for paddy cultivation in upstream areas but, there is no quantitative data to prove this explanation either. However, assuming that there is no any other human activity which induces the growth of this plant, it is very important to conduct some social mobilization programs and educate villagers those who are involved in paddy farming and cattle rearing about the serious environmental repercussions of their activities on proposed water supply project. As suggested by the Environmental Officer, depending on the severity of this problem perhaps grazing lands for stray cattle may be allocated from an another area so that pollutant free water flow can be maintained in the Verugal River.

Mitigatiory measures

- Awareness creation among farmers with respect to fertilizer and agro-chemical usage
- Measures to avoid cattle grazing within the immediate vicinity of the Verugal River upstream
- Regular monitoring of water quality especially for phytoplanktons

As mentioned in 5.4.3, awareness creation among the farmers will be carried out by the project. Water quality monitoring will be conducted by the project with the consultation of suitable Institute (eg. Institute of Fundamental studies, Industrial Technological Institute, etc). The institute will be selected according the previous consultation experience to the other water supply projects. Shifting of cattle from Verugal River upstream will be conducted only when cattle grazing will be a threat to the proposed water supply especially on raw water quality. In case, it will be carried out with the consultation of Divisional Secretary, the District veterinary Surgeon of Department of Animal Production and Health and other relevant Government departments.

5.4.8. Impacts of laying out of distribution network, their maintenance on road network and vise versa

The laying out of water distribution network will affect the existing road network at crossing points and meeting points. Even after the laying out, during operational and maintenance, it might affect the road network. On the other-hand, construction of roads and during their maintenance, the road development activities also can affect the water supply network. Therefore, integrated planning through participation of relevant stakeholder agencies and sharing a common spatial database depicting the geographical positions of each and every network (either water distribution or the road network) is an essential prerequisite for the smooth functioning of the activities pertaining to the NWSDB and RDA.

Mitigatory measures

- Integrated planning with relevant stake holder agencies , Eg NWSDB, RDA and Divisional Secretary / Assistant Director of Planning
- Development of a spatial database in a Geographical Information System depicting all networks (Eg. Water supply net work, road network) and their important attributes and sharing the same database for future planning, operation and maintenance.
- Proper updating of the database

5.4.9. Impacts on safety of project staff

Project staff is vulnerable to health hazards, accidents during even operational period. Therefore the safety of staff should be ensured. In case of an accident, a mechanism for reaching a hospital immediately and rectification of the situation should be dealt with high priority.

Mitigatory measures

- Awareness creation among staff regarding safely measures and maintaining safety standards of working sites

- In case of an accident due to Project construction activities, immediate steps to direct the affected parties to required and able health care
- Financial compensation based on the severity

CHAPTER 6 : INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

This chapter describess the process undertaken during project design and preparation for engaging stake holders including information disclosure and consultation with affected people and other stake holders.

6.1. Consultations held with Line Agencies

Divisional Secretary- Ecahchalampattu D.S. Division

Since the D.S was away attending opening ceremony organized by the Peoples' Bank, some discussions were held with the Assistant Divisional Secretary and Assistant Directly Planning both of whom were very responsive about the project. They explained in details the severity of the problem faced by the people due to water scarcity. They informed that OXFAM has already implemented Drinking Water supply project but it is not at all adequate the drinking water demand of all the needy people. They assured their fullest cooperation for successful implantation of the project and indicated that on the instruction of Divisional Secretary people have already started construction works of access road leading to Water Treatment plant and Intake point.

Irrigation Engineer in Charge of Verugal Aru Authoritative Area, Department of Irrigation

The Irrigation Engineer, during the discussions we had with him was a little apprehensive about adequacy of water supply in Verugal River during peak dry periods. However, he was of the opinion that river discharge measurements taken at regular intervals may perhaps give a better picture of the water availability during the above periods and requested that the NWSDB, which is the implementation agency of this project should collect more information.

National water Supply and Drainage Board

During the discussions the Regional Manager and the others informed us that they are already in possession of some data to prove that River water flow during peak period is more than sufficient for meeting the water demand of the proposed project and downstream habitats.

6.2. Observations by the Consultants

Supply of Drinking water facilities has been a long felt need of the entire community of Eachchalampattu and during the feasibility survey carried out by NWSDB to a great extent people had already been educated about the proposed water supply project to be implemented in their area. During IEA, most of the information about the intended project was conveyed through the Divisional Secretary and Grama

Niladharies of respective G.N. Divisions. In addition a number of pockets meetings were conducted for the stake holders by the Environmental Officer in-charge of this area to explain different component of the project and what support project needs from them (List of participants attached as Annex -09). At these meetings the advantages of drinking of good quality water was comprehensively explained with some examples from other areas where people were reported to be affected by various kidney ailments due to consumption of poor quality water. By quoting a number of reports and also displaying various diagrams and photographs compiled on health issues related to drinking water, the cost the government has to incur for treating of those affected by drinking water borne diseases and how it affects the socio economic status of individual households and then as a whole of the development of the country has been explained. In fact, after these meetings, the inculcation of sense of ownership amongst stakeholders towards the project was so much that as per instructions of Divisional Secretary, they volunteered to construct temporary earthen road leading to Intake point and Treatment plant using their own labour. The lands suitable for construction of water treatment plant and Distribution Tanks were also selected with the consultation of the stake holders.

6.3. Concerns of stakeholders

One of the main concerns expressed by the stake holders living at the tail end of the project area was that whether they would be able to enjoy the project benefits as of those living closer to Distribution Tank because they fear that the pressure of the distribution system would be reduced as it extends to faraway places. At the designing stage the height of the Distribution tank has been decided by taking this factor into consideration. Furthermore, instead of 12000 people presently occupied in the area, the project has been designed to cater about 20000 people. Hence there will not be any foreseeable water scarcity in near future. Although NWSDB will take the full responsibility of implementation of all project activities and subsequent maintanence , a committee comprising stake holders headed by Divisional Secretary be appointed to ensure fair distribution of water, especially for the most vulnerable group of the community. In order to avoid unnecessary wastages of water, nominal charge for water consumed by individual house hold based on some gauging system should be worked out and in the case of women headed households, some concessions when issuing water could be decided by the committee.

A very few people who are involved in irrigated farming on river levee below the intake point were bit skeptical about the project because they believe that with the construction of intake tank their lands would face problem of water scarcity during Yala cultivation. At the moment these farmers directly pump water from the river without adopting any water saving methods. Hence they would be given through training on water management so that unnecessary waste of irrigation water could be controlled.

Nevertheless, according to water measurements available with NWSDB, even after the construction of low level bund across the river at the intake point the river flow below this particular point would be more than sufficient to cater the irrigation needs of those people.

Very often, part of the river levee below the proposed intake point is vulnerable to inundation During the North East Monsoon period and some believe that this situation will get further aggravated with the construction works proposed at the intake point. The place where the intake tank is proposed to be constructed is so incised and no damage due to river overflow is expected in upstream area. In fact the construction of bund at the intake point to a certain extent will reduce the flood damage in downstream area.

6.4. Planed methodologies for Information Dissemination

The Majority of the people in this D.S. Division fall within the most Vulnerable category and therefore the most appropriate method of information dissemination would be through awareness creation in the forms of meetings and other social gatherings. Open discussions allowing people to talk at their will too would be useful. As far as community is concerned the most respected resource persons at these meetings would be Divisional Secretary, Officials of NWSDB, Grama Niladharies, Environmental Officer and the Irrigation Engineer etc.

The importance of Collective responsibility of the community for speedy implementation of project, Water Management in irrigated agriculture, prevention of soil erosion of river banks caused by burning, prevention of root causes of algae growth in surface water bodies, controlled water use during dry periods, Proper maintanence of project assets after completion of the project are some of the important topics to be covered under information dissemination programme. Also an educated youth residing in the village must be trained to measure water quality and quantity at the intake tank and below it so that unnecessary travelling of NWSDB officials to and from the site could be avoided.

In order to facilitate active participation of the community in project activities and also as highlighted earlier for them to have the feeling of that this is a project implemented *by their community and for their community*, they should be employed in all unskilled or skilled jobs depending on their experience and capabilities. This also will pave the way for most vulnerable group to earn their day to living at least during the period of project implementation.

CHAPTER 7 - ENVIRONMENTAL MANAGEMENT PLAN

The environmental management plan is developed in a manner where negative impacts are identified, and mitigation measures proposed with a monitoring mechanism.

Activity	Impact	Severity / & its duration	Mitigatory Measures	Institutional Responsibility for Implementation	Monitoring Frequency	Monitoring Responsibility
Design Stage						
1. Planning and designing of project activities	• Improper planning will reduce the project efficiency interns of physical, social , and financial • Adversely affect the environment, and other stakeholder agency activities	Severe / Can be short to long term	• Proper planning with adequate, reliable data • Integration with other relevant authorities within the locality during planning stage • Conducting Workshops and obtaining views • Sharing a common updated database within relevant stakeholders	NWSDB to integrate with other agencies such as DS, CEA RDA, ID, FD, NGO's	Monthly	NWSDB
Construction stage						
1. Construction of Intake related structures	• Soil erosion, Stream bank erosion , Scouring	Low to moderate severity / Short term	• Construction of intake structures during the period dry weather flow period. • Adoption of mechanical conservation measures, but it could be coupled with vegetative conservation measures, such as improving the plant density along the river bank with suitable, locally available species. • To reduce sedimentation at the intake site, make sure that upstream river banks are protected through adoption of vegetative control measures • Awareness creation of the community.	NWSDB to integrate with PDOA, FD	Monthly	NWSDB

2. Access road construction to Intake and Treatment plant	• Damages to access road • Soil erosion • Dust during construction and passing of traffic	Moderate severity / Short to medium term	• Proper construction of access road to withhold heavy traffic with heavy vehicle • Compacting, performing earth moving activities on rainless periods, road bank stabilization by mechanical and / or vegetative means • Road construction standards should be strictly adhered to. • Access roads should be tarred to minimize erosion. • Spraying of water to prevent forming of dust during vehicle transportation • Use covers for the vehicles, during sand, cement, or gravel transportations. • Avoid transportation of such materials during heavy traffic periods or most populated time periods.	NWSDB to integrate with RDA	Daily	NWSDB
3.Construction of Water Treatment Plant and Distribution Tower	• Sites vulnerable to water logging during rainy periods • mosquito breeding is anticipated in the basement of towers	Low severity / Short to Medium term	• To avoid water logging, an effective runoff water disposal plans should be designed and developed for both sites. • Runoff disposal drains should be connected to the nearest natural drainages. If scouring and erosion is taking place, steps should be taken to line masonry protections. • The depressions of the above sites should be back filled using quartz gravel excavated from a burrow Pits consisting Reddish Brown Earth soils. • Turfing and landscaping of the immediate neighborhood to avoid soil erosion • Spraying of water to prevent forming of dust during vehicle transportation, use covers for the vehicles, during sand, cement, or gravel transportations. Avoid transportation of such materials during heavy traffic periods or	NWSDB	Daily	NWSDB

			most populated time periods • Dewatering of tower basement is mandatory at least once a week to avoid mosquito breeding.			
4.Laying out of distribution layout	• Soil erosion • Creating traffic congestions, • Dust, disturbances for the road network, noise and vibrations. • Damages to existing structures / building are anticipated in situations where unavoidable.	Moderate / Short term	• Avoid peak rainy period for laying of pipe lines • Use small or medium size trenching equipments and use adequate number of such equipments to complete the task within a shortest possible time period. Once trenches are done, immediately lay pipes and compact to a reasonable degree. • Avoid damages to existing structures / building as much as possible. In unavoidable situations, prior notice and compensation for the affected parties • Avoid peak traffic hours, Communicate with Police regarding traffic plans if and when roads are closed ; Give alternative roads and their directions • Spray water if dust is forming extensively • Repair roads immediately, if and when those are damaged due to trenching • Suitable barricade must be applied at unfilled trenches and arrange warning lights during nights. • During the laying of pipelines at main roads, traffic must be regulated by contractor in order to avoid accidents. • During sheet pile works, use of a ***Silent pile driver*** (working by hydraulic force) instead of vibro hammer is preferable to avoid noise pollution and vibration	NWSDB in collaboration with RDA and Police	Daily	NWSDB with RDA
5.Constructi	• Enhanced soil erosion	Low /	• Use higher elevations for constructions, and	NWSDB	Once a	NWSDB

on of other buildings / officer quarters	• Temporary water stagnation during showers due to blockages of drainage lines	Moderate term	if the sites are in a lower elevation, fill the site with gravel to avoid inundation during heavy rainy period. • Turfing and landscaping the immediate neighborhood • Design and implement a proper storm water disposal system		week	
6. Ensure safety of project staff and or affected parties during project activities	Vulnerable to health hazards, accidents during project activities (Project staff as well as outsiders)	Low to moderate severity / Short to medium term	• Awareness creation among staff regarding safely measures and maintaining safety standards of working sites • In case of an accident due to Project construction activities, immediate steps to direct the affected parties to required and able health care • Financial compensation based on the severity	NWSDB with the collaboration of Police and Hospitals	When required	NWSDB
Operational Period						
1. Intake of water from Verugal aru at Intake point	• May affect downstream hydrological balance • Sea water intrusions	Low to Moderate severity / Short to Medium term	• Maintaining hydrological equilibrium by assessing the agricultural water requirement, project intake volume, requirement of environmental flow and river flow, (This necessitates measuring of river flow, assessing the exact extent under irrigated agriculture) • If water is limiting to serve above purposes, allocation for each requirement should be controlled • Limiting spread of agricultural activities, and /or increasing their water use efficiencies through awareness creation programs. • Further expansion of the project should be based on flow data measurements • If water is scarce during the dry weather	NWSDB in collaboration with ID, PDOA	Monitoring water quality once in a week during dry weather flow	NWSDB

			period, increase the storage of water within the geometry of the Verugal river intake point, by adjusting the height of the weir • Construct a sea water barrier in the downstream, if sea water intrusions are becoming a threat. Bar Mouth operation based on river flow could be a feasible solution.			
2.Irrigated agriculture in river levee	• Only under water scarce, situations there can be limitations for irrigation water availability.	Low to Severe depending on water scarcity / medium term	• Increase water use efficiencies through introduction of better irrigation methods such as sprinkler, drip etc • Preventing further expansion / controlling of agricultural activities during low flow periods • Awareness creation among farming communities on water usage	NWSDB, PDOA	Once in two weeks	NWSDB
3. River banks at intake point	• Soil erosion and bank collapses can be expected.	Low severity / Short , Medium & Long-term	• Adoption of mechanical conservation measures, & it could be coupled with vegetative conservation measures, such as improving the plant density along the river bank with suitable, locally available species. • Awareness creation of the community on stream bank protection	NWSDB in collaboration with PDOA , FD, ID	Once in a month	NWSDB, ID
4.Project activities on ecological resources, fauna, flora including aquatic resources	• Loss of shrub jungle • Under low flow situations, downstream aquatic resources may face with adverse impacts, due to inadequacy of water.	Not severe Medium to high severity / medium term	• Planting trees in suitable places around above sites • Maintaining the environmental flow requirement	NWSDB NWSDB in collaboration with CEA and ID	Once in three months Once in a week	NWSDB NWSDB and ID
5.Operation of the	• Inappropriate disposal of sludge can be harmful to its	Moderate severity /	• Appropriate treatment of sludge • Adhering to a standard disposal system	NWSDB in consultation	Once a month	NWSDB

treatment plant	immediate environment.	moderate to long term		with CEA, Pradeshiya Sabha		
6.Solid waste disposal	• Unsystematic disposal will be hazardous to the environment and it will affect its aesthetic beauty.	Moderate severity / moderate to long term	• Disposal sites for project left outs should be decided in consultation with relevant Pradeshiya Sabha and Environmental Officers of the area, and its safe disposal should be ensured. • The solid waste from office quarters: Separate bio-degradable and non-biodegradable parts and entrust handling bio-degradable component to each and every dweller through compost making. • The non-degradable garbage should be left into the Pradehiya Sabha solid waste management system.	NWSDB in collaboration with Pradeshiya Sabha	Once a week	NWSDB , Pardeshee ya Sabha
7. Presence of intake structures on water quality of Verugal Aru river	• A low wire at intake will cause a stagnation of water (though it will be insignificant) and will enhance the algae growth.	Low severity / Medium term	• Awareness creation among farmers with respect to fertilizer and agro-chemical usage • Measures to avoid cattle grazing within the immediate vicinity of the Verugal River upstream • Regular monitoring of water quality	NWSDB in collaboration with PDOA	Twice a month	NWSDB, CEA
8.Laying out of distribution network, their maintenance on road network and vise versa	• Affect the existing road network at crossing points and meeting points. (Even after the laying out, during operational and maintenance) • Construction of roads and during their maintenance, the road development activities also can affect the water	Medium / Short to Medium	• Integrated planning with relevant stake holder agencies , Eg NWSDB, RDA and Divisional Secretary / Planning • Development of a spatial database in a Geographical Information System depicting all networks (Eg. Water supply net work, road network) and their important attributes and sharing the same database for future planning, operation and maintenance.	NWSDB and RDA along with the calculation of DS / Planning	When required	NWSDB and RDA

	supply network. Mitigatory measures		• Proper updating of the database			
9. Ensure safety of project staff	• Vulnerable to health hazards, accidents during project activities	Low to moderate severity / Short to medium term	• Awareness creation among staff regarding safely measures and maintaining safety standards of working sites • In case of an accident due to Project construction activities, immediate steps to direct the affected parties to required and able health care • Financial compensation based on the severity	NWSDB with the collaboration of Police and Hospitals	When required	NWSDB

CHAPTER 8 : GRIEVENCE AND REDRESS MECHANISM

The institutional arrangements established to ensure effective management of the design, construction and subsequent operation of the project infrastructure, include special provisions to enable affected persons to bring to the attention of the project authorities, if any dissatisfaction that they may experience and to ensure that this is dealt with appropriately. The flow chart given in Figure 06 depicts the proposed grievance and redress mechanism.

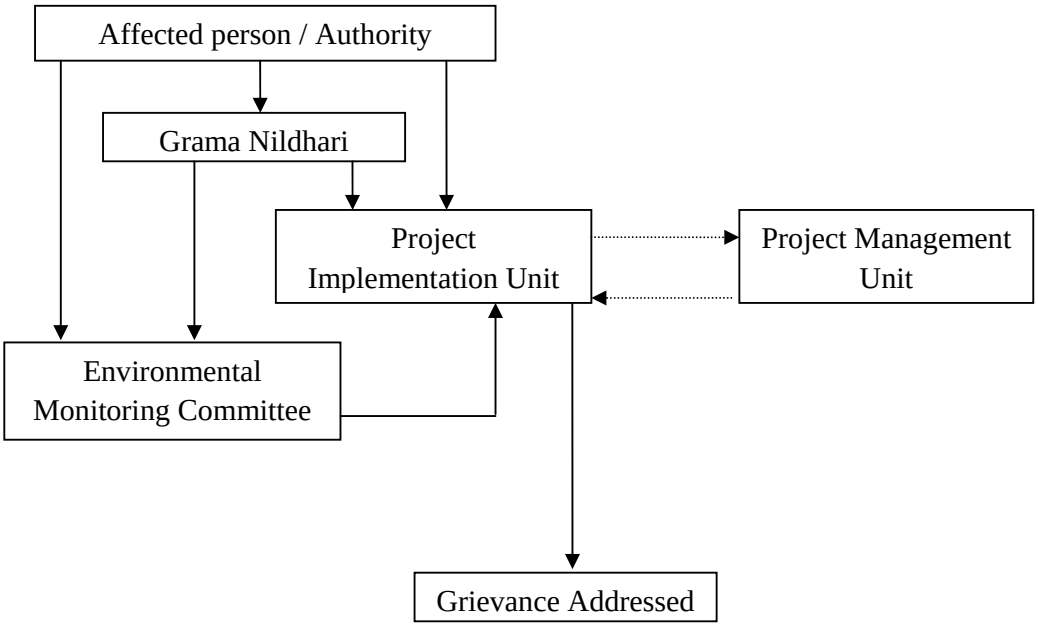


Figure 06: Grievance Redress Mechanism

Grievances of affected persons / Authority will first be brought to the attention of the Project Environmental Officer in the Project Implementation Unit (PIU), it may be directly, through *Grama Niladhari* or through the Environmental Monitoring committee. The Environmental Officer will discuss the issues on site with the complainant and other involved parties to achieve an acceptable solution, if possible. Grievances that cannot be redressed at field level, he will bring this in to the attention of respective staff in the Project management Unit (PMU), and the PMU will bring a suitable solution by consultation of all parties in higher management levels.

If the person who filed the grievance is dissatisfied with the outcome of the process they may refer their case to the appropriate court of law.

The grievance redress mechanism will be made aware to all project communities. All minor grievances will be resolved within 7 working days from the time of receiving the complaint, whereas the PMU will resolve more complicated grievances within 21 working days.

The Environmental Officer will be responsible to:

a) record, register, and sort grievances,
b) conduct an initial assessment of grievances,
c) refer grievances to appropriate units or persons,
d) notify complainants and other affected parties of eligibility, the resolution process, and outcomes;
e) track, monitor, document and evaluate grievances; and
f) submit Quarter/ half/annual summary report to PMU, Project Director to be submitted to ADB

CHAPTER 9 : MONITORING PROGRAMME

Monitoring is an essential activity for any kind of Project. However, under the present context, monitoring of projects of are not up to the expectations and thus needs to be strengthened. In this effort the Project Proponent himself should play a key role with good intension. The Proponent should not take shortcuts when implementing the program, but strictly adhere to the proposed mitigatory measures that are important for environmental protection. In order to facilitate and coordinate the monitoring program, a committee which represents the key stakeholders / agencies as identified below is suggested. The committee will identify the specific aspects of the suitable monitoring program for the project. They will monitor the changes and implementation of mitigatory measures to minimize the adverse impacts in order to increase the benefits of the proposed project. If the intended activities are not going towards the right direction, the committee will take necessary actions to re-orient the planned activities, so that adverse impacts are reduced.

9.1. Parameters to be monitored

The monitoring plan should consider following components

- Construction of intake structures and implementation of adverse impact mitigation activities
- Construction of Water treatment plant , maintenance of its standards during construction, water quality after treatment, sludge disposal, site management in relation to soil erosion control, landscaping
- Construction of water distribution tower and its site management
- Laying out of distribution network and associated activities, implementation of suggested methods for adverse impact mitigation
- Water flow measurements and water quality measurements including conductivity (salinity levels), pesticides and agro-chemical residues and other important chemicals and metals and providing a trend analysis to the monitoring committee, Project Director and the ID .

9.2. Frequency of monitoring

Frequency of monitoring with respective to each and every aspect is given in Environmental Management Plan.

9.3. Institutional framework for monitoring

Following personal are suggested as the members of the monitoring committee: The committee will meet once in a month during construction period under the Chairmanship of the Divisional Secretary. However, in case of an urgent issue, there must be provision to meet the committee at a higher frequency.

- Project Proponent / Project Director (NWSDB) , or his able representation
- Director, Central Environmental Authority (CEA), Battaramulla or his / her nominee
- An officer to represent relevant Divisional Secretary
- An officer nominated by the Pradeshiya Sabha
- An officer to represent the Department of Forest
- An officer to represent the Department of Irrigation
- An officer to represent the RDA
- An officer to represent the Provincial Department of Agriculture
- A representation from Project Beneficiaries
- Interested local NGO

It is strongly recommended that Monitoring Committee should play an active role in ensuring implementation of all mitigatory measures. The problems that may encounter during the course of implementation of the project will be forwarded to the relevant person / authority by the monitoring committee.

Responsible agencies

Responsible agencies for each parameter are given in Environmental Management Plan.

Availability of funds, expertise, facilities

Cost of monitoring will be borne by the project proponent.

Other issues

It is recommended that a comprehensive Environmental Management Plan (EMP) be prepared by the Project at the detailed design stage. The EMP will provide both the Project consultants with environmental guidelines and requirements for construction activities and the NWSDB with guidelines and requirements for ongoing operation and maintenance of the water supply and sanitation facilities. After every monitoring activity a detailed report will have to be submitted on the progress of the mitigatory measurers taken and precautionary action taken to prevent adverse environmental effects.

CHAPTER 10: CONCLUSION AND RECOMMENADATIONS

The IEE has been undertaken in the context of a project that will provide potable water to around 21, 000 individuals in Eachchalampattu & Seruwila D.S. Division who were severely affected by the ethnic conflict and rely almost exclusively on domestic wells for their water supplies. These wells were contaminated by Tsunami in December 2004 and those also have limited yield potential in dry periods, during which many are prone to salt water intrusion.

The project involves the tapping of raw water of Verugal River at intake point at Kallarippu along with Water treatment plant, elevated storage tank and transmission and distribution lines. Lands selected for construction of water treatment plant and storage tanks are state lands presently not being used for any other activity. Acquisition processes of these lands are under way by NWSDB.

Project activities at construction and operational stages will be managed in accordance with the guidelines provided in Environmental Management Plan to be prepared based on IEE recommendations. It is considered that the above recommendations, once incorporated in the EMP, will minimize harmful environmental impacts due to the project implementation. The Proponent (and thereby the contractor as well) is no way should deviate from the conditions given in the performance bonds and should comply with guidelines given in the EMP. It is the responsibility of the project proponent to adhere to those mitigatory measures and continuous monitoring of construction and operational period is essential and if necessary intervention of relevant state agencies is a must to direct the program through the proper direction.

Under these circumstances, the proposed water supply and sanitation project will not have severe or significant negative impacts on the physical and social environment as a whole. On the other hand, with the implementation of the project, the rural population, especially of those belong to most vulnerable group would be supplied with treated water suited for drinking purposes and there is every possibility for improvement of health and other socio economic status and quality of life of project beneficiaries. When summarized everything, cumulative benefits of the project would be the improved quality of lives of those who have suffered due to more than three decades of long ethnic war and other natural calamities including that of Tsunami.

Careful evaluation of positive and adverse impacts due to the project implementation, it is clear that there are no significant adverse impacts which suppress its beneficial impacts. Nonetheless, strict adherence to mitigatory measures are essential during project implementation.

However, monitoring of water quality in Verugal Aru below the intake point and measuring the flow data of Verugal Aru near intake point are essential activities of which the sustainability and the expandability of the project is based with.

TERMS OF REFERENCE (TOR) FOR CONSULTANCY SERVICES FOR THE ASSIGNMENT ON INITIAL ENVIRONMENTAL EXAMINATION (IEE) FOR THE PROPOSED ECHCHALAMPATTU WATER SUPPLY SCHEME

1. BACKGROUND

The Northern and Eastern Provinces of Sri Lanka has been severely affected by an armed internal conflict for over three decades and it has had a devastating impact in the war affected regions and infrastructure has also been severely damaged or destroyed during the conflict.

The drinking water is grossly inadequate in Echchalampattu region and there is no piped borne water supply scheme within the proposed project area due to long period of under investment resulted from the conflict situation. At present population in Echchalampattu mainly relies on dug wells, tube wells, lakes and river for their day to day water needs. The development activities are being taking place in the area that will create greater demand for water supply facilities. The expected outcome of the project is to develop water supply infrastructure and services in Echchalampattu area. The proposed Eachchalampattu water supply project will provide access to about 22,000 people including resettled IDPs, piped drinking water in Eastern Province. The project will support for construction of intake facilities, treatment facilities, storage facilities, and transmission and distribution system. The project comprises following parts;

- Provision of an intake facilities including low lift pump house at Verugal Aru River at Patchchalthurai in Kallarippu to abstract raw water including provision for a micro strainer.
- Installation of three number low lift pumps (two working and one standby) each of approximately with a discharge capacity of 75 m^3/hour against a 25m head.
- Approximately 3,600m length of raw water conveyance main of 315mm dia. PE 100 (PN 10) from intake to treatment plant to transmit 2,970 m^3 of raw water per day.
- Comprehensive treatment plant of capacity 2,700 m^3 per day of fully treated water.
- A clear water tank with twin compartments and a total storage capacity of approximately 500 m^3.

- High lift pumping station installed with two sets of centrifugal pumps, 2 nos. of 68m^3/hour against a 45m head to draw water from the 500m^3 capacity clear water sump at WTP.
- An elevated storage tank of capacity 675m^3 at Eachchalampattu junction.
- Approximately 4,000m of PVC (T 1000) 225mm dia. Transmission main to feed the elevated water tower.
- Distribution network to Eachchalampattu town and its suburbs, approximately 60km.
- Extension of 3.5 km of electric power supply line.
- Standby power generators (2 nos.) at intake and WTP.
- Service quarters 7 nos.
- Power supply to intake, WTP and Tower site.

The government of Sri Lanka has requested Asian Development Bank (ADB) for a Conflict Affected Region Emergency Loan (the Project). The borrower of the project is the Democratic Socialist Republic of Sri Lanka. The Echchalampattu water supply scheme is one of the sub projects identified to implement under the water supply subcomponent of Component B of the above project. The Implementing Agency (IA) for water supply component will be through Ministry of Water Supply and Drainage by using the PMU of the on-going Secondary Towns and Rural Community Based Water Supply and Sanitation Project under National Water Supply and Drainage Board.

This TOR is for consultancy assignment for preparation of documents for Initial Environmental Examination (IEE) for the implementation of proposed Eachchalampattu water supply scheme. The purpose of this TOR is to investigate the environmental impacts due to the implementation of Eachchalampattu water supply scheme.

The employer will be provided guidance for preliminary site inspection to identify the project area. The Consultant shall be responsible for use of his own traveling arrangements for further inspections, secretarial arrangements for reporting, translating arrangements during quarries, surveys at his own expenses.

2. KEY QUALIFICATION

The assignment requires a qualified environmental specialist with a B.Sc. degree in related discipline or equivalent qualifications, preferably with a M.Sc/M.Eng degree in environmental sciences. Those who have specialized in environmental sciences field and following experience will be given preference. The specialist shall have minimum 8years experience of which 5 years shall be in the performance of environmental assessments with particular reference to

I. Preparing IEE/EIA s and Environmental Management Plans for ground water extraction projects.
II. Conducting environmental baseline studies.

3. DUTY STATION

The duty station will be Eachchalampattu.

4. INPUTS

The environmental specialist will be required for one and a half (1 1/2) months.

5. Scope of the Services

The consultant will be responsible for preparation of the Initial Environmental Examination of the project in line with ADB's Safeguard Policy Statement, 2009. The consultant is responsible to down load ADB's SPS 2009 found in
http://www.adb.org/Documents/Policies/Safeguards/default.asp and prepare the IEE in accordance with the requirements stipulated in Annex to Appendix 1.

6. DUTIES AND RESPONSIBILITIES

The environmental consultant's duties will include, though not be limited to the following.

- Prepare IEE in accordance with ADB's Safeguard Policy 2009. In the report of IEE the impacts caused due to the proposed project and proposed mitigation measures should be clearly mentioned.
- Collect data relevant to the environment screening and evaluate the direct and indirect environment impacts and based on the evaluation recommend alternatives for mitigation that limit environment degradation.
- Comment on possibilities of adverse environmental impacts and propose Mitigatory measures.
- Conduct public consultations in line with the requirements of ADB's Safeguard Policy 2009.
- To conduct pollution monitoring and waste management survey and based on the results and aquifer characteristics, propose a water source protection and development plan for the environmentally sensitive Verugal Aru river.
- Prepare an Environmental Management Plan (EMP) and Environmental Monitoring requirements.
- Propose a well defined mechanism for the monitoring of Environmental Management Action Plan.
- Discuss with relevant Governmental institutions and determine necessary clearances required and prepare the necessary documents required to obtain governmental clearances, Taking the approval and participating of all relevant activities (meetings etc.) from Central Environmental Authority and Provincial Environmental Authority.
- Comparing in particular the appropriateness of extraction water from large diameter wells with shallow tube wells, and that of extraction from both the sand and limestone layers against that of sand layer alone.
- Comment on upstream capacity and downstream impacts during the construction period and Operational period of the proposed water supply project.
- Discuss the water quality of the proposed intake site water and provide the alternatives for restore the water quality (If any water quality problems are observed); presence of pesticides, Heavy metals (by atomic absorption method), and algal assemblage (particularly cyanobacteria) must be discussed in addition with recommended physical and chemical parameters (Testing must be done any of regional laboratories or Central laboratory of NWSDB).
- Comments on the disposal of waste which will be generated from proposed treatment plant

- Discuss the actual water demand for the people who are not included at this proposed water supply projects (Particularly people at proposed Intake and Treatment plant site).

7. REPORTING RELATIONSHIP

The consultant will report to Project Director, CARE – Water sector Project thro' Secondary Towns and Rural Community based Water Supply and Sanitation Project, National Water Supply and Drainage Board at No.17/5A, Asoka Place, P.B. Alwis Perera Mawatha, Katubedda, Moratuwa, Sri Lanka.

8. OUTPUTS

- The consultant will submit the Draft IEE and EMP by the end of the 3rd week, and upon receipt of comments from NWSDB and ADB will submit the final IEE report original Soft copy (a CD) and five hard copies in English language by the end of 1 ½ months.

Outline of an IEE Report should contain following. Please refer Annex to Appendix 1 of ADB's Safeguard Policy Statement 2009.

Chapter 1 - Executive Summary
Chapter 2 - Policy and Legal and Administrative Framework
Chapter 3 - Description of the Project
Chapter 4 -Description of the environment (Baseline Data)
Chapter 5 - Anticipated Environmental Impacts and Mitigation Measures
Chapter 6 -Information Disclosure, Consultation and Participation
Chapter 7 - Grievance Redress Mechanism
Chapter 8 - Environmental Management Plan
Chapter 9 -Conclusions and Recommendations

Under the Chapter 5 the following must be discussed in addition with the Annex to Appendix 1 of ADB's Safeguard Policy Statement 2009

During Construction Period

1. Impact on bedrock stability

2. Impact on water quality
3. Soil erosion and siltation
4. Impact on natural drainage pattern
5. Impact due to transportation of construction material and equipment
6. Impact due to noise and vibration
7. Impact on existing habitats
8. Construction material
9. Construction Labour

During Operation Period

1. Impact on water quality
2. Impact on downstream users
3. Impact on flora and fauna
4. Impact on employment and income of the people
5. Impact of inundation

Annexure: Should include all supporting information and other information as appropriate Description of the existing environment of the project shall contain the following areas given in the table and add additional appropriate areas of concern.

Area	Yes	No	Unaware
100 m from the boundaries of or within any area declared under the National Heritage Wilderness Act No. 3 of 1988.			
100 m from the boundaries of or within any area declared under the Forest Ordinance (Chapter 451)			
Coastal zone as defined in the Coast Conservation Act No. 57 of 1981			

Any erodible area declared under the Soil Conservation Act (Chapter 450)			
Any Flood Area declared under flood protection ordinance. (Chapter 449)			
Any Flood protection area declared under the Sri Lanka Land Reclamation and Development Corporation Act 15 of 1968 as amended by Act 15 of 1968 as amended by Act No. 52 of 1982			
Area	**Yes**	**No**	**Unaware**
60 meters from the bank of a public stream as defined in the Crown Lands Ordinance (Chapter 454) and having width of more than 25 meters at any point of its course.			
Any archaeological reserve, ancient or protected monument as defined or declared under the Antiquities Ordinance (Chapter 188)			
Any area declared under Botanic Gardens Ordinance (Chapter 446)			
Within 100 meters from the boundaries of, or within, any area declared as a Sanctuary under Fauna and Flora Protection Ordinance. (Chapter 469)			
100 meters from the high flood level contour of or within, a public lake as defined in the Crown Lands Ordinance (Chapter 454) including those declared under section 71 of the said Ordinance.			
Within a distance of one mile of the boundary of a National Reserve declared under the Fauna and Flora Protection Ordinance.			

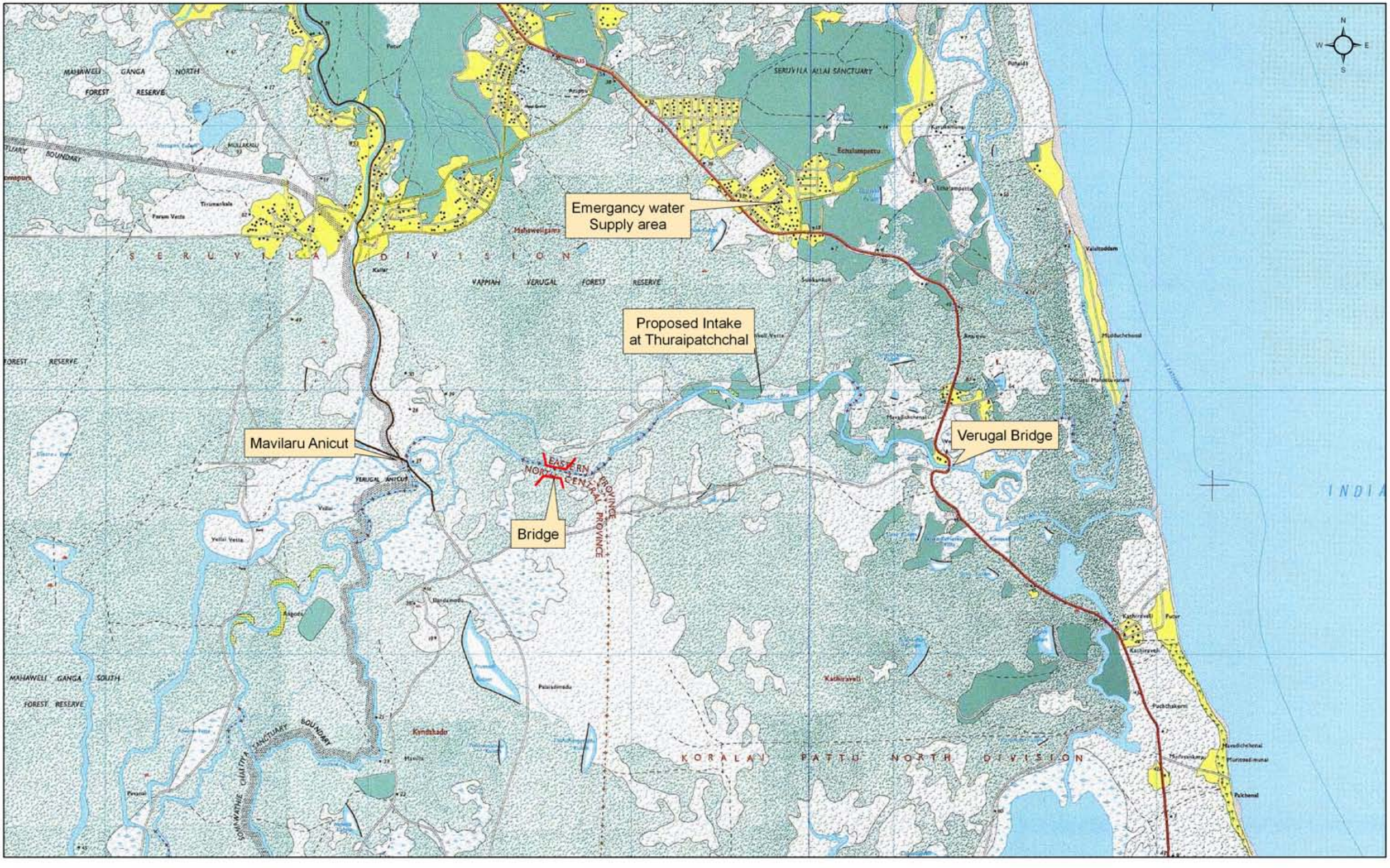


Figure 1.0 - Verugal River

Rapid Environmental Assessment (REA) Checklist

Annex-03

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Sri Lanka / Eachchilampattu Water Supply Project

Sector Division: Water Sector

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area…			
▪ Densely populated?		√	Proposed Intake area is covered with jungle and Highland cultivation, WTP is situated in the Jungle area, like wise Water tower also situated in uninhabited area. Distribution zones also contain human settlements but not densely populated
▪ Heavy with development activities?		√	Major development (Road) was completed and minor (general) development works are implemented by local authorities
▪ Adjacent to or within any environmentally sensitive areas?		√	According to the information gained from Divisional Secretary of this division, Cultural heritage sites, bay and protected areas are not in this division. Although, Wetlands, Mangroves, and Estuarine are in this DS division, those are neither within the project area nor adjacent to the project area
• Cultural heritage site		√	
• Protected Area		√	
• Wetland		√	
• Mangrove		√	
• Estuarine		√	
• Buffer zone of protected area		√	
• Special area for protecting biodiversity		√	

Screening Questions	Yes	No	Remarks
• Bay		√	
B. Potential Environmental Impacts Will the Project cause…			
▪ Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		√	No potential causes of pollution are identified, Water quality test also prove this
▪ Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	According to the information gained from Divisional Secretary of this division, Cultural heritage sites are not in this division.
▪ Hazard of land subsidence caused by excessive ground water pumping?		√	Water Source for this water supply is surface water
▪ Social conflicts arising from displacement of communities?		√	Major project construction sites are remote areas and free from human settlements
▪ Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	Ample amount of surface water is available for all users,
▪ Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		√	Raw water quality is acceptable
▪ Delivery of unsafe water to distribution system?		√	NWSDB ensures that distributes only safe water
▪ Inadequate protection of intake works or wells, leading to pollution of water supply?		√	NWSDB is always monitoring the water quality through the project and instruct the contractor for adequate protection of water body as well as their labours
▪ Over pumping of ground water, leading to salinization and ground subsidence?		√	Water Source for this water supply is surface water
▪ Excessive algal growth in storage reservoir?		√	This is running water, excessive algal growth only at stagnated water. but NWSDB will carry out testing to confirm the non-presence of algae.
▪ Increase in production of sewage beyond capabilities of community facilities?		√	Not suitable for this project
▪ Inadequate disposal of sludge from water treatment plants?		√	The capacity of WTP is 6000m^3 /day and enough spaces for sludge drying and disposal
▪ Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		√	Major project construction sites are remote areas and free from human settlements
▪ Impairments associated with transmission lines and access roads?		√	Transmission and distribution lines will be laid under the ground surface
▪ Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		√	Here chlorine gas will be used and handled by skilled workers along with industry proven safety measures

Screening Questions	Yes	No	Remarks
▪ Health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?		√	Safety gears will be used when handling chlorine.
▪ Dislocation or involuntary resettlement of people?		√	Major project construction sites are remote areas and free from human settlements
▪ Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	Major project construction sites are remote areas and free from human settlements
▪ Noise and dust from construction activities?	√		Potential impact by dust during the construction will be controlled by proper mitigatory activities
▪ Increased road traffic due to interference of construction activities?	√		At Intake and treatment plant site, but, not interference to the public
▪ Continuing soil erosion/silt runoff from construction operations?		√	Low to moderate at Intake site and it will controlled by conservation methods
▪ Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		√	NWSDB ensures supply of safe water.
▪ Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		√	Chemical, physical and biological parameters will be checked at treatment plant before distribution
▪ Accidental leakage of chlorine gas?		√	It can be controlled by dilution or neutralization mechanism available at every WTP of NWSDB
▪ Excessive abstraction of water affecting downstream water users?		√	Ample amount of surface water is available for all users
▪ Competing uses of water?		√	Ample amount of surface water is available for all users,
▪ increased sewage flow due to increased water supply		√	Population density of this area is very low
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant		√	Population density of this area is very low, The capacity of WTP is 6000m^3 /day and enough spaces for sludge drying and disposal
▪ Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	NWSDB ensures adequate steps are taken by contractor to avoid this in every projects
▪ Social conflicts if workers from other regions or countries are hired?		√	It is better to hire unskilled workers at the area during the off cropping season
▪ Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		√	NWSDB ensures adequate steps are taken by contractor to avoid this in every projects

Screening Questions	Yes	No	Remarks
▪ Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		√	NWSDB ensures adequate steps are taken by contractor to avoid this in every projects

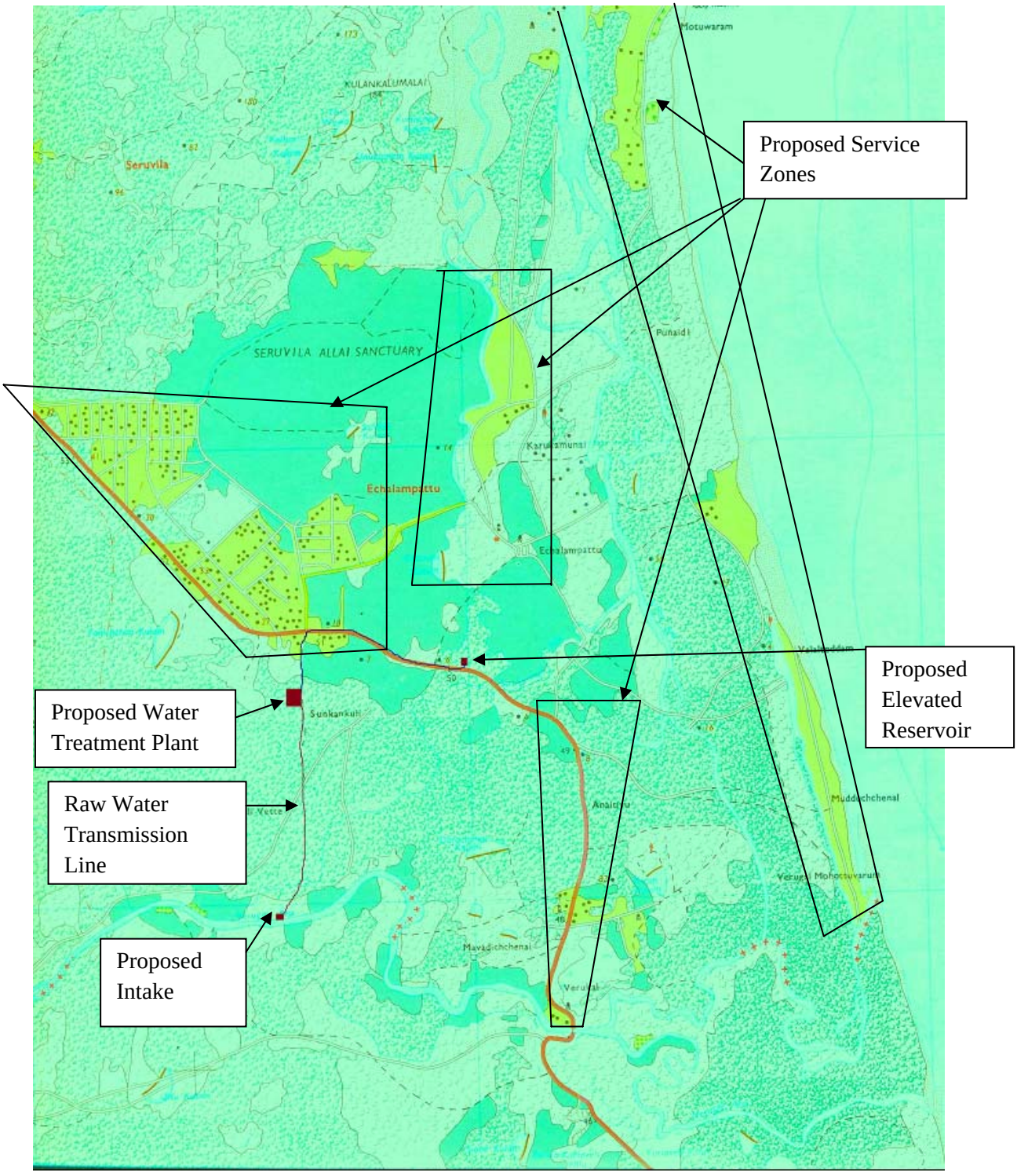
Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	Yes	No	Remarks
• Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)?	√		Only flood and tropical cyclone
▪ Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., changes in rainfall patterns disrupt reliability of water supply; sea level rise creates salinity intrusion into proposed water supply source)?		√	
▪ Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g.,high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		√	
▪ Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)?		√	

* Hazards are potentially damaging physical events.

Appendix I: Environments, Hazards and Climate Changes

Environment	Natural Hazards and Climate Change	Example Impact on Water Supply
Arid/Semi-arid and desert environments	Low erratic rainfall of up to 500 mm rainfall per annum with periodic droughts and high rainfall variability. Low vegetative cover. Resilient ecosystems & complex pastoral and systems, but medium certainty that 10–20% of drylands degraded; 10-30% projected decrease in water availability in next 40 years; projected increase in drought duration and severity under climate change. Increased mobilization of sand dunes and other soils as vegetation cover declines; likely overall decrease in agricultural productivity, with rain-fed agriculture yield reduced by 30% or more by 2020. Earthquakes and other geophysical hazards may also occur in these environments.	Reduced availability of water due to reduced precipitation, increased temperatures, increased water demand and evaporation
Humid and sub-humid plains, foothills and hill country	More than 500 mm precipitation/yr. Resilient ecosystems & complex human pastoral and cropping systems. 10-30% projected decrease in water availability in next 40 years; projected increase in droughts, heatwaves and floods; increased erosion of loess-mantled landscapes by wind and water; increased gully erosion; landslides likely on steeper slopes. Likely overall decrease in agricultural productivity & compromised food production from variability, with rain-fed agriculture yield reduced by 30% or more by 2020. Increased incidence of forest and agriculture-based insect infestations. Earthquakes and other geophysical hazards may also occur in these environments.	Increased landslides and mudflows disrupt water supply networks, water seepage into storage tanks during floods, increased sedimentation and runoff reduce storage capacity and increase maintenance costs
River valleys/deltas and estuaries and other low-lying coastal areas	River basins, deltas and estuaries in low-lying areas are vulnerable to riverine floods, storm surges associated with tropical cyclones/typhoons and sea level rise; natural (and human-induced) subsidence resulting from sediment compaction and ground water extraction; liquefaction of soft sediments as result of earthquake ground shaking. Tsunami possible/likely on some coasts. Lowland agri-business and subsistence farming in these regions at significant risk.	Increased salinity of ground and surface water supplied caused in part by salt water intrusion, contamination of water supplies, physical damage to infrastructure caused by earthquakes
Small islands	Small islands generally have land areas of less than 10,000km2 in area, though Papua New Guinea and Timor with much larger land areas are commonly included in lists of small island developing states. Low-lying islands are especially vulnerable to storm surge, tsunami and sea-level rise and, frequently, coastal erosion, with coral reefs threatened by ocean warming in some areas. Sea level rise is likely to threaten the limited ground water resources. High islands often experience high rainfall intensities, frequent landslides and tectonic environments in which landslides and earthquakes are not uncommon with (occasional) volcanic eruptions. Small islands may have low adaptive capacity and high adaptation costs relative to GDP.	Same as above
Mountain ecosystems	Accelerated glacial melting, rockfalls/landslides and glacial lake outburst floods, leading to increased debris flows, river bank erosion and floods and more extensive outwash plains and, possibly, more frequent wind erosion in intermontane valleys. Enhanced snow melt and fluctuating stream flows may produce seasonal floods and droughts. Melting of permafrost in some environments. Faunal and floral species migration.	Erratic water supply caused by glacial melting, loss of infrastructure investment resulting from rockfalls

Environment	Natural Hazards and Climate Change	Example Impact on Water Supply
	Earthquakes, landslides and other geophysical hazards may also occur in these environments.	
Volcanic environments	Recently active volcanoes (erupted in last 10,000 years – see www.volcano.si.edu). Often fertile soils with intensive agriculture and landslides on steep slopes. Subject to earthquakes and volcanic eruptions including pyroclastic flows and mudflows/lahars and/or gas emissions and occasionally widespread ashfall.	Damage and loss of infrastructure, insecurity for local communities and settlements.


Proposed Service Zones
Proposed Water Treatment Plant
Raw Water Transmission Line
Proposed Intake
Proposed Elevated Reservoir
SERUVILA ALLAI SANCTUARY
Seruvila
Echalampattu
Sunkankuli
Punaidi
Motuwaram
Muddichchenal
Mavadichchenai

Annex-05

SALINITY & ELECTRICAL CONDUCTIVITY - Central Laboratory Telawala Road, Ratmalana

Source of Sample : Verugal River Water - Eachchalampattu

Sample Collected Date : 19.07.2011 (High tide day))

Parameters	Results								Units
	1	2	3	4	5	6	7	8	
	10.30 a.m.	10.35 a.m.	10.40 a.m.	10.45 a.m.	10.55 a.m.	11.05 a.m.	11.17 a.m.	11.30 a.m.	
Salinity	0.021	0.021	0.021	0.021	0.023	0.031	0.031	0.176	g/Kg
Electrical Conductivity	225	225	225	224	231	245	248	555	µS/cm

Location
1 - Proposed Intake
2 - 250m downstream of the proposed Intake
3 - 750m downstream of the proposed Intake
4 - 1Km downstream of the proposed Intake
5 - 2Km downstream of the proposed Intake
6 - 3Km downstream of the proposed Intake
7 - 4Km downstream of the proposed Intake
8 - Near Verugal Bridge

METAL ANALYSIS IN WATER & ENUMERATION OF ALGAE –
Source of Sample : Verugal River Water - Eachchalampattu

Sample Collected Date : 28.03.2011

Source of Sample	Total Algae Count (Cells / ml)						
	Cadmium (as Cd)	Manganese (as MN)	Zinc (as Zn)	Copper (as Cu)	Lead (as Pb)	Chromium (as Cr)	Arsenic (as AS)
Verugal River - Eachchalampattu WWS	ND<0.001	0.018	0.051	ND<0.001	0.008	ND<0.001	ND<0.001

ND : Not Detected

Source of Sample	Total Algae Count (Cells / ml)
Verugal River - Eachchalampattu WWS	$5x10^6$

PHYSICAL AND CHEMICAL ANALYSIS IN WATER –
Central Laboratory Telawala Road, Ratmalana
Source of Sample : Verugal River Water - Eachchalampattu

Sample Collected Date : 28.03.2011

	Parameters	Results	SLS 614 : Part I : 1983 Specification		Units
			Max. desirable level	Max. Permissible level	
	PHYSICAL QUALITY				
1	Colour	120	5	30	Hazen units
2	Turbidity	50.4	2	8	NTU
	CHEMICAL QUALITY				
1	pH	7.3	7.0-8.5	6.5-9.0	
2	Electrical conductivity	170	750	3500	µS/cm
3	Chloride (as Cl)	6.9	200	1200	mg/l
4	Free residual chlorine (as Cl_2)	-	-	0.2	mg/l
5	Alkalinity (Total as $CaCO_3$)	60	200	400	mg/l
6	Free Ammonia	Nil	-	0.06	mg/l
7	Nitrate (as N)	0.92	-	10	mg/l
8	Nitrite (as N)	0.019	-	0.01	mg/l
9	Fluoride (as F)	0.19	0.6	1.5	mg/l
10	Total phosphate (as PO_4)	0.09	-	2	mg/l
11	Total residue	103	500	2000	mg/l
12	Total hardness(as CaCO3)	80	250	600	mg/l
13	Total iron (as Fe)	1.3	0.3	1	mg/l
14	Sulphate (as SO_4)	2	200	400	mg/l
15	Manganese (as Mn)	0.002	0.05	0.5	mg/l

WATER QUALITY REPORTS FOR EACHCHALAMPATTU WATER SUPPLY PROJECT

PESTICIDE RESIDUES ANALYSIS - ITI

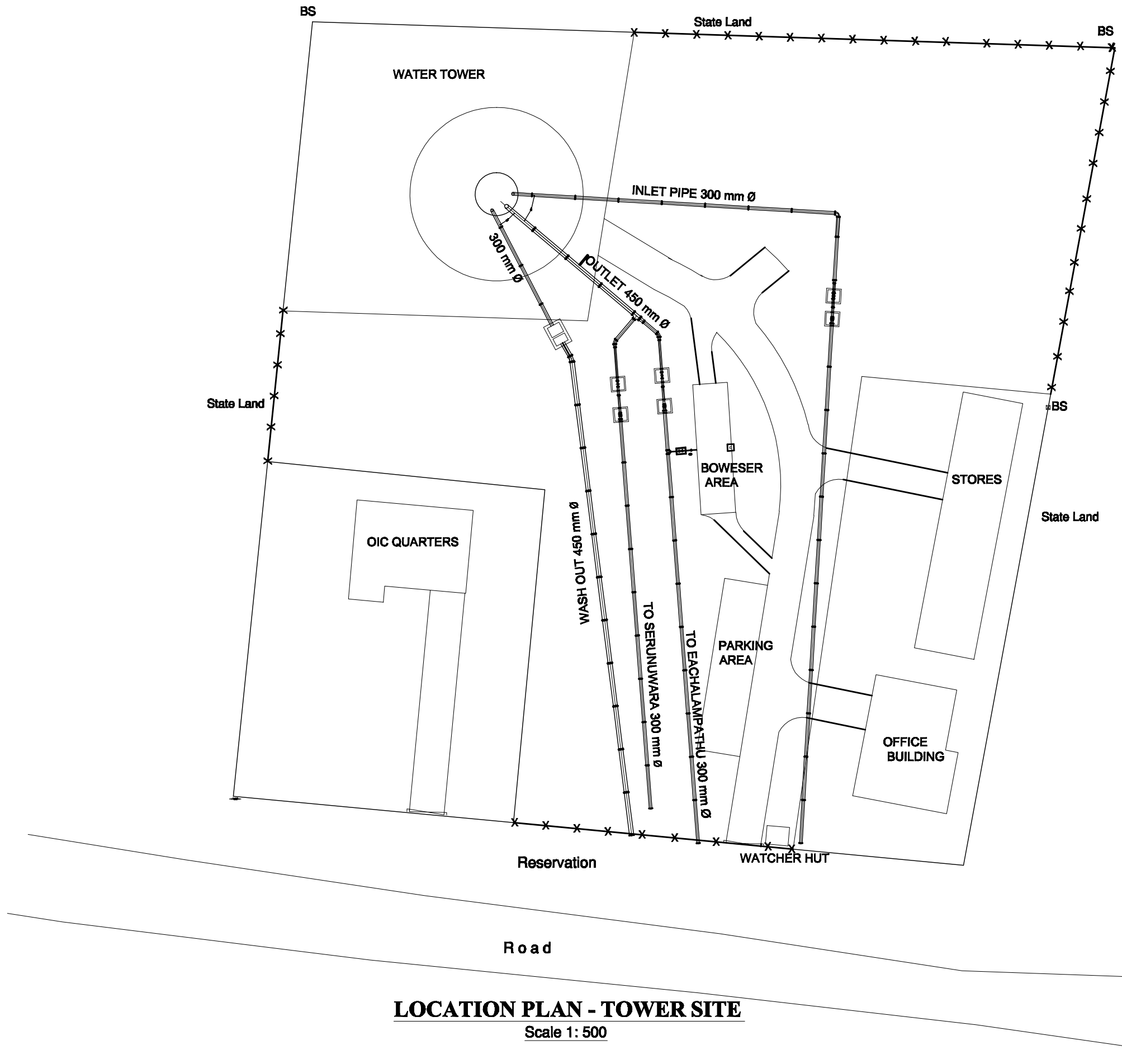
Source of Sample : Verugal River Water - Eachchalampattu

Sample Collected Date		29.03.2011	04.05.2011	02.06.2011	Limit of determination µg/L
Test Method		CML/MM/W&WS/022	CML/MM/W&WS/022	CML/MM/W&WS/022	
Test		Testvalues, µg/L	Testvalues, µg/L	Testvalues, µg/L	
#*	α-HCH	Not detected	Not detected	Not detected	0.08
#*	β-HCH	Not detected	Not detected	Not detected	0.08
#*	γ-HCH	Not detected	Not detected	Not detected	0.08
#*	δ-HCH	Not detected	Not detected	Not detected	0.08
#*	Aldrin	Not detected	Not detected	Not detected	0.08
#*	Dieldrin	Not detected	Not detected	Not detected	0.08
#*	Heptachlor	Not detected	Not detected	Not detected	0.08
#*	Heptachlorepoxide	Not detected	Not detected	Not detected	0.08
#*	Endrin	Not detected	Not detected	Not detected	0.08
#*	Endrin aldehyde	Not detected	Not detected	Not detected	0.08
#*	Endosulfan I	Not detected	Not detected	Not detected	0.08
#*	Endosulfan II	Not detected	Not detected	Not detected	0.08
#*	Endosulfan sulphate	Not detected	Not detected	Not detected	0.08
#*	p.p' DDE	Not detected	Not detected	Not detected	0.08
	o.p. DDT	Not detected	Not detected	Not detected	0.08
#*	p.p' DDT	Not detected	Not detected	Not detected	0.08
#*	o.p' DDD	Not detected	Not detected	Not detected	0.08
#*	p.p' DDD	Not detected	Not detected	Not detected	0.08
#*	HCB	Not detected	Not detected	Not detected	0.08
#*	Triflurin	Not detected	Not detected	Not detected	0.08
#*	Chorpyrifos	Not detected	Not detected	Not detected	1
#*	Dimethoate	Not detected	Not detected	Not detected	1
#*	Diazinon	Not detected	Not detected	Not detected	1
#*	Captan	Not detected	Not detected	Not detected	1
#*	Fenitrothion	Not detected	Not detected	Not detected	1
	Pirimiphos	Not detected	Not detected	Not detected	1
#*	Profenofos	Not detected	Not detected	Not detected	1
#*	Malathion	Not detected	Not detected	Not detected	1
#*	Phenthoate	Not detected	Not detected	Not detected	1
	Parathion	Not detected	Not detected	Not detected	1
	Parathion Methy I	Not detected	Not detected	Not detected	1
	Penthion	Not detected	Not detected	Not detected	1
#*	Pirimiphos methy I	Not detected	Not detected	Not detected	1

Sample Collected Date		29.03.2011	04.05.2011	02.06.2011	Limit of determination µg/L
Test Method		CML/MM/W&WS/022	CML/MM/W&WS/022	CML/MM/W&WS/022	
Test		Testvalues, µg/L	Testvalues, µg/L	Testvalues, µg/L	
	Quinalphos	Not detected	Not detected	Not detected	2
	Carbofuran	Not detected	Not detected	Not detected	2
	Chlorothalonil	Not detected	Not detected	Not detected	2
	Propanil	Not detected	Not detected	Not detected	2
	Metalaxy I	Not detected	Not detected	Not detected	1
	Alachlor	Not detected	Not detected	Not detected	2
	Fipronil	Not detected	Not detected	Not detected	2
	Fenemiphos	Not detected	Not detected	Not detected	2
	Oxyflorfen	Not detected	Not detected	Not detected	2
	Ethion	Not detected	Not detected	Not detected	2
	Carbaryi	Not detected	Not detected	Not detected	2

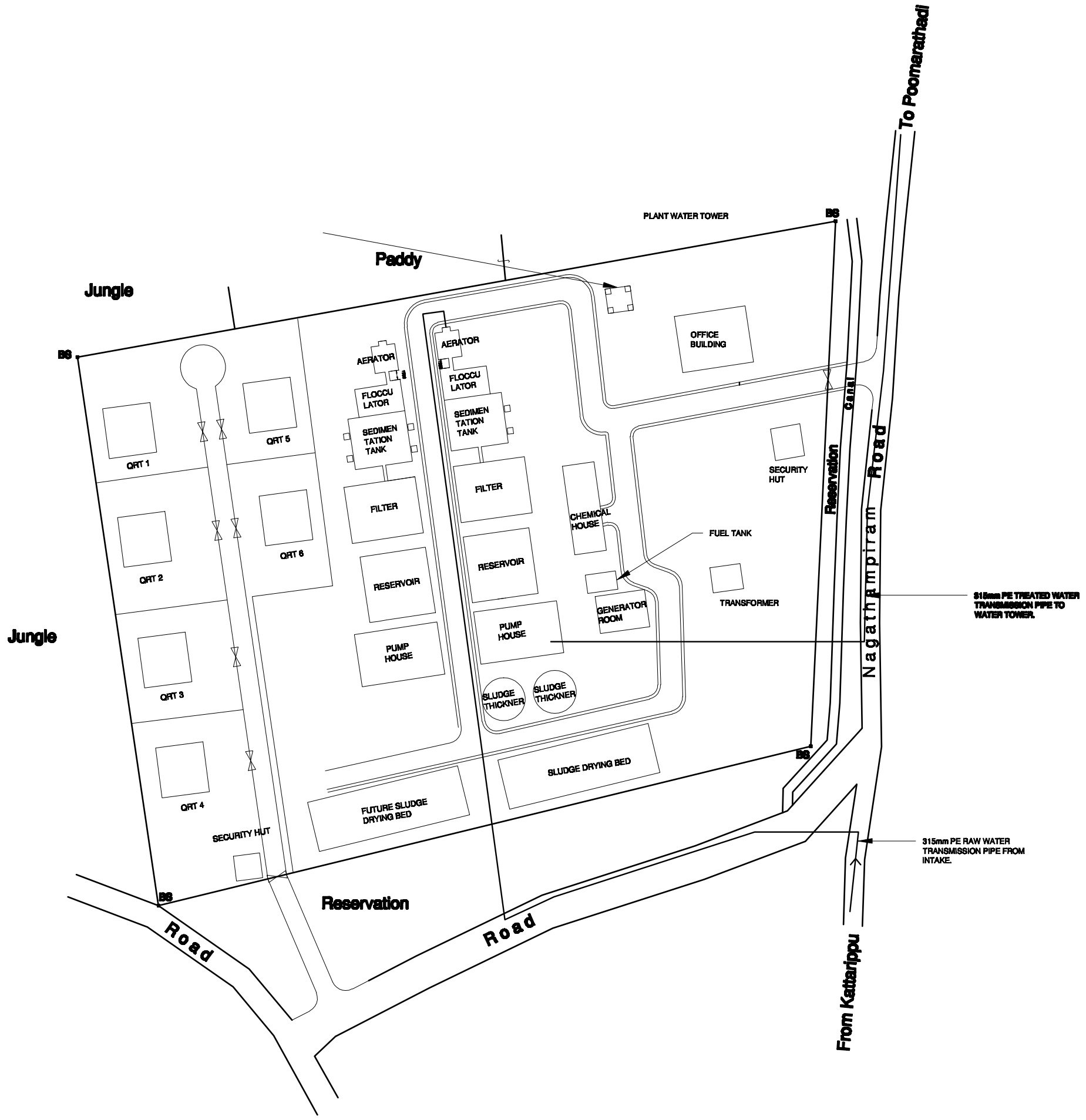
- SLABA Accredited test

* - SWEDAC Accredited test

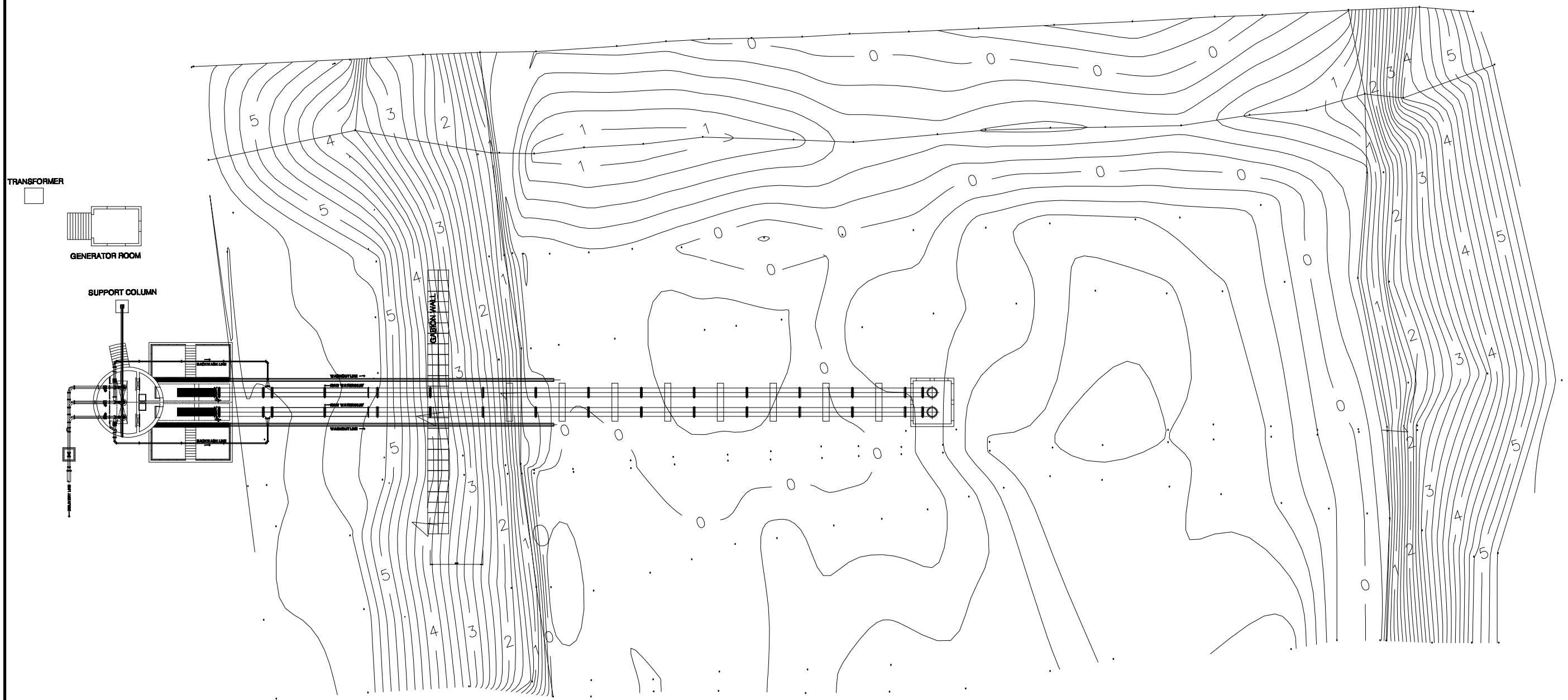


LOCATION PLAN - TOWER SITE

Scale 1: 500



WATER TREATMENT PLANT
LAY OUT PLAN



NOTE:-

1. [redacted]
2. [redacted]

ජාතික ජලසම්පාදන හා ජලාපවහන මණ්ඩලය

தேசிய நீர் வழங்கல் வடிகாலமைப்புச் சபை

NATIONAL WATER SUPPLY AND DRAINAGE BOARD

CONFLICT AFFECTED REGIONAL EMERGENCY PROJECT

EACHCHALAMPATTU WATER SUPPLY SCHEME

INTAKE SITE

LAY-OUT MAP

REV.	DESCRIPTION	DATE	SIGN.

Sriyas DRAWN	D.O.A.(D)	W1062/SP/03 Drg.No,
ENGINEER (D)	C.E. (D)	27-07-2011 DATE
A.G.M. (P&D)/SPECIALIST	D.G.M. (P&D)	

ANNEX - 9

Farmers Name List

1.	K. Anpurasa	Palathadichchenai, Mutur.
2.	M. Ramanan	Palathadichchenai, Mutur.
3.	K. Yoheshwaran	Palathadichchenai, Mutur.
4.	I. Somathas	Palathadichchenai, Mutur.
5.	A. Konalingam	Palathadichchenai, Mutur.
6.	V. Sujeeharan	Palathadichchenai, Mutur.
7.	M.K. Nihmathulla	Arabic College Road, Mutur 05.
8.	M.S. Samed	Bazaar Mosque Road, Mtutur 05.
9.	A.S. Mousoon	Iqbal Road, Mutur 06.
10.	M. Jawath	Knox Road, Mutur 06.
11.	A.V. Ubaithulla	Palathoppur, Thoppur.
12.	V. Inamulla	Palathoppur, Thoppur.
13.	V.T. Caseen	Palathoppur, Thoppur.
14.	S. Pichchaithamby	Palathoppur, Thoppur.
15.	H.M. Aslam	Palathoppur, Thoppur.
16.	N.M. Alifukhan	Palathoppur, Thoppur.
17.	M.M. Rafeek	Palathoppur, Thoppur.
18.	M. Kabeer	Palathoppur, Thoppur.
19.	S. Idroos	Palathoppur, Thoppur.
20.	K. Akmal	Palathoppur, Thoppur.